

Technical Documentation
Part 1 Mechanic

Transformer Lamination Cut-to-Length Line
TBA/ME/EL 400 x 2000 PBT

Order-No: 46072

GEORG Works Ref.-No.: 4295 - 2 - 06

Technical Documentation



HEINRICH GEORG GMBH
MASCHINENFABRIK

Contents

4295 - 2 - 06

File 1 of 1

1. **Bedienungsanleitung**
Operating instruction
2. **Anlagenzeichnung**
Line's layout
3. **Technische Daten - Grenzwertblätter**
Technical data - Limit Value Sheets
- 4.
5. **Anlagenaufbau**
Description of units
6. **Instandhaltung**
Maintenance
7. **Schmieranweisung / Schmierplan**
Lubrication instructions / Lubrication plan
8. **Schneidwerkzeuge**
Cutting tools
9. **Hydraulik**
Hydraulic system
10. **Pneumatik**
Pneumatic system
11. **Ersatzteilliste**
Spare part list
12. **Fundamentplan**
Foundation drawing
13. **Zukaufteile**
External parts
- 14.
15. **Technische Richtlinien**
Technical Information
- 16.

Technische Dokumentation

Technical Documentation



HEINRICH GEORG GMBH
MASCHINENFABRIK

Kapitel 1

Chapter 1

Inhaltsverzeichnis

Contents

- 1. Betriebsanleitung**
Instrucciones para el uso

Seite 1 – 148
Página



Capítulo 1

Instrucciones para el uso

Instrucciones para el uso

Preliminary
de

TBA / ME / EL 400 X 2000 PB / T

Número del contrato : 46072
Número de pedido GEORG: 4295 - 2 - 06

Este boceto de instrucciones para el uso deberá ser completado o modificado in situ.
La redacción definitiva incluirá las modificaciones y complementos y será traducida al idioma del país.

Ident-Nr.: 4295 baes.doc	Revisión 0	Redactado por: opper 07.11.07 13:32 Impr: 08.11.07 10:18	Entrega QS: Entrega MB: Entrega ST:	Página 1 de 148
-----------------------------	------------	--	---	--------------------



Capítulo 1 Instrucciones para el uso

i

Índice

Página

1.	Servicio posventa / de urgencia.....	8
2.	Zur Betriebsanleitung	9
2.1.	<i>Prefacio de las instrucciones para el uso</i>	<i>9</i>
2.2.	<i>¡Normas generales de seguridad!</i>	<i>10</i>
2.3.	<i>Indicaciones de aviso y señales de seguridad</i>	<i>10</i>
2.4.	<i>Referencias cruzadas.....</i>	<i>10</i>
3.	Datos técnicos	11
3.1.	<i>GEORG robot de soldadura para cubas de paredes coarrugadas.....</i>	<i>11</i>
3.2.	<i>Material de entrada.....</i>	<i>11</i>
3.3.	<i>Residuos de producción</i>	<i>11</i>
3.4.	<i>Material terminado.....</i>	<i>11</i>
3.5.	<i>Datos sobre rendimiento</i>	<i>12</i>
3.6.	<i>Nivel de ruido</i>	<i>12</i>
4.	Descripción del funcionamiento	13
4.1.	<i>Modos de funcionamiento</i>	<i>13</i>
4.2.	<i>Manual.....</i>	<i>13</i>
4.3.	<i>Funcionamiento automático</i>	<i>14</i>
5.	Instrucciones de seguridad.....	15
5.1.	<i>Uso conforme al previsto de la máquina / instalación.....</i>	<i>15</i>
5.2.	<i>Medidas organizativas básicas.....</i>	<i>16</i>
5.3.	<i>Selección y calificación de personal; obligaciones básicas.....</i>	<i>17</i>
5.4.	<i>Régimen de servicio normal</i>	<i>19</i>
5.5.	<i>Trabajos especiales dentro del margen de utilización de una determinada máquina / instalación, actividades de conservación y mantenimiento y eliminación de averías en régimen de servicio; descontaminación.....</i>	<i>19</i>
5.6.	<i>Energía eléctrica.....</i>	<i>22</i>



Capítulo 1 Instrucciones para el uso

5.7.	Gas, polvo, vapor, humo	22
5.8.	Sistemas hidráulicos y neumáticos.....	23
5.9.	Ruidos	23
5.10.	Aceites, grasas y otras sustancias químicas	23
6.	Ingeniería de seguridad	25
6.1.	Introducción a la descripción de los dispositivos de protección.....	25
6.2.	Puertas de acceso con bloqueo eléctricamente desenclavable y contacto de seguridad	25
6.3.	Zugriffsfenster mit elektrisch entsperrbarer Verriegelung und Sicherheitskontakt	28
6.4.	Barreras de luz de seguridad	29
6.5.	Las zonas peligrosas de la máquina / instalación	29
6.6.	Hinweise zu Antrieben die nicht von der Energiezufuhr getrennt werden.....	40
6.7.	Marcaciones de seguridad	40
6.8.	Marcaciones de seguridad por colores de advertencia	40
6.9.	Señales prescriptivas en la máquina / instalación	41
6.10.	Señales de prohibición en la máquina / instalación	42
6.11.	Señales de advertencia en la máquina / instalación.....	43
6.12.	Señales informativas en la máquina / instalación	45
7.	Peligros residuales.....	47
7.1.	El personal de operación y mantenimiento.....	47
7.2.	Informaciones sobre peligros residuales en los grupos de la máquina / instalación	48
8.	Lugares y zonas de trabajo	56
8.1.	Lugares de trabajo establecidos en la máquina / instalación	56
8.2.	Plano de situación de los lugares de trabajo para los operarios	57
9.	Interruptores relevantes desde el punto de vista de la seguridad para desconectar la máquina / instalación	59
9.1.	Dispositivo de desconexión de la red	59
9.2.	Circuito de PARADA DE EMERGENCIA.....	59
9.3.	Interruptor de seguridad	60
9.4.	Dispositivo de validación	60
9.5.	Sistemas de transferencia por llave.....	61



Capítulo 1 Instrucciones para el uso

10.	Descripción de los elementos de control e indicaciones Funciones eléctricas	62
10.1.	Índice de las abreviaturas y símbolos empleados para los elementos de control e indicaciones.	62
10.2.	Armario de distribución	63
10.3.	Pupitre de mando principal +P1	65
10.4.	Pupitre de mando principal +P1	67
10.5.	Pupitre de mando principal +P1	76
10.6.	Pupitre de mando avance +P2	78
10.7.	Aspa desarrolladora +M2	86
10.8.	Dispositivo de validación aspa desarrolladora ZT1	86
10.9.	Drucktastergehäuse puerta de acceso T2 +S2.1	87
10.10.	Pupitre de mando apilado +P3	88
10.11.	Drucktastergehäuse instalación de apilado +M12	97
10.12.	Instalación de apilado +M10	98
10.13.	Drucktastergehäuse carro de apilado 1 +S3.1	98
10.14.	Drucktastergehäuse carro de apilado 1 2 +S3.2	98
10.15.	Pulsadores adicionales de PARADA DE EMERGENCIA	99
11.	Descripción de los elementos de control e indicaciones Funciones no eléctricas	100
11.1.	Elementos de control e indicaciones para el sistema mecánico	100
11.2.	Elementos de control e indicaciones para el sistema neumático	100
11.3.	Elementos de control e indicaciones para el sistema hidráulico	101
12.	Montaje, puesta en marcha y desmontaje de la máquina / instalación	102
12.1.	Introducción	102
12.2.	Otras indicaciones	102
12.3.	Desmontaje y retirada	102
13.	Conectar la máquina / instalación	103
13.1.	Directrices básicas para la conexión	103
13.2.	Conectar el dispositivo de desconexión de la red	103
13.3.	Medidas prescritas de control	103
13.4.	Conectar la tensión de mando	104



Capítulo 1 Instrucciones para el uso

13.5.	<i>Conectar las cintas transportadoras</i>	104
14.	Ajustar la máquina / instalación	105
14.1.	<i>Indicaciones generales</i>	105
14.2.	<i>Introducir los datos de producción</i>	105
14.3.	<i>Preparar la máquina / instalación para la producción</i>	105
14.4.	<i>Alimentar la máquina / instalación con material de producción</i>	105
14.5.	<i>Alimentar la máquina / instalación con material de producción</i>	105
14.6.	<i>Función de reglaje para el sistema de medición longitudinal</i>	107
15.	Funcionamiento automático de la máquina / instalación	109
15.1.	<i>Inicio del funcionamiento automático de la máquina / instalación</i>	109
15.2.	<i>Funcionamiento automático</i>	109
15.3.	<i>Detención del funcionamiento automático de la máquina / instalación</i>	109
16.	Toma del material de producción	112
16.1.	<i>Indicaciones generales</i>	112
16.2.	<i>Preparar el material de producción para su transporte de salida</i>	112
16.3.	<i>Toma del material de producción</i>	112
17.	Eliminación de los residuos de producción	114
17.1.	<i>Posiciones en la máquina / instalación donde se producen residuos de producción</i>	114
17.2.	<i>Toma del material restante</i>	114
17.3.	<i>Toma de los residuos de producción</i>	115
18.	Reparación de averías de producción	117
18.1.	<i>Indicaciones generales</i>	117
18.2.	<i>Averías por oscilaciones de la tolerancia en la cinta de entrada</i>	117
18.3.	<i>Procedimiento en caso de averías de producción</i>	117
19.	Reparación de averías de la máquina / instalación	119
19.1.	<i>Indicaciones generales</i>	119
19.2.	<i>Directrices para la desconexión</i>	119
20.	Desconectar la máquina / instalación	120
20.1.	<i>Indicaciones importantes para la desconexión</i>	120



Capítulo 1 Instrucciones para el uso

20.2. Desconectar	120
21. Desconectar la máquina / instalación para mantenimiento y reparación ..	121
21.1. Directrices generales de desconexión	121
21.2. Desconectar la alimentación eléctrica	121
21.3. Bloquear el suministro hidráulico	122
21.4. Bloquear el suministro neumático	123
22. Limpieza de la máquina / instalación	124
22.1. Indicaciones generales	124
22.2. Preparación para la limpieza	124
23. Mantenimiento de la máquina / instalación	126
23.1. Indicaciones generales	126
23.2. Comprobar el funcionamiento de los dispositivos de seguridad	127
23.3. Cambio de cuchilla en una cizalla	127
23.4. Cambio de cuchilla en un punzón en V	128
23.5. Cambio de herramienta en una punzonadora	130
24. Instrucciones de lubricación de la máquina / instalación	132
24.1. Indicaciones generales	132
24.2. Lubricantes	132
25. Directrices de mantenimiento para el sistema hidráulico	133
25.1. Indicaciones generales	133
25.2. Filtros hidráulicos	134
25.3. Aceite hidráulico	134
26. Directrices de mantenimiento para el sistema neumático	135
26.1. Indicaciones generales	135
26.2. Filtros neumáticos	136
26.3. Aceitadores de aire comprimido	136
27. Conservación de la máquina / instalación	137
27.1. Indicaciones generales	137
27.2. Directrices de seguridad	138
27.3. Medidas preventivas	138



Capítulo 1 Instrucciones para el uso

27.4.	<i>Conservación de los componentes mecánicos</i>	139
27.5.	<i>Conservación de la instalación hidráulica.....</i>	139
27.6.	<i>Conservación de la instalación neumática</i>	140
27.7.	<i>Conservación de los componentes electrotécnicos.....</i>	140
28.	Listas de recambios para la máquina / instalación	142
28.1.	<i>Indicaciones generales sobre listas de recambios</i>	142
28.2.	<i>Lista de recambios de los componentes mecánicos</i>	142
28.3.	<i>Lista de recambios de los componentes hidráulicos</i>	142
28.4.	<i>Lista de recambios de los componentes neumáticos</i>	142
28.5.	<i>Lista de recambios de los componentes electrotécnicos.....</i>	143
29.	Informe sobre la medición de ruido en los lugares de trabajo.....	144



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

1. Servicio posventa / de urgencia

- 1.1.1. En caso de surgir problemas o preguntas en relación con las instrucciones para el uso o con la máquina / instalación, dirijase por favor sin demora a la siguiente dirección en Alemania:

**HEINRICH GEORG GMBH
MASCHINENFABRIK**
Siegener Straße 73 - 83
D 57223 Kreuztal

Tel.: 02732 - 779 - 0
Fax.: 02732 - 779 - 365
Internet: www.georg.com
E-mail: georg@georg.com

- 1.1.2. Por favor, indique en todas sus consultas el siguiente número de pedido de **HEINRICH GEORG GMBH MASCHINENFABRIK** para esta máquina / instalación:

4295 - 2 - 06



Capítulo 1 Instrucciones para el uso

2. Zur Betriebsanleitung

2.1. *Prefacio de las instrucciones para el uso*

- 2.1.1. Die Beschreibung der Sicherheitstechnik und die Sicherheitshinweise in dieser Betriebsanleitung wurden nach den Vorgaben der 'Gefahrenanalyse, Risikobewertung und Schutzmaßnahmen', Stand: 08. 06. 2005, ausgeführt.
- 2.1.2. Las presentes instrucciones para el uso tienen la misión de facilitar los conocimientos sobre una determinada máquina / instalación y sus posibilidades de aplicación o uso.
- 2.1.3. Dichas instrucciones comprenden informaciones importantes de cómo hacer funcionar la citada instalación / máquina de forma segura, adecuada y económica. Al observar las mismas ello contribuye a que sean evitados peligros, disminuidos los gastos de reparación y períodos muertos y aumentada la seguridad funcional y la vida útil de la máquina / instalación en cuestión.
- 2.1.4. Las presentes instrucciones han de complementarse introduciendo las pertinentes normas nacionales para la prevención de accidentes y de protección medioambiental.
- 2.1.5. **Las instrucciones para el uso deben estar disponibles en todo momento en el lugar de uso de la respectiva máquina / instalación.**
- 2.1.6. **Dichas instrucciones han de ser estudiadas y aplicadas por toda aquella persona que esté encargada de llevar a cabo los siguientes trabajos que tengan que ver con la máquina / instalación:**
- **servicio** inclusive preparación de la maquinaria, eliminación de fallos en régimen de funcionamiento, eliminación de residuos de producción, conservación, descontaminación de combustibles y materiales auxiliares;
 - **conservación** (mantenimiento, inspección, reparación) y / o
 - **transporte**
- 2.1.7. Estas instrucciones para el uso han sido redactadas con el máximo nivel de exigencia. Sin embargo, no es posible excluir absolutamente la existencia de errores. No se asume ninguna responsabilidad por informaciones erróneas ni por sus consecuencias.
- 2.1.8. En caso de posibles dudas o dificultades de interpretación, será siempre la redacción alemana de estas instrucciones para el uso la que sirva de norma.

Capítulo 1 Instrucciones para el uso

2.2. *¡Normas generales de seguridad!*

- 2.2.1. Es necesario leer y comprender en todas sus partes estas instrucciones para el uso antes de la puesta en marcha.
- 2.2.2. La respectiva máquina / instalación se ha construido siguiendo las reglas del arte reconocidas en materia de seguridad. A pesar de ello, los usuarios o terceros pueden correr graves riesgos y / o causarse daños materiales en la máquina y otros valores reales.
- 2.2.3. La respectiva máquina / instalación debe utilizarse solamente en estado técnicamente idóneo y para el uso previsto, el usuario ha de ser consciente de los peligros, observando lo indicado en las instrucciones para el uso. Cabe decir que son especialmente todas aquellas averías por las que quede afectada la seguridad funcional que deben eliminarse sin demora.
- 2.2.4. Es imprescindible observar en todos los trabajos las directrices nacionales y técnicas sobre prevención de accidentes.

2.3. *Indicaciones de aviso y señales de seguridad*

- 2.3.1. Las indicaciones especialmente importantes se identifican adicionalmente en las instrucciones para el uso mediante señales de seguridad:

Señales de seguridad son p. ej.:



¡Las señales de seguridad dan indicaciones importantes para la seguridad en el trabajo!

PELIGRO!



Informaciones, avisos preceptivos y prohibitivos para la prevención de daños personales o daños materiales de consideración.

2.4. *Referencias cruzadas*

- 2.4.1. Las referencias cruzadas se indican en estas instrucciones para el uso mediante el símbolo .
-  II; 5; 8 significa: En la Documentación Técnica parte II archivo 5 capítulo 8 encontrará más información.
-  II; ∞; ∞ significa: En la Documentación Técnica parte II en todos los archivos y en todos los capítulos encontrará más información.
-   4.0 significa: En estas instrucciones para el uso en el apartado 4.0 encontrará más información.
-  ? ; ? significa: no hay disponible más información.



Capítulo 1 Instrucciones para el uso

3. Datos técnicos

3.1. GEORG

3.1.1. Typ: TBA / ME / EL 400 x 2000 PB / T.

3.1.2. Das Material, das mit der Maschine / Anlage bearbeitet werden soll, muss die im Abschnitt 3.2 dieser Betriebsanleitung genannten Qualitätsmerkmale erfüllen. Die dort genannten Grenzwerte dürfen nicht überschritten oder unterschritten werden.

3.1.3. La máquina / instalación está concebida para desarrollar, mecanizar, cortar y apilar chapas para transformadores de forma continua.

3.2. *Material de entrada*

3.2.1. Chapa para transformador: kornorientiert EU - Norm 10107;

3.2.2. Grosor de cinta: min.: 0,23 mm;
máx.: 0,35 mm;

3.2.3. Ancho de cinta: min.: 50 mm;
max.: 440 mm;

3.2.4. Diámetro interior de bulto: min.: 495 mm;
máx.: 510 mm;

3.2.5. Diámetro exterior de bulto: máx.: 1000 mm;

3.2.6. Peso de bulto: máx.: 2000 kg;

3.3. *Residuos de producción*

3.3.1. Die bei der Produktion entstehenden Blechabfälle werden in Behältern gesammelt.

3.4. *Material terminado*

3.4.1. Longitud de corte: min.: 250 mm (longitud media);
máx.: 2000 mm (longitud media);

3.4.2. Altura de apilado: máx.: 450 mm incl. canales de refrigeración y material aislante;

3.4.3. Stapelgewicht:
Gesamtgewicht untere Stapelebene: max.: 6000 kg;
Gesamtgewicht obere Stapelebene: max.: 4000 kg;



Capítulo 1

Instrucciones para el uso

3.5. Datos sobre rendimiento

3.5.1. Velocidades:

Velocidad de introducción: aprox.: 20 m / min; (regulable)

Velocidad de avance de la cinta: 0 - 240 m / min; (regulable)

Cintas transportadoras y apiladoras para
chapas para transformadores: aprox.: 250 m / min;

3.5.2. Tiempos de frenado:

Parada rápida de

240 m / min → 0 m / min: aprox.: 0,2 sec; (sólo avance)

3.5.3. Parada de emergencia de 240 m / min → 0 m / min:

Accionamientos con dispositivo de frenado:

aprox.: 0,5 sec;

Accionamientos sin dispositivo de frenado:

¡no definido!

En caso de PARADA DE EMERGENCIA se desconectan los accionamientos de la alimentación de energía y siguen rodando durante distintos periodos según su masa móvil.

3.5.4. Carro apilado

aprox.: 6 m / min;

3.6. Nivel de ruido

3.6.1. El nivel de ruido en los lugares de trabajo de la máquina / instalación depende del correspondiente material de producción y sus dimensiones, así como de la velocidad de producción.

3.6.2. Las mediciones del ruido realizadas en los lugares de trabajo de una instalación de corte comparable para chapas de transformadores dieron como resultado un nivel máximo de intensidad acústica continua de 76 db (A).

☞ 29;



Capítulo 1 Instrucciones para el uso

4. Descripción del funcionamiento

4.1. *Modos de funcionamiento*

4.1.1. La máquina / instalación permite los siguientes modos de funcionamiento:

Modo de funcionamiento 'manual'

Funcionamiento parcialmente automático

Modo de funcionamiento 'automático'

4.2. *Manual*

4.2.1. En este modo de funcionamiento se activan todos los movimientos de la máquina / instalación pulsando los correspondientes elementos de control.

4.2.1.1. **Funcionamiento por pulsador**

Los movimientos de la máquina / instalación tienen lugar solamente mientras un operario esté pulsando el correspondiente elemento de mando.

4.2.1.2. **Funcionamiento parcialmente automático**

Determinados movimientos de la máquina / instalación son activados pulsando el correspondiente elemento de control y luego se desarrollan hasta su término de forma automática. Jede Teilautomatik kann auch von der Bedienungsperson ausgeschaltet werden.

➤ **Posicionar guía lateral**

El ancho de cinta necesario para la producción se determina en la máquina / instalación con los datos de producción. Utilizando la función parcialmente automática "posicionar guía lateral" se pueden ajustar las guías laterales de cinta antes de la introducción de la cinta al ancho de cinta prescrito por el ordenador de la instalación.

Dependiendo de la tolerancia de anchura y de la calidad de la cinta puede ser necesario corregir este ajuste teórico.

➤ **Posicionar apilado**

Die Stapelebenen müssen einen bestimmtem Abstand zu den Paletten bzw. zu der Stapeloberkante haben. Nur wenn dieser Abstand eingehalten wird können optimale Stapelergebnisse erzielt werden. Durch die Anwendung der Teilautomatik „Posicionar apilado“ werden die Stapelebenen automatisch in die optimale Position gestellt.

➤ **Posicionar carro apilado**

Die Ablage - Positionen der fertigen Bleche auf den Stapelwagen werden der Maschine / Anlage mit den Produktionsdaten vorgegeben. Durch die Anwendung der Teilautomatik „Posicionar carro apilado“ können die Stapelwagen vor Produktionsbeginn automatisch in die vom Anlagenrechner vorgegebenen Positionen gefahren werden.

➤ **Reglaje**



Capítulo 1 Instrucciones para el uso

El sistema de medición longitudinal explora los movimientos de la cinta con un rodillo de medición. Por ello, el valor de fricción de la superficie de la cinta tiene una influencia sobre la exactitud de la medición que no se puede despreciar. Utilizando la función parcialmente automática "reglaje", el sistema de medición se ajusta automáticamente a los distintos valores de fricción. El operario puede llamar la función de reglaje o seleccionar la ejecución automática de la función de reglaje tras cada cambio de cinta por medio de un conmutador selector.

➤ Programa final

Un comienzo de cinta sólo se puede introducir sin problemas en la máquina / instalación si está recortado en forma de cuña. Una vez alcanzado el objetivo de producción, el comienzo de cinta puede ser automáticamente recortado por medio de la función parcialmente automática "programa final". Entonces, la cinta será llevada de vuelta hasta el grupo de avance. El bucle de cinta se acorta hasta el tamaño mínimo por el aspa desarrolladora.

4.3. *Funcionamiento automático*

- 4.3.1. En este modo de funcionamiento, todos los movimientos de la máquina / instalación son activados y vigilados por el mando.
- 4.3.2. En el modo de funcionamiento 'automático', la producción en la máquina / instalación se realiza sin interrupción a la velocidad ajustada hasta alcanzar el objetivo productivo o hasta que se detecta el final de la cinta.
- 4.3.3. La producción también puede ser interrumpida por un operario a través de las correspondientes instrucciones de mando.
- 4.3.4. En la medida de lo posible, el mando vigila continuamente el proceso de producción de la máquina / instalación. Adicionalmente se realiza una amplia autovigilancia de cada uno de los componentes del mando. Tan pronto como el mando detecta una avería o error importante en el proceso de producción o en algún componente del mando, la máquina / instalación se frena reguladamente y con la mayor rapidez.



Capítulo 1 Instrucciones para el uso

5. Instrucciones de seguridad

5.1. *Uso conforme al previsto de la máquina / instalación*

- 5.1.1. La máquina / instalación está concebida exclusivamente para el procesamiento de los materiales indicados en estas instrucciones para el uso, capítulo 3 'Datos técnicos de la máquina / instalación'.
- 5.1.2. Los valores límite indicados en el capítulo 3 'Datos técnicos de la máquina / instalación' no podrán ser rebasados ni por exceso ni por defecto.
- 5.1.3. Cualquier uso distinto o que exceda de lo previsto (p. ej. para material más grueso o para material con superior resistencia o de peor calidad) se considera no conforme al previsto. El **HEINRICH GEORG GMBH MASCHINENFABRIK** no se hace responsable de los daños de ello resultantes. El usuario asume todos los riesgos.
- 5.1.4. Por lo que respecta al uso conforme al previsto ha de dejarse constancia de que en dicho concepto entra incluso el de observar las instrucciones para el uso y cumplir con las condiciones de inspección y conservación / mantenimiento.
- 5.1.5. Hacer funcionar la máquina / instalación sin dispositivos de protección o en un estado técnico no perfecto se considera uso no conforme al previsto. El **HEINRICH GEORG GMBH MASCHINENFABRIK** no se hace responsable de los daños de ello resultantes. El usuario asume todos los riesgos.



Capítulo 1 Instrucciones para el uso

5.2. *Medidas organizativas básicas*

- 5.2.1. Las instrucciones para el uso deben guardarse siempre a mano, en el compartimiento previsto y señalizado para ello del pupitre de mando principal.
- 5.2.2. Además de las instrucciones para el uso deben observarse también todas las normativas de validez general, legales y obligatorias de otro tipo para la prevención de accidentes y la protección del medio ambiente. Todos los operarios deben ser correspondientemente instruidos. Esto se refiere también a la manipulación de sustancias peligrosas, el uso de gafas protectoras, calzado de seguridad y todo tipo de dispositivos de protección.
- 5.2.3. Las instrucciones para el uso deberán ser completadas por el explotador de la máquina / instalación mediante anotaciones de servicio (obligación de vigilancia y aviso para el control de particularidades de servicio).
- 5.2.4. El personal encargado de atender una determinada máquina debe haber estudiado las pertinentes instrucciones para su uso y haberse familiarizado a fondo, especialmente, con el capítulo dedicado a la seguridad, antes de dar comienzo a los trabajos en la máquina en cuestión. Ello es de especial aplicación a todo aquel personal cuyo servicio en los trabajos de reparación, conservación y mantenimiento de la máquina sea de carácter ocasional.
- 5.2.5. Deben controlarse, al menos ocasionalmente, los trabajos del personal que impliquen un alto grado de consciencia y riesgo, teniendo en cuenta lo indicado por las instrucciones para el uso.
- 5.2.6. El personal no debe llevar cabello largo suelto, ropa de trabajo suelta o joyas inclusive anillos, por existir el riesgo inminente de lesiones debido a poder quedarse enganchada o arrastrada una persona.
- 5.2.7. Debe utilizarse ropa protectora personal en la medida de lo necesario o si queda prevista por alguna norma o disposición. Die persönlichen Schutzausrüstungen sind vom Betreiber der Maschine / Anlage bereitzustellen.
- 5.2.8. Hay que fijar la atención en lo indicado en materia de seguridad y peligros en la respectiva máquina / instalación.
- 5.2.9. Las instrucciones de seguridad y las indicaciones en materia de peligros en una determinada máquina / instalación misma han de mantenerse completas y en estado bien legible. ➡ 6.7;
- 5.2.10. En caso de cambios relevantes en materia de seguridad de una determinada máquina / instalación o su comportamiento funcional, la misma debe pararse en el acto y la avería debe notificarse al organismo / persona que corresponda.



Capítulo 1 Instrucciones para el uso

- 5.2.11. No deben realizarse cambios, construcciones suplementarias ni reformas en una máquina / instalación que puedan afectar la seguridad, sin contar con la oportuna autorización del **HEINRICH GEORG GMBH MASCHINENFABRIK**. Ello también es de aplicación a la incorporación y la puesta a punto de equipos y válvulas de seguridad así como a la soldadura que se efectúe sobre elementos sustentantes.
- 5.2.12. Piezas de repuesto deben cumplir con los requerimientos técnicos especificados por el **HEINRICH GEORG GMBH MASCHINENFABRIK**, lo cual queda garantizado en todo caso al tratarse de piezas originales.
- 5.2.13. No deben introducirse cambios a nivel de sistemas de mando programables. (software)
- 5.2.14. Hay que cambiar las tuberías flexibles hidráulicas periódicamente, según las indicaciones al respecto, o en períodos razonables, incluso si no se presencian defectos relevantes en términos de seguridad.
- 5.2.15. Deben observarse los plazos previstos o especificados en las instrucciones para el uso en lo referente a pruebas / inspecciones periódicas.
- 5.2.16. Es indispensable que se disponga de instalaciones de taller idóneas para realizar unas medidas de conservación y mantenimiento que sean propias del respectivo trabajo.
- 5.2.17. Hay que dar a conocer los puntos de situación y el manejo de extintores de incendios.
- 5.2.18. Hay que prestar atención a las posibilidades de aviso y de lucha contra incendios.
- 5.3. Selección y calificación de personal; obligaciones básicas**
- 5.3.1. Todo trabajo que sea realizado en / con una determinada máquina instalación ha de serlo por personal de confianza, en cuyo caso debe observarse la edad mínima admitida por la Ley.
- 5.3.2. Ha de emplearse exclusivamente personal bien formado o instruido, con unas competencias claramente definidas para todo lo relacionado con las operaciones de manejo, preparación, conservación, mantenimiento y reparación.
- 5.3.3. Hay que asegurar que el uso de una determinada máquina quede limitado a personal encargado al respecto.
- 5.3.4. Responsabilidad del maquinista - incluso con respecto a lo señalado por las normas en materia de derecho de circulación - establecer la misma y darle la oportunidad de negarse a cumplir instrucciones contrarias a la seguridad dadas por terceros.



Capítulo 1

Instrucciones para el uso

- 5.3.5. Todo aquel personal que esté en vías de formación, aprendizaje, instrucción o que realice una formación de tipo generalizado ha de ir acompañado de personas experimentadas en la máquina / instalación en cuestión.
- 5.3.6. Todo trabajo que tenga que realizarse en equipos eléctricos de una determinada máquina / instalación ha de serlo exclusivamente por un electricista profesional o personas instruidas al respecto, bajo la dirección y supervisión del mismo, conforme a lo establecido por las pertinentes normas electrotécnicas.
- 5.3.7. Todo trabajo a realizar en equipos de gas (instalaciones de consumo de gas) ha de serlo exclusivamente por personal especializado al respecto.
- 5.3.8. Todo trabajo a realizar en instalaciones hidráulicas ha de llevarse a cabo exclusivamente por personal de conocimientos y experiencias especiales en hidráulica.
- 5.3.9. Todo trabajo a realizar en instalaciones neumáticas ha de llevarse a cabo exclusivamente por personal de conocimientos y experiencias especiales en neumática.



Capítulo 1 Instrucciones para el uso

5.4. *Régimen de servicio normal*

- 5.4.1. No se debe realizar ningún trabajo que sea considerado crítico o peligroso en materia de seguridad.
- 5.4.2. Hay que tomar las correspondientes medidas para que una determinada máquina / instalación se ponga en funcionamiento sólo en estado seguro y operativo.
Hacer funcionar la máquina / instalación sólo si ésta cuenta con la totalidad de las instalaciones de protección y de seguridad, por ejemplo: instalaciones de protección desmontables, de parada de emergencia, de insonorización, de aspiración, y si las mismas se encuentran en estado operativo.
- 5.4.3. La máquina / instalación debe revisarse al menos una vez por turno para comprobar si han ocurrido daños y desperfectos exteriores. Cualquier cambio que haya ocurrido (inclusive cambios en el funcionamiento) debe avisarse con carácter inmediato a la sección / persona competente. Dicha máquina / instalación debe pararse en el acto en su caso.
- 5.4.4. De ocurrir averías funcionales la respectiva máquina / instalación debe pararse en el acto y tomarse las oportunas medidas de seguridad. Las averías deben eliminarse sin demora.
- 5.4.5. Las operaciones de puesta y parada y las lámparas testigo han de controlarse según lo indicado por las instrucciones para el uso.
- 5.4.6. Antes de ponerse en funcionamiento / marcha una determinada máquina / instalación hay que cerciorarse de que no haya nadie que corra peligro por la misma en régimen de arranque.
- 5.4.7. Las instalaciones de aspiración y aireación no deben desconectarse con la máquina funcionando.
- 5.5. ***Trabajos especiales dentro del margen de utilización de una determinada máquina / instalación, actividades de conservación y mantenimiento y eliminación de averías en régimen de servicio; descontaminación.***
- 5.5.1. Deben cumplirse las actividades y plazos previstos para la puesta a punto, conservación y mantenimiento así como inspecciones inclusive las instrucciones relacionadas con la sustitución de piezas / componentes. Dichas actividades deben llevarse a cabo únicamente por personal especializado.
- 5.5.2. Hay que avisar al personal de servicio antes de iniciar cualquier trabajo especial o de conservación y mantenimiento. Encargar a una persona de la vigilancia de dicho trabajo.



Capítulo 1 Instrucciones para el uso

- 5.5.3. Hay que prestar atención a las operaciones de marcha y parada según lo especificado en las instrucciones para el uso y las de conservación y mantenimiento en todos los trabajos que estén relacionados con el funcionamiento, armonización de la producción, cambio de equipo o puesta a punto de una determinada máquina / instalación y sus pertinentes equipos de seguridad como asimismo con la inspección, conservación y mantenimiento y reparación.
- 5.5.4. Hay que prever un área protegida lo suficientemente amplia para fines de conservación y mantenimiento.
- 5.5.5. De estar una determinada máquina / instalación completamente parada en caso de trabajos de conservación o mantenimiento y reparación, la misma debe protegerse de tal forma que resulte imposible su puesta en funcionamiento no autorizada, en cuyo caso ha de procederse tal y como sigue:
- cerrar las instalaciones principales de mando con llave,
 - quitar la llave y / o
 - colocar un indicador de aviso en el interruptor general.
- 5.5.6. Todos los componentes y mayores grupos constructivos deben sujetarse adecuadamente a mecanismos elevadores y protegerse de tal modo que no causen peligro. Han de utilizarse solamente unos mecanismos de elevación idóneos y técnicamente adecuados así como unos medios receptores de cargas que dispongan de la oportuna fuerza sustentadora. No permanecer ni trabajar por debajo de cargas en suspensión.
- 5.5.7. Los trabajos relacionados con la sujeción de cargas y la orientación de grúas han de ser realizados solamente por personal experimentado. La persona encargada de dicha orientación debe estar al alcance visual o vocal con el mismo.
- 5.5.8. Al tener que realizar trabajos de montaje que se sitúen a una altura allá de la del cuerpo humano, en tales casos han de utilizarse escalerillas y plataformas de trabajo que estén conformes a lo establecido en materia de seguridad. No utilizar elementos de máquina en funciones de escalerilla. En caso de trabajos en grandes alturas deben utilizarse medios protectores de caída.
- Asas, superficies de pisada, barandillas, descansillos, plataformas, escalerillas deben mantenerse libres de suciedad.
- 5.5.9. La respectiva máquina, especialmente las conexiones y racores de la misma, debe(n) limpiarse de aceite, combustible o conservantes. No se deben utilizar agentes limpiadores agresivos. No utilizar trapos deshilachados.
- 5.5.10. Antes de limpiar la máquina / instalación deben cubrirse o cerrarse todas las aberturas por las cuales por razones de seguridad y / o de funcionamiento no



Capítulo 1 Instrucciones para el uso

deba penetrar agua ni detergente. Son especialmente vulnerables los motores eléctricos y armarios de distribución.

- 5.5.11. **¡Está prohibido limpiar la máquina / instalación con aparatos de alta presión!**
- 5.5.12. Al estar llevando a cabo trabajos de limpieza en la casa de máquinas hay que fijarse en que sondas térmicas de las instalaciones avisadoras y extintoras de incendios no entren en contacto con agentes de limpieza calientes. De ser así, podría reaccionar la instalación extintora.
- 5.5.13. Una vez terminada la limpieza, las cubiertas / los cierres deben recogerse o eliminarse por completo.
- 5.5.14. Después de limpiar la máquina / instalación deben comprobarse todas las tuberías neumáticas y de aceite hidráulico en cuanto a fugas, uniones flojas, puntos desgastados o desperfectos. Reparar inmediatamente los defectos constatados.
- 5.5.15. A la hora de realizar trabajos de conservación o mantenimiento y reparación, apretar las uniones atornilladas que se hayan aflojado.
- 5.5.16. De ser necesario el desmontaje de instalaciones de seguridad a la hora de realizar trabajos de preparación, conservación o mantenimiento y reparación, dichas instalaciones han de montarse y revisarse de nuevo comprobando su estado operativo, tan pronto como se hayan concluido los citados trabajos.
- 5.5.17. Hay que tomar las pertinentes medidas de descontaminación segura y no perjudicial para el medio ambiente de combustibles y materiales auxiliares.



Capítulo 1 Instrucciones para el uso

5.6. *Energía eléctrica*

- 5.6.1. Deben usarse solamente fusibles originales para las tensiones de corriente previstas. La respectiva máquina / instalación debe pararse en el acto en caso de que ocurran desperfectos en su sistema de alimentación de energía eléctrica.
- 5.6.2. Todo trabajo que tenga que realizarse en instalaciones eléctricas o utillaje ha de serlo exclusivamente por un electricista profesional o personas instruidas al respecto, bajo la dirección y supervisión de un electricista profesional, conforme a lo establecido por las pertinentes normas electrotécnicas.
- 5.6.3. Aquellas partes de la máquina e instalación sobre las que se realicen trabajos de inspección, conversación o mantenimiento y reparación, no deben estar bajo tensión, si ello está conforme a lo previsto.
Primero ha de comprobarse si los componentes supuestamente libres de tensión lo están en realidad. A continuación proceder a dar tierra, cortocircuitar y aislar cualquier componente adyacente que esté bajo tensión.
- 5.6.4. Los equipos eléctricos de una determinada máquina / instalación han de someterse a inspección / prueba periódicamente. Cualquier defecto como elementos de unión aflojados o cables quemados debe eliminarse sin demora.
- 5.6.5. De tener que realizarse cualquier trabajo en elementos bajo tensión, debe estar presente una segunda persona que en caso de emergencia pueda pulsar el interruptor de emergencia o el general de desconexión de tensión. El área de trabajo ha de cortarse mediante cadena de seguridad de color roji - blanco e indicador de precaución. Debe utilizarse solamente herramienta que lleve aislamiento de tensión.
- 5.6.6. De tratarse de trabajos en grupos de alta tensión, el cable de alimentación debe conectarse a tierra; y los componentes, por ejemplo, los condensadores deben ponerse en cortocircuito, una vez desconectada la tensión.

5.7. *Gas, polvo, vapor, humo*

- 5.7.1. Todo trabajo de soldadura, oxicorte y rectificación que tenga que realizarse en una determinada máquina / instalación ha de serlo solamente previa autorización expresa obtenida al respecto. Puede existir, por ejemplo, peligro de incendio o de explosión.
- 5.7.2. Antes de iniciar cualquier trabajo de soldadura, oxicorte y rectificación en una determinada máquina / instalación, el entorno de la misma ha de limpiarse de polvo y sustancias inflamables, debiendo ventilarse el local de manera adecuada. (peligro de explosión !)

Capítulo 1 Instrucciones para el uso

- 5.7.3. De tener que llevarse a cabo trabajos en locales poco espaciosos, debe cumplirse lo establecido por las respectivas normas nacionales que haya en su caso.
- 5.8. Sistemas hidráulicos y neumáticos**
- 5.8.1. Cualquier trabajo que tenga que efectuarse en sistemas hidráulicos debe serlo solamente por personas que dispongan de conocimientos y experiencias específicas en hidráulica.
Cualquier trabajo que tenga que efectuarse en sistemas neumáticos debe serlo solamente por personas que dispongan de conocimientos y experiencias específicas en neumática.
- 5.8.2. Deben revisarse periódicamente las tuberías, tubos flexibles y uniones roscadas para comprobar si hay fugas y si cuentan con desperfectos que se puedan reconocer desde fuera. Cualquier desperfecto que haya debe subsanarse sin tardanza.   25;   26;   27.5;   27.6;



**Aceite que salga a presión puede dar lugar
a lesiones e incendios !**

- 5.8.3. Cualquier tramo de un sistema y tuberías bajo presión que tengan que abrirse (sistema hidráulico o neumático) debe quedar sin presión antes de iniciarse los trabajos de reparación, siguiendo lo especificado en las respectivas descripciones de grupos constructivos.
- 5.8.4. Las tuberías hidráulicas y neumáticas deben colocarse conforme a lo previsto por la especialidad. No confundir las tomas! Los accesorios, la longitud y calidad de las tuberías flexibles deben cumplir con las exigencias previstas.
- 5.9. Ruidos**
- 5.9.1. Las instalaciones insonorizantes de una determinada máquina / instalación deben encontrarse en posición protectora durante el funcionamiento de la misma.
- 5.9.2. El personal debe llevar su equipo protector de los oídos.
- 5.10. Aceites, grasas y otras sustancias químicas**
- 5.10.1. Al manejar aceites, grasas y otras sustancias químicas hay que observar las normas de seguridad en vigor que sean de aplicación al respectivo producto.



Capítulo 1

Instrucciones para el uso

- 5.10.2. Atención! Hay que proceder con el debido cuidado al manejar combustibles y materias auxiliares. (peligro de quemaduras !)

Capítulo 1

Instrucciones para el uso

6. Ingeniería de seguridad

6.1. *Introducción a la descripción de los dispositivos de protección*

- 6.1.1. Por motivos de producción y de técnica de mantenimiento, cada uno de los grupos de la máquina / instalación debe permanecer accesible. Los dispositivos protectores de separación integrados directamente sobre los grupos podrían dificultar o imposibilitar intervenciones eventualmente necesarias del personal operario o de mantenimiento. Esto podría llevar a evitar o desmontar tales dispositivos protectores de separación.
- 6.1.2. Las intervenciones manuales necesarias en el proceso de producción de la máquina / instalación se limitan a la reparación de averías. Para ello, previamente se deberá haber puesto la máquina / instalación en un estado seguro.



**¡Está prohibido manipular partes de la máquina /
instalación que no estén desconectadas!**

- 6.1.3. Para alcanzar los objetivos de seguridad exigidos se ha escogido una protección con rejillas y barreras de luz de seguridad para las zonas peligrosas de esta máquina / instalación.
- 6.1.4. El libre acceso a estas zonas de la máquina / instalación sólo es posible a través de puertas bloqueadas y vigiladas por medios técnicos de mando. Penetrar en una zona peligrosa atravesando una abertura vigilada por barreras de luz de seguridad implica la inmediata interrupción de la producción. Al mismo tiempo se desencadena la desconexión de la alimentación eléctrica de los sistemas móviles peligrosos situados en la respectiva zona de la máquina / instalación.

6.2. *Puertas de acceso con bloqueo eléctricamente desenclavable y contacto de seguridad*



**¡El acceso a las zonas peligrosas sólo está permitido al
personal operario y de mantenimiento adiestrado!**

- 6.2.1. Para realizar los trabajos necesarios en las zonas peligrosas así protegidas de la máquina / instalación existen puertas de acceso bloqueadas por resorte y vigiladas por el mando, que sólo pueden abrirse cuando la parte respectiva de la máquina / instalación ha sido puesta en estado seguro. En caso de trabajos

Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

extensos de mantenimiento y / o reparación deberán primero abrirse todas las puertas de acceso vigiladas y luego desconectarse completamente la máquina / instalación.   21;

Sólo será posible la operación de las funciones manuales peligrosas de la máquina / instalación cuando la puerta de acceso a la respectiva zona de la máquina / instalación esté cerrada y bloqueada. Para las funciones imprescindibles puede conectarse la alimentación de energía mediante el dispositivo de validación.

Las funciones automáticas de la máquina / instalación sólo son posibles cuando todas las puertas de acceso están cerradas y bloqueadas.



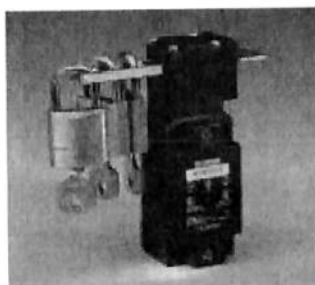
¡Las personas no deben penetrar en la zona de peligro!

¡PELIGRO DE MUERTE!

6.2.2. Las puertas de acceso sólo pueden abrirse cuando los accionamientos de la correspondiente zona de la máquina / instalación están parados.

Para desbloquear una puerta de acceso debe presionarse el pulsador luminoso LIBERAR PUERTA DE ACCESO situado cerca de la puerta. Con ello se pone en marcha la desconexión de la alimentación eléctrica de los sistemas móviles peligrosos situados en la respectiva zona de la máquina / instalación. Mientras tiene lugar este proceso, la lámpara testigo del pulsador luminoso parpadea. Tan pronto como se ha realizado esta desconexión, el interruptor de seguridad de la puerta de acceso se desbloquea electromagnéticamente. Se enciende entonces la lámpara testigo y ya se puede abrir la puerta de acceso.

Nach dem Öffnen der Tür muss ein Sperreinsatz - wie auf der Abbildung gezeigt - in den Betätigungskopf des Sicherheitsschalters eingeführt und durch ein persönliches Vorhängeschloß gegen Entfernen gesichert werden. Dadurch wird unerlaubtes Schliessen der Zugangstüre verhindert.



Capítulo 1 Instrucciones para el uso



¡Toda persona que entre en la zona de peligro debe asegurar la puerta de acceso abierta contra cierre no autorizado por medio de un candado personal!

- 6.2.3. El candado personal debe estar identificado con el nombre de la persona que esté impidiendo el cierre de la puerta de acceso y con ello el funcionamiento de la máquina / instalación. La llave correspondiente a ese candado deberá estar en posesión de esa persona. Deberá haber otras llaves para ese candado guardadas bajo llave, accesibles solamente a personas autorizadas. Al término de los trabajos a realizar, **todas las personas deberán** abandonar la zona de peligro. Los candados personales serán retirados por sus propietarios.



¡Cuando quede asegurado que todas las personas han abandonado la zona de peligro, se podrá cerrar la puerta de acceso!

- 6.2.4. El bloqueo de seguridad de las puertas de acceso cerradas y bloqueadas mecánicamente se activa por el mando tras presionar el pulsador ASEGURAR CIERRE PUERTA ACCESO, conectándose de nuevo la alimentación eléctrica. La lámpara testigo se apaga.

6.2.5. **Desbloqueo auxiliar de las puertas de acceso**

En caso de fallos de funcionamiento se podrá desbloquear la posición cerrada por medio del desbloqueo auxiliar, independientemente del estado del electroimán.

Quitarle el precinto a la llave;
retirar el tapón roscado;
desbloquear girando la llave;
la puerta de acceso se puede abrir;
volver a colocar el desbloqueo auxiliar en orden inverso;

El **precintado** deberá **restituirse** después del uso con un nuevo precinto.

Capítulo 1 Instrucciones para el uso

6.3. *Zugriffsfenster mit elektrisch entsperrbarer Verriegelung und Sicherheitskontakt*



**Die Zugriffsfenster dürfen nur von geschultem
Bedienungs- und Wartungspersonal geöffnet werden !**

- 6.3.1. Für notwendige Arbeiten in den so abgesicherten Gefahrenbereichen der Maschine / Anlage sind federkraftverriegelte und durch die Steuerung überwachte Zugriffsfenster vorhanden, die nur geöffnet werden können wenn der zugehörige Maschinen-/ Anlagenteil in einen sicheren Zustand überführt wurde. Bei umfassenden Wartungs- und / oder Reparaturarbeiten müssen zuerst alle überwachten Zugriffsfenster geöffnet und dann die Maschine / Anlage komplett abgeschaltet werden.   21;

Die Bedienung der gefährlichen Handfunktionen der Maschine / Anlage ist nur möglich, wenn das dem jeweiligen Maschinen-/ Anlagenbereich zugeordnete Zugriffsfenster geschlossen und verriegelt ist. Für unbedingt notwendige Funktionen kann die Energieeinspeisung mittels Zustimmungstaster eingeschaltet werden.

Automatische Maschinen-/ Anlagenfunktionen sind nur möglich, wenn alle Zugriffsfenster geschlossen und verriegelt sind.



**Zugriffsfenster dürfen nicht als Zugang zu einem
Gefahrenbereich benutzt werden !**

LEBENSGEFAHR !

- 6.3.2. Die Zugriffsfenster dürfen nur geöffnet werden wenn die Antriebe im jeweiligen Maschinen-/ Anlagenbereich stillstehen.
Zum Entriegeln eines Zugriffsfensters muss der in der Nähe des Fensters angeordnete Leuchtdrucktaster FENSTER ENTRIEGELN / VERRIEGELN betätigt werden. Darüber wird die Trennung der im jeweiligen Maschinen-/ Anlagenbereich befindlichen, gefährlichen Bewegungssysteme von der elektrischen Energieeinspeisung ausgelöst. Während dieser Vorgang ausgeführt wird blinkt die Meldeleuchte des Leuchtdrucktasters. Sobald diese Trennung erfolgt ist, wird der Sicherheitsschalter des Zugriffsfensters durch elektromagnetische Betätigung entsperrt. Die Meldeleuchte wird dann eingeschaltet und das Zugriffsfenster kann geöffnet werden.
- 6.3.3. Die Sicherheits - Verriegelung des geschlossenen und mechanisch verriegelten Zugriffsfensters wird nach Betätigen des Tasters FENSTER ENTRIEGELN /

Capítulo 1 Instrucciones para el uso

VERRIEGELN von der Steuerung aktiviert und die elektrische Energieeinspeisung wieder zugeschaltet. Die Meldeleuchte wird ausgeschaltet.

6.4. *Barreras de luz de seguridad*

- 6.4.1. Cuando una persona penetra en una de las zonas peligrosas de la máquina / instalación protegidas por barreras de luz de seguridad, las funciones peligrosas son inmediatamente frenadas hasta la detención en la parte respectiva de la máquina / instalación, desconectándose luego de la alimentación eléctrica.

Todas las barreras de luz de seguridad son vigiladas por el mando de la máquina / instalación. Al detectarse la desconexión de una parte de la máquina / instalación por una barrera de luz de seguridad, se bloquea el funcionamiento automático y las funciones peligrosas para la zona respectiva. Sólo es posible dar instrucciones de mando para las funciones peligrosas de la máquina / instalación cuando está activada la barrera de luz de seguridad asignada a la parte correspondiente de la máquina / instalación. Para las funciones imprescindibles puede conectarse la alimentación de energía mediante el dispositivo de validación.

Las funciones automáticas de la máquina / instalación sólo son posibles cuando están activadas todas las barreras de luz de seguridad.

Al término de los trabajos a realizar, **todas las personas deberán** abandonar la zona de peligro.



¡Cuando quede asegurado que todas las personas han abandonado la zona de peligro, se podrá activar la barrera de luz de seguridad!

- 6.4.2. La barrera de luz de seguridad sólo deberá ser activada por el operario después de haber comprobado que todas las personas han abandonado la zona peligrosa.

Al activar la barrera de luz de seguridad se vuelve a conectar la alimentación de energía a los grupos de la zona peligrosa. La lámpara testigo del pulsador luminoso se apaga.

6.5. *Las zonas peligrosas de la máquina / instalación*

- 6.5.1. Es imprescindible observar el modo de proceder descrito en el apartado 6.0 'Ingeniería de seguridad' para entrar y salir de una zona peligrosa. P. ej., no está permitido entrar ni salir de las zonas peligrosas pasando por encima o por debajo de piezas de la máquina / instalación. No observar las directrices y / o evitar o manipular los dispositivos de seguridad conduce siempre a situaciones de gran peligro. La **responsabilidad por los daños por ello ocasionados** en la salud y la vida de las personas, animales o cosas **la asume únicamente la persona causante de esta situación peligrosa.**



Capítulo 1 Instrucciones para el uso

6.5.2. In den folgenden Tabellen sind die elektrotechnischen Abschaltmaßnahmen aufgelistet die durch die Überwachungseinrichtungen zu den einzelnen Gefahrenbereichen ausgelöst werden. Für Einzelfunktionen können bestimmte Abschaltmaßnahmen über einen Zustimmungstaster unwirksam gemacht werden.

6.5.3. Zeichenerklärung:

- 6.5.3.1. Die in den Funktionstabellen verwendeten Zeichen haben folgende Bedeutung:
- I Die Überwachungseinrichtung zum Gefahrenbereich ist aktiv geschaltet.
 - O Die Überwachungseinrichtung zum Gefahrenbereich ist nicht aktiv.
 - X Der Schaltzustand der Überwachungseinrichtung ist nicht relevant.
 - ⚡ Die Funktion ist mit der elektrischen Energieversorgung verbunden.
 - ⏏ Die Funktion ist von der elektrischen Energieversorgung getrennt.
 - ~ Die Funktion wird von dieser Kombination der Überwachungseinrichtungen nicht beeinflusst.



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

6.5.4. Zona peligrosa A: Aspa desarrolladora / Bund - Ladebereich

6.5.4.1. Überwachungseinrichtungen:

Devanadora:	Haspelkopf 1:	B46;
	Haspelkopf 2:	B47;

6.5.4.2. Funktionstabelle

Sicherheitseinrichtungen													
B46	+M2=11EA1-B46:	I	O	X	X								
B47	+M2=11EA1-B47:	X	X	I	O								

Devanadora:													
Haspelkopf 1: Atras / Adelante		⚡	↘	~	~								
Haspelkopf 2: Atras / Adelante		~	~	⚡	↘								



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

6.5.5. Zona peligrosa B: Aspa desarrolladora / Band - Einführbereich

6.5.5.1. Überwachungseinrichtungen:

Devanadora:

Aktiver Haspelkopf:

B46 / B47;

Zugriffsfenster:

T3;

6.5.5.2. Dispositivo de validación:

Devanadora:

Interruptor confirmacion:

ZT1;

6.5.5.3. Funktionstabelle

Sicherheitseinrichtungen													
B46 / B47	I	X	I	X									
T3 +M4=01.PB1-S12:	I	O	O	I									
ZT1 +P2=01.PB1-S42:	X	O	I	X									

Devanadora:													
Aktiver Haspelkopf: Atras / Adelante	⚡	↘	⚡	~									
Einlaufaggregat:													
Traccion: Atras / Adelante	⚡	↘	↘	⚡									
Guia lateral: Abrir / Cerrar	⚡	↘	↘	⚡									



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

6.5.6. Zona peligrosa B: Aspa desarrolladora, Einlaufaggregat, Stanzenaggregat, Scherenaggregat

6.5.6.1. Überwachungseinrichtungen:

Devanadora:	Aktiver Haspelkopf:	B46 / B47;
Zona peligrosa:	Puerta de acceso:	T2;
	Zugriffsfenster:	T3;

6.5.6.2. Dispositivo de validación:

Interruptor confirmacion: ZT1;

6.5.6.3. Funktionstabelle

Sicherheitseinrichtungen															
B46 / B47	I	X	I	X											
T2 +M4=01.PB2-S13:	I	O	O	I											
T3 +M4=01.PB1-S12:	I	O	O	I											
ZT1 +P2=01.PB1-S42:	X	O	I	X											

Devanadora:															
Aktiver Haspelkopf: Atras / Adelante	⚡	↘	⚡	~											
Einlaufaggregat:															
Traccion: Atras / Adelante	⚡	↘	↘	⚡											
Guia lateral: Abrir / Cerrar / Posicionar	⚡	↘	↘	⚡											
Stanzenaggregat:															
Punzon 1: Retroceso / Avance	⚡	↘	↘	⚡											
Punzonadora 1: Punzonar	⚡	↘	↘	⚡											
Cizalla / V: Desplazar / Retroceder	⚡	↘	↘	⚡											
Cizalla / V: Punzonar	⚡	↘	↘	⚡											
Hubführung zur V - Stanze: Auf / Zu	⚡	↘	↘	⚡											
Punzon 2: Retroceso / Avance	⚡	↘	↘	⚡											
Punzonadora 2: Punzonar	⚡	↘	↘	⚡											
Punzon 3: Desplazar / Recojer	⚡	↘	↘	⚡											



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

Punzonadora 3: Punzonar	⚡	↘	↘	⚡															
Scherenaggregat:																			
Cizalla 1 / Cisalla 2: Desplazar / Recojer	⚡	↘																	
Hubleiste vor Schere 1: Auf / Ab	⚡	↘	↘	⚡															
Hochhaltebleche vor Schere 1: Auf / Ab	⚡	↘	↘	⚡															
Cizalla 1: Corte	⚡	↘	↘	⚡															
Cizalla 1: Bascular 0° / Bascular 45°	⚡	↘	↘	⚡															
Hubführung nach Schere 1: Auf / Zu	⚡	↘	↘	⚡															
Hochhaltebleche nach Schere 1: Auf / Ab	⚡	↘	↘	⚡															
Hubführung vor Schere 2: Auf / Zu	⚡	↘	↘	⚡															
Cizalla 2: Corte	⚡	↘	↘	⚡															
Hochhaltebleche nach Schere 2: Auf / Ab	⚡	↘	↘	⚡															
Transportaggregat:																			
Transportrollen: Antrieb Ein	⚡	↘	↘	⚡															
Transportrollen: Ausschwenken	⚡	↘	↘	⚡															
Druckrollen vor Scheren: Senken	⚡	↘	↘	⚡															
Druckrollen zwischen Scheren: Senken	⚡	↘	↘	⚡															
Druckrollen nach Scheren: Senken	⚡	↘	↘	⚡															
Auslauftransportband:																			
Cinta Transporte: Antrieb Ein	⚡	↘	↘	⚡															
Druckrollen: Senken	⚡	↘	↘	⚡															
Cuña separadora: Depositar material superior	⚡	↘	↘	⚡															
Umlenkung:																			
Schrägtransportbänder: Antriebe Ein	⚡	↘	↘	⚡															



Capítulo 1
Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

Ajuste de altura: Abrir / Posicionar	⚡	↘	↘	⚡										
---	---	---	---	---	--	--	--	--	--	--	--	--	--	--



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

6.5.7. Zona peligrosa C: Einlaufaggregat, Stanzenaggregat, Scherenaggregat

6.5.7.1. Überwachungseinrichtungen:

Zona peligrosa: Puerta de acceso:

T1;

6.5.7.2. Funktionstabelle

Sicherheitseinrichtungen													
T1	+M4=01.PB2-S12:	I	O										

Einlaufaggregat:													
Traccion: Atras / Adelante	⚡	↘											
Guia lateral: Abrir / Cerrar / Posicionar	⚡	↘											
Stanzenaggregat:													
Punzon 1: Retroceso / Avance	⚡	↘											
Punzonadora 1: Punzonar	⚡	↘											
Cizalla / V: Desplazar / Retroceder	⚡	↘											
Cizalla / V: Punzonar	⚡	↘											
Hubführung zur V - Stanze: Auf / Zu	⚡	↘											
Punzon 2: Retroceso / Avance	⚡	↘											
Punzonadora 2: Punzonar	⚡	↘											
Punzon 3: Desplazar / Recojer	⚡	↘											
Punzonadora 3: Punzonar	⚡	↘											
Scherenaggregat:													
Cizalla 1 / Cizalla 2: Desplazar / Recojer	⚡	↘											
Hubleiste vor Schere 1: Auf / Ab	⚡	↘											
Hochhaltebleche vor Schere 1: Auf / Ab	⚡	↘											
Cizalla 1: Corte	⚡	↘											
Cizalla 1: Bascular 0° / Bascular 45°	⚡	↘											



Capítulo 1

Instrucciones para el uso

[illegible]



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

6.5.8. Zona peligrosa D: Umlenkung, Instalación de apilado, Carro apilado

6.5.8.1. Überwachungseinrichtungen:

Zona peligrosa: Barrera de luz de seguridad: LS1;

6.5.8.2. Funktionstabelle

Sicherheitseinrichtungen													
LS1	+M12=01.PB4-B12:	I	O										

Umlenkung:													
Ajuste de altura: Abrir / Posicionar	⚡	↘											
Stapelebene 1:													
Cinta de apilado: Avance	⚡	↘											
Guia lateral: Abrir / Posicionar	⚡	↘											
Hubleisten: Schließen	⚡	↘											
Hochhalteleisten: Ausschwenken	⚡	↘											
Despegar: Chapa	⚡	↘											
Despegar: Hochdruck Ein	⚡	↘											
Blechhaltevorrichtung: Chapa	⚡	↘											
Blechhaltevorrichtung: Abrir	⚡	↘											
Stapelebene 2:													
Cinta de apilado: Avance	⚡	↘											
Guia lateral: Abrir / Posicionar	⚡	↘											
Hubleisten: Schließen	⚡	↘											
Hochhalteleisten: Ausschwenken	⚡	↘											
Despegar: Chapa	⚡	↘											
Despegar: Hochdruck Ein	⚡	↘											
Blechhaltevorrichtung: Chapa	⚡	↘											



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

Blechhaltevorrichtung: Abriir																			
----------------------------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

6.5.9. Zona peligrosa E: Carros de apilado

6.5.9.1. Überwachungseinrichtungen:

Carro apilado 1:	Anfahrerschutz nach links:	SS1;
	Anfahrerschutz nach rechts:	SS2;
	Anfahrerschutz Wagen 1 ↔ 2:	SS3;
Carro apilado 2:	Anfahrerschutz nach links:	SS4;
	Anfahrerschutz nach rechts:	SS5;

6.5.9.2. Dispositivo de validación:

Schlüssel - Zustimmungstaster: SZT1;

6.5.9.3. Funktionstabelle

Sicherheitseinrichtungen															
SS1	+M21=61.FA1-S35.1:	I	O	X	X	X	X	X	X	X	X				
SS2	+M21=61.FA1-S37.1:	X	X	I	O	X	X	X	X	X	X				
SS3	+M21=61.FA1-S37.2:	X	X	I	X	O	I	X	X	X	X				
SS4	+M22=62.FA1-S35.1:	X	X	X	X	X	I	O	X	X	X				
SS5	+M22=62.FA1-S37.1:	X	X	X	X	X	X	I	O	X					
SZT1	+E=61.FA1-S53	X	O	X	O	O	X	O	X	O	I				

Carro apilado 1:															
Fahrtrieb: Izquierda			~	~	~	~	~	~	~						
Derecha	~	~				~	~	~	~						
Carro apilado 2:															
Fahrtrieb: Izquierda	~	~	~	~				~	~						
Derecha	~	~	~	~	~	~	~								



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

6.6. *Hinweise zu Antrieben die nicht von der Energiezufuhr getrennt werden*

- 6.6.1.  Alle weiteren, nicht aufgeführten Funktionen und Bewegungen der Maschine / Anlage werden durch die Sicherheitseinrichtungen zum Gefahrenbereich nicht von der elektrischen Energiezufuhr getrennt. **En caso de manejo erróneo, avería o fallo del mando no se puede excluir la posibilidad de un arranque inesperado.** ¡Trabaje con cuidado y siendo consciente del peligro!

6.7. *Marcaciones de seguridad*

- 6.7.1. Las marcaciones de seguridad de la máquina / instalación forman parte de las medidas de protección. El explotador está obligado a mantener todas las indicaciones de seguridad y peligro en la máquina / instalación al completo y en buen estado de lectura o reconocimiento.

6.8. *Marcaciones de seguridad por colores de advertencia*

- 6.8.1. El color de fondo de la máquina / instalación es: 'resedagrün', tono de color RAL 6011.
- 6.8.2. Todas las piezas móviles, como carros de cuchillas etc. y rejillas de protección, barandillas están destacadas ópticamente en color 'amarillo oro' (RAL 1004).
- 6.8.3. Todas las esquinas y cantos de piezas desplazables de la máquina / instalación están sombreados. 'Amarillo oro / negro intenso' (RAL 1004 / 9005).

Todos los trabajos sobre las partes así marcadas de la máquina / instalación deben realizarse con especial consciencia de la seguridad y los peligros.

- 6.8.4. Die Arretierungsbolzen für bewegliche Maschinen- / Anlagenteile sind durch die Farbe 'Leuchttrot' (RAL 3024) gekennzeichnet.
- 6.8.5. Las tuberías de la instalación hidráulica de la máquina / instalación están marcadas en el color marcador 'pardo ocre' (RAL 8001).
- 6.8.6. Las tuberías de la instalación neumática de la máquina / instalación están marcadas en el color marcador 'gris plata' (RAL 7001).
- 6.8.7. Los puntos de lubricación de la máquina / instalación están marcados con el color 'rojo fuego' (RAL 3000).
- 6.8.8. Los armarios de distribución de la máquina / instalación están barnizados en: 'gris guijarro texturizado' (RAL 7032).
- 6.8.9. Los pupitres de mando de la máquina / instalación están barnizados en: 'gris guijarro texturizado' (RAL 7032).

Capítulo 1

Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

- 6.8.10. Las placas de montaje el. están galvanizadas Senzimir.
- 6.8.11. Las líneas de los circuitos que no se desconectan de la alimentación energética a través del dispositivo de desconexión de la red de la máquina / instalación, están marcadas en color NARANJA.

6.9. *Señales prescriptivas en la máquina / instalación*

6.9.1. Pictogramas.



¡Utilizar protección para los ojos!

En la zona peligrosa así señalizada, la señal de seguridad ordena el uso de gafas protectoras. Se evitarán así lesiones en los ojos por piezas despedidas. Durch den Luftstrahl, der bei jedem Blecheinlauf in die Stapelanlage erzeugt wird, können kleine Teile aufgewirbelt werden.

Hay una señal colocada en cada una de las siguientes posiciones:

En el apilado;

4.1.1.1



¡Desconectar antes de los trabajos!

La señal de seguridad ordena desconectar de la alimentación eléctrica la máquina / instalación, o bien las partes con ella marcadas de la máquina / instalación, antes de cualquier trabajo de mantenimiento y / o reparación desconectando de la alimentación eléctrica el dispositivo de desconexión de la red o el interruptor de seguridad.

Por favor, observe las 5 normas de seguridad para trabajos en instalaciones o medios de producción eléctricos.

Antes de comenzar los trabajos:

- Desconectar.
- Asegurar contra reconexión.
- Comprobar la ausencia de tensión.

Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

- Poner a tierra y cortocircuitar.
- Cubrir o encerrar las partes contiguas sometidas a tensión.

Hay una señal colocada en cada una de las siguientes posiciones:

Dispositivo de desconexión de la red en el armario de distribución de la máquina / instalación;

4.1.1.25



Auffanggurt anlegen !

En la zona peligrosa así señalizada, la señal de seguridad ordena llevar puesta una protección personal contra caídas. Se evitará así caer en el foso de bucles.

Hay una señal colocada en cada una de las siguientes posiciones:

T2, Puerta de acceso a la zona peligrosa B;

4.1.1.16

6.9.2. Señales de texto.

¿ ; ?

6.10. Señales de prohibición en la máquina / instalación

6.10.1. Pictogramas.



Für Fußgänger verboten !

Das Sicherheitszeichen verbietet über den Schutzzaun neben dem Abwickelhaspelständer zu steigen.

Hay una señal colocada en cada una de las siguientes posiciones:

An dem Schutzzaun neben dem Abwickelhaspelständer.

4.1.2.3

Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK



¡Prohibido el acceso a las personas no autorizadas!

La señal de seguridad prohíbe a todas las personas no encargadas de realizar trabajos con o en la máquina / instalación la entrada en la zona peligrosa así marcada.

Hay una señal colocada en cada una de las siguientes posiciones:

Junto a todas las puertas de acceso.

4.1.2.6

6.10.2. Señales de texto.

☞ ? ; ?

6.11. *Señales de advertencia en la máquina / instalación*

6.11.1. Pictogramas.



¡Atención a la tensión eléctrica peligrosa!

La señal de seguridad advierte del peligro de las tensiones eléctricas a las cuales se puede acceder libremente una vez abiertas las cubiertas así marcadas. En estos dispositivos de la máquina / instalación sólo deben trabajar electricistas especializados o personas instruidas bajo la dirección y supervisión de un electricista especializado de acuerdo con las normas electrotécnicas.

Hay una señal colocada en cada una de las siguientes posiciones:

En todas las cajas de bornes, puestos de mando y dispositivos comparables en donde puedan darse peligrosas tensiones eléctricas.

4.1.3.8



¡Atención, peligro de aplastamiento!

Das Sicherheitszeichen warnt vor Gefahren, die im Ladebereich durch Pendelbewegungen der Bunde oder beim Schwenken der Haspelköpfe entstehen können.

Hay una señal colocada en cada una de las siguientes posiciones:

Am Schutzzaun neben dem Haspelständer;
Am Schutzgeländer im Einführbereich;

4.1.3.20



¡Cuidado con la superficie caliente!

La señal de seguridad advierte de los peligros que pueden darse por contacto con:

- las superficies de los servomotores trifásicos.
- las superficies de las bombas hidráulicas.

El contacto con esas superficies puede ocasionar quemaduras y accidentes.

Hay una señal colocada en cada una de las siguientes posiciones:

En los servomotores trifásicos;
En las bombas hidráulicas;

4.1.3.22



¡Atención, peligro de lesiones en las manos!

Das Sicherheitszeichen warnt vor Gefahren die in allen Bereichen vom Band verursacht werden und die im Ladebereich beim Auflegen der Bunde und bei Spreizbewegungen am Abwickelhaspel entstehen können.

Hay una señal colocada en cada una de las siguientes posiciones:

Capítulo 1

Instrucciones para el uso

T1, Puerta de acceso a la zona peligrosa C;
T2, Puerta de acceso a la zona peligrosa B;
T3, Zugriffsfenster zum Gefahrenbereich B;
LS1, Barrera de luz de seguridad a la zona peligrosa D;

4.1.3.23



¡Atención, peligro de caída!

La señal de seguridad advierte de los peligros que existen en la inmediata cercanía del foso de bucles y Schrottbehältergrube.

Hay una señal colocada en cada una de las siguientes posiciones:

T2, Puertas de acceso a la zonas peligrosa B y C;

4.1.3.31

6.11.2. Señales de texto.



¡También bajo tensión aun con el dispositivo de desconexión de la red desconectado!

La señal de seguridad advierte de las peligrosas tensiones eléctricas que pueden darse en determinados componentes y que no se desconectan de la alimentación eléctrica por medio del dispositivo de desconexión de la red.

Hay una señal colocada en cada una de las siguientes posiciones:

En todos los circuitos que no se desconectan de la alimentación de tensión por medio del dispositivo de desconexión de la red.

4.1.3.39

6.12. Señales informativas en la máquina / instalación

6.12.1. Pictogramas.

☞ ? ; ?



Capítulo 1 Instrucciones para el uso

6.12.2. Señales de texto.

☞ ? ; ?

Capítulo 1 Instrucciones para el uso

7. Peligros residuales



¡Es indispensable observar las siguientes indicaciones de seguridad para evitar peligros!

7.1. *El personal de operación y mantenimiento*

7.1.1. Sólo personal formado o adiestrado puede manejar y / o realizar el mantenimiento de la máquina / instalación. El explotador es responsable de la selección de las personas adecuadas y su formación o adiestramiento.

7.1.2.  **¡Atención!** Las personas formadas o adiestradas deben también haber leído las instrucciones para el uso e indicaciones de seguridad a las cuales se hace referencia en este apartado. Cada vez que haya que realizar un trabajo especial en un determinado grupo de la máquina / instalación es necesario leer primero detenidamente los capítulos correspondientes de la documentación técnica.



¡Protección contra incendios! Todas las personas encargadas de realizar trabajos con la máquina / instalación o en la máquina / instalación deben estar formadas en la utilización de los medios para el aviso y la lucha contra incendios. Estas personas deben ser informadas de la ubicación y manejo de los medios para la lucha contra incendios.

7.1.3. El explotador de la máquina / instalación debe establecer la responsabilidad del jefe de máquinas. Deberán conferirse los correspondientes poderes directivos.

7.1.4.  **¡Alto!** El acceso / estancia en zonas de la máquina / instalación protegidas por dispositivos de protección sólo está autorizado a las personas no formadas o adiestradas bajo la constante vigilancia de un operario experimentado.

7.1.5. Für die Produktion mit der Maschine / Anlage ist **maximal 1 Bedienungsperson** und, wenn erforderlich, eine Person die geschult wird, zugelassen. En la zona de la máquina / instalación no puede haber nadie más.

7.1.6.  Los trabajos que sólo puedan realizarse con zonas conectadas de la máquina / instalación sólo pueden ser realizadas conjuntamente por **dos** especialistas formados y aplicando las medidas de seguridad necesarias en cada caso. Los especialistas deberán mantener en todo momento contacto visual y de palabra. **En caso de emergencia, el especialista deberá poder presionar en cualquier momento el pulsador de PARADA DE EMERGENCIA.**

7.1.7. **¡Cuidado!** En los bornes de conexión de los motores eléctricos puede haber

Capítulo 1 Instrucciones para el uso



aún tensión a causa de los condensadores de la unidad de accionamiento, incluso estando ya desconectada la máquina / instalación. Obsérvense las indicaciones de seguridad de la respectiva unidad de accionamiento.  Documentación Técnica, parte II.

- 7.1.8. Trabaje sólo con plena consciencia de la seguridad y los peligros. No sólo la ligereza, también una previsión de tiempo errónea aumenta el peligro de accidente.
- 7.1.9. Debe llevarse únicamente ropa de trabajo ceñida, calzado protector y, cuando se trabaje con material de producción, guantes protectores.
- 7.1.10. Todos los dispositivos de protección deben estar en condiciones de funcionamiento y en perfecto estado técnico.
- 7.1.11.  **¡Atención!** Sólo estando presente un operario se puede conectar la tensión de mando de la máquina / instalación. Es decir, sólo se permite el '**funcionamiento vigilado**'.
- 7.1.12. No penetre ni agarre las zonas en marcha de la máquina / instalación. Cuando sea necesario intervenir, antes se deberá poner la máquina / instalación en un estado seguro.



¡Las personas no deben penetrar en la zona de peligro!

¡PELIGRO DE MUERTE!

- 7.1.13. Cerrar las puertas de acceso sólo cuando todas las personas hayan salido ya de la zona peligrosa.

7.2. **Informaciones sobre peligros residuales en los grupos de la máquina / instalación**

- 7.2.1. Aspa desarrolladora.



¡Atención! Póngase guantes protectores. Los bordes de la cinta pueden causar lesiones por corte.

Vorsicht bei der Beseitigung einer Störung. El material sometido a tensión puede ocasionar peligros.



¡Alto! Während die Haspelköpfe geschwenkt werden, wird eine Blitzlampe eingeschaltet. Der Aufenthalt im Gefahrenbereich ist dann verboten.



¡Cuidado, peligro de aplastamiento!

An dem Haspelkopf: Beim Schwenken der Haspelköpfe zwischen den Haspelköpfen und feststehenden Teilen.

Capítulo 1

Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

Con la cabeza del aspa: Al soltar entre cada segmento de sujeción.

Al extender entre los segmentos de sujeción y el bulto.



¡Cuidado! La carga y, en caso necesario, descarga de los bultos se realiza por medio de grúa de interiores. Dabei sind die betriebsinternen Vorschriften für Materialtransporte zu beachten. El operario o jefe de grúa es el responsable de utilizar los medios de enganche apropiados.



Vorsicht! Al colocar los bultos, trabaje con cuidado. Pendelbewegungen des Bundes vermeiden. No penetre ni agarre entre el bulto y la cabeza de puntal. Existe peligro de lesiones por aplastamiento y corte.



Los bultos de material deben colocarse bien seguros sobre las cabezas de puntal, de lo contrario existe el peligro de que el bulto resbale.



¡Cuidado! Los frenos de las cabezas de aspa pierden su efecto en caso de caída de la presión en el sistema neumático.

7.2.1.1. Con la puerta de acceso abierta, el comienzo de la cinta se desliza hasta la unidad de avance. El accionamiento del eje del aspa desarrolladora se puede conectar por medio del dispositivo de validación si el movimiento giratorio está bloqueado. **La persona que presiona el dispositivo de validación es responsable de la seguridad en la zona peligrosa.**

Sólo los accionamientos eléctricos causantes de peligros especiales se desconectan - desenchufando de la alimentación de energía o mediante el bloqueo seguro de los onduladores - antes de desbloquear las puertas de acceso. Para los movimientos especialmente peligrosos accionados mediante energía neumática y / o hidráulica sólo se desconecta la tensión de la válvula al desbloquear una puerta de acceso.

☞ 6.5;

☞ I; 1; 5;

7.2.2. Foso de bucles.



¡Atención! Cuando sea necesario trabajar en la zona no protegida del foso de bucles, deberá llevarse puesta la protección personal contra caídas (arnés). Sólo se podrán realizar trabajos en el equipamiento del foso de bucles cuando el foso esté cubierto con seguridad o en su caso se haya instalado sobre el fondo del foso de bucles un armazón de montaje de acuerdo con la normativa.



¡Cuidado! Auf der Antriebseite der Maschine / Anlage ist die Schlaufengrube nicht durch ein zusätzliches Geländer gesichert. In diesem Teil des Gefahrenbereichs besteht Absturzgefahr!



¡Cuidado! Al subir y bajar la palanca de bucles existe peligro de aplastamiento. Durante los trabajos de mantenimiento y conservación en la zona de paso, la palanca de bucles deberá estar asegurada mecánicamente en la posición deseada.



¡Cuidado! Laufendes Band darf nicht berührt werden. Die Kanten am Band können Schnittverletzungen verursachen.

7.2.2.1. Con la puerta de acceso abierta, el comienzo de la cinta se desliza hasta la unidad de avance. El accionamiento del eje del aspa desarrolladora se puede conectar por medio del dispositivo de validación si el movimiento giratorio está blo-

Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 49 de 148
-----------------------------	------------	--------------------------	---------------------

Capítulo 1 Instrucciones para el uso

queado. **La persona que presiona el dispositivo de validación es responsable de la seguridad en la zona peligrosa.**

Sólo los accionamientos eléctricos causantes de peligros especiales se desconectan - desenchufando de la alimentación de energía o mediante el bloqueo seguro de los onduladores - antes de desbloquear las puertas de acceso. Para los movimientos especialmente peligrosos accionados mediante energía neumática y / o hidráulica sólo se desconecta la tensión de la válvula al desbloquear una puerta de acceso.

☞ 6.5;

☞ I; 1; 5;

7.2.3. Band - Einlaufaggregat.



¡Cuidado! Al subir y bajar el rodillo de medición y el rodillo de transporte, así como al ajustar la guía lateral de la cinta existe peligro de aplastamiento.

7.2.3.1. Si hace falta, antes de extraer la cinta restante o para reparar una avería, ajuste las guías laterales a un ancho de cinta mayor al necesario en ese momento.

Sólo los accionamientos eléctricos causantes de peligros especiales se desconectan - desenchufando de la alimentación de energía o mediante el bloqueo seguro de los onduladores - antes de desbloquear las puertas de acceso. Para los movimientos especialmente peligrosos accionados mediante energía neumática y / o hidráulica sólo se desconecta la tensión de la válvula al desbloquear una puerta de acceso.

☞ 6.5;

☞ I; 1; 5;

7.2.4. Cizalla en V.



¡Atención! Las averías en la expulsión de residuos de producción deben repararse siempre utilizando medios auxiliares. Los residuos de chapa acumulados pueden resbalar / caer repentinamente y ocasionar lesiones por cortes.



¡Atención! Wenn die Funktion 'Werkzeuge einrichten' eingeschaltet ist, müssen alle Werkzeuge im unteren Totpunkt stehen bevor eine Zugangstüre zum Gefahrenbereich geöffnet wird.



¡Atención! Beim Wechseln der Messer durch Schutzhandschuhe vor Handverletzungen schützen.



¡Cuidado! No introduzca las manos entre las cuchillas, ni siquiera con la máquina / instalación desconectada. Trabaje sólo en el cizalla en V cuando el cuerpo de la cuchilla superior esté mecánicamente inmovilizado.

7.2.4.1. Die ordnungsgemäße Funktion der Haltebremse am Antriebsmotor muß in regelmäßigen Abständen geprüft werden. Festgestellte Mängel müssen unverzüglich behoben werden. **Der Betrieb der V - Stanzen mit mangelhafter Bremse ist Verboten.**

Sólo los accionamientos eléctricos causantes de peligros especiales se

Capítulo 1 Instrucciones para el uso

desconectan - desenchufando de la alimentación de energía o mediante el bloqueo seguro de los onduladores - antes de desbloquear las puertas de acceso. Para los movimientos especialmente peligrosos accionados mediante energía neumática y / o hidráulica sólo se desconecta la tensión de la válvula al desbloquear una puerta de acceso.

☞ 6.5;

☞ I; 1; 5;

7.2.5. Punzonadoras.



¡Atención! Las averías en la expulsión de residuos de producción deben repararse siempre utilizando medios auxiliares. Los residuos de chapa acumulados pueden resbalar / caer repentinamente y ocasionar lesiones por cortes.



¡Atención! Wenn die Funktion 'Werkzeuge einrichten' eingeschaltet ist, müssen alle Werkzeuge im unteren Totpunkt stehen bevor eine Zugangstüre zum Gefahrenbereich geöffnet wird.



¡Atención! Beim Wechseln der Werkzeuge durch Schutzhandschuhe vor Handverletzungen schützen.



¡Cuidado! No introduzca las manos entre las cuchillas, ni siquiera con la máquina / instalación desconectada. Arbeiten an der Lochstanze nur ausführen wenn der Lochstempel - Halter mechanisch arretiert ist.

7.2.5.1. Die ordnungsgemäße Funktion der Haltebremse am Antriebsmotor muß in regelmäßigen Abständen geprüft werden. Festgestellte Mängel müssen unverzüglich behoben werden. **Der Betrieb der Lochstanzen mit mangelhafter Bremse ist Verboten.**

Sólo los accionamientos eléctricos causantes de peligros especiales se desconectan - desenchufando de la alimentación de energía o mediante el bloqueo seguro de los onduladores - antes de desbloquear las puertas de acceso. Para los movimientos especialmente peligrosos accionados mediante energía neumática y / o hidráulica sólo se desconecta la tensión de la válvula al desbloquear una puerta de acceso.

☞ 6.5;

☞ I; 1; 5;

7.2.6. Cizallas.



¡Atención! Las averías en la expulsión de residuos de producción deben repararse siempre utilizando medios auxiliares. Los residuos de chapa acumulados pueden resbalar / caer repentinamente y ocasionar lesiones por cortes.



¡Atención! Wenn die Funktion 'Werkzeuge einrichten' eingeschaltet ist, müssen alle Werkzeuge im unteren Totpunkt stehen bevor eine Zugangstüre zum Gefahrenbereich geöffnet wird.

Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK



¡Atención! Beim Wechseln der Messer durch Schutzhandschuhe vor Handverletzungen schützen.



¡Cuidado! No introduzca las manos entre las cuchillas, ni siquiera con la máquina / instalación desconectada. Trabaje sólo en el cizalla cuando el cuerpo de la cuchilla superior esté mecánicamente inmovilizado.

- 7.2.6.1. Die ordnungsgemäße Funktion der Haltebremse am Antriebsmotor muß in regelmäßigen Abständen geprüft werden. Festgestellte Mängel müssen unverzüglich behoben werden. **Der Betrieb der Scheren mit mangelhafter Bremse ist Verboten.**

Sólo los accionamientos eléctricos causantes de peligros especiales se desconectan - desenchufando de la alimentación de energía o mediante el bloqueo seguro de los onduladores - antes de desbloquear las puertas de acceso. Para los movimientos especialmente peligrosos accionados mediante energía neumática y / o hidráulica sólo se desconecta la tensión de la válvula al desbloquear una puerta de acceso.

☞ 6.5;

☞ I; 1; 5;

7.2.7. Schrottbehälter



¡Cuidado! Die Schrottbehälter müssen geleert werden, wenn der darin befindliche Schrottstapel einen Abstand von ca. 10 cm zur Oberkante des Behälters erreicht hat. Bei einem höheren Füllstand können beim Transport Schrottstücke herausfallen und Personen gefährden.



¡Cuidado! Der Transport der Schrottbehälter erfolgt mit dem Hallenkran. Dabei sind die betriebsinternen Vorschriften für Arbeiten mit dem Kran zu beachten. Die Bedienungsperson bzw. der Kranführer ist für die Verwendung geeigneter Anschlagmittel verantwortlich.



¡Cuidado! Die Schrottbehältergrube ist **nicht** durch ein zusätzliches Geländer gesichert. In diesem Teil des Gefahrenbereichs besteht Absturzgefahr!

- 7.2.7.1. Sólo los accionamientos eléctricos causantes de peligros especiales se desconectan - desenchufando de la alimentación de energía o mediante el bloqueo seguro de los onduladores - antes de desbloquear las puertas de acceso. Para los movimientos especialmente peligrosos accionados mediante energía neumática y / o hidráulica sólo se desconecta la tensión de la válvula al desbloquear una puerta de acceso.

☞ 6.5;

☞ I; 1; 5;

7.2.8. Auslauftisch.



¡Alto! Laufende Transportbänder oder die darauf liegenden Bleche nicht berühren. Gefahr von Schnittverletzungen.

Capítulo 1

Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

7.2.8.1. Sólo los accionamientos eléctricos causantes de peligros especiales se desconectan - desenchufando de la alimentación de energía o mediante el bloqueo seguro de los onduladores - antes de desbloquear las puertas de acceso. Para los movimientos especialmente peligrosos accionados mediante energía neumática y / o hidráulica sólo se desconecta la tensión de la válvula al desbloquear una puerta de acceso.

☞ 6.5;

☞ I; 1; 5;

7.2.9. Instalación de apilado.



¡Atención! Utilice guantes protectores con protección del pulso.

Las chapas y la pila de chapas pueden ocasionar lesiones por cortes.

Cuidado al reparar una avería. Las pilas que no estén en posición perpendicular o que sean muy estrechas y altas pueden volcar fácilmente.



¡Atención! Utilice gafas protectoras. El rayo de aire que se produce cada vez que se introduce una chapa puede arrastrar pequeñas partículas.



¡Atención! Bevor der Bereich der Stapelanlage betreten wird müssen die Transport- und Stapelbänder in der Maschine / Anlage ausgeschaltet und zum völligen Stillstand gekommen sein.



¡Alto! Der Bereich der Stapelanlage darf nur von geschulten Bedienungspersonen betreten werden.



¡Cuidado! Im Bereich der Hubleisten besteht Quetschgefahr.

7.2.9.1. Si hace falta, antes de extraer la cinta restante o para reparar una avería, ajuste las guías laterales a un ancho de cinta mayor al necesario en ese momento.

Sólo los accionamientos eléctricos causantes de peligros especiales se desconectan - desenchufando de la alimentación de energía o mediante el bloqueo seguro de los onduladores - antes de desbloquear las puertas de acceso. Para los movimientos especialmente peligrosos accionados mediante energía neumática y / o hidráulica sólo se desconecta la tensión de la válvula al desbloquear una puerta de acceso.

☞ 6.5;

☞ I; 1; 5;

7.2.10. Carros de apilado



¡Atención! Utilice guantes protectores con protección del pulso.

Las chapas y la pila de chapas pueden ocasionar lesiones por cortes.

Cuidado al reparar una avería. Las pilas que no estén en posición perpendicular o que sean muy estrechas y altas pueden volcar fácilmente.



¡Alto! Das Befördern von Personen auf dem Stapelwagen ist verboten.

Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK



¡Cuidado! Die Bleche dürfen nur auf Unterbauten abgelegt werden die einen sicheren Abtransport mit dem Hallenkran ermöglichen.

Vor dem Transport müssen die Blechstapel auf den Unterbauten fixiert werden. Bei dem Abtransport der Blechstapel ist besonders sicherheits- und gefahrenbewusst zu arbeiten. Fehler wie **unzureichende Sicherung** des Materials oder die Verwendung **nicht geeigneter Anschlagmittel** für den Transport können zu **tödlichen Unfällen** führen.



¡Cuidado! Im Bereich der Stapelwagen besteht Quetschgefahr und Gefahr durch herabfallende Gegenstände wenn die Plattformen bewegt werden.



Vor dem Anheben einer Plattform an einem Stapelwagen müssen alle Blechstapel, Paletten, Werkzeug, Hilfsmittel usw. abgeräumt werden. Im Gefahrenbereich dürfen sich keine Personen befinden. **Die Person, die das Kommando für das Anheben der Plattform gibt, ist für die Sicherheit im Gefahrenbereich verantwortlich.**



7.2.11. Sistema hidráulico.



¡Alto! Sobre los depósitos de almacenamiento y de presión no se deben realizar trabajos de soldadura ni oxicorte, ni tampoco de mecanizado.



¡Cuidado! La bomba hidráulica puede alcanzar una alta temperatura de funcionamiento. El contacto con la superficie puede ocasionar quemaduras y accidentes.



¡Cuidado! Si el aceite hidráulico se sale, existe peligro de resbalones. Desconecte la máquina / instalación y haga que personal especializado selle las fugas. Retire el aceite hidráulico derramado de acuerdo con la normativa con aglutinantes de aceite.

☞  27.5; ☞ I; 1; 5; ☞ I; 1; 9;

7.2.12. Sistema neumático



¡Alto! Sobre los depósitos de almacenamiento y de presión no se deben realizar trabajos de soldadura ni oxicorte, ni tampoco de mecanizado.

☞  27.6; ☞ I; 1; 5; ☞ I; 1; 10;

7.2.13. Sistema eléctrico



¡Cuidado! Los servomotores trifásicos pueden alcanzar una alta temperatura de funcionamiento. El contacto con la superficie puede ocasionar quemaduras y accidentes.



¡Cuidado! Todos los dispositivos de protección de la instalación eléctrica (puertas del armario de distribución, cubiertas del pupitre de mando y de las cajas de bornes, etc.) deben estar siempre cerrados.

Sólo estando presente un operario se puede conectar la tensión de mando de la máquina / instalación. Es decir, sólo se permite el '**funcionamiento vigilado**'.

Si se detecta cualquier desperfecto, por pequeño que sea, en alguna pieza de la instalación eléctrica (cables, cadena del cable flexible alimentador, aparato de



Capítulo 1 Instrucciones para el uso

distribución, elemento de control, etc.) la máquina / instalación debe ser inmediatamente desconectada y asegurada contra reconexión. Un electricista especializado o personas adiestradas bajo la dirección y supervisión de un electricista especializado deberán solventar las deficiencias antes de la reconexión y de acuerdo con las normas electrotécnicas.

☞ II; ∞; ∞;



Capítulo 1 Instrucciones para el uso

8. Lugares y zonas de trabajo

8.1. *Lugares de trabajo establecidos en la máquina / instalación*

- 8.1.1. En el dibujo adjunto a continuación de la planificación dentro del local de la máquina / instalación están señalados los lugares de trabajo para el personal operario.
- 8.1.2. El tiempo de permanencia normalmente aceptable para los operarios en cada zona está indicado en forma de porcentaje sobre un turno completo.
- 8.1.3. Todos los valores indicados son valores medios. Son posibles grandes variaciones dependiendo de los distintos encargos de corte.



Capítulo 1 Instrucciones para el uso

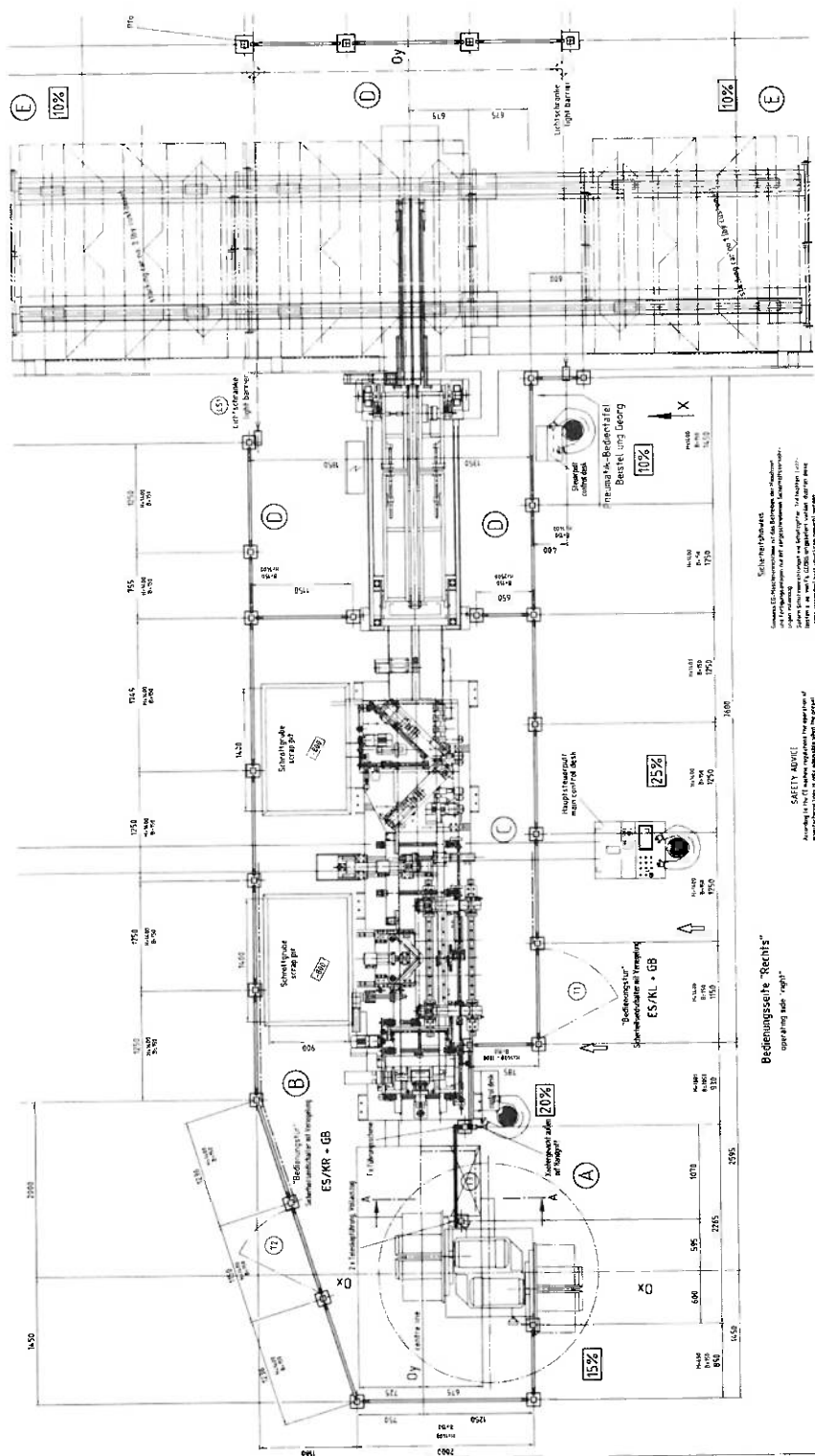
8.2. *Plano de situación de los lugares de trabajo para los operarios*



Capítulo 1

Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**





Capítulo 1 Instrucciones para el uso

9. Interruptores relevantes desde el punto de vista de la seguridad para desconectar la máquina / instalación

9.1. *Dispositivo de desconexión de la red*

- 9.1.1. El dispositivo de desconexión de la red se encuentra en el armario de distribución de la máquina / instalación. Desconectando el dispositivo de desconexión de la red (posición 0), la máquina / instalación se desconecta en todos los polos de la alimentación de la red.

Los siguientes grupos constructivos del armario de distribución no se desconectan a través del dispositivo de desconexión de la red:

**aparatos de aire acondicionado;
ventiladores;
cajas de enchufe de servicio;
iluminación;**

Estos circuitos están cableados en color naranja.

- 9.1.2. El dispositivo de desconexión de la red debe desconectarse antes de cualquier reparación o mantenimiento de la máquina / instalación, además de asegurarse por medio de un candado personal contra conexión no autorizada. El candado personal se cuelga del mando con muletila del dispositivo de desconexión de la red.

9.2. *Circuito de PARADA DE EMERGENCIA*

- 9.2.1. Unos pulsadores de seta rojos con enclavamiento mecánico funcionan como pulsadores de PARADA DE EMERGENCIA. Cada pulsador de PARADA DE EMERGENCIA está marcado con una superficie amarilla. La activación de los pulsadores de PARADA DE EMERGENCIA no debe verse obstaculizada por objetos dejados u otros impedimentos.

- 9.2.2. Los pulsadores de PARADA DE EMERGENCIA se encuentran en las siguientes posiciones de la máquina / instalación:

**Pupitre principal de mando +P1;
Pupitre de mando avance +P2;
Pupitre de mando apilado +P3;
Pulsadores adicionales de PARADA DE EMERGENCIA
Lado de accionamiento avance +P2;
Lado de accionamiento instalación de apilado +M12;**

- 9.2.3. Presionando una vez el pulsador de PARADA DE EMERGENCIA se desconecta la tensión de mando.

Todos los accionamientos equipados con posibilidad de freno eléctrico o mecánico se frenan inmediatamente y luego se desconectan de la alimentación



Capítulo 1 Instrucciones para el uso

de energía.

De este modo se neutralizan todos los peligros con la mayor rapidez posible.

- 9.2.4. Tras una PARADA DE EMERGENCIA, la máquina / instalación no puede volver a arrancar hasta desbloquear el pulsador de PARADA DE EMERGENCIA y presionar el pulsador DESACTIVAR PARADA DE EMERGENCIA.

9.3. *Interruptor de seguridad*

- 9.3.1. Los interruptores de seguridad son dispositivos de desconexión que permiten que **personas adiestradas** realicen trabajos en zonas parciales de una máquina / instalación conectada. Pulsando el interruptor de seguridad se interrumpe el suministro de energía a la respectiva zona y se impide un arranque inesperado. El interruptor de seguridad debe asegurarse contra conexión no autorizada en la posición de conmutación APAGADO por medio de un candado personal.

Sólo los trabajos descritos en este capítulo para cada uno de los interruptores de seguridad pueden realizarse sin peligro con el interruptor de seguridad activado.

9.4. *Dispositivo de validación*

- 9.4.1. Los dispositivos de validación son órganos de conmutación que permiten a **personas adiestradas** el funcionamiento de ajuste o de prueba en zonas parciales de una zona peligrosa desconectada de la máquina / instalación. Pulsando el dispositivo de validación (posición media) vuelven a conectarse determinados accionamientos eléctricos causantes de ciertos peligros en una determinada parte de la máquina / instalación con la puerta de acceso a la zona peligrosa abierta. Presionar completamente o liberar el dispositivo de validación supone, independientemente de todas las demás funciones, el frenado inmediato de todos los movimientos y la subsiguiente desconexión de los accionamientos.

El operario que presiona el dispositivo de validación es responsable de la seguridad en la zona peligrosa.

Sólo los trabajos descritos en este apartado para cada uno de los dispositivos de validación pueden realizarse sin peligro con el dispositivo de validación activado.

- 9.4.2. Dispositivo de validación ZT1 para el aspa desarrolladora.
Para introducir un comienzo de cinta en la máquina / instalación es necesario que la cabeza de puntal del aspa desarrolladora pueda realizar las funciones 'adelante' o 'atrás' con la puerta de protección abierta. Una vez bloqueado el movimiento giratorio del aspa desarrolladora, se puede conectar el suministro de energía al accionamiento con el interruptor confirmacion (posición media). A través de dos pulsadores situados en la misma caja se pueden dar las dos órdenes de servicio DEVANADORA MARCHA ATRAS o DEVANADORA MARCHA ADELANTE al accionamiento.



Capítulo 1

Instrucciones para el uso

9.5. *Sistemas de transferencia por llave*

9.5.1. Las zonas peligrosas donde el personal de operación sólo puede entrar con la **máquina / instalación desconectada** están protegidas mediante sistemas de transferencia por llave. Las principales características de funcionamiento de este sistema son:

- Con el mando de la máquina / instalación conectado, la llave debe estar en la posición no extraíble del conmutador selector de llave.
- Con la puerta de acceso abierta, la llave se retiene de forma no extraíble en el dispositivo de cierre.

El explotador de la máquina / instalación debe asegurarse de que sólo haya una llave en uso por cada sistema de transferencia por llave.

Las llaves de recambio para los sistemas de transferencia por llave deben guardarse en un lugar únicamente accesible para las personas autorizadas.



Capítulo 1 Instrucciones para el uso

10. Descripción de los elementos de control e indicaciones Funciones eléctricas

10.1. *Índice de las abreviaturas y símbolos empleados para los elementos de control e indicaciones.*

BMK : Distintivo de medio de producción. Sirve exclusivamente para la identificación en trabajos de mantenimiento y reparación.

DT	: Pulsador	LL	: Conductor de luz
LDT	: Pulsador luminoso	US	: Sensor de ultrasonidos
SDT	: Pulsador escalonado	TH	: Interruptor térmico
PDT	: Pulsador de seta	DW	: Controlador de presión
NT	: Dispositivo de desconexión de la red		
H	: Bocina / sirena	LED	: Diodo luminoso
WS	: Conmutador selector	ML	: Lámpara testigo
SS	: Interruptor de llave		: Funcionamiento por pulsación
ZT	: Dispositivo de validación		
SZT	: Dispositivo de validación con llave		
ST	: Pulsador basculante		
KS	: Interruptor codificador		
SiS	: Interruptor de seguridad		
MS	: Interruptor maestro		
INIT	: Iniciador		
ES	: Interruptor de fin		
LS	: Barrera de luz		
LT	: Explorador de punto luminoso		

Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

10.2. Armario de distribución

BMK	Abreviatura	Identificación	Descripción
=01.DA1 -Q12	NT	0 INTERRUPTOR PRINCIPAL I	Alimentación de red desconectada. ¡Cuidado! Determinados grupos constructivos del armario de distribución no se desconectan de la alimentación de energía.  21.2.4; Alimentación de red conectada.
=02.NA1 -H12	ML	CONEXION INTERRUPTOR PRINCIPAL Claro	Activado: El dispositivo de desconexión de la red está conectado y hay tensión de red.

10.2.1. Für Fehlersuche und Testlauf.

¡Atención! Darf nur von einer geschulten Elektrofachkraft betätigt werden!

BMK	Abreviatura	Identificación	Descripción
=01.DC1 -S23	WS	AKKU - BETRIEB EIN	Die Unterspannungsversorgung wird 'Betriebsbereit' geschaltet.
=61.FA1 -S53	SZT	NOT - ENDBEGRENZUNG STAPELWAGEN ÜBERBRÜCKEN	 Dieser Schlüsselszustimmtaster darf nur von Fachkräften betätigt werden! Die Not - Endbegrenzung der Antriebe zu den Stapelwagen wird außer Betrieb gesetzt.
=02.NA1 -S33	WS	UMSCHALTUNG LPG / MPG LPG MPG	Schaltet das Längenmeßsystem um. Die Vorschublänge wird über die Messrolle gemessen. (Normal- betrieb) Die Vorschublänge wird über die Vorschubrolle gemessen.



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

=02.NA1 -S34	WS	AUTOMATIK OHNE MATERIAL	Schaltet die Materialüberwachung in der Maschine / Anlage aus. Automatikbetrieb ohne Material. Normalbetrieb.



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

10.3. Pupitre de mando principal +P1

BMK	Abreviatura	Identificación	Descripción
=01.PA1 -S25	PDT	Parada de emergencia Pulsador de seta Color: rojo Fondo: amarillo	Pasa la máquina / instalación a estado seguro con la mayor rapidez posible y desconecta entonces la tensión de mando. El pulsador presionado se bloquea mecánicamente. El mando guarda el comando.
=01.PA1 -S34	LDT	DESBLOQUEO PARADA DE EMERGENCIA	¡Atención! Este pulsador luminoso sólo debe ser activado por el operario después de haber comprobado que la situación de emergencia que motivó la activación de un pulsador de PARADA DE EMERGENCIA ya no existe. Una vez desbloqueados todos los pulsadores de PARADA DE EMERGENCIA, el comando de parada de emergencia guardado por el mando se borra y se habilita la conexión de la máquina / instalación.
	ML	Azul	Activado: Die Maschine / Anlage wurde durch das Betätigen eines PARADA DE EMERGENCIA Tasters ausgeschaltet.
=02.NA1 -S14	SS	TENSION MANDO DESCONEC.	Desconecta la tensión de mando de la máquina / instalación. Todos los accionamientos y elementos de control se desconectan de la alimentación de energía.
=02.NA1 -S14.1	LDT	TENSION MANDO CONECTADO	Conecta la tensión de mando de la máquina / instalación. Con ello se conecta la alimentación de energía eléctrica.
Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 65 de 148



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

	ML	Claro	Activado: La máquina / instalación está conectada.
		BILDSCHIRM	II; 1; 10;



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

10.4. Pupitre de mando principal +P1

BMK	Abreviatura	Identificación	Descripción
=31.EA1 -S43	LDT 	PUNZON 1 RETROCESO	Función manual para el accionamiento de posicionamiento en la punzonadora 1. Mover en la dirección de avance a velocidad de pulsación.
	ML	Verde Rojo	Parpadea: La punzonadora 1 está en la posición final 'adelante'. Activado: La punzonadora 1 está en la posición final 'volver'.
=31.EA1 -S42	LDT 	PUNZON 1 AVANCE	Función manual para el accionamiento de posicionamiento en la punzonadora 1. Mover en la dirección a las cizallas a velocidad de pulsación.
	ML	Verde Rojo	Parpadea: La punzonadora 1 está en la posición final 'volver'. Activado: La punzonadora 1 está en la posición final 'adelante'.
=21.EA1 -S47	DT 	RETROCEDER AVANCE	Máquina / instalación en modo de funcionamiento 'manual': Transporta la cinta en avance en dirección al foso de bucles o bien ejecuta el correspondiente movimiento de giro de los rodillos de avance. Máquina / instalación en modo de funcionamiento 'automático': Reducir la velocidad de transporte del avance.



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

=21.EA1 -S46	DT 	DESPLAZAR AVANCE	Máquina / instalación en modo de funcionamiento 'manual': Transporta la cinta en avance en dirección a las cizallas o bien ejecuta el correspondiente movimiento de giro de los rodillos de avance. Máquina / instalación en modo de funcionamiento 'automático': Aumentar la velocidad de transporte del avance.
	LDT 	CIZALLA / V DESPLAZAR	Función manual para el accionamiento de posicionamiento en el cizalla en V. Mover en dirección al lateral de la instalación a velocidad de pulsación.
=31.EA2 -S43	ML	Verde Rojo	Parpadea: El punzón en V está en la posición final 'entrar'. Activado: El punzón en V está en la posición final 'salir'.
	LDT 	CIZALLA / V RETROCEDER	Función manual para el accionamiento de posicionamiento en el cizalla en V. Mover en dirección al centro de la instalación a velocidad de pulsación.
=31.EA2 -S42	ML	Verde Rojo	Parpadea: El punzón en V está en la posición final 'salir'. Activado: El punzón en V está en la posición final 'entrar'.



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

=31.EA3 -S43	LDT 	PUNZON 2 RETROCESO	Función manual para el accionamiento de posicionamiento en la punzonadora 2. Mover en la dirección de avance a velocidad de pulsación.
	ML	Verde Rojo	Parpadea: La punzonadora 2 está en la posición final 'adelante'. Activado: La punzonadora 2 está en la posición final 'volver'.
=31.EA3 -S42	LDT 	PUNZON 2 AVANCE	Función manual para el accionamiento de posicionamiento en la punzonadora 2. Mover en la dirección a las cizallas a velocidad de pulsación.
	ML	Verde Rojo	Parpadea: La punzonadora 2 está en la posición final 'volver'. Activado: La punzonadora 2 está en la posición final 'adelante'.
=02.NA15 -S23	DT	DESCONEX. CINTA TRANSPORTE	Desconecta las cintas transportadoras de la máquina / instalación previstas para transportar el material de producción.
=02.NA15 -S22	LDT	CONEXION CINTA TRANSPORTE	Conecta las cintas transportadoras de la máquina / instalación previstas para transportar el material de producción. Der cuña separadora wird in die Betriebsart 'Automatik' geschaltet.
Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 69 de 148



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

	ML	Verde Rojo	Activado: Las cintas transportadoras están conectadas. Parpadea: An mindestens einem der Antriebe hat die Steuerung einen Fehler erkannt.
=31.EA4-S43	LDT ⊕	PUNZON 3 DESPLAZAR	Función manual para el accionamiento de posicionamiento en la punzonadora 3. Mover en dirección al lateral de la instalación a velocidad de pulsación.
	ML	Verde Rojo	Parpadea: La punzonadora 3 está en la posición final 'entrar'. Activado: La punzonadora 3 está en la posición final 'salir'.
=31.EA4-S42	LDT ⊕	PUNZON 3 RECOJER	Función manual para el accionamiento de posicionamiento en la punzonadora 3. Mover en dirección al centro de la instalación a velocidad de pulsación.
	ML	Verde Rojo	Parpadea: La punzonadora 3 está en la posición final 'salir'. Activado: La punzonadora 3 está en la posición final 'entrar'.



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

=41.ED1 -S22	WS	CUÑA SEPARADORA MANUAL MANUAL AUTO	Conmutar el mando de la chaveta separadora. Modo de funcionamiento 'manual': Las chapas se depositan sobre el plano de apilado preseleccionado con el conmutador selector DEPOSITAR MATERIAL INFERIOR. Modo de funcionamiento 'automático': Diese Betriebsart wird auch durch das Einschalten der Transportbänder vorgewählt. Las chapas se depositan sobre el plano de apilado preprogramado.
	ML	Verde Amarillo	Activado: La chaveta separadora está en modo de funcionamiento 'automático'. Activado: La chaveta separadora está en modo de funcionamiento 'manual'.
=41.ED1 -S23	WS	DEPOSITAR MATERIAL INFERIOR	Preseleccionar el plano de apilado para depositar las chapas. (modo de funcionamiento 'manual'.)
	ML	Verde	Desactivado: Las chapas se depositan sobre el plano de apilado superior. Activado: Las chapas se depositan sobre el plano de apilado inferior.



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

=02.NA15 -S24	DT 	TEST LÁMPARAS	Prueba de funcionamiento para las lámparas testigo y las luces de los pulsadores luminosos en este pupitre de mando. ('Tensión de mando conectada' no se comprueba.)
=02.NA15 -S36	LDT	MENSAJE ALARMA	Borrar mensajes de fallo.
	ML	Verde Amarillo Rojo	Durch die Meldeleuchten wird die Bedienungsperson auf Informationen am Bildschirm im Hauptsteuerpult hingewiesen. Activado: Info zu Betriebszuständen der Maschine / Anlage, Bedienerhilfe. Activado: Info zu Fehlern an der Maschine / Anlage. Die Produktion wurde mit der Funktion 'Parada automática' unterbrochen. Activado: Info zu fatalen Fehlern an der Maschine / Anlage. Der Betriebszustand 'Manual' wurde eingeschaltet.
=02.NA15 -S26	WS	PREPARACION 0 1	 Dieser Schlüsselschalter darf nur von geschulten Fachkräften betätigt werden! Vor dem Entriegeln der Zugangstüren zum Gefahrenbereich werden alle Werkzeuge in die Endlage 'Unten' gestellt. Die Bremsen zu den Antrieben bleiben geöffnet, auch wenn die Steuerspannung ausgeschaltet wird.



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

=02.NA15 -S37	LDT	PROGRAMA FINAL	Programmabbruch und Band mit V- bzw. Loch- Ausstanzungen: Der Bandanfang wird in Schopfbleche zerschnitten. Band ohne V- bzw. Loch- Ausstanzungen: El comienzo de cinta se recorta en forma de cuña y se devuelve al avance.
	ML	Claro	Blinkt schnell: (1,25 Hz) V- bzw. Loch- Ausstanzungen im Band. Nach betätigen des Tasters wird der Bandanfang in Schopfbleche zerschnitten. Blinkt langsam: (0,625 Hz) Se lleva a cabo el comando. Ein: Keine V- bzw. Loch- Ausstanzungen im Band. Nach betätigen des Tasters wird das Endprogramm gestartet.
=02.NA15 -H32	ML	AJUSTE ACTIVADO Claro	Parpadea: Se ejecuta el proceso de reglaje.
=02.NA15 -S32	WS	AJUSTE MANUAL AUTOM MANUAL AUTOM	Conmutador selector para funciones de reglaje. (Ajustar el sistema de medición a la cinta existente en la máquina / instalación) Funcionamiento por tecla. Tras pulsar se ejecuta un proceso de reglaje. Función de reglaje conectada. El proceso de reglaje se ejecuta después de parada y arranque del rodillo de transporte inmediatamente al comenzar el funcionamiento automático.



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

=02.NA15 -S15	LDT	STOP RAPIDO	Máquina / instalación en modo de funcionamiento 'manual': Alle aktiven Teilautomatiken werden ausgeschaltet. Máquina / instalación en modo de funcionamiento 'automático': Interrumpe inmediatamente el proceso automático de producción de la máquina / instalación. La producción puede reanudarse presionando el pulsador START.
	ML	Amarillo	Activado: Se ha interrumpido la producción.
=02.NA15 -S14	LDT	STOP AUTOMATICO	Interrumpe el proceso automático de producción de la máquina / instalación una vez terminada la chapa entonces en proceso. La producción puede reanudarse presionando el pulsador START.
	ML	Claro	Activado: Se ha interrumpido la producción.
=02.NA15 -S16	DT	START Amarillo	Inicia el proceso de producción de la máquina / instalación en el modo de funcionamiento 'automático'.
=02.NA15 -S12	LDT	MANUAL	Conecta el modo de funcionamiento 'manual' de la máquina / instalación.
	ML	Verde	Activado: Conectado el modo de funcionamiento 'manual' de la máquina / instalación.
=02.NA15 -S13	LDT	AUTOMATICO	Conecta el modo de funcionamiento 'automático' de la máquina / instalación.
Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 74 de 148



Capítulo 1 Instrucciones para el uso

	ML	Claro	Activado: Conectado el modo de funcionamiento 'automático' de la máquina / instalación.
--	----	-------	---



Capítulo 1 Instrucciones para el uso

10.5. *Pupitre de mando principal +P1*

BMK	Abreviatura	Identificación	Descripción
=32.EA1 -S36	DT	PUNZO- NADORA 1 PUNZONAR	Inicia una carrera de trabajo de la punzonadora 1.
=32.EA2 -S36	DT	CIZALLA / V PUNZONAR	Inicia una carrera de trabajo del cizalla en V.
=32.EA3 -S36	DT	PUNZO- NADORA 2 PUNZONAR	Inicia una carrera de trabajo de la punzonadora 2.
=32.EA4 -S36	DT	PUNZO- NADORA 3 PUNZONAR	Inicia una carrera de trabajo de la punzonadora 3.
=32.EA6 -S36	DT	CIZALLA 2 CORTE	Inicia una carrera de trabajo de la cizalla 2.
=32.EA5 -S36	DT	CIZALLA 1 CORTE	Inicia una carrera de trabajo de la cizalla 1.
=33.ED1 -S12	LDT	CIZALLA 1 45°	Coloca la cizalla 1 en posición para cortes de 45°.
	ML	Verde	Parpadea: Se lleva a cabo el comando. Activado: La cizalla está en posición 45°.
=33.ED1 -S13	LDT	CIZALLA 1 0°	Coloca la cizalla 1 en posición para cortes de 0°.
	ML	Verde	Parpadea: Se lleva a cabo el comando. Activado: La cizalla está en posición 0°.



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

=02.NA15 -S35	WS	CHAPA INDIVIDUAL 0 I 0 I	Preselección del modo de producción 'chapa individual'. Desconectado. La máquina / instalación produce en cada caso una chapa terminada y espera entonces a que se presione de nuevo el pulsador START.
=02.NA15 -S34	WS	CORTE INDIVIDUAL 0 I 0 I	Preselección del modo de producción 'corte individual'. Desconectado. La máquina / instalación produce en cada caso hasta la siguiente carrera de trabajo de una herramienta y espera entonces a que se presione de nuevo el pulsador START.



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

10.6. Pupitre de mando avance +P2

BMK	Abreviatura	Identificación	Descripción
=01.PA1 -S12	PDT	Parada de emergencia Pulsador de seta Color: rojo Fondo: amarillo	Pasa la máquina / instalación a estado seguro con la mayor rapidez posible y desconecta entonces la tensión de mando. El pulsador presionado se bloquea mecánicamente. El mando guarda el comando.
=01.PB1 -S62	ZT 	INTERRUPTOR CONFIRMACION Amarillo	Schaltet die Energiezuführung für die Antriebe ein, deren Funktionen von diesem Steuerpult aus bei geöffnetem Zugang zum Gefahrenbereich ausgeführt werden müssen. Die Stellteile sind in diesem Abschnitt mit + Interruptor confirmacion gekennzeichnet.
=11.ED2 -S16	DT	BASCULAR DEVANADORA IZQUIERDA + Interruptor confirmacion	Handfunktion zu dem Schwenkantrieb an dem Abwickelhaspel. Bascula las cabezas del aspa en sentido contrario al de las agujas del reloj.
	ML	Verde Amarillo Rojo	Parpadea: Se lleva a cabo el comando. Activado: Haspelkopf in Abwickelposition und arretiert. Activado: Haspelkopf in Abwickelposition aber nicht arretiert. Activado: Kein Haspelkopf in Abwickelposition.
=11.ED2 -S15	DT	BASCULAR DEVANADORA DERECHA + Interruptor confirmacion	Handfunktion zu dem Schwenkantrieb an dem Abwickelhaspel. Bascula las cabezas del aspa en el sentido de las agujas del reloj.
Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 78 de 148



Capítulo 1 Instrucciones para el uso

	ML	Verde	Parpadea: Se lleva a cabo el comando.
		Amarillo	Activado: Haspelkopf in Abwickelposition und arretiert.
		Rojo	Activado: Haspelkopf in Abwickelposition aber nicht arretiert.
			Activado: Kein Haspelkopf in Abwickelposition.
=11.EA1-S63	DT ⊕	DEVANADORA MARCHA ATRAS	Funcionamiento manual al accionamiento en el mandril del aspa desarrolladora. Girar hacia atrás a velocidad de pulsación.
=11.EA1-S62	DT ⊕	DEVANADORA MARCHA ADELANTE	Funcionamiento manual al accionamiento en el mandril del aspa desarrolladora. Girar hacia adelante a velocidad de pulsación.
=21.ED1-S27	LDT	MR + TR BAJAR	Bajar los rodillos de medición y de transporte.
	ML	Verde	Parpadea: La presión actualmente existente no es suficiente para el avance de la cinta dentro de los límites de tolerancia. Activado: Presión suficiente.
=21.ED1-S26	LDT	MR + TR ELEVAR	Subir los rodillos de medición y de transporte.
	ML	Verde	Parpadea: Aktuell vorhandener Druck noch nicht abgebaut. Activado: Rodillos parados.



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

=21.EA1 -S43	DT ⊕	TRACCION MARCHA ATRAS	Máquina / instalación en modo de funcionamiento 'manual': Transporta la cinta en avance en dirección al foso de bucles o bien ejecuta el correspondiente movimiento de giro de los rodillos de avance. Die Schlaufenregelung steuert, wenn notwendig, den Abwickelhaspeldorn rückwärts. Máquina / instalación en modo de funcionamiento 'automático': Reducir la velocidad de transporte del avance.
=21.EA1 -S42	DT ⊕	TRACCION MARCHA ADELANTE	Máquina / instalación en modo de funcionamiento 'manual': Transporta la cinta en avance en dirección a las cizallas o bien ejecuta el correspondiente movimiento de giro de los rodillos de avance. Die Schlaufenregelung steuert, wenn notwendig, den Abwickelhaspeldorn vorwärts. Máquina / instalación en modo de funcionamiento 'automático': Aumentar la velocidad de transporte del avance.
=33.FA1 -S53	LDT ⊕	CERRAR GUIA LATERAL	Ajustar las guías laterales a una anchura de cinta menor.
	ML	Rojo Amarillo	Activado: Die Seitenführung steht in der Endlage 'Schliessen'. Activado: Der Verstellantrieb läuft im Schleichgang.
=33.FA1 -S52	LDT ⊕	ABRIR GUIA LATERAL	Ajustar las guías laterales a una anchura de cinta mayor.
Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 80 de 148



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

	ML	Rojo	Activado: Die Seitenführung steht in der Endlage 'Öffnen'.
=33.FA1 -S54	LDT	POSICIONAR GUIA LATERAL	Iniciar el ajuste automático de la guía lateral de la cinta. La guía lateral de la cinta se ajusta a la anchura de cinta predeterminada por el ordenador de la instalación.
	ML	Verde Amarillo	Desactivado: La posición de las guías laterales no es idéntica a la anchura de cinta predeterminada por el ordenador. Parpadea: Se lleva a cabo el comando. Activado: La guía lateral está ajustada a la anchura de cinta predeterminada. Activado: Die Seitenführung ist im Bereich der minimalen Bandbreite und fährt nur noch im Schleichgang weiter.
=33.FA1 -S55	DT	GUIA LATERAL STOP	Desactivar el ajuste automático de la guía lateral de la cinta.
=02.NA16 -S23	DT	DESCONEXI CINTA TRANSPORTE	Desconecta las cintas transportadoras de la máquina / instalación previstas para transportar el material de producción.
=02.NA16 -S22	LDT	CONEXION CINTA TRANSPORTE	Conecta las cintas transportadoras de la máquina / instalación previstas para transportar el material de producción. Der cuña separadora wird in die Betriebsart 'Automatik' geschaltet.
Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 81 de 148



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

	ML	Verde Rojo	Activado: Las cintas transportadoras están conectadas. Parpadea: An mindestens einem der Antriebe hat die Steuerung einen Fehler erkannt.
=02.NA16 -S24	DT	TEST LAMPARAS	Prueba de funcionamiento para las lámparas testigo y las luces de los pulsadores luminosos en este pupitre de mando.
=02.NA16 -H26	ML	MENSAJE ALARMA Verde Amarillo Rojo	Durch die Meldeleuchten wird die Bedienungsperson auf Informationen am Bildschirm im Hauptsteuerpult hingewiesen. Activado: Info zu Betriebszuständen der Maschine / Anlage, Bedienerhilfe. Activado: Info zu Fehlern an der Maschine / Anlage. Die Produktion wurde mit der Funktion 'Parada automática' unterbrochen. Activado: Info zu fatalen Fehlern an der Maschine / Anlage. Der Betriebszustand 'Manual' wurde eingeschaltet.
=21.ED2 -S17	WS	BRAZO BUQLE BAJAR ELEVAR SENKEN HEBEN	Der Schlaufenhebel verhindert, das das in den Vorschub einlaufende Band Wellen bildet. Schlaufenhebel in vertikale Position stellen. (Band glatt halten) Schlaufenhebel in horizontale Position stellen. (Für Bandanfang vom Abwickelhaspel zum Vorschubaggregat transportieren.)



Capítulo 1 Instrucciones para el uso

=01.PB1 -S32	LDT	PUERTAS SEGURIDAD CERRAR / ABRIR ABRIR CERRAR	Pulsador de función doble. Se desconecta la alimentación de energía a las partes de la máquina / instalación causantes del peligro. Se desenchava el bloqueo de seguridad. Se activa el bloqueo de seguridad de la puerta de acceso cerrada y bloqueada mecánicamente.
	ML	Azul	Parpadea lentamente: (1 Hz) Se toman las medidas de desconexión necesarias. Activado: Eine der Zugangstüren ist geöffnet. Parpadea rápidamente: (2 Hz) Die Zugangstüren sind geschlossen, aber nicht verriegelt. Desactivado: La puerta de acceso está bloqueada.
=01.PB2 -S32	LDT	PUERTAS SEGURIDAD CERRAR / ABRIR ABRIR CERRAR	Pulsador de función doble. Se desconecta la alimentación de energía a las partes de la máquina / instalación causantes del peligro. Se desenchava el bloqueo de seguridad. Se activa el bloqueo de seguridad de la puerta de acceso cerrada y bloqueada mecánicamente.
Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 83 de 148



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

	ML	Azul	Parpadea lentamente: (1 Hz) Se toman las medidas de desconexión necesarias. Activado: Eine der Zugangstüren ist geöffnet. Parpadea rápidamente: (2 Hz) Die Zugangstüren sind geschlossen, aber nicht verriegelt. Desactivado: La puerta de acceso está bloqueada.
=02.NA16 -S12	LDT	MANUAL	Conecta el modo de funcionamiento 'manual' de la máquina / instalación.
	ML	Verde	Activado: Conectado el modo de funcionamiento 'manual' de la máquina / instalación.
=02.NA16 -S16	DT	START Amarillo	Inicia el proceso de producción de la máquina / instalación en el modo de funcionamiento 'automático'.
=02.NA16 -S14	LDT	STOP AUTOMATICO	Interrumpe el proceso automático de producción de la máquina / instalación una vez terminada la chapa entonces en proceso. La producción puede reanudarse presionando el pulsador START.
	ML	Claro	Activado: Se ha interrumpido la producción.



Capítulo 1 Instrucciones para el uso

=02.NA16 -S15	LDT	STOP RAPIDO	Máquina / instalación en modo de funcionamiento 'manual': Alle aktiven Teilautomatiken werden ausgeschaltet. Máquina / instalación en modo de funcionamiento 'automático': Interrumpe inmediatamente el proceso automático de producción de la máquina / instalación. La producción puede reanudarse presionando el pulsador START.
	ML	Amarillo	Activado: Se ha interrumpido la producción.

Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

10.7. Aspa desarrolladora +M2

BMK	Abreviatura	Identificación	Descripción
=11.ED2-H22	ML	WARNLAMPE HASPEL SCHWENKEN	Parpadea: Die Abwickelhaspelköpfe werden geschwenkt. Der Aufenthalt im Schwenkbereich ist verboten !

10.8. Dispositivo de validación aspa desarrolladora ZT1

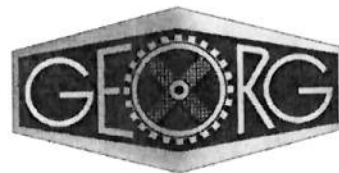
BMK	Abreviatura	Identificación	Descripción
=01.PB1-S42		INTERRUPTOR CONFIRMACION ZT1	Conecta la alimentación de energía al accionamiento en el mandril del aspa desarrolladora con el acceso a la zona peligrosa abierto.
		DEVANADORA MARCHA ADELANTE + Interruptor confirmacion	Funcionamiento manual al accionamiento en el mandril del aspa desarrolladora. Girar hacia adelante a velocidad de pulsación.
		DEVANADORA MARCHA ATRÁS + Interruptor confirmacion	Funcionamiento manual al accionamiento en el mandril del aspa desarrolladora. Girar hacia atrás a velocidad de pulsación.



Capítulo 1 Instrucciones para el uso

10.9. Drucktastergehäuse puerta de acceso T2 +S2.1

BMK	Abreviatura	Identificación	Descripción
=01.PB1 -S36	LDT	ZONA PELIGROSA B PUERTA SEGURIDAD CERRAR / ABRIR ABRIR CERRAR	Pulsador de función doble. Se desconecta la alimentación de energía a las partes de la máquina / instalación causantes del peligro. Se desenclava el bloqueo de seguridad. Se activa el bloqueo de seguridad de la puerta de acceso cerrada y bloqueada mecánicamente.
	ML	Azul	Parpadea lentamente: (1 Hz) Se toman las medidas de desconexión necesarias. Activado: Eine der Zugangstüren ist geöffnet. Parpadea rápidamente: (2 Hz) Die Zugangstüren sind geschlossen, aber nicht verriegelt. Desactivado: La puerta de acceso está bloqueada.



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

10.10. Pupitre de mando apilado +P3

BMK	Abreviatura	Identificación	Descripción
=01.PA1 -S22.1	PDT	Parada de emergencia Pulsador de seta Color: rojo Fondo: amarillo	Pasa la máquina / instalación a estado seguro con la mayor rapidez posible y desconecta entonces la tensión de mando. El pulsador presionado se bloquea mecánicamente. El mando guarda el comando.
=41.FA3 -S33	LDT	POSICIONAR AJUSTE ALTURA	Bajar automáticamente el dispositivo de apilado a posición de apilado.
	ML	Verde Rojo	Parpadea: Se lleva a cabo el comando. Activado: El dispositivo de apilado está en la posición de apilado sobre una pila de chapas. Activado: El dispositivo de apilado está en la posición final 'abajo'.
=41.FA3 -S32	LDT	ABRIR AJUSTE ALTURA	Mover el dispositivo de apilado hacia arriba.
	ML	Rojo Amarillo	Activado: Die Stapelvorrichtung steht in der Endlage 'Oben'. Activado: Die maximale Stapelhöhe ist erreicht.
=41.FA3 -S34	DT	PARADA AJUSTE DE ALTURA	Desconecta la función parcialmente automática 'posicionar el ajuste en altura'.
=61.ED1 -S22	LDT	BAJAR PLATAFORMA	Die obere Plattform des Stapelwagens wird in waagerechte Position gestellt.
Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 88 de 148



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

	ML	Verde	Activado: Die obere Plattform steht in waagerechter Position.
=61.FA1 -S43	LDT	CARRO APILADO 1 IZQUIERDA	1. Stapelwagen im Entladebereich: In Richtung Bedienseite fahren. 2. Stapelwagen im Stapelbereich: Funktion 1 und, nach Freigabe des Tasters, die in Fahrtrichtung nächstmögliche Stapelposition automatisch anfahren.
	ML	Verde Amarillo Rojo	Parpadea rápidamente: (0,625 Hz) Stapelwagen fährt in eine Stapelposition. Parpadea lentamente: (1,25Hz) Stapelwagen steht in einer Stapelposition, ist aber noch nicht arretiert. Activado: Stapelwagen steht in einer Stapelposition und ist arretiert. Activado: Stapelwagen steht in der Endlage 'Antriebseite'. Activado: Stapelwagen steht in der Not - Endbegrenzung 'Antriebseite'.
=61.FA1 -S42	LDT	CARRO APILADO 1 DERECHA	1. Stapelwagen im Entladebereich: In Richtung Antriebseite fahren. 2. Stapelwagen im Stapelbereich: Funktion 1 und, nach Freigabe des Tasters, die in Fahrtrichtung nächstmögliche Stapelposition automatisch anfahren.
Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 89 de 148



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

	ML	Verde	Parpadea rápidamente: (0,625 Hz) Stapelwagen fährt in eine Stapelposition. Parpadea lentamente: (1,25Hz) Stapelwagen steht in einer Stapelposition, ist aber noch nicht arretiert. Activado: Stapelwagen steht in einer Stapelposition und ist arretiert. Activado: Stapelwagen steht in der Endlage Richtung 'Bedienseite'. Activado: Stapelwagen steht in der Not - Endbegrenzung 'Bedienseite'.
		Amarillo	
		Rojo	
=62.FA1 -S43	LDT	CARRO APILADO 2 IZQUIERDA	1. Stapelwagen im Entladebereich: In Richtung Bedienseite fahren. 2. Stapelwagen im Stapelbereich: Funktion 1 und, nach Freigabe des Tasters, die in Fahrtrichtung nächstmögliche Stapelposition automatisch anfahren.
	ML	Verde	Parpadea rápidamente: (0,625 Hz) Stapelwagen fährt in eine Stapelposition. Parpadea lentamente: (1,25Hz) Stapelwagen steht in einer Stapelposition, ist aber noch nicht arretiert. Activado: Stapelwagen steht in einer Stapelposition und ist arretiert. Activado: Stapelwagen steht in der Endlage Richtung 'Antriebseite'. Activado: Stapelwagen steht in der Not - Endbegrenzung 'Antriebseite'.
		Amarillo	
		Rojo	



Capítulo 1

Instrucciones para el uso

=62.FA1 -S42	LDT	CARRO APILADO 2 DERECHA	1. Stapelwagen im Entladebereich: In Richtung Antriebseite fahren. 2. Stapelwagen im Stapelbereich: Funktion 1 und, nach Freigabe des Tasters, die in Fahrtrichtung nächstmögliche Stapelposition automatisch anfahren.
	ML	Verde Amarillo Rojo	Parpadea rápidamente: (0,625 Hz) Stapelwagen fährt in eine Stapelposition. Parpadea lentamente: (1,25Hz) Stapelwagen steht in einer Stapelposition, ist aber noch nicht arretiert. Activado: Stapelwagen steht in einer Stapelposition und ist arretiert. Activado: Stapelwagen steht in der Endlage 'Bedien-seite'. Activado: Stapelwagen steht in der Not - Endbegrenzung 'Bedienseite'.
=02.NA17 -S27	LDT	POSICIONAR CARRO APILADO	Die Stapelwagen werden automatisch in die vom Rechner vorgegebenen Positionen gefahren.
	ML	Verde	Parpadea lentamente: (1,25 Hz) Die Position der Stapelwagen ist nicht identisch mit der vom Rechner vorgegebenen Position. Parpadea rápidamente: (0,624 Hz) Se lleva a cabo el comando. Activado: Die Stapelwagen stehen auf den vom Rechner vorgegebenen Positionen.



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

=51.EA1 -S32	DT 	CINTA DE APILADO 1 AVANCE	Handfunktion zu den Antrieben an Auslauftransportband, Schrägtransportband 1 und Sta- pelband 1. Mit Tippgeschwindigkeit vorwärts drehen.
=51.EA2 -S32	DT 	CINTA DE APILADO 2 AVANCE	Handfunktion zu den Antrieben an Auslauftransportband, Schrägtransportband 2 und Sta- pelband 2. Mit Tippgeschwindigkeit vorwärts drehen.
=02.NA17 -S23	DT	DESCONEX. CINTA TRANSPORTE	Desconecta las cintas transportadoras de la máquina / instalación previstas para transportar el material de producción.
=02.NA17 -S22	LDT	CONEXION CINTA TRANSPORTE	Conecta las cintas transportadoras de la máquina / instalación previstas para transportar el material de producción. Der cuña separadora wird in die Betriebsart 'Automatik' geschal- tet.
	ML	Verde Rojo	Activado: Las cintas transportadoras están conectadas. Parpadea: An mindestens einem der Antriebe hat die Steuerung einen Fehler erkannt.
=02.NA17 -S25	DT 	DESPEGAR CHAPA	Mit den Abstreifern werden die Bleche von den Stapelbändern abgelöst. Die Abstreifleisten werden nach unten gestellt.



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

=02.NA17 -S24	DT	TEST DE LAMPARAS	Prueba de funcionamiento para las lámparas testigo y las luces de los pulsadores luminosos en este pupitre de mando.
=02.NA17 -S26	LDT	MENSAJE ALARMA	Borrar mensajes de fallo.
	ML	Verde Amarillo Rojo	Durch die Meldeleuchten wird die Bedienungsperson auf Informationen am Bildschirm im Hauptsteuerpult hingewiesen. Activado: Info zu Betriebszuständen der Maschine / Anlage, Bedienerhilfe. Activado: Info zu Fehlern an der Maschine / Anlage. Die Produktion wurde mit der Funktion 'Parada automática' unterbrochen. Activado: Info zu fatalen Fehlern an der Maschine / Anlage. Der Betriebszustand 'Manual' wurde eingeschaltet.
	LDT	POSICIONAR GUIAS LATERALES	Iniciar el ajuste automático de la guía lateral de la cinta. La guía lateral de la cinta se ajusta a la anchura de cinta predeterminada por el ordenador de la instalación.
=51.FA1 -S37	ML	Claro	Desactivado: La posición de las guías laterales no es idéntica a la anchura de cinta predeterminada por el ordenador. Parpadea: Se lleva a cabo el comando. Activado: La guía lateral está ajustada a la anchura de cinta predeterminada.



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

=51.FA1 -S36	LDT ⊕	ABRIR GUIAS LATERALES	Handfunktion zu dem Antrieb an der Breitenverstellung der Bandseitenführung in der Stapelung. Ajustar las guías laterales a una anchura de cinta mayor.	
	ML	Rojo	Activado: Die Seitenführung steht in der Endlage 'Öffnen'.	
=51.EA3 -S22	DT	BAJAR BULON CENTRADO INFERIOR	Pulsador de función doble. Der Fädelbolzen in der unteren Stapelebene wird in die andere Endlage gestellt. Fädelbolzen: Funktion: ist oben nach unten; ist unten nach oben;	
		Blanco		
=51.EA4 -S22	DT	BAJAR BULON CENTRADO SUPERIOR	Pulsador de función doble. Der Fädelbolzen in der oberen Stapelebene wird in die andere Endlage gestellt. Fädelbolzen: Funktion: ist oben nach unten; ist unten nach oben;	
		Blanco		
=01.PB4 -S52	LDT	RESET BARRERA LUZ	¡Atención! Este pulsador luminoso sólo debe ser presionado por el operario después de haber comprobado que todas las personas han salido de la zona peligrosa. Se borran los mensajes de error de la zona de apilado que se habían guardado en el mando. Se conecta de nuevo la alimentación de energía a los grupos de la zona peligrosa y se activan las barreras de luz.	
Ident-Nr.: 4295 bade.doc		Revisión 0	Druck: 08.11.07 10:18	Página 94 de 148



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

	ML	Azul	Desactivado: Die Lichtschranke ist aktiv geschaltet und überwacht den Gefahrenbereich. Parpadea: Die Lichtschranke wurde unterbrochen. Die elektrische Energiezuführung zu Gefährdung verursachenden Maschinen-/ Anlagenteilen wird abgeschaltet.
=02.NA17-S12	LDT	MANUAL	Conecta el modo de funcionamiento 'manual' de la máquina / instalación.
	ML	Verde	Activado: Conectado el modo de funcionamiento 'manual' de la máquina / instalación.
=02.NA17-S16	DT	START Amarillo	Inicia el proceso de producción de la máquina / instalación en el modo de funcionamiento 'automático'.
=02.NA17-S14	LDT	STOP AUTOMATICO	Interrumpe el proceso automático de producción de la máquina / instalación una vez terminada la chapa entonces en proceso. La producción puede reanudarse presionando el pulsador START.
	ML	Claro	Activado: Se ha interrumpido la producción.



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

=02.NA17 -S15	LDT	STOP RAPIDO	Máquina / instalación en modo de funcionamiento 'manual': Alle aktiven Teilautomatiken werden ausgeschaltet. Máquina / instalación en modo de funcionamiento 'automático': Interrumpe inmediatamente el proceso automático de producción de la máquina / instalación. La producción puede reanudarse presionando el pulsador START.
	ML	Amarillo	Activado: Se ha interrumpido la producción.



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

10.11. Drucktastergehäuse instalación de apilado +M12

BMK	Abreviatura	Identificación	Descripción
=01.PB4 -S55	LDT	RESET BARRERA LUZ	¡Atención! Este pulsador luminoso sólo debe ser presionado por el operario después de haber comprobado que todas las personas han salido de la zona peligrosa. Se borran los mensajes de error de la zona de apilado que se habían guardado en el mando. Se conecta de nuevo la alimentación de energía a los grupos de la zona peligrosa y se activan las barreras de luz.
	ML	Azul	Desactivado: Die Lichtschranke ist aktiv geschaltet und überwacht den Gefahrenbereich. Parpadea: Die Lichtschranke wurde unterbrochen. Die elektrische Energiezuführung zu Gefährdung verursachenden Maschinen-/ Anlagenteilen wird abgeschaltet.
=01.PB4 -S56	DT	START Amarillo	Inicia el proceso de producción de la máquina / instalación en el modo de funcionamiento 'automático'.



Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

10.12. *Instalación de apilado +M10*

BMK	Abreviatura	Identificación	Descripción
=41.FA1 -H27	ML	WARNLAMPE TRANSPORTBÄNDER	Parpadea: Die Transportbänder sind eingeschaltet. Der Aufenthalt im Bereich der Stapelung ist verboten.

10.13. *Drucktastergehäuse carro de apilado 1 +S3.1*

BMK	Abreviatura	Identificación	Descripción
=61.ED1 -S12	DT	CARRO APILADO ELEVAR PLATAFORMA	Die obere Plattform des Stapelwagens wird in senkrechte Position gestellt.
=61.ED1 -S13	DT	CARRO APILADO BAJAR PLATAFORMA	Die obere Plattform des Stapelwagens wird in waagerechte Position gestellt.

10.14. *Drucktastergehäuse carro de apilado 1 2 +S3.2*

BMK	Abreviatura	Identificación	Descripción
=62.ED1 -S12	DT	CARRO APILADO ELEVAR PLATAFORMA	Die obere Plattform des Stapelwagens wird in senkrechte Position gestellt.
=62.ED1 -S13	DT	CARRO APILADO BAJAR PLATAFORMA	Die obere Plattform des Stapelwagens wird in waagerechte Position gestellt.



Capítulo 1 Instrucciones para el uso

10.15. Pulsadores adicionales de PARADA DE EMERGENCIA

10.15.1. Lado de accionamiento avance +P2

BMK	Abreviatura	Identificación	Descripción
=01.PA1 -S12.1	PDT	Parada de emergencia Pulsador de seta Color: rojo Fondo: amarillo	Pasa la máquina / instalación a estado seguro con la mayor rapidez posible y desconecta entonces la tensión de mando. El pulsador presionado se bloquea mecánicamente. El mando guarda el comando.

10.15.2. Lado de accionamiento instalación de apilado +M12

BMK	Abreviatura	Identificación	Descripción
=01.PA1 -S22	PDT	Parada de emergencia Pulsador de seta Color: rojo Fondo: amarillo	Pasa la máquina / instalación a estado seguro con la mayor rapidez posible y desconecta entonces la tensión de mando. El pulsador presionado se bloquea mecánicamente. El mando guarda el comando.



Capítulo 1 Instrucciones para el uso

11. Descripción de los elementos de control e indicaciones Funciones no eléctricas

11.1. Elementos de control e indicaciones para el sistema mecánico

11.1.1. ? ; ?

11.2. Elementos de control e indicaciones para el sistema neumático

11.2.1. Verzeichnis der verwendeten Abkürzungen und Symbole für Stellteile und Anzeigen.

E.-Wert : Normaler Einstellwert für den bezeichneten Druckregler in bar.

DRR : Druckregler

11.2.2. Avance

BMK	Abreviat.	Identificación	Descripción
3,5	DRR	ANTRIEBSROLLE	Einstellen des Anpressdruckes der Antriebsrollen des Bandvorzugs.
1,8 max. 2,0	DRR	MESSROLLE	Einstellen des Anpressdruckes der Druckrolle zur Messrolle.
2,5	DRR	MESSROLLENKLEMMUNG	Einstellen des Arbeitsdruckes der Klemmvorrichtung zum Freilauf an der Messrollenaufhängung.
4,0 - 5,0	DRR	HASPELBREMSE	Einstellen des Arbeitsdruckes zu der mechanischen Bremse am Abwickelhaspel.



Capítulo 1 Instrucciones para el uso

11.2.3. Vor der Schere.

BMK	Abreviat.	Identificación	Descripción
3,0	DRR	HUBFÜHRUNG IM STANZAGGREGAT	Einstellen des Arbeitsdruckes für die Hubleisten in den Seitenführungen im Werkzeugbereich. (Loch - Stanzen)
3,0	DRR	HUBFÜHRUNG VOR DER SCHERE	Einstellen des Arbeitsdruckes für die Hubleisten in den Seitenführungen vor der Schere.

11.2.4. Máquina / instalación

BMK	Abreviat.	Identificación	Descripción
6,0	DRR	BEHÄLTERDRUCK	Einstellen des Druckes im Speicherbehälter der Pneumatikanlage.

11.3. *Elementos de control e indicaciones para el sistema hidráulico*

11.3.1. ? ; ?



Capítulo 1 Instrucciones para el uso

12. Montaje, puesta en marcha y desmontaje de la máquina / instalación

12.1. *Introducción*

- 12.1.1. La máquina / instalación se ancla fija en su lugar de emplazamiento con el asiento o el suelo de la nave.
- 12.1.2. El montaje y puesta en marcha correctos de la máquina / instalación requieren unos especiales conocimientos. Estos trabajos sólo podrán ser llevados a término por personal especializado de **HEINRICH GEORG GMBH MASCHINENFABRIK** o bien bajo su supervisión.

12.2. *Otras indicaciones*

- 12.2.1.  I; 1; 2;  I; 1; 12;

12.3. *Desmontaje y retirada*

- 12.3.1. La máquina / instalación deberá retirarse al término de su vida útil de acuerdo con la normativa nacional.
- 12.3.2. Es para ello imprescindible ponerse en contacto con una empresa especializada en su desmontaje y retirada.



Capítulo 1 Instrucciones para el uso

13. Conectar la máquina / instalación

13.1. Directrices básicas para la conexión

- 13.1.1. **Antes de conectar** la máquina / instalación se deben **leer estas instrucciones para el uso**, y en especial los apartados sobre **indicaciones de seguridad**. ¡Una vez comenzados los trabajos es demasiado tarde!
- 13.1.2. La máquina / instalación sólo debe conectarse en **perfecto estado técnico**. Todos los **dispositivos de protección** y relacionados con la seguridad deben estar en su posición prevista y **en condiciones de funcionamiento**.
- 13.1.3. **Antes de cada conexión** hay que asegurarse de que no hay **ninguna persona en la zona peligrosa** de la máquina / instalación.
- 13.1.4. Sólo se podrá conectar la tensión de mando de la máquina / instalación cuando esté presente un operario. Es decir, sólo está permitido el **“funcionamiento vigilado”**.

13.2. Conectar el dispositivo de desconexión de la red

- 13.2.1. Todos los dispositivos de protección de la instalación eléctrica (puertas del armario de distribución, cubiertas del pupitre de mando y de las cajas de bornes, etc.) deben estar cerrados.
- 13.2.2. Conecte el dispositivo de desconexión de la red en posición INTERRUPTOR PRINCIPAL CONEC. en el armario de distribución de la máquina / instalación.
- 13.2.3. Presione el pulsador DESBLOQUEO PARADA DE EMERGENCIA.
- 13.2.4. El mando de la máquina está listo para el servicio.

13.3. Medidas prescritas de control



**¡Ninguna persona debe permanecer en la zona
peligrosa de la máquina / instalación!**

- 13.3.1. Todos los dispositivos de protección deben estar listos para funcionar y en perfectas condiciones técnicas.
- 13.3.2. No hay ninguna posición de conmutación especial definida para los conmutadores selectores.



Capítulo 1 Instrucciones para el uso

13.4. *Conectar la tensión de mando*

- 13.4.1. Debe desbloquearse el interruptor de llave para TENSION MANDO DESCONEC.
- 13.4.2. Presionando el pulsador luminoso TENSION MANDO CONECTADO se conecta la máquina / instalación. El mando guarda este comando mediante Kontakt - Logic. La acción se señala ópticamente al encenderse la lámpara testigo del pulsador luminoso.
- 13.4.3. En ese momento se realiza automáticamente la necesaria búsqueda de puntos de referencia para el mando o en su caso las iniciaciones especiales.
- 13.4.4. **¡Cuidado!** Los accionamientos de posicionamiento son conectados por el mando. Los accionamientos pueden permanecer inmóviles, pero reciben alimentación de energía.

13.5. *Conectar las cintas transportadoras*

- 13.5.1. Las cintas transportadoras existentes en la máquina / instalación sólo pueden conectarse mediante el pulsador y estando conectada la tensión de mando.

Capítulo 1 Instrucciones para el uso

14. Ajustar la máquina / instalación

14.1. Indicaciones generales

- 14.1.1. La carga y, en caso necesario, descarga de los bultos se realiza por medio de grúa de interiores oder Gabelstapler. Dabei sind die betriebsinternen Vorschriften für Materialtransporte zu beachten. Fallos como una **sujeción insuficiente** del bulto o la utilización de **medios de enganche inapropiados** para el transporte pueden provocar **accidentes con resultado de muerte**. El operario o jefe de grúa es el responsable de utilizar los medios de enganche apropiados.



14.2. Introducir los datos de producción

- 14.2.1. Véase descripción del Data - Processing - System.
II; 4; 1;

14.3. Preparar la máquina / instalación para la producción

- 14.3.1. Comprobar y vaciar en caso necesario todos los depósitos de chatarra. Retirar todos los fragmentos de chatarra de la máquina / instalación.
- 14.3.2. Comprobar y limpiar en caso necesario el rodillo de medición, el rodillo de presión para el rodillo de medición y los rodillos de avance.
- 14.3.3. Posicionar los palés o la plataforma del núcleo previstos para la producción sobre el carro apilador.
Los palés y plataformas del núcleo no están incluidos en el material suministrado por **HEINRICH GEORG GMBH MASCHINENFABRIK**.

14.4. Alimentar la máquina / instalación con material de producción



¡Póngase guantes protectores para realizar estos trabajos!

14.5. Alimentar la máquina / instalación con material de producción



¡Póngase guantes protectores para realizar estos trabajos!



Capítulo 1 Instrucciones para el uso

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

- 14.5.1. Ajuste la máquina / instalación a la anchura de cinta a utilizar.
Posicione el punzón en V en el centro de la cinta. De ese modo se ayuda a la introducción de la cinta.
Funciones de mando: GUIA LATERAL posición automática;
GUIA LATERAL cerrar / abrir;
CIZALLA / V desplazar / retroceder;
- 14.5.2. Cargue el aspa desarrolladora con el bulto previsto para la producción. Zugriffs-
fenster zum Band - Einführbereich öffnen. Gire la cabeza del aspa cargada ante
la unidad de transporte y avance.
Funciones de mando: CABEZAL 1 soltar / apretar;
CABEZAL 2 soltar / apretar;
INTERRUPTOR CONFIRMACION;
BASCULAR DEVANADERA izquierda / derecha;
- 14.5.3. Coloque el rodillo de presión para el rodillo de medición y los rodillos de trans-
porte. Levante el brazo de bucles.
Funciones de mando: MR + TR elevar;
BRAZO BUQLE elevar;
- 14.5.4. Abra la puerta de acceso a la zona de entrada de la cinta. Recoja el comienzo
de la cinta del bulto y muévelo hacia delante presionando el dispositivo de valida-
ción. Beschädigungen und evt. Vorhandene Aufkleber am Bandanfang abschnei-
den. Para utilizar una cizalla eléctrica de manejo manual hay una caja de enchufe
(230VAC) instalada en el pupitre de mando para avance. Es conveniente realizar
el corte en forma arqueada, tanto en el margen izquierdo como en el derecho de
la cinta. De ese modo se facilita el deslizamiento hacia las guías laterales.
Funciones de mando: PUERTA PROTEC abrir;
INTERRUPTOR CONFIRMACION ZT1 +
DEVANADORA marcha adelante;
- 14.5.5. Der unbeschädigte Bandanfang kann durch betätigen des Zustimmungstasters ca. 2
m abgewickelt und manuell in das Vorschubaggregat eingeschoben werden.
Druckrolle zur Messrolle und die Transportrollen zustellen. Zugriffsfenster zum
Band - Einführbereich schließen.
Funciones de mando: INTERRUPTOR CONFIRMACION ZT1 +
DEVANADORA marcha adelante;
MR + TR bajar;
PUERTA PROTEC cerrar;
- 14.5.6. Band abwickeln bis die Schlaufengrube gefüllt ist. Danach den Schlaufenarm
senken und den Bandanfang bis zur Schere vorwärts transportieren. Transport-
bänder einschalten.
Funciones de mando: DEVANADORA marcha adelante;
BRAZO BUQLE bajar;



Capítulo 1 Instrucciones para el uso

TRACCION marcha adelante;
CONEXION CINTA TRANSPORTE;

- 14.5.7. Las zonas inservibles de la cinta se pueden recortar en funcionamiento manual en chapas de hasta 2000 mm de longitud. Conecte las cintas transportadoras. Adelante el comienzo de la cinta hasta la longitud de corte deseada y recorte con la cizalla 1. Cuando haya que recortar más de 2000 mm de longitud de cinta deberá repetirse el proceso.

Funciones de mando: CONEXION CINTA TRANSPORTE;
TRACCION marcha adelante;
CIZALLA 1 corte;
CIZALLA 2 corte;

14.6. *Función de reglaje para el sistema de medición longitudinal*

- 14.6.1. El sistema de medición longitudinal explora los movimientos de la cinta con un rodillo de medición. El valor de fricción de la superficie de la cinta tiene así una influencia no despreciable sobre la exactitud de la medición. Utilizando la función de reglaje, el sistema de medición se ajusta a los distintos valores de fricción. Con el conmutador selector AJUSTE MANUAL / AUTOM, el operario puede llamar la función de reglaje o seleccionar la ejecución automática de la función de reglaje después de cada cambio de cinta.

- 14.6.2. Llamada de la función de reglaje por parte del operario.
Coloque la cizalla giratoria en posición de 0°. Conecte las cintas transportadoras y adelante el comienzo de cinta para recortar la chapa sobrante. Pulse el conmutador selector AJUSTE MANUAL. La máquina / instalación ejecutará entonces las siguientes funciones:
recortar la chapa sobrante;
hacer retroceder la cinta hasta que el iniciador 'comienzo trayecto de reglaje' ya no esté cubierto por la cinta.
adelantar la cinta hasta que el iniciador 'final trayecto de reglaje' sea cubierto por la cinta.

- 14.6.3. Descripción del proceso de una función de reglaje ejecutada automáticamente. El conmutador selector AJUSTE debe ponerse en AUTOM. Después de cada cambio de cinta (levantar y acercar los rodillos de transporte) la máquina / instalación ejecuta antes de la primera producción automática las siguientes funciones:
conectar las cintas transportadoras.
adelantar la cinta hasta que el iniciador 'final trayecto de reglaje' sea cubierto por la cinta.
hacer retroceder la cinta.
recortar la chapa sobrante.
hacer retroceder la cinta hasta que el iniciador 'comienzo trayecto de reglaje' ya no esté cubierto por la cinta.



Capítulo 1 Instrucciones para el uso

adelantar la cinta hasta que el iniciador 'final trayecto de reglaje'
sea cubierto por la cinta.

- 14.6.4. Die beim Trimmvorgang gemessenen Länge wird in der DPS unter Dienste /
Testhilfen / Trace angezeigt.



Capítulo 1 Instrucciones para el uso

15. Funcionamiento automático de la máquina / instalación

15.1. *Inicio del funcionamiento automático de la máquina / instalación*

- 15.1.1. El mando comprueba las premisas necesarias para el funcionamiento automático de la máquina / instalación. Aquellas condiciones que no se cumplan aparecerán reflejadas en lenguaje claro en la pantalla del pupitre de mando principal. (P. ej. la puerta de acceso está desbloqueada; etc.)
- 15.1.2. Cuando se cumplan todas las condiciones se podrá cambiar la máquina / instalación al modo de funcionamiento 'automático' presionando el pulsador luminoso AUTOMÁTICO.
- 15.1.3. El mando comprueba las premisas necesarias para poner en marcha la máquina / instalación. Aquellas condiciones que no se cumplan aparecerán reflejadas en lenguaje claro en la pantalla del pupitre de mando principal.
- 15.1.4. Cuando se cumplan todas las condiciones se podrá poner en marcha la máquina / instalación presionando el pulsador START.

15.2. *Funcionamiento automático*

- 15.2.1. En todos los modos de funcionamiento es necesario observar continuamente el flujo de material a la máquina / instalación. Corregir a tiempo pequeñas desviaciones ayuda a prevenir averías en el proceso de producción y con ello los tiempos de parada.
- 15.2.2. Las siguientes zonas requieren de especial atención:
Einzelne Abschnitte des Bundes können Beschädigungen aufweisen. Ya no estaría pues garantizado un transporte sin fricción a través de la máquina / instalación. En este caso se puede mejorar la situación reduciendo la velocidad de avance.
Beschädigte Bandkanten, insbesondere durch Umknicken entstehende 'Doppelbleche' können die Werkzeuge beschädigen.
Las costuras soldadas en la cinta pueden ocasionar desperfectos en las herramientas. Estas piezas de la cinta sobrantes deben recortarse en modo de funcionamiento 'manual'. ¡Cuidado! No realice ningún corte por las costuras soldadas, tampoco con las cizallas.

15.3. *Detención del funcionamiento automático de la máquina / instalación*

- 15.3.1. Modo de funcionamiento: Producción por número de unidades.
La máquina / instalación interrumpe la producción tras alcanzar el número de unidades predeterminado. El modo de funcionamiento de la máquina / instalación pasa de 'automático' a 'manual'. Los trabajos a realizar en el modo de funcionamiento 'manual' se describen en los apartados 0 y **Fehler!**



Capítulo 1 Instrucciones para el uso

Verweisquelle konnte nicht gefunden werden. de estas instrucciones para el uso.

- 15.3.2. Modo de funcionamiento: Producción por ciclos en steplap (solapado escalonado).
La máquina / instalación interrumpe la producción tras alcanzar el número predeterminado de ciclos en steplap. El modo de funcionamiento de la máquina / instalación pasa de 'automático' a 'manual'. Los trabajos a realizar en el modo de funcionamiento 'manual' se describen en los apartados 16 y 17 de estas instrucciones para el uso.
- 15.3.3. Modo de funcionamiento: Producción por altura de apilado.
La máquina / instalación interrumpe la producción tras alcanzar la altura de apilado predeterminada. El modo de funcionamiento de la máquina / instalación pasa de 'automático' a 'manual'. Los trabajos a realizar en el modo de funcionamiento 'manual' se describen en los apartados 16 y 17 de estas instrucciones para el uso.
- 15.3.4. Final de cinta.
La máquina / instalación reduce la velocidad de producción cuando se detecta el final de la cinta a la salida del foso de bucles. Esta velocidad de producción lenta es regulable. Véase el manual de servicio del DPS. En cuanto el final de la cinta alcanza la entrada del grupo de avance se cambia el modo de funcionamiento de la máquina / instalación de 'automático' a 'manual'. Los trabajos a realizar en el modo de funcionamiento 'manual' se describen en el apartado 17 de estas instrucciones para el uso.
- 15.3.5. En la medida de lo posible, el mando vigila constantemente el proceso de producción de la máquina / instalación. Tiene lugar además una amplia autovigilancia de cada uno de los componentes de mando. En cuanto el mando detecta averías o fallos graves en el proceso de producción o en algún componente individual de mando, la máquina / instalación se frena de forma regulada y con la mayor rapidez posible, cambiando entonces a modo de funcionamiento 'manual'. Sólo será posible volver al modo de funcionamiento automático después de haberse subsanado la avería o fallo. La causa de la interrupción se mostrará en lenguaje claro en la pantalla del pupitre de mando principal. (P. ej. el bucle es demasiado pequeño;)
- 15.3.6. Se puede detener la producción presionando el pulsador luminoso STOP RAPIDO. La máquina / instalación interrumpe entonces de forma inmediata el proceso automático de producción. La máquina / instalación permanece en modo de funcionamiento 'automático'. La producción puede reanudarse presionando el pulsador START.
- 15.3.7. Se puede detener la producción presionando el pulsador luminoso STOP ATUOMATICO. La máquina / instalación interrumpirá el proceso automático de



Capítulo 1

Instrucciones para el uso

producción una vez terminada la chapa entonces en proceso. La máquina / instalación permanece en modo de funcionamiento 'automático'. La producción puede reanudarse presionando el pulsador START.

- 15.3.8. Se puede detener la producción presionando el pulsador luminoso MANUAL. Con ello se desactiva de forma inmediata el modo de funcionamiento 'automático'.

Capítulo 1 Instrucciones para el uso

16. Toma del material de producción

16.1. Indicaciones generales

- 16.1.1.  **¡Cuidado!** En la toma del material hay que trabajar con especial consciencia de la seguridad y el peligro. Fallos como una **sujeción insuficiente** del material o la utilización de **medios de enganche inapropiados** para el transporte pueden provocar **accidentes con resultado de muerte**.



¡Póngase guantes protectores para realizar estos trabajos!

16.2. Preparar el material de producción para su transporte de salida

- 16.2.1. La máquina / instalación cambia a modo de funcionamiento 'manual' una vez alcanzado el objetivo de producción.  15;
- 16.2.2. Desconecte las cintas transportadoras. Lleve el carro de apilado a posición de aparcamiento.
- 16.2.3. Abra la puerta de acceso a la zona de apilado de chapas. Compruebe la situación segura de la pila de chapas. Aleje los objetos no relacionados con la pila de chapas de los palés o plataformas de núcleo.
- 16.2.4.  **¡Atención!** Antes del transporte, las pilas de chapas deben fijarse sobre los palés o plataformas de núcleo.

16.3. Toma del material de producción

- 16.3.1.  **¡Atención!** Antes del transporte, las pilas de chapas deben fijarse sobre los palés o plataformas de núcleo.
- 16.3.2. La toma del material de producción sólo debe realizarse observando las directrices internas de la empresa para transporte de material. El operario o jefe de grúa es el responsable de utilizar los medios de enganche apropiados.
- 16.3.3. Enganchar concienzudamente los palés o plataformas de núcleo a la grúa de interiores.
 **¡Cuidado!** Observe el centro de gravedad de los palés o plataformas a enganchar.



Capítulo 1 Instrucciones para el uso

16.3.4. Levantar con cuidado los palés o plataformas de núcleo del carro de apilado y transportarlos.



**¡No permanezca en la zona de acción de la grúa de
interiores!**

¡Observe las normas!

17. Eliminación de los residuos de producción

17.1. *Posiciones en la máquina / instalación donde se producen residuos de producción*

- 17.1.1. Los residuos generados en la producción de chapas con recorte en V caen en los depósitos previstos para ello. El depósito está situado junto a la máquina / instalación.
- 17.1.2. Los residuos generados en la producción de chapas con punzonado caen en los depósitos previstos para ello. El depósito está situado junto a la máquina / instalación.
- 17.1.3. Los residuos generados en la producción en la zona de las cizallas caen en los depósitos previstos para ello. El depósito está situado junto a la máquina / instalación.
Las zonas dañadas o inservibles del comienzo de cinta a causa de los recortes en V o punzonados se recortan con la cizalla.
Al comienzo de toda producción automática, la cizalla realiza un corte inicial en el cual se recorta una chapa con una longitud determinada.
- 17.1.4. Las chapas recortadas se depositan por la máquina / instalación sobre el plano de apilado preseleccionado. Die Schopfbleche müssen von der Bedienungsperson entfernt werden.

17.2. *Toma del material restante*



**¡Póngase guantes protectores
para realizar estos trabajos!**

- 17.2.1. Al final de cada encargo de corte, la máquina / instalación corta automáticamente el comienzo de la cinta en forma de cuña. De ese modo se facilita volver a introducir el comienzo de cinta en la máquina / instalación.
- 17.2.2. En todos los demás casos, detenga la máquina / instalación y cambie a modo de funcionamiento 'manual'.
Funciones de mando: STOP AUTOMÁTICO;
MODO MANUAL;
- 17.2.3. Recorte las zonas dañadas o inservibles del comienzo de cinta a causa de los recortes en V o punzonados con la cizalla giratoria. Recorte después en forma de cuña el comienzo de la cinta con las cizallas o con ayuda del punzón en V y



Capítulo 1 Instrucciones para el uso

hágala retroceder hasta el grupo de avance.
Funciones de mando: PROGRAMA FINAL;

- 17.2.4. Abra los rodillos de medición y de transporte. Enrolle la cinta restante con el aspa desarrolladora extrayendo al tiempo el comienzo de la cinta de la máquina / instalación.

Funciones de mando: MR + TR elevar;
DEVANADORA marcha atrás;

- 17.2.5. Fije el comienzo de la cinta sobre el bulto restante con cinta adhesiva. Aplique varias tiras de cinta adhesiva si es necesario. Póngala en posición de descarga.

Funciones de mando: DEVANADORA marcha atrás;
INTERRUPTOR CONFIRMACION;
BASCLAR DEVANADERA izquierda / derecha;

- 17.2.6. Separe la cabeza del aspa. En la toma de los bultos hay que trabajar con especial consciencia de la seguridad y el peligro. Fallos como una sujeción insuficiente del bulto o la utilización de medios de enganche inapropiados para el transporte pueden provocar accidentes con resultado de muerte. El operario o jefe de grúa es el responsable de utilizar los medios de enganche apropiados. Unter Beachtung der betriebsinternen Vorschriften für Materialtransporte den Restbünd vom Haspelkopf abnehmen.

17.3. Toma de los residuos de producción



**¡Póngase guantes protectores
para realizar este trabajo!**

- 17.3.1. Los depósitos para la recogida de los residuos de producción de la zona de corte no se incluyen en el material suministrado **por HEINRICH GEORG GMBH MASCHINENFABRIK.**

Los depósitos deben vaciarse cuando el montón de chatarra que contienen llegue a una distancia de aprox. 10 cm hasta el borde superior del depósito. En caso de estar más llenos los depósitos, al transportarlos pueden caer fragmentos de chatarra y poner en peligro a las personas.

El transporte y vaciado de estos depósitos deben realizarse de acuerdo con las directrices internas de la empresa.

- 17.3.2. La máquina / instalación interrumpe la producción cuando se detecta el final de la cinta a la entrada del grupo de avance. La chapa para transformador que en ese momento esté aún situada en la zona de corte ya no podrá ser enrollada por el aspa desarrolladora.

En caso necesario, haciendo un corte con una cizalla se podrá recortar la chapa



Capítulo 1 Instrucciones para el uso

sobranter.

Funciones de mando: CIZALLA 1 corte;
CIZALLA 2 corte;

- 17.3.3. Levante el brazo de bucles. Levante los rodillos de medición y transporte y extraiga la cinta de la máquina / instalación.



Funciones de mando: MR + TR elevar;

- 17.3.4. Los finales de cinta no dañados pueden extraerse de la máquina / instalación hacia atrás con los rodillos de transporte estando el brazo de bucles y la mesa de guía levantados. En ese proceso es necesario observar el movimiento de la cinta con la máxima atención. Si es necesario, interrumpa el proceso y extraiga el final de la cinta a mano.  17.3.3;

Funciones de mando: TRACCION marcha adelante;

Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

18. Reparación de averías de producción

18.1. Indicaciones generales

- 18.1.1. Las averías de producción pueden estar causadas, entre otras razones, por:
- Mal mantenimiento de la máquina / instalación.
 - Mala limpieza de la máquina / instalación.
 - Manejo inapropiado de la máquina / instalación.
 - Fallo del personal de operación.
 - Cinta de entrada inadecuada.

- 18.1.2. Observar bien el correr de la cinta en la máquina / instalación y corregir inmediatamente las irregularidades ayuda a prevenir averías de producción.

- 18.1.3. Antes de penetrar / tocar durante el proceso de producción la máquina / instalación, ésta deberá siempre ponerse en estado seguro. Observe las indicaciones de seguridad.

- 14.0.0.4 En todos los trabajos en la zona no protegida del foso de bucles debe llevarse puesta la protección personal contra caídas (arnés).



**¡Está prohibido manipular partes de la máquina /
instalación que no estén desconectadas!**

18.2. Averías por oscilaciones de la tolerancia en la cinta de entrada

- 18.2.1. En caso de oscilaciones de la tolerancia dentro de los límites indicados en el apartado 3 de estas instrucciones para el uso no es de esperar que se produzcan averías de producción.

18.3. Procedimiento en caso de averías de producción

- 18.3.1. Si ha de manipular la máquina / instalación, observe las siguientes indicaciones.

- 18.3.2. Desactive el modo de funcionamiento 'automático'. Espere a que se detengan todos los accionamientos de la máquina / instalación.

- 18.3.3. Cuando la avería tenga que repararse en una zona protegida mediante dispositivos protectores de desconexión, primero habrá que levantar el bloqueo de las rejillas protectoras – puertas de acceso a la zona de la máquina / instalación presionando el pulsador PUERTAS SEGURIDAD CERRAR / ABRIR. Las rejillas protectoras – puertas de acceso se abren y se aseguran contra cierre no autorizado mediante un **candado personal**. **Sólo entonces puede entrar en**





Capítulo 1 Instrucciones para el uso

la zona peligrosa.

- 18.3.4. ¡**Cuidado!** No todas las funciones y movimientos de la máquina / instalación



se desconectan de la alimentación de energía eléctrica al entrar en una zona peligrosa. **En caso de mal manejo, avería o fallo del mando no se puede excluir la posibilidad de arranque inesperado de estas funciones o movimientos.** ¡Trabaje con cuidado y consciencia del peligro!

Quando sea necesario o lo obliguen las normas, lleve puesto el equipo de protección personal.

- 18.3.5. La **responsabilidad** por la reparación de la avería de producción la asume la **persona** que repara la avería. **¡HEINRICH GEORG GMBH MASCHINENFABRIK no asume ninguna responsabilidad por los eventuales daños ocasionados por tal reparación!**

- 18.3.6. Reparar la avería de producción de forma adecuada y experta.

- 18.3.7. En caso de que para reparar la avería de producción sea necesario emplear herramientas o medios auxiliares, todos ellos deberán retirarse sin falta de la zona de la máquina / instalación.

- 18.3.8. **Asegúrese de que todas las personas han salido de la zona peligrosa.** Retire el candado personal y cierre la rejilla protectora – puerta de acceso. A continuación bloquee la puerta presionando el pulsador PUERTAS SEGURIDAD CERRAR / ABRIR.

- 18.3.9. Reanude el funcionamiento normal, vigilando con especial atención el proceso de producción.  14;  15;



Capítulo 1 Instrucciones para el uso

19. Reparación de averías de la máquina / instalación

19.1. Indicaciones generales

19.1.1. **En caso de avería en el funcionamiento, pare inmediatamente la máquina / instalación y asegúrela contra conexión no autorizada.**

El personal de operación debe avisar de inmediato al centro o persona competente cada vez que aparezca una avería en la máquina / instalación.

19.1.2. Las averías en el funcionamiento de la máquina / instalación sólo deben ser reparadas por personal especializado y debidamente formado para ello.

19.1.3. El especialista deberá ponerse en contacto con **HEINRICH GEORG GMBH MASCHINENFABRIK** antes de reparar la avería.

☞ 1;

19.1.4. La responsabilidad por la reparación de la avería en el funcionamiento la asume el especialista que repara la avería.

19.2. Directrices para la desconexión

19.2.1. Para reparar averías en el funcionamiento es necesario impedir movimientos descontrolados de piezas individuales de la máquina / instalación. Esto se consigue interrumpiendo la alimentación de energía a la zona correspondiente. (P. ej. al sistema hidráulico o neumático: cerrar la llave de aislamiento; sistema electrotécnico: retirar los fusibles de los circuitos de carga, desconectar el interruptor de reparación;) ☞ 21;

19.2.2. Deben observarse las directrices para la desconexión prescritas por las normativas nacionales o técnicas para la prevención de accidentes.

19.2.3. Si para reparar la avería en el funcionamiento es necesario acceder a la máquina / instalación, **todos los componentes móviles** deberán situarse en su **posición máxima inferior** (tope mecánico o posición final).



Si por razones técnicas o de otro tipo fuera necesaria una posición distinta a la indicada, será necesario asegurar los componentes en la posición deseada mediante los medios mecánicos adecuados (pernos de inmovilización, barras de seguridad, distanciadores, etc.).

Si esta **directriz no se respeta**, puede haber **peligro** para las **personas** que estén realizando trabajos en / con la máquina / instalación por movimientos incontrolados de componentes individuales.



Capítulo 1 Instrucciones para el uso

20. Desconectar la máquina / instalación

20.1. *Indicaciones importantes para la desconexión*

- 20.1.1. Para evitar procesos de operación suplementarios al conectar la máquina / instalación, este comando debería darse sólo cuando todas las partes de la máquina / instalación estén detenidas y el material situado en la cizalla esté ya cortado.

20.2. *Desconectar*

- 20.2.1. Presionando y enclavando el pulsador de llave TENSION MANDO DESCONEC. se desconecta la máquina / instalación. La lámpara testigo del pulsador luminoso 'Conexion tension mando' se apaga. Los accionamientos y elementos de control de la instalación eléctrica están desconectados de la alimentación de energía.
- 20.2.2. Debe extraerse la llave de este interruptor de llave y guardarse en un lugar accesible únicamente a personas autorizadas. De este modo se evita que personas no autorizadas conecten la máquina / instalación.



Capítulo 1 Instrucciones para el uso

21. Desconectar la máquina / instalación para mantenimiento y reparación

21.1. *Directrices generales de desconexión*

- 21.1.1. Para cualquier trabajo de mantenimiento y reparación es necesario primero abrir todas las puertas de acceso vigiladas y luego cortar de modo seguro todas las fuentes de alimentación externas de la máquina / instalación. Los dispositivos de desconexión o bloqueo deben ser asegurados contra la conexión no autorizada de la alimentación de energía p. ej. mediante un 'candado personal'.
- 21.1.2. Es imprescindible observar las normas establecidas en las directrices nacionales y técnicas sobre prevención de accidentes en todos los procesos de desconexión para realizar trabajos de mantenimiento y reparación en la máquina / instalación.
- 21.1.3. El 'candado personal' debe ser colocado por la persona en el dispositivo de desconexión o bloqueo que se encuentra en la zona peligrosa. La persona debe llevar consigo la llave para este candado.
En un lugar accesible únicamente a personas autorizadas deben guardarse llaves de reserva.
- 21.1.4. La interrupción de la alimentación de energía debe señalarse con una **señal de advertencia junto al dispositivo de desconexión / bloqueo**.
- 21.1.5. **Antes de volver a conectar** la alimentación de energía se debe **comprobar sin falta la correcta conclusión** del mantenimiento y / o la reparación. Deben volverse a conectar y apretar bien todas las uniones sueltas.
Todos los dispositivos de protección deben estar en su posición prevista y en condiciones de funcionamiento.

21.2. *Desconectar la alimentación eléctrica*

- 21.2.1. Los trabajos en el equipamiento eléctrico de la máquina / instalación sólo deben ser realizados por un electricista especializado o por personas adiestradas y bajo la dirección y supervisión de un electricista especializado de acuerdo con las normas electrotécnicas.
- 21.2.2. **Primero** se debe **desconectar la tensión de mando**. La alimentación de energía eléctrica sólo se puede desconectar estando la máquina / instalación desconectada a su vez.
- 21.2.3. La alimentación de energía eléctrica se corta desconectando el dispositivo de desconexión de la red situado en el armario de distribución de la máquina / instalación. Para ello, el **dispositivo de desconexión de la red** debe colocarse **en posición 0**. En esta posición se debe **inmovilizar** el dispositivo de desconexión de la red por medio de un **candado personal**. La **puerta del**

Capítulo 1 Instrucciones para el uso

armario de distribución en donde se encuentra la empuñadura del dispositivo de desconexión de la red debe estar **cerrada**.

- 21.2.4. Los siguientes grupos constructivos del armario de distribución no se desconectan a través del dispositivo de desconexión de la red:



aparatos de aire acondicionado;
ventiladores;
cajas de enchufe de servicio;
iluminación;

Los cables de estos circuitos están marcados en color NARANJA.

- 21.2.5. Después de cada operación de mantenimiento y / o reparación debe realizarse una marcha de prueba. Al realizar esta marcha de prueba debe procederse con especial consciencia de la seguridad y los peligros.

21.3. *Bloquear el suministro hidráulico*

- 21.3.1. Todo trabajo a realizar en instalaciones hidráulicas ha de llevarse a cabo exclusivamente por personal de conocimientos y experiencias especiales en hidráulica.

- 21.3.2. Esta máquina / instalación está equipada con su propia estación hidráulica. Al conectar la máquina / instalación se conectan también los accionamientos para las bombas hidráulicas, refrigeradores, etc.

- 21.3.3. **Antes de comenzar** los trabajos de mantenimiento y / o reparación en esta máquina / instalación, **todos los componentes móviles** deben colocarse en su **posición máxima inferior** (tope mecánico o posición final).



Si por razones técnicas o de otro tipo fuera necesaria una posición distinta a la indicada, será necesario asegurar los componentes en la posición deseada mediante los medios mecánicos adecuados (pernos de inmovilización, barras de seguridad, distanciadores, etc.).

Si esta **directriz no se respeta**, puede haber **peligro** para las **personas** que estén realizando trabajos en / con la máquina / instalación por movimientos hacia abajo incontrolados de componentes individuales.

- 21.3.4. El suministro hidráulico sólo puede **bloquearse con seguridad desconectando la alimentación de energía eléctrica**. ☞ 21.2;

- 21.3.5. **¡Cuidado!** La **energía residual** en el / los depósito(s) de presión de la instalación hidráulica puede resultar **peligrosa**.

Capítulo 1 Instrucciones para el uso



**¡Antes de comenzar una reparación es necesario
despresurizar hidrostáticamente la instalación!**

- 21.3.6. Después de cada operación de mantenimiento y / o reparación debe realizarse una marcha de prueba. Al realizar esta marcha de prueba debe procederse con especial consciencia de la seguridad y los peligros.

21.4. *Bloquear el suministro neumático*

- 21.4.1. Todo trabajo a realizar en instalaciones neumáticas ha de llevarse a cabo exclusivamente por personal debidamente formado para ello.

- 21.4.2. **Antes de comenzar** los trabajos de mantenimiento y / o reparación en esta máquina / instalación, **todos los componentes móviles** deben situarse en su **posición máxima inferior** (tope mecánico o posición final).



Si por razones técnicas o de otro tipo fuera necesaria una posición distinta a la indicada, será necesario asegurar los componentes en la posición deseada mediante los medios mecánicos adecuados (pernos de inmovilización, barras de seguridad, distanciadores, etc.).

Si esta **directriz no se respeta**, puede haber **peligro** para las **personas** que estén realizando trabajos en / con la máquina / instalación por movimientos hacia abajo incontrolados de componentes individuales.

- 21.4.3. El **suministro neumático** de la máquina / instalación se bloquea cerrando la **llave esférica** de la **tubería de admisión principal**. In dieser Stellung muss der Kugelhahn mit dem persönlichen **Vorhängeschloß arretiert** werden.

- 21.4.4. **¡Cuidado!** La **energía residual** en la instalación neumática puede resultar **peligrosa**.



**¡Antes de comenzar una reparación es necesario
despresurizar la instalación abriendo la válvula de
aireación!**

- 21.4.5. Después de cada operación de mantenimiento y / o reparación debe realizarse una marcha de prueba. Al realizar esta marcha de prueba debe procederse con especial consciencia de la seguridad y los peligros.

Capítulo 1 Instrucciones para el uso

22. Limpieza de la máquina / instalación

22.1. Indicaciones generales



¡Antes de comenzar la limpieza, desconecte la máquina / instalación de todas las fuentes de alimentación de energía!

¡Despresurice los sistemas hidráulico y neumático!

- 22.1.1. La máquina / instalación debe limpiarse a intervalos regulares o cuando sea necesario. Los intervalos dependen fundamentalmente del periodo diario de utilización y del grado de suciedad del material de entrada, y el explotador de la máquina / instalación es el encargado de determinarlos.
- 22.1.2. Para todos los trabajos de limpieza es necesario desconectar de forma segura la máquina / instalación de todas las fuentes externas de alimentación de energía. El dispositivo de desconexión o bloqueo debe ser asegurado mediante un candado personal contra la conexión no autorizada de la alimentación de energía.
☞ 21;
- 22.1.3. Es imprescindible observar las normas establecidas en las directrices nacionales y técnicas sobre prevención de accidentes para procesos de desconexión en la limpieza de la máquina / instalación.
- 22.1.4. El 'candado personal' debe ser colocado por la persona en el dispositivo de desconexión o bloqueo que se encuentra en la zona peligrosa. La persona debe llevar consigo la llave para este candado.
En un lugar accesible únicamente a personas autorizadas deben guardarse llaves de reserva.
- 22.1.5. La interrupción de la alimentación de energía debe señalarse con una **señal de advertencia junto al dispositivo de desconexión / bloqueo**.
- 22.1.6. **¡Está prohibido limpiar la máquina / instalación con aparatos de alta presión!**

22.2. Preparación para la limpieza

- 22.2.1. Una vez terminados los trabajos, **todos los componentes móviles** deberán situarse en su **posición máxima inferior** (tope mecánico o posición final).
 Si por razones técnicas o de otro tipo fuera necesaria una posición distinta a la indicada, será necesario asegurar los componentes en la posición deseada mediante los medios mecánicos adecuados (pernos de inmovilización, barras de seguridad, distanciadores, etc.).
Si esta **directriz no se respeta**, puede haber **peligro** para las **personas** que



Capítulo 1

Instrucciones para el uso

estén realizando trabajos en / con la máquina / instalación por movimientos incontrolados hacia abajo de componentes individuales.

- 22.2.2. Las personas encargadas de la limpieza de la máquina / instalación deben ser informadas sobre la misma por parte del explotador o de una persona por él autorizada (maestro, capataz, etc.).
- 22.2.3. Antes de limpiar la máquina / instalación deben cubrirse o cerrarse todas las aberturas por las cuales por razones de seguridad y / o de funcionamiento no deba penetrar agua ni detergente. Son especialmente vulnerables los motores eléctricos y armarios de distribución.
- 22.2.4. El personal de limpieza no debe abrir el armario de distribución.
- 22.2.5. Una vez terminada la limpieza, las cubiertas / los cierres deben recogerse o eliminarse por completo.
- 22.2.6. Deberá avisarse al explotador o persona autorizada de los desperfectos detectados en la máquina / instalación (tornillos flojos, tuberías hidráulicas o neumáticas dañadas, etc.).
- 22.2.7. Los desperfectos detectados en la máquina / instalación deberán ser subsanados antes de volver a conectarla.

Capítulo 1 Instrucciones para el uso

23. Mantenimiento de la máquina / instalación

23.1. Indicaciones generales



¡Antes de comenzar los trabajos de mantenimiento o reparación, desconecte la máquina / instalación de todas las fuentes de alimentación de energía!

- 23.1.1. Los trabajos de mantenimiento en la máquina / instalación sólo deben ser realizados por personal especializado y debidamente formado para ello.
- 23.1.2. El mantenimiento de la máquina / instalación debe realizarse a intervalos regulares o cuando sea necesario. Los intervalos dependen fundamentalmente del periodo diario de utilización. Los trabajos de mantenimiento periódicos están recogidos en la documentación técnica con su intervalo de realización. ☞ I; 1; 6;
- 23.1.3. **Antes de comenzar** los trabajos de mantenimiento y / o reparación en esta máquina / instalación, **todos los componentes móviles** deben situarse en su **posición máxima inferior** (tope mecánico o posición final).
 Si por razones técnicas o de otro tipo fuera necesaria una posición distinta a la indicada, será necesario asegurar los componentes en la posición deseada mediante los medios mecánicos adecuados (pernos de inmovilización, barras de seguridad, distanciadores, etc.).
Si esta **directriz no se respeta**, puede haber **peligro** para las **personas** que estén realizando trabajos en / con la máquina / instalación por movimientos incontrolados hacia abajo de componentes individuales.
- 23.1.4. Para todos los trabajos de mantenimiento es necesario desconectar de forma segura la máquina / instalación de todas las fuentes externas de alimentación de energía. El dispositivo de desconexión o bloqueo debe ser asegurado mediante un candado personal contra la conexión no autorizada de la alimentación de energía. ☞  21;
- 23.1.5. Es imprescindible observar las normas establecidas en las directrices nacionales y técnicas sobre prevención de accidentes para los procesos de desconexión en los trabajos de mantenimiento en la máquina / instalación.
- 23.1.6. El 'candado personal' debe ser colocado por la persona en el dispositivo de desconexión o bloqueo que se encuentra en la zona peligrosa. La persona debe llevar consigo la llave para este candado.
En un lugar accesible únicamente a personas autorizadas deben guardarse llaves de reserva.

Capítulo 1 Instrucciones para el uso

23.1.7. La interrupción de la alimentación de energía debe señalarse con una **señal de advertencia junto al dispositivo de desconexión / bloqueo**.

23.2. **Comprobar el funcionamiento de los dispositivos de seguridad**

23.2.1. El funcionamiento seguro del circuito de PARADA DE EMERGENCIA de la máquina / instalación debe ser comprobado a intervalos regulares, al menos una vez a la semana, por un electricista especializado.

Los desperfectos detectados deben ser subsanados antes de que el personal operario vuelva a hacerse cargo de la máquina / instalación.

23.2.2. El funcionamiento seguro de las puertas de acceso bloqueadas de la máquina / instalación debe ser comprobado a intervalos regulares, al menos una vez a la semana, por un operario especializado.

Los desperfectos detectados deben ser subsanados antes de que el personal operario vuelva a hacerse cargo de la máquina / instalación.

23.3. **Cambio de cuchilla en una cizalla**



¡Póngase calzado y guantes protectores para realizar este trabajo!

23.3.1. El cambio de cuchilla en una cizalla sólo debe ser realizado por personas formadas o adiestradas.

23.3.2. Las cuchillas de una cizalla deben desmontarse y reafilearse cuando sea necesario, pero a lo más tardar después de 1,5 millones de cortes. ☞ I; 1; 8;

23.3.3. Para cambiar la cuchilla en una cizalla hacen falta las siguientes herramientas y medios auxiliares:

Ring - Maulschlüssel: SW 13, SW 17;
Llave de hexágono interior: 3 mm; 4 mm; 6 mm;
Llave dinamométrica para tornillos hexagonales y de hexágono interior;
Lámina de apoyo: 0,01 mm;
Piedra de repasar;
Paños de limpieza;

Prepare una base de madera o plástico para descansar la cuchilla.

23.3.4. Preparativos para el cambio de cuchilla.

- Extraiga hacia atrás la cinta del transformador de la máquina / instalación y enróllela por medio de la cabeza del aspa desarrolladora.
- Ajuste las guías laterales a aprox. el 30 % del ancho de cinta máximo.

Capítulo 1 Instrucciones para el uso



- Schlüsselschalter PREPARACION einschalten.
 - Drucktaster BEREICH C SCHUTZTÜR ENT- / VERRIEGELN betätigen.
- Vorsicht!** Die Bremsen zu den Exzenterantrieben an den Werkzeugen sind geöffnet. Darum müssen vor dem Öffnen der Zugangstüre alle Werkzeuge im Unteren Totpunkt stehen.

- 23.3.5. - Steuerspannung ausschalten.
- Tenga preparadas las herramientas y los medios auxiliares.
 - Abdeckhaube des Exzenterantriebs abnehmen.



- 23.3.6. **¡Cuidado!** Las cuchillas de la cizalla tienen aristas afiladas. Las herramientas, cuchillas etc. pueden caerse. Por eso es necesario llevar calzado y guantes protectores. En los trabajos que no puedan realizarse desde el suelo del local deberán utilizarse medios auxiliares seguros para subir. Mantenga la zona de trabajo siempre limpia. Las herramientas, etc. dejadas en cualquier parte pueden desencadenar accidentes.

¡Atención! Cada vez que se monte una cuchilla nueva o recién afilada debe comprobarse el solapamiento de la cuchilla con el dispositivo de cambio de cuchilla, bajando y subiendo el carro de la cuchilla superior. La cuchilla superior no debe tocar la cuchilla inferior (distancia mínima 0,01 mm). Si las cuchillas superior e inferior se tocan, en los movimientos de corte pueden desprenderse fragmentos de metal duro.

- 23.3.7. Der Messerwechsel ist in der technischen Dokumentation Teil I beschrieben.

- 23.3.8. Nach dem Messerwechsel alle demontierten Maschinenteile anbauen und falls möglich auf Funktion prüfen.
- Abdeckhaube des Exzenterantriebs anbringen.
 - Werkzeuge und Hilfsmittel aus der Maschine / Anlage entfernen.
 - Compruebe la apropiada conclusión de los trabajos.
 - Steuerspannung einschalten.
 - Schlüsselschalter PREPARATION ausschalten.

23.4. **Cambio de cuchilla en un punzón en V**



¡Póngase calzado y guantes protectores para realizar este trabajo!

- 23.4.1. El cambio de cuchilla en un punzón en V sólo debe ser realizado por personas formadas o adiestradas.

- 23.4.2. Las cuchillas de un punzón en V deben desmontarse y reafilearse cuando sea necesario, pero a lo más tardar después de 1,5 millones de cortes. ☞ I; 1; 8;

Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

23.4.3. Para cambiar la cuchilla en un punzón en V hacen falta las siguientes herramientas y medios auxiliares:

Ring - Maulschlüssel: SW 17;
Llave de hexágono interior: 4 mm; 6 mm;
Llave dinamométrica para tornillos hexagonales y de hexágono interior;
Lámina de apoyo: 0,01 mm;
Piedra de repasar;
Paños de limpieza;

Prepare una base de madera o plástico para descansar la cuchilla.

23.4.4. Preparativos para el cambio de cuchilla.

- Extraiga hacia atrás la cinta del transformador de la máquina / instalación y enróllela por medio de la cabeza del aspa desarrolladora.
- Coloque el punzón en V en posición.
- Ajuste las guías laterales a aprox. el 30 % del ancho de cinta máximo.
- Schlüsselschalter PREPARATION einschalten.
- Drucktaster BEREICH C SCHUTZTÜR ENT- / VERRIEGELN betätigen.



Vorsicht ! Die Bremsen zu den Exzenterantrieben an den Werkzeugen sind geöffnet. Darum müssen vor dem Öffnen der Zugangstüre alle Werkzeuge im Unteren Totpunkt stehen.

- 23.4.5. - Steuerspannung ausschalten.
- Tenga preparadas las herramientas y los medios auxiliares.
- Abdeckhaube des Exzenterantriebs abnehmen.

23.4.6. **¡Cuidado!** Las cuchillas del punzón en V tienen aristas afiladas. Las herramientas, cuchillas etc. pueden caerse. Por eso es necesario llevar calzado y guantes protectores. En los trabajos que no puedan realizarse desde el suelo del local deberán utilizarse medios auxiliares seguros para subir. Mantenga la zona de trabajo siempre limpia. Las herramientas, etc. dejadas en cualquier parte pueden desencadenar accidentes.



¡Atención! Cada vez que se monte una cuchilla nueva o recién afilada debe comprobarse el solapamiento de la cuchilla con el dispositivo de cambio de cuchilla, bajando y subiendo el carro de la cuchilla superior. La cuchilla superior no debe tocar la cuchilla inferior (distancia mínima 0,01 mm). Si las cuchillas superior e inferior se tocan, en los movimientos de corte pueden desprenderse fragmentos de metal duro.

23.4.7. Der Messerwechsel ist in der technischen Dokumentation Teil I beschrieben.

23.4.8. Nach dem Messerwechsel alle demontierten Maschinenteile anbauen und falls möglich auf Funktion prüfen.

- Abdeckhaube des Exzenterantriebs anbringen.
- Werkzeuge und Hilfsmittel aus der Maschine / Anlage entfernen.
- Compruebe la apropiada conclusión de los trabajos.

Capítulo 1 Instrucciones para el uso

- Steuerspannung einschalten.
- Schlüsselschalter PREPARATION ausschalten.

23.5. Cambio de herramienta en una punzonadora



¡Póngase calzado y guantes protectores para realizar este trabajo!

- 23.5.1. El cambio de herramienta en una punzonadora sólo debe ser realizado por personas formadas o adiestradas.
- 23.5.2. Las herramientas de una punzonadora deben desmontarse y reafilarse cuando sea necesario, pero a lo más tardar después de 1,5 millones de cortes. ☞ I; 1; 8;
- 23.5.3. Para cambiar la herramienta en una punzonadora hacen falta las siguientes herramientas y medios auxiliares:
- Ring - Maulschlüssel: SW 17;
 - Llave de hexágono interior: 5 mm; 6 mm;
 - Llave dinamométrica para tornillos hexagonales y de hexágono interior;
 - Piedra de repasar;
 - Paños de limpieza;
- Prepare una base de madera o plástico para descansar las herramientas.
- 23.5.4. Preparativos para el cambio de herramienta.
- Extraiga hacia atrás la cinta del transformador de la máquina / instalación y enróllela por medio de la cabeza del aspa desarrolladora.
 - Coloque la punzonadora en posición.
 - Ajuste las guías laterales a aprox. el 50 % del ancho de cinta máximo.
 - Schlüsselschalter PREPARATION einschalten.
 - Drucktaster BEREICH C SCHUTZTÜR ENT- / VERRIEGELN betätigen.
-  **Vorsicht!** Die Bremsen zu den Exzenterantrieben an den Werkzeugen sind geöffnet. Darum müssen vor dem Öffnen der Zugangstüre alle Werkzeuge im Unteren Totpunkt stehen.
- 23.5.5. - Steuerspannung ausschalten.
- Tenga preparadas las herramientas y los medios auxiliares.
 - Abdeckhaube des Exzenterantriebs abnehmen.

- 23.5.6.  **¡Cuidado!** Las herramientas de punzonado tienen aristas afiladas. Las herramientas, punzonadoras etc. pueden caerse. Por eso es necesario llevar calzado y guantes protectores. En los trabajos que no puedan realizarse desde el suelo del local deberán utilizarse medios auxiliares seguros para subir.



Capítulo 1 Instrucciones para el uso

Mantenga la zona de trabajo siempre limpia. Las herramientas, etc. dejadas en cualquier parte pueden desencadenar accidentes.

¡Atención! Cada vez que se monte un juego de herramientas nuevo o recién afilado debe comprobarse el solapamiento de las herramientas de punzonado. El punzón no debe tocar la matriz. Si el punzón y la matriz se tocan, en los movimientos de corte pueden desprenderse fragmentos de metal duro.

23.5.7. Der Werkzeugwechsel ist in der technischen Dokumentation Teil I beschrieben.

23.5.8. Nach dem Werkzeugwechsel alle demontierten Maschinenteile anbauen und falls möglich auf Funktion prüfen.

- Abdeckhaube des Exzenterantriebs anbringen.
- Werkzeuge und Hilfsmittel aus der Maschine / Anlage entfernen.
- Compruebe la apropiada conclusión de los trabajos.
- Steuerspannung einschalten.
- Schlüsselschalter PREPARACION ausschalten.

Capítulo 1 Instrucciones para el uso

24. Instrucciones de lubricación de la máquina / instalación

24.1. Indicaciones generales



**¡Antes de comenzar los trabajos de lubricación,
desconecte la máquina / instalación de todas las
fuentes de alimentación de energía!**

- 24.1.1. La máquina / instalación debe lubricarse a intervalos regulares o cuando sea necesario. Los intervalos dependen fundamentalmente del periodo diario de utilización. Los trabajos de lubricación periódicos están recogidos en la documentación técnica con su intervalo de realización. ☞ I; 1; 7;
- 24.1.2. Para todos los trabajos de lubricación es necesario desconectar de forma segura la máquina / instalación de todas las fuentes externas de alimentación de energía. El dispositivo de desconexión o bloqueo debe ser asegurado mediante un candado personal contra la conexión no autorizada de la alimentación de energía. ☞ 21;
- 24.1.3. Es imprescindible observar las normas establecidas en las directrices nacionales y técnicas sobre prevención de accidentes para los procesos de desconexión de una máquina / instalación.
- 24.1.4. El 'candado personal' debe ser colocado por la persona en el dispositivo de desconexión o bloqueo que se encuentra en la zona peligrosa. La persona debe llevar consigo la llave para este candado.
En un lugar accesible únicamente a personas autorizadas deben guardarse llaves de reserva.
- 24.1.5. La interrupción de la alimentación de energía debe señalarse con una **señal de advertencia junto al dispositivo de desconexión / bloqueo**.

24.2. Lubricantes

- 24.2.1. Utilice únicamente lubricantes de alta calidad que cumplan con los estándares de calidad indicados por **HEINRICH GEORG GMBH MASCHINENFABRIK**. En la tabla de lubricantes que encontrará en la documentación técnica se mencionan lubricantes adecuados. ☞ I; 1; 7;

Capítulo 1 Instrucciones para el uso

25. Directrices de mantenimiento para el sistema hidráulico

25.1. Indicaciones generales



¡Antes de comenzar los trabajos de mantenimiento o reparación, desconecte la máquina / instalación de todas las fuentes de alimentación de energía!

25.1.1. Los trabajos de mantenimiento en la instalación hidráulica sólo deben ser realizados por personal especializado y debidamente formado para ello.

25.1.2. El mantenimiento de la instalación hidráulica debe realizarse a intervalos regulares o cuando sea necesario. Los intervalos dependen fundamentalmente del periodo diario de utilización. Los trabajos de mantenimiento periódicos están recogidos en la documentación técnica con su intervalo de realización.

☞ I; 1; 9;

25.1.3. **Antes de comenzar** los trabajos de mantenimiento y / o reparación en esta máquina / instalación, **todos los componentes móviles** deben situarse en su **posición máxima inferior** (tope mecánico o posición final).



Si por razones técnicas o de otro tipo fuera necesaria una posición distinta a la indicada, será necesario asegurar los componentes en la posición deseada mediante los medios mecánicos adecuados (pernos de inmovilización, barras de seguridad, distanciadores, etc.).

Si esta **directriz no se respeta**, puede haber **peligro** para las **personas** que estén realizando trabajos en / con la máquina / instalación por movimientos incontrolados hacia abajo de componentes individuales.

25.1.4. Para todos los trabajos de mantenimiento es necesario desconectar de forma segura la máquina / instalación de todas las fuentes externas de alimentación de energía. El dispositivo de desconexión o bloqueo debe ser asegurado mediante un candado personal contra la conexión no autorizada de la alimentación de energía. ☞ 21;

25.1.5. Es imprescindible observar las normas establecidas en las directrices nacionales y técnicas sobre prevención de accidentes para los procesos de desconexión en los trabajos de mantenimiento en la máquina / instalación.

25.1.6. El 'candado personal' debe ser colocado por la persona en el dispositivo de desconexión o bloqueo que se encuentra en la zona peligrosa. La persona debe llevar consigo la llave para este candado.

En un lugar accesible únicamente a personas autorizadas deben guardarse llaves de reserva.

Capítulo 1 Instrucciones para el uso

- 25.1.7. La interrupción de la alimentación de energía debe señalarse con una **señal de advertencia junto al dispositivo de desconexión / bloqueo**.
- 25.1.8. **¡Cuidado!** La **energía residual** en el / los depósito(s) de presión de la instalación hidráulica puede resultar **peligrosa**.



**¡Antes de comenzar una reparación es necesario
despresurizar hidrostáticamente la instalación!**

25.2. *Filtros hidráulicos*

- 25.2.1. Es imprescindible limpiar o dado el caso cambiar los filtros de la instalación hidráulica de la máquina / instalación a los intervalos indicados en la documentación técnica. ☞ I; 1; 9;

25.3. *Aceite hidráulico*

- 25.3.1. La vida útil de los componentes utilizados en la instalación hidráulica depende de la calidad del aceite hidráulico empleado.
Por eso, utilice únicamente aceites de marca que cumplan los requisitos indicados por **HEINRICH GEORG GMBH MASCHINENFABRIK**. ☞ I; 1; 9;
En caso de duda, remítase por favor a la dirección de contacto indicada en estas instrucciones para el uso. ☞ 1;

26. Directrices de mantenimiento para el sistema neumático

26.1. Indicaciones generales



¡Antes de comenzar los trabajos de mantenimiento o reparación, desconecte la máquina / instalación de todas las fuentes de alimentación de energía!

26.1.1. Los trabajos de mantenimiento en la instalación neumática sólo deben ser realizados por personal especializado y debidamente formado para ello.

26.1.2. El mantenimiento de la instalación neumática debe realizarse a intervalos regulares o cuando sea necesario. Los intervalos dependen fundamentalmente del periodo diario de utilización. Los trabajos de mantenimiento periódicos están recogidos en la documentación técnica con su intervalo de realización.

☞ 1; 10;

26.1.3. **Antes de comenzar** los trabajos de mantenimiento y / o reparación en esta máquina / instalación, **todos los componentes móviles** deben situarse en su **posición máxima inferior** (tope mecánico o posición final).



Si por razones técnicas o de otro tipo fuera necesaria una posición distinta a la indicada, será necesario asegurar los componentes en la posición deseada mediante los medios mecánicos adecuados (pernos de inmovilización, barras de seguridad, distanciadores, etc.).

Si esta **directriz no se respeta**, puede haber **peligro** para las **personas** que estén realizando trabajos en / con la máquina / instalación por movimientos incontrolados hacia abajo de componentes individuales.

26.1.4. Para todos los trabajos de mantenimiento es necesario desconectar de forma segura la máquina / instalación de todas las fuentes externas de alimentación de energía. El dispositivo de desconexión o bloqueo debe ser asegurado mediante un candado personal contra la conexión no autorizada de la alimentación de energía. ☞ 21;

26.1.5. Es imprescindible observar las normas establecidas en las directrices nacionales y técnicas sobre prevención de accidentes para los procesos de desconexión en los trabajos de mantenimiento en la máquina / instalación.

26.1.6. El 'candado personal' debe ser colocado por la persona en el dispositivo de desconexión o bloqueo que se encuentra en la zona peligrosa. La persona debe llevar consigo la llave para este candado.

En un lugar accesible únicamente a personas autorizadas deben guardarse llaves de reserva.



Capítulo 1 Instrucciones para el uso

- 26.1.7. La interrupción de la alimentación de energía debe señalarse con una **señal de advertencia junto al dispositivo de desconexión / bloqueo**.
- 26.1.8. **¡Cuidado!** La **energía residual** en la instalación neumática puede resultar **peligrosa**.



**¡Antes de comenzar una reparación es necesario
despresurizar la instalación abriendo la válvula de
aireación!**

26.2. *Filtros neumáticos*

- 26.2.1. Es imprescindible limpiar o dado el caso cambiar los filtros de la instalación neumática de la máquina / instalación a los intervalos indicados en la documentación técnica. ☞ I; 1; 10;

26.3. *Aceitadores de aire comprimido*

- 26.3.1. Los aceitadores de aire comprimido deben comprobarse cada día antes de comenzar el trabajo. En caso necesario deberán rellenarse de aceite.

Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

27. Conservación de la máquina / instalación

27.1. Indicaciones generales



¡Antes de comenzar los trabajos de mantenimiento o reparación, desconecte la máquina / instalación de todas las fuentes de alimentación de energía!

- 27.1.1. Los trabajos de conservación en la máquina / instalación sólo deben ser realizados por personal especializado y debidamente formado para ello.
- 27.1.2. Para todos los trabajos de conservación es necesario desconectar de forma segura la máquina / instalación de todas las fuentes externas de alimentación de energía. El dispositivo de desconexión o bloqueo debe ser asegurado mediante un candado personal contra la conexión no autorizada de la alimentación de energía. ☞ 21;
- 27.1.3. Es imprescindible observar las normas establecidas en las directrices nacionales y técnicas sobre prevención de accidentes para los procesos de desconexión en los trabajos de conservación en la máquina / instalación.
- 27.1.4. El 'candado personal' debe ser colocado por la persona en el dispositivo de desconexión o bloqueo que se encuentra en la zona peligrosa. La persona debe llevar consigo la llave para este candado.
En un lugar accesible únicamente a personas autorizadas deben guardarse llaves de reserva.
- 27.1.5. Una alta disponibilidad de la máquina / instalación requiere buenos cuidados y conservación. Es pues imprescindible observar los intervalos establecidos por **HEINRICH GEORG GMBH MASCHINENFABRIK** en la documentación técnica para determinadas operaciones de cuidado y conservación.
- 27.1.6. Los plazos indicados están pensados para un esfuerzo y condiciones de servicio normales. Si tales condiciones son desfavorables, puede ser necesario acortar tales plazos.
- 27.1.7. La limpieza periódica de la máquina / instalación forma parte asimismo de su adecuada conservación.
- 27.1.8. Para todos los trabajos de conservación y reparación en la máquina / instalación le remitimos a la documentación técnica al completo y a la dirección de contacto indicada en estas instrucciones para el uso. ☞ 1;



Capítulo 1 Instrucciones para el uso

27.1.9. La responsabilidad por los trabajos de conservación la asume el especialista encargado de su ejecución.

27.2. *Directrices de seguridad*

27.2.1.  **Antes de comenzar** los trabajos de conservación y / o reparación en esta máquina / instalación, **todos los componentes móviles** deben situarse en su **posición máxima inferior** (tope mecánico o posición final).

Si por razones técnicas o de otro tipo fuera necesaria una posición distinta a la indicada, será necesario asegurar los componentes en la posición deseada mediante los medios mecánicos adecuados (pernos de inmovilización, barras de seguridad, distanciadores, etc.).

Si esta **directriz no se respeta**, puede haber **peligro** para las **personas** que estén realizando trabajos en / con la máquina / instalación por movimientos incontrolados hacia abajo de componentes individuales.

27.2.2. La máquina / instalación debe **desconectarse de la alimentación de energía** tal como se describe en estas instrucciones para el uso. ☞  21;

27.2.3. La interrupción de la alimentación de energía debe señalarse con una **señal de advertencia junto al dispositivo de desconexión / bloqueo**.

27.2.4. El **área de trabajo** para la conservación debe ser **protegida con espacio suficiente** de acuerdo con las necesidades.

27.2.5. Sólo deben utilizarse **recambios originales** autorizados por **HEINRICH GEORG GMBH MASCHINENFABRIK**.

27.2.6. **Las uniones flojas** deben ser siempre **bien apretadas antes de dar por concluidos** los trabajos.

27.2.7. Si es necesario **desmontar dispositivos de seguridad**, inmediatamente **después de concluidos los trabajos** tales dispositivos deberán ser nuevamente **montados y comprobados**.

27.3. *Medidas preventivas*

27.3.1. A intervalos regulares, al menos cada 200 horas de servicio, se deberán controlar todas las piezas de la máquina / instalación, comprobando su perfecto funcionamiento.

27.3.2. En caso de escucharse ruidos anormales, su causa deberá ser establecida y subsanada.

27.3.3. Si se detecta desgaste de piezas individuales de la máquina / instalación, se deberá tomar nota y encargar a tiempo los recambios necesarios.



Capítulo 1 Instrucciones para el uso

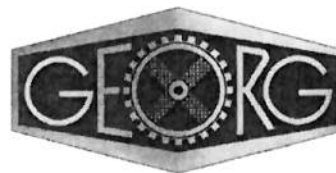
**HEINRICH GEORG GMBH
MASCHINENFABRIK**

27.4. Conservación de los componentes mecánicos

- 27.4.1. Emplee únicamente a personal especializado o formado y adiestrado bajo la supervisión de un especialista.
- 27.4.2. Compruebe la buena fijación de todos los tornillos, apretar en caso necesario.
- 27.4.3. Compruebe el juego interno del cojinete, la marcha concéntrica y la temperatura desarrollada en todas las piezas giratorias de la máquina / instalación.
Comprobar con especial detenimiento los cojinetes sometidos a grandes cargas.
- 27.4.4. Las piezas de la máquina / instalación que no están protegidas con pintura anticorrosión deben limpiarse y recubrirse con una película lubricante adecuada. Esto es de especial importancia para las piezas móviles, como vástagos de émbolo, husillos, guías etc.
☞ I; 1; 6;

27.5. Conservación de la instalación hidráulica

- 27.5.1. Todo trabajo a realizar en instalaciones hidráulicas ha de llevarse a cabo exclusivamente por personal de conocimientos y experiencias especiales en hidráulica.
- 27.5.2. El equipamiento hidráulico de la máquina / instalación debe ser inspeccionado / comprobado regularmente. Purgue el aceite de los dispositivos de recogida del aceite de fuga. Cambie los filtros a los intervalos prescritos. Los desperfectos como componentes o piezas del sistema de conducción sueltos o dañados deben ser inmediatamente subsanados. El periodo de utilización máximo de las tuberías flexibles está limitado a 6 años a partir de la fecha de fabricación. Las tuberías flexibles que hayan alcanzado esta antigüedad deben ser cambiadas, aunque no presenten daños visibles. Las tuberías flexibles que lleven almacenadas más de 2 años no deben ser ya montadas en la máquina / instalación. Consulte la documentación técnica para obtener datos más detallados. ☞ I; 1; 6; ☞ I; 1; 9; ☞ I; 1; 13;
- 27.5.3. Utilice únicamente piezas originales que mantengan la presión de referencia prescrita.
- 27.5.4. Los planos hidráulicos que recoge la documentación técnica son de obligatorio y exacto cumplimiento. No se pueden alterar los valores de ajuste en ellos indicados, como p. ej. la presión de trabajo máxima, el flujo máximo etc. ☞ I; 1; 9;
- 27.5.5. Las modificaciones en el sistema hidráulico de la máquina / instalación sólo pueden ser realizadas por personal especializado de **HEINRICH GEORG GMBH MASCHINENFABRIK**.



Capítulo 1 Instrucciones para el uso

27.5.6. **HEINRICH GEORG GMBH MASCHINENFABRIK** no asume ninguna responsabilidad por las modificaciones realizadas en el sistema hidráulico de la máquina / instalación por personal ajeno a **HEINRICH GEORG GMBH MASCHINENFABRIK**. La **responsabilidad por los daños por ello ocasionados** en la salud y la vida de las personas, animales o cosas **la asume únicamente la persona que realiza la modificación**.

27.6. *Conservación de la instalación neumática*

27.6.1. Todo trabajo a realizar en instalaciones neumáticas ha de llevarse a cabo El equipamiento neumático de la máquina / instalación debe ser inspeccionado / comprobado regularmente. Purgue el agua de condensación. Cambie los filtros a los intervalos prescritos. Los desperfectos como componentes o piezas del sistema de conducción sueltos o dañados deben ser inmediatamente subsanados. El periodo de utilización máximo de las tuberías flexibles está limitado a 6 años a partir de la fecha de fabricación. Las tuberías flexibles que hayan alcanzado esta antigüedad deben ser cambiadas, aunque no presenten daños visibles. Las tuberías flexibles que lleven almacenadas más de 2 años no deben ser ya montadas en la máquina / instalación. Consulte la documentación técnica para obtener datos más detallados.

☞ I; 1; 6; ☞ I; 1; 10; ☞ I; 1; 13;

27.6.2. Utilice únicamente piezas originales que mantengan la presión de referencia prescrita.

27.6.3. Los planos neumáticos que recoge la documentación técnica son de obligatorio y exacto cumplimiento. No se pueden alterar los valores de ajuste en ellos indicados, como p. ej. la presión de trabajo máxima, el flujo máximo etc.

☞ I; 1; 10;

27.6.4. Las modificaciones en el sistema neumático de la máquina / instalación sólo pueden ser realizadas por personal especializado de **HEINRICH GEORG GMBH MASCHINENFABRIK**.

27.6.5. **HEINRICH GEORG GMBH MASCHINENFABRIK** no asume ninguna responsabilidad por las modificaciones realizadas en el sistema neumático de la máquina / instalación por personal ajeno a **HEINRICH GEORG GMBH MASCHINENFABRIK**. La **responsabilidad por los daños por ello ocasionados** en la salud y la vida de las personas, animales o cosas **la asume únicamente la persona que realiza la modificación**.

27.7. *Conservación de los componentes electrotécnicos*

27.7.1. Los trabajos en el equipamiento eléctrico de la máquina / instalación sólo pueden ser realizados por un electricista especializado o por personas adiestradas y bajo la dirección y supervisión de un electricista especializado de acuerdo con las normas electrotécnicas.

Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 140 de 148
-----------------------------	------------	--------------------------	----------------------



Capítulo 1 Instrucciones para el uso

- 27.7.2. El equipamiento eléctrico de la máquina / instalación debe ser inspeccionado / comprobado regularmente. Los desperfectos como conexiones sueltas, cables superficialmente fundidos o con el aislamiento dañado deben ser inmediatamente subsanados.
- 27.7.3. Utilice únicamente fusibles originales con la intensidad de corriente prescrita.
- 27.7.4. Los esquemas de circuitos que recoge la documentación técnica son de obligatorio y exacto cumplimiento. No se pueden alterar los valores de ajuste en ellos indicados, como p. ej. la sobrecorriente máxima, etc. ☞ II; 1; 1;
- 27.7.5. Las modificaciones en el mando de la máquina / instalación sólo pueden ser realizadas por personal especializado de **HEINRICH GEORG GMBH MASCHINENFABRIK**.
- 27.7.6. **HEINRICH GEORG GMBH MASCHINENFABRIK** no asume ninguna responsabilidad por las modificaciones realizadas en el mando de la máquina / instalación por personal ajeno a **HEINRICH GEORG GMBH MASCHINENFABRIK**. La **responsabilidad por los daños por ello ocasionados** en la salud y la vida de las personas, animales o cosas **la asume únicamente la persona que realiza la modificación**.



Capítulo 1 Instrucciones para el uso

28. Listas de recambios para la máquina / instalación

28.1. *Indicaciones generales sobre listas de recambios*

- 28.1.1. Los recambios deben satisfacer los requisitos técnicos establecidos por **HEINRICH GEORG GMBH MASCHINENFABRIK**. Esto está siempre garantizado con recambios originales.
- 28.1.2. Una alta disponibilidad de la máquina / instalación requiere contar con los recambios más importantes. Conviene tener siempre en el lugar de uso los recambios propuestos por **HEINRICH GEORG GMBH MASCHINENFABRIK**.
- 28.1.3. Al encargar recambios, indique por favor además del número del recambio el número de pedido de **HEINRICH GEORG GMBH MASCHINENFABRIK**.
- 28.1.4. Para los recambios electrotécnicos, indique también el número de posición que identifica al componente en la máquina / instalación. Si esta identificación se ha perdido o está ilegible, consulte el número de posición en la lista de piezas de aparatos.
- 28.1.5. El número de pedido de **HEINRICH GEORG GMBH MASCHINENFABRIK** para esta máquina / instalación es:

4295 - 2 - 05

28.2. *Lista de recambios de los componentes mecánicos*

- 28.2.1. Consulte la lista de recambios en la documentación técnica. ☞ I; 1; 11;
- 28.2.2. Si el recambio que necesita no está incluido en la lista, diríjase por favor a la dirección de contacto indicada en estas instrucciones para el uso. ☞ 1;

28.3. *Lista de recambios de los componentes hidráulicos*

- 28.3.1. Consulte la lista de recambios en la documentación técnica. ☞ I; 1; 11;
- 28.3.2. Si el recambio que necesita no está incluido en la lista, diríjase por favor a la dirección de contacto indicada en estas instrucciones para el uso. ☞ 1;

28.4. *Lista de recambios de los componentes neumáticos*

- 28.4.1. Consulte la lista de recambios en la documentación técnica. ☞ I; 1; 11;



Capítulo 1 Instrucciones para el uso

28.4.2. Si el recambio que necesita no está incluido en la lista, diríjase por favor a la dirección de contacto indicada en estas instrucciones para el uso. ☞ 1;

28.5. *Lista de recambios de los componentes electrotécnicos*

28.5.1. Consulte la lista de recambios en la documentación técnica. ☞ I; 1; 11;

28.5.2. Consulte la lista de piezas de aparatos en la documentación técnica. ☞ II; ? ; ?

28.5.3. Si el recambio que necesita no está incluido en las listas, diríjase por favor a la dirección de contacto indicada en estas instrucciones para el uso. ☞ 1;



Capítulo 1 Instrucciones para el uso

29. Informe sobre la medición de ruido en los lugares de trabajo

Kom.: 3727-2-99
Instalación: TBA/ME/HY 400 x 2200 STA/B
Año de construcción: 2000

Informe

Medición de los niveles de intensidad acústica emitidos en lugares determinados

1. Instalación examinada

véase más arriba; consulte la Documentación Técnica para más datos técnicos.

2. Fundamentos de medición y de valoración

- 2.1 Directiva sobre máquinas de la CE 98/37/EG
- 2.2 DIN EN ISO 11200 : 07/96 – Irradiación de ruidos por máquinas y aparatos – Directrices para la aplicación de las normas básicas para determinar los niveles de intensidad acústica emitidos en el lugar de trabajo y en otros lugares determinados.
- 2.3 DIN EN ISO 11201 : 07/96 – Irradiación de ruidos por máquinas y aparatos – Medición de los niveles de intensidad acústica emitidos en el lugar de trabajo y en otros lugares determinados; método de la clase de exactitud 2 para un campo sonoro básicamente libre a través de un plano reflector.
- 2.4 Norma para prevención de accidentes "Ruido" BGV B3 (hasta ahora VBG 121) del 01.01.1990 en la redacción del 01.01.1997, HV de las asociaciones profesionales

3. Condiciones de medición

3.1 Colocación de la instalación y entorno acústico

Las mediciones tuvieron lugar en el marco de la puesta en marcha previa de la instalación en la nave de montaje Planta II de Heinrich Georg GmbH Maschinenfabrik.



Capítulo 1 Instrucciones para el uso

Suelo: hormigón, solado industrial.

Techo: construcción de acero, altura aprox. 10 m

Paredes: hormigón

Distancia al centro de la instalación – lado de accionamiento: > 10 m

Distancia al centro de la instalación – lado de mando: > 30 m

Distancia al eje de la devanadora – lado de entrada: > 10 m

Distancia al punto de apilado 2 – lado de salida: > 30 m

De otras experiencias en similares condiciones de entorno acústico puede concluirse que el indicador de entorno K_{2A} no es mayor a 2 dB(A), satisfaciéndose así el criterio de idoneidad del entorno de medición según DIN EN ISO 11201, Pkt. 6.2.

3.2 Datos del rollo/Datos de la instalación

Las mediciones se realizaron con cinta de transformador, ancho 300 mm, grosor 0,27 mm bei einer Geschwindigkeit von ca. 210 m/min.

4. Aparatos de medición

4.1 Aparato medidor manual del nivel acústico integrador: CEL-328, Ser.-Nr. 1011383A

4.2 Micrófono: Typ 230, Ser.-Nr. 091521

4.3 Calibrador: Larson/Davis, Modell CA 250, Ser.-Nr. 1273

4.4 Calibración: Al comienzo de las mediciones se comprobó y ajustó la indicación del nivel acústico con el calibrador, al término de las mediciones se controló de nuevo.

5. Puntos de medición

El micrófono se colocó en los puntos de medición del 1 al 4 a una altura en cada caso de aprox. 1,6 m. (Sobre la ubicación de los puntos de medición véanse las tablas 6.2 y 6.3.)

6. Datos acústicos

6.1 Estados de funcionamiento/Duración de la medición

Las mediciones del ruido sobre la instalación en marcha tuvieron lugar durante su funcionamiento continuado. No se tuvieron en cuenta los procesos de enhebrado y desenhebrado, la carga y descarga de material, los cambios de herramienta ni los

Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18	Página 145 de 148
-----------------------------	------------	--------------------------	----------------------

Capítulo 1 Instrucciones para el uso

trabajos de ajuste. De modo subjetivo se pudo constatar que estos procesos – con la excepción de breves ruidos de golpes al enhebrar y desenhebrar – no causaban emisiones acústicas dignas de mención.

La duración de la medición se determinó en todos los puntos de medición de manera que fuera lo suficientemente larga como para que no se observaran variaciones en los valores de medición indicados.

6.2 Valores de medición/Dimensiones calculadas

L'_{AFeq}	Nivel de intensidad acústica continua equivalente calificado como A, valoración de tiempo "F", medido con la instalación en marcha
L'_{AFTeq}	Nivel promedio a ritmo máximo calificado como A, valoración de tiempo "F", tiempo del ciclo 5 s, medido con la instalación en marcha (tiene en cuenta si los ruidos contienen impulsos)
L'_{AFmax}	Valor máximo del nivel de intensidad acústica calificado como A, medido con la instalación en marcha
L^*_{AFeq}	Nivel de intensidad acústica continua equivalente calificado como A, valoración de tiempo "F", medido con la tensión de mando desconectada (ruidos extraños)
L^*_{AFTeq}	Nivel promedio a ritmo máximo calificado como A, valoración de tiempo "F", tiempo del ciclo 5 s, medido con la tensión de mando desconectada (tiene en cuenta si los ruidos extraños contienen impulsos)
K_{1AFeq}	Corrección de ruidos extraños para el nivel de intensidad acústica continua equivalente según DIN EN ISO 11201, Pkt. 6.4: $K_{1AFeq} = -10 \cdot \log(1 - 10^{-0,1 \cdot \Delta L_{AFeq}}) \quad \text{mit } \Delta L_{AFeq} = L'_{AFeq} - L^*_{AFeq}$
K_{1AFTeq}	Corrección de ruidos extraños para el nivel promedio a ritmo máximo según DIN EN ISO 11201, Pkt. 6.4 (analog K_{1AFeq})
L_{AFeq}	Nivel calculado de intensidad acústica continua emitido equivalente calificado como A, según DIN EN ISO 11201, Pkt. 8: $L_{AFeq} = L'_{AFeq} - K_{1AFeq}$
L_{AFTeq}	Nivel promedio calculado a ritmo máximo calificado como A, según DIN EN ISO 11201, Pkt. 8. (analog L_{AFeq})
ΔL_I	Medida de impulsos: Diferencia entre el nivel de intensidad acústica continua equivalente y el nivel promedio a ritmo máximo: $\Delta L_I = L_{AFTeq} - L_{AFeq}$
ζ_{con}	Según DIN EN ISO 11201, Anh. A, se considera que el ruido contiene impulsos? impulsos cuando la medida de impulsos es igual o mayor a 3 dB(A).
L_{eq}	Nivel de intensidad acústica continua emitido equivalente calificado como A (corresponde a L_{AFeq} para ruidos sin impulsos y a L_{AFTeq} para ruidos con impulsos).

Capítulo 1 Instrucciones para el uso

HEINRICH GEORG GMBH
MASCHINENFABRIK

Medición

Nr	Lugar	L'_{AFeq} [dB(A)]	L'_{AFTeq} [dB(A)]	L'_{AFmax} [dB(A)]	L^*_{AFeq} [dB(A)]	L^*_{AFTe} [dB(A)]	K_{1AFeq} [dB(A)]	K_{1AFTeq} [dB(A)]	L_{AFeq} [dB(A)]	L_{AFTeq} [dB(A)]	ΔL_1 [dB(A)]	¿con impulsos ?	L_{eq} [dB(A)]	Observa- ciones
1	Pupitre de mando entrada	72,5	74,1	78,2	62,1	63,9	0,4	0,4	72,1	73,7	1,58	no	72,1	
2	Pupitre de mando principal	76,2	78,5	79,3	62,3	64,5	0,2	0,2	76,0	78,3	2,30	no	76,0	
3	Pupitre de mando apilado	73,4	75,9	78,6	62,3	64,6	0,4	0,3	73,0	75,6	2,52	no	73,0	
4	Lado de accionamiento grupo hidráulico	74,5	75,9	79,1	64,8	65,7	0,5	0,4	74,0	75,5	1,46	no	74,0	

6.3 Nivel de intensidad acústica emitido referido a un lugar

Para calcular el nivel de intensidad acústica emitido referido a un lugar se asumieron las siguientes suposiciones, pues no se disponía de datos exactos:

En promedio, durante un turno se procesa cinta con una duración de 360 min según el punto 3.2. Durante el resto del tiempo (120 min) no tiene lugar un funcionamiento continuo (pausa, carga y descarga de material, cambio de herramientas y trabajos de ajuste).

Para calcular el correspondiente nivel de intensidad acústica emitido referido a un lugar L_r se determinan los niveles individuales de intensidad acústica continua emitidos equivalentes calificados como A L_{eq} (i) según la siguiente fórmula según DIN EN ISO 11201, Pkt. 10.1.1:

$$L_r = 10 \cdot \log \left(\frac{1}{T} \sum_{i=1}^N T_i \cdot 10^{0,1 \cdot L_{eq}(i)} \right) \quad \text{mit } T = \sum_{i=1}^N T_i$$

Nr	Lugar	$L_{eq}(1)$ [dB(A)]	T_1 [min]	$L_{eq}(2)$ [dB(A)]	T_2 [min]	$L_{eq}(3)$ [dB(A)]	T_3 [min]	$L_{eq}(4)$ [dB(A)]	T_4 [min]	$L_{eq}(5)$ [dB(A)]	T_5 [min]	T [min]	L_r [dB(A)]	Observa- ciones
1	Pupitre de mando entrada	72,1	360	62,1	120							480	71,0	
2	Pupitre de mando principal	76,0	360	62,3	120							480	74,8	
3	Pupitre de mando apilado	73,0	360	62,3	120							480	71,9	
4	Lado de accionamiento grupo hidráulico	74,0	360	64,8	120							480	72,9	



Capítulo 1

Instrucciones para el uso

7. Valoración

7.1 Norma para prevención de accidentes "Ruido"

Los valores límite para ser considerada *zona de ruido* según UVV "Lärm" (BGV B3) de 85 dB(A) para el nivel de valoración referido a un lugar L_r y de 130 dB(A) para el valor máximo del nivel de intensidad acústica calificado como A L'_{AFmax} no se superan en ninguno de los puntos de medición.

7.2 Directiva sobre máquinas de la CE

La directiva sobre máquinas de la CE exige en las instrucciones para el uso los siguientes datos sobre los ruidos emitidos por la máquina:

- nivel de intensidad acústica continua equivalente calificado como A en los lugares de trabajo del personal operario, si está por encima de 70 dB(A).
 - Estos datos pueden consultarse en la tabla, punto 6.3, columna L_r .
 - valor máximo del nivel acústico momentáneo calificado como C en los lugares de trabajo del personal operario, en la medida en que sobrepase los 130 dB en referencia a 20 μ Pa.
 - Este valor límite no se sobrepasa en ninguno de los puntos de medición.
 - nivel de potencia acústica de la máquina, cuando el nivel de intensidad continua equivalente calificado como A en los lugares de trabajo del personal operario está por encima de 85 dB(A). En máquina de grandes dimensiones, en lugar del nivel de potencia acústica pueden indicarse los niveles de intensidad acústica continua equivalentes en determinados puntos del entorno de la máquina.
 - Esta indicación no es obligatoria, pues el valor límite no se sobrepasa en ninguno de los puntos de medición. Se trata además de una máquina o instalación de gran tamaño. Los niveles de intensidad acústica continua equivalentes en el entorno de la máquina pueden consultarse igualmente en la tabla, punto 6.3, columna L_r , ya que los lugares de trabajo del personal operario donde se tomaron las mediciones se encuentran en el entorno de la máquina.
- ⇒ No son necesarias medidas para la disminución de las emisiones acústicas ni medios de protección auditiva para el personal operario.

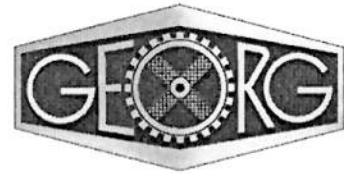
Gestión de calidad/Gestión de seguridad

(i.A. Heyde)
29.1.1.

Ident-Nr.: 4295 bade.doc	Revisión 0	Druck: 08.11.07 10:18		Página 148 de 148
-----------------------------	------------	--------------------------	--	----------------------

Technische Dokumentation

Technical Documentation



HEINRICH GEORG GMBH
MASCHINENFABRIK

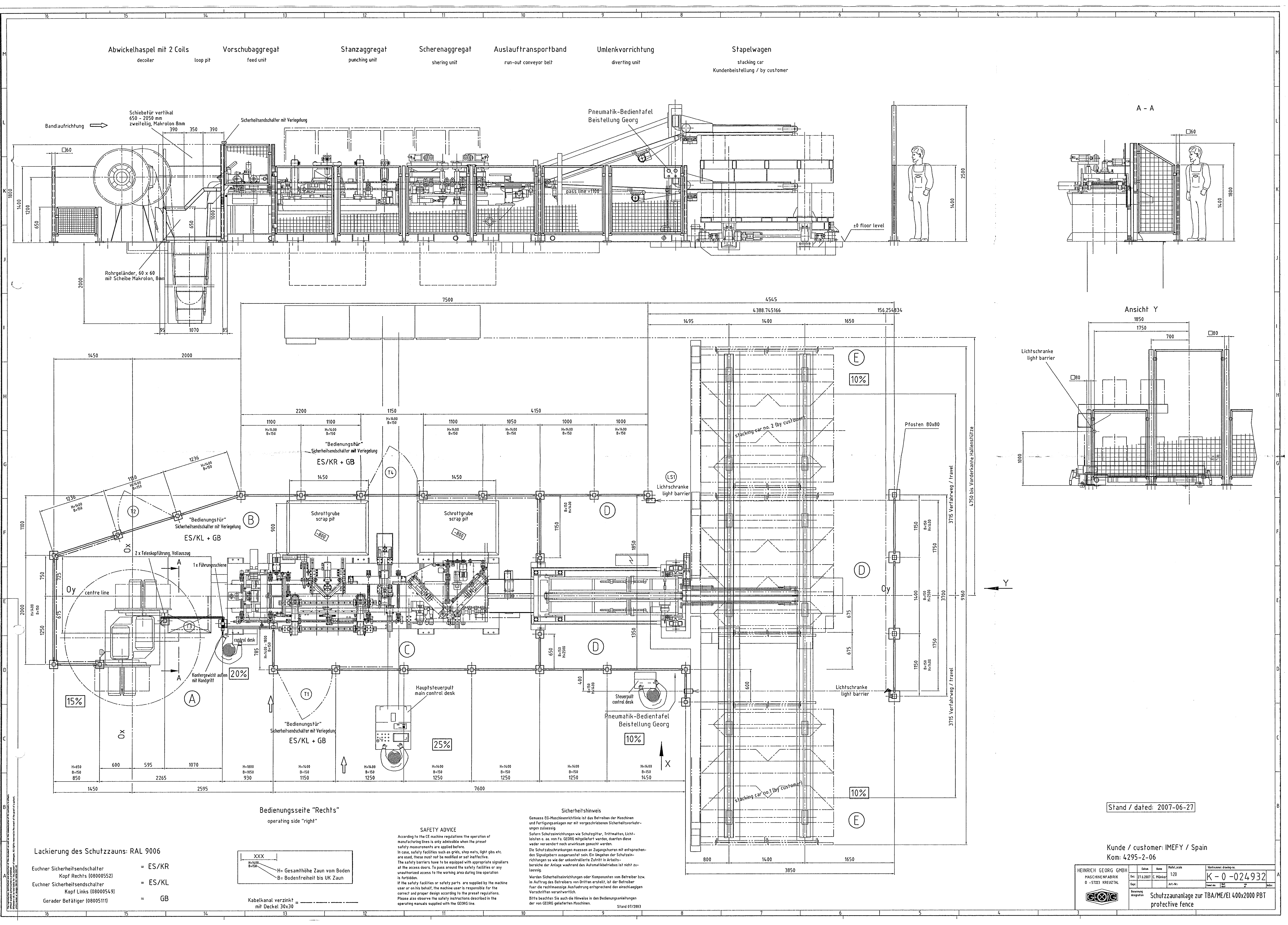
Kapitel 2

Chapter 2

Contents

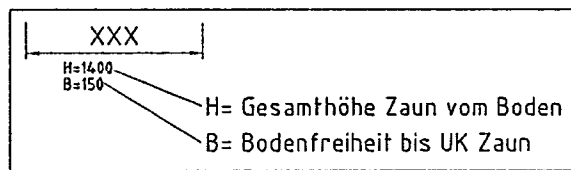
1. **Schutzzaun zur Anlage**
safety fence

K-0-024932



Lackierung des Schutzzauns: RAL 9006

- Euchner Sicherheitschalter
Kopf Rechts (08000552) = ES/KR
Euchner Sicherheitschalter
Kopf Links (08000549) = ES/KL
Gerader Befähiger (08005111) = GB



Kabelkanal verzinkt mit Deckel 30x30

SAFETY ADVICE

According to the CE machine regulations the operation of manufacturing lines is only admissible when the preset safety measurements are applied before.
In case, safety facilities such as grids, step mats, light gbs etc. are used, these must not be modified or set ineffective.
The safety barriers have to be equipped with appropriate signalers at the access doors. To pass around the safety facilities or any unauthorized access to the working area during line operation is forbidden.
If the safety facilities or safety parts are supplied by the machine user or on his behalf, the machine user is responsible for the correct and proper design according to the preset regulations. Please also observe the safety instructions described in the operating manuals supplied with the GEORG line.

Sicherheitshinweis

Gemäss EG-Maschinenrichtlinie ist das Betreiben der Maschinen und Fertigungsanlagen nur mit vorgeschriebenen Sicherheitsvorkehrungen zulässig.
Safere Schutzanordnungen wie Schutzgitter, Trittmatten, Lichtschranken o. ä. von Fa. GEORG mitgeliefert werden, dürfen diese weder verändert noch unwirksam gemacht werden.
Die Schutzabschränkungen müssen an Zugangstüren mit entsprechenden Signalgebern ausgerüstet sein. Ein Umgehen der Schutzanordnungen so wie der unkontrollierte Zutritt in Arbeitsbereiche der Anlage während des Automatikbetriebes ist nicht zulässig.
Werden Sicherheitseinrichtungen oder Komponenten vom Betreiber bzw. im Auftrag des Betreibers von Dritten erstellt, ist der Betreiber für die rechtmässige Ausführung entsprechend den einschlägigen Vorschriften verantwortlich.
Bitte beachten Sie auch die Hinweise in den Bedienungsanleitungen der von GEORG gelieferten Maschinen.

Stand 07/2003

Stand / dated: 2007-06-27

Kunde / customer: IMEFY / Spain
Kom: 4295-2-06

HEINRICH GEORG GMBH MASCHINENFABRIK D - 57263 KREUZTAL	Datum 04.12.2007	Zeichn.-Nr. C. Pflücker	Blatt-Nr. 1:20	Northamer-Drawings K-0-024932
Gepr. Berechnung Ausg.	Gepr. Berechnung Ausg.	Gepr. Berechnung Ausg.	Gepr. Berechnung Ausg.	Gepr. Berechnung Ausg.

Schutzzaunanlage zur TBA/ME/El 400x2000 PBT
protective fence



Kapitel 3

Chapter 3

Inhaltsverzeichnis

Contents

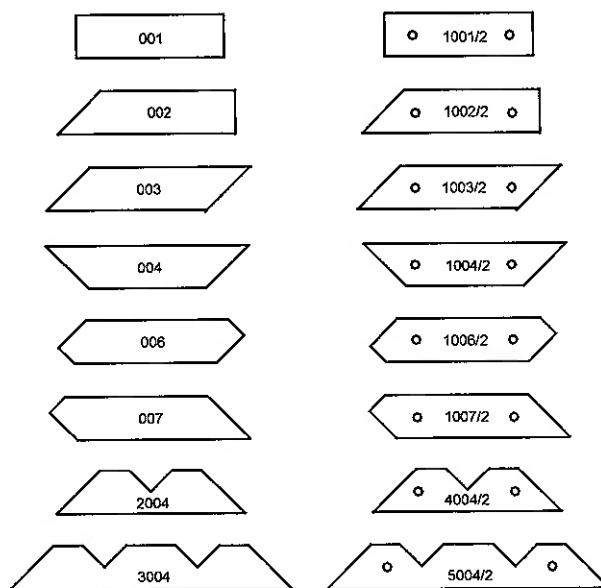
1. **Technische Daten**
Technical data

Seite 1 bis 2
Page 1 bis 2

2. **Grenzwertblätter**
Limit value sheets

TECHNICAL DATA OF LINE'S EQUIPMENT

Examples of Lamination shapes which can be produced on a line equipped with 1 V notch and 1 Hole punch:-



Leg and Yoke example



Lamination with V notch must be produced together with lamination without V notch
UNLESS LINE IS EQUIPPED WITH TWO V NOTCHES.



With one hole punch one or more holes can be punched in the lamination

See also limit diagram No. 3-051657 (TBA400)
& "Lamination Shapes and Core Designs"



Kapitel 3

Chapter 3

Cutting programme examples as per	SE 1-1, SE 2-1, SE 3-1, SE 4-1
Scrap saving programmes start & end	as per system drawing 4-01064/2 pages 1-3
Strip width range	50 to 440 mm (PB/T)
Material	Grain Orientated Electrical Steel to EN 10107
Min sheet length	250 mm (centre length)
Max sheet length	2000 mm (centre length)
Strip thickness	0.23 to 0.35 mm
Accuracy of feed unit item 3	Approx. +/- 0.2 mm Std dev Sx = 0,1 mm as per Technical Information TR 020 E-1992
Angular position accuracy of shears	+/- 0.005 deg
Measuring tolerances on cut laminations:	as per Technical Information TR 020/E-1992 see section [9]
Life of carbide blade between regrinds	approx. 1-2 million cuts at approx. 0.02 mm burr height
Max strip feed speed	240 m/min
Max cutting capacity Output diagram	as per enclosures LD/ME 400 4-063051 (HS/T & PB/T stacking) Note: The data for the cutting part must be compared to the stacking system The slowest part determines capacity
Air pressure	5 - 6 bar
Voltage	400 volt $\pm$ 5% 3 phase 50 Hz $\pm$ 1% or as per customers specification.
Ambient conditions	5 - 50 deg C max and 95% RH

Notes on the minimum and maximum cutting lengths:

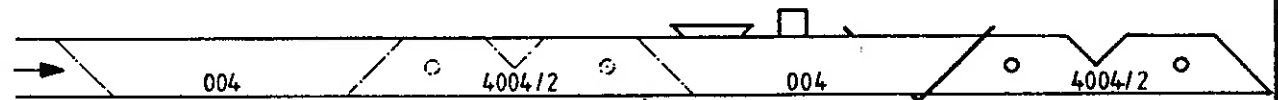
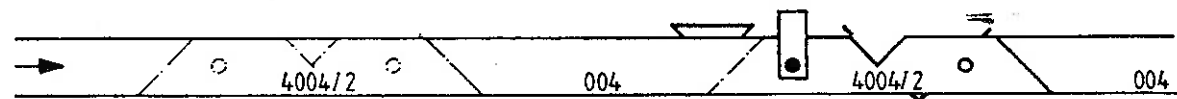
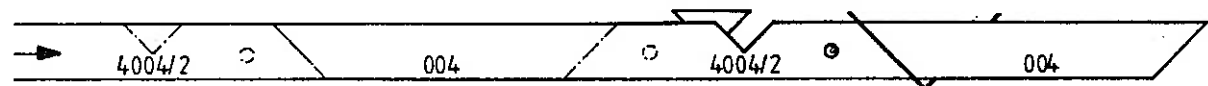
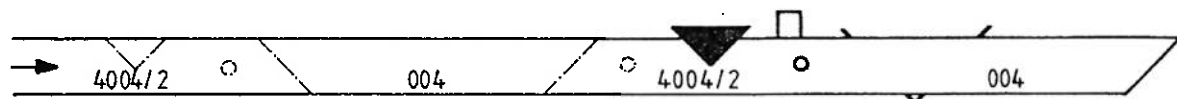
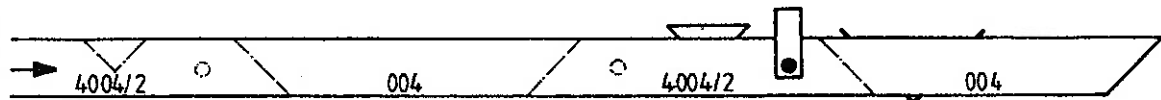
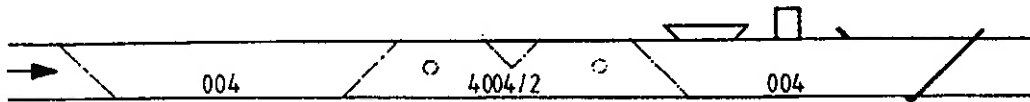
The length control system of the line enables the entry of feed lengths in 0.1 mm steps in the range of 0.1 to 9999.9 mm.

TBA / ME Schnittprogramm



SE 4-1

Entsprechend dem Urheberschutzvermerk
nach DIN 34 behalten wir uns für diese
Technische Unterlage und sämtliche Bel-
Innen alle Rechte vor.



HEINRICH GEORG GMBH MASCHINENFABRIK
D - 5910 KREUZTAL

Maßstab

Tag

Name

1/

09.08.84

H.Münker

4-00996/2

F-32503

V 2015

Schnittprogramme :

Cutting programs :

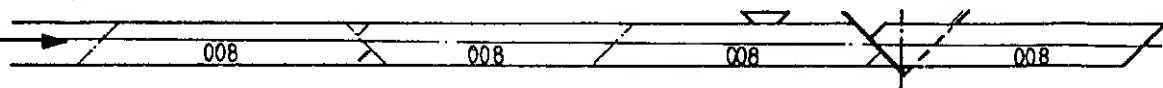
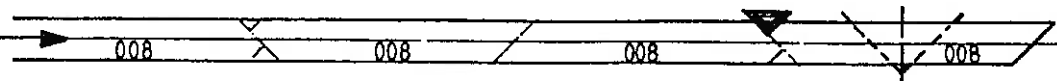
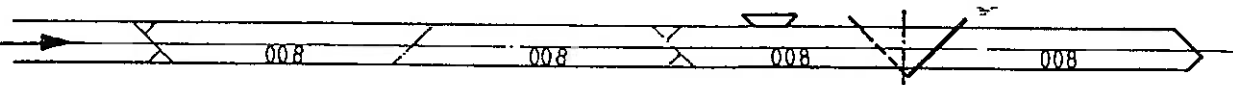
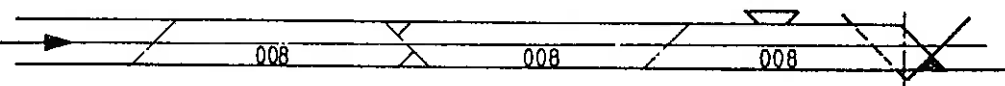
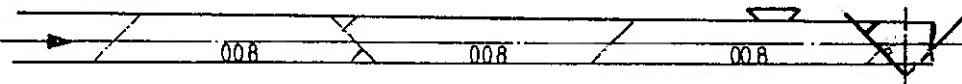
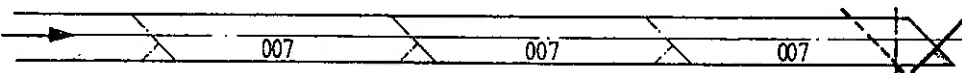
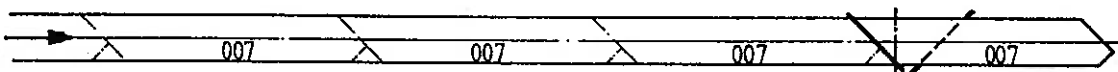
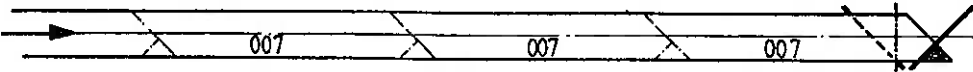
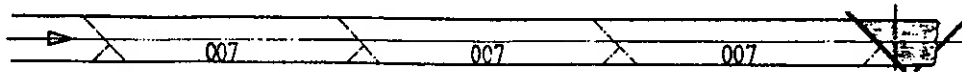
2 Scheren (konst.) + 1 V-Stanze (konst)

2 Shears (const.) + 1 V-Notching Press (const.)

TBA / ME-Anlage



SE 2-1



Entsprechend dem Urheberrechtsvermerk
nach DIN 34 behalten wir uns für diese
Technische Unterlage und sämtliche Bei-
lagen alle Rechte vor.

HEINRICH GEORG GMBH MASCHINENFABRIK
D - 5910 KREUZTAL

Maßstab

Tag

Name

1/

09.08.84

H.Münker

4-00997/2

E- 212/1-1

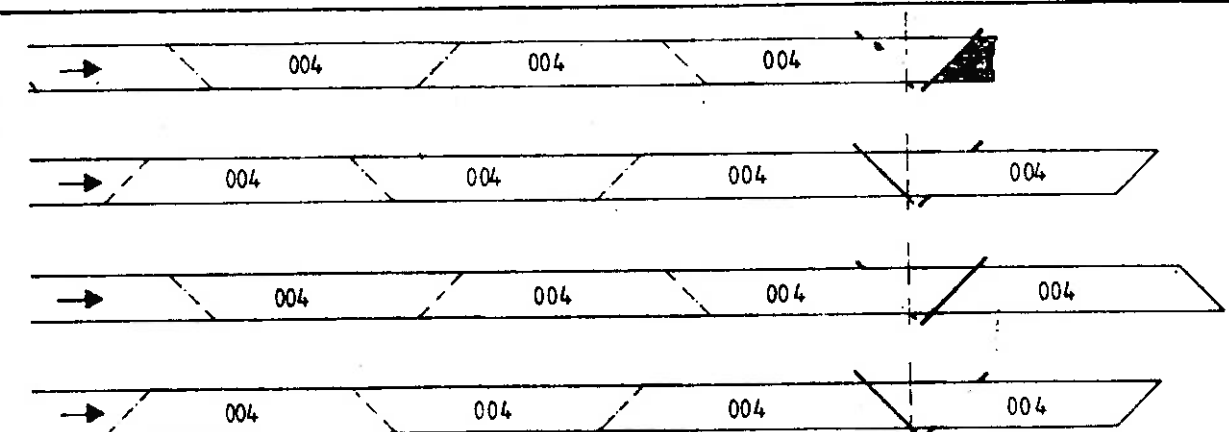
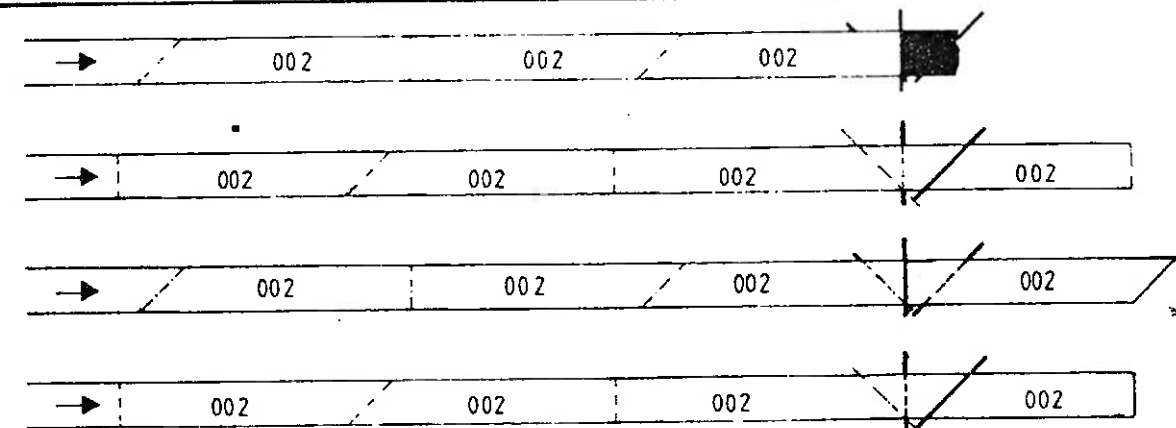
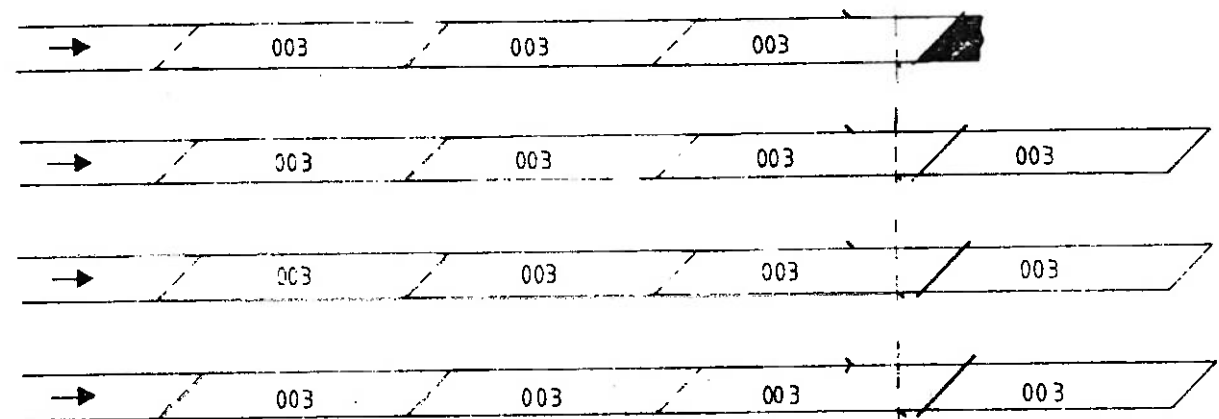
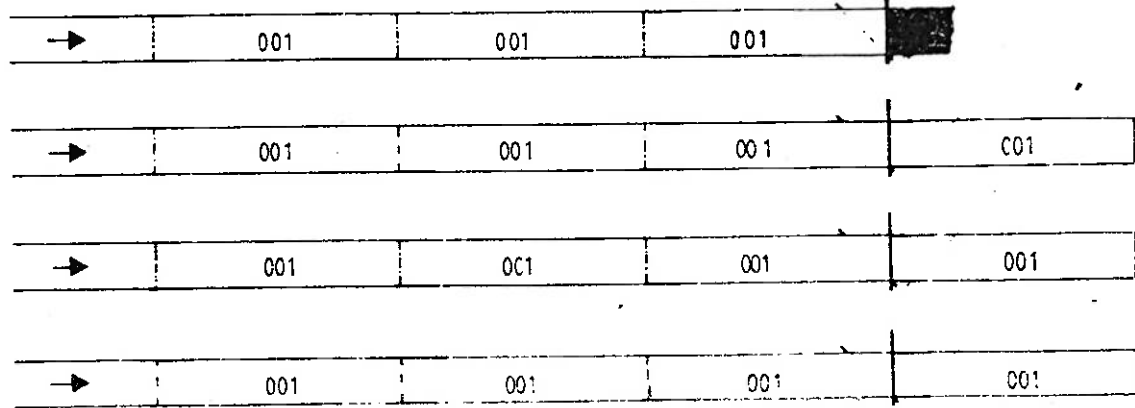
Schnittprogramme:

Cutting programs:

2 Scheren (const.)
2 Shears (const.)

TBA/ME-Anlage

SE 1-1



HEINRICH GEORG

Maschinenfabrik
5910 Kreuztal

Tag
27.06.75

Name
Op

4-00998/2

E-21258-1

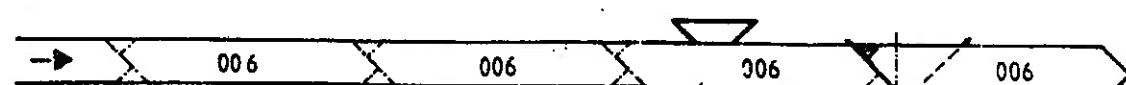
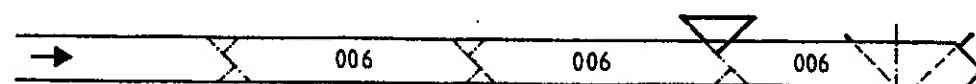
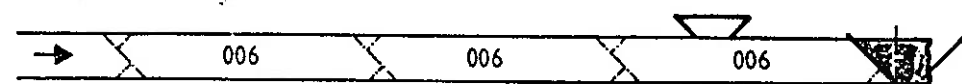
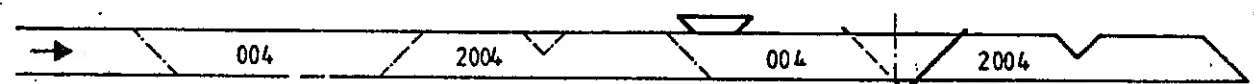
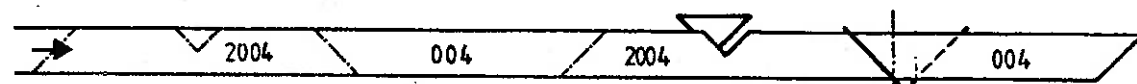
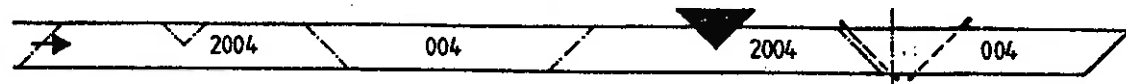
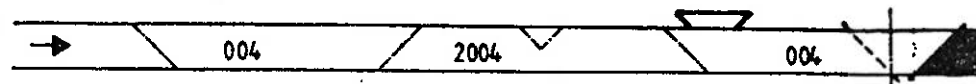
Schnittprogramme:

Cutting programs:

TBA/ME-Anlage

SE 3-1

2 Scheren (konst.) + 1 V-Stanze (konst.)
2 Shear (const.) + 1 V-Notching Press (const.)



HEINRICH GEORG

Maschinenfabrik
5910 Kreuztal

Tag
30.06.75

Name
Op

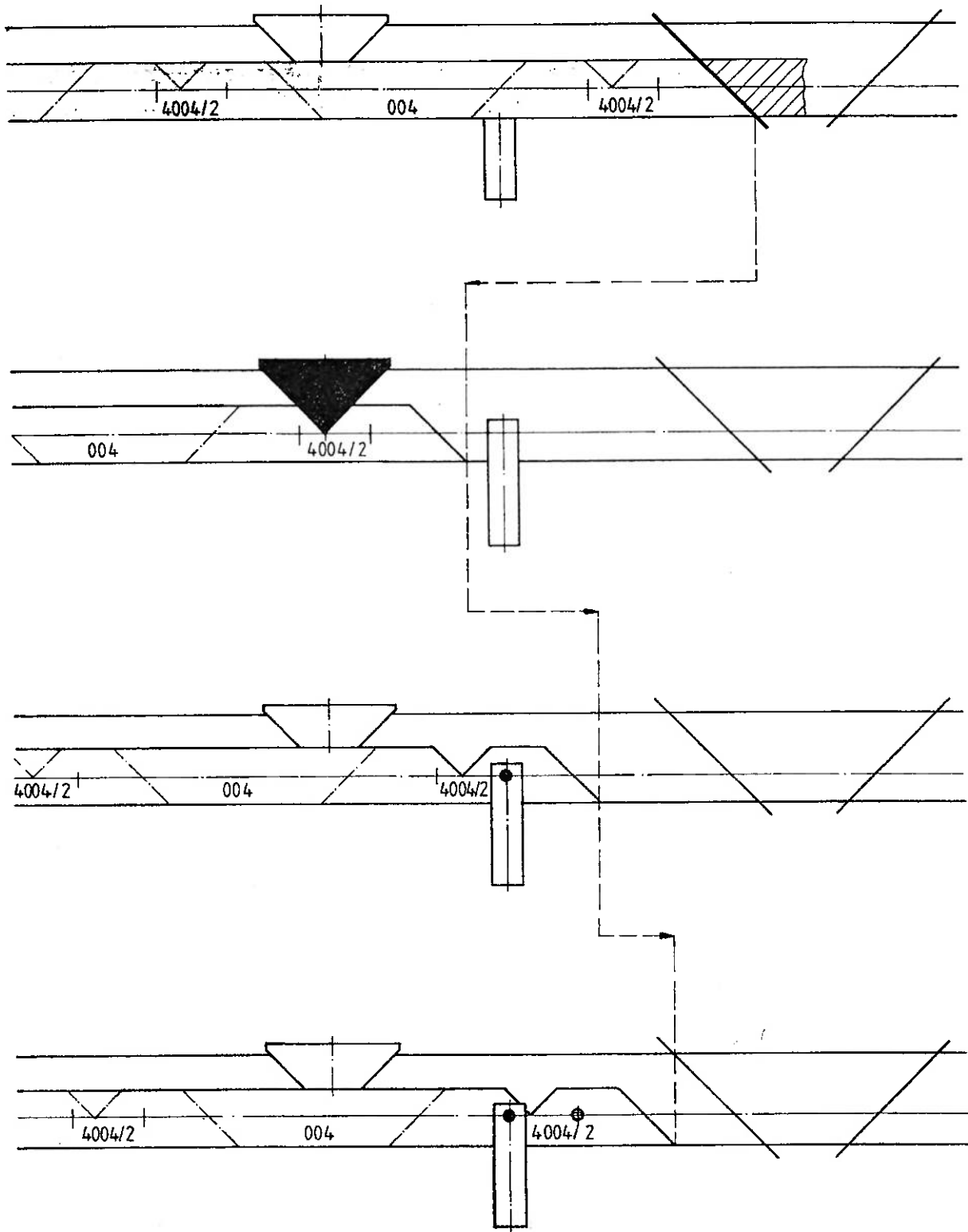
4-00999/2

11-2425

Schrottsparendes „Anfangs - Programm“ Scrap saving „Starting - Program“



Entsprechend dem Urheberschutzvermerk
nach DIN 34 behalten wir uns für diese
Technische Unterlage und sämtliche Bei-
lagen alle Rechte vor.



Blatt 1
sheet 1

HEINRICH GEORG GMBH MASCHINENFABRIK
D - 5910 KREUZTAL

Maßstab

1/2

Tag

13.11.84

Name

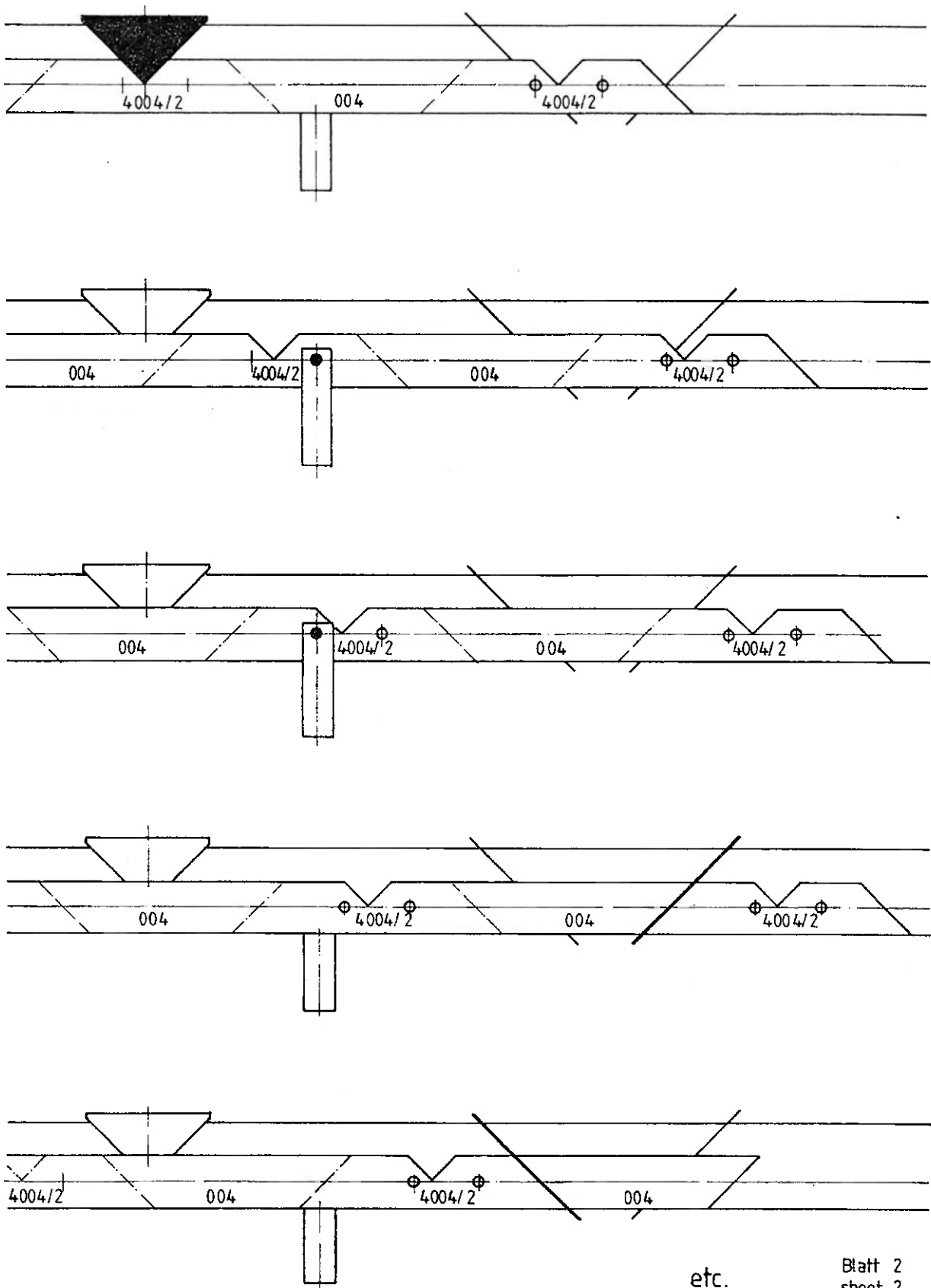
H.Münker

4-01064 / 2

1 Programm - Zyklus (5 Stops für 2 Bleche)
1 Program - cycle (5 stops for 2 laminations)



Entsprechend dem Urheberschutzvermerk
nach DIN 34 behalten wir uns für diese
Technische Unterlage und sämtliche Bei-
lagen alle Rechte vor.



Blatt 2
sheet 2

HEINRICH GEORG GMBH MASCHINENFABRIK
D - 5910 KREUZTAL

Maßstab

1:1

Tag

13.11.84

Name

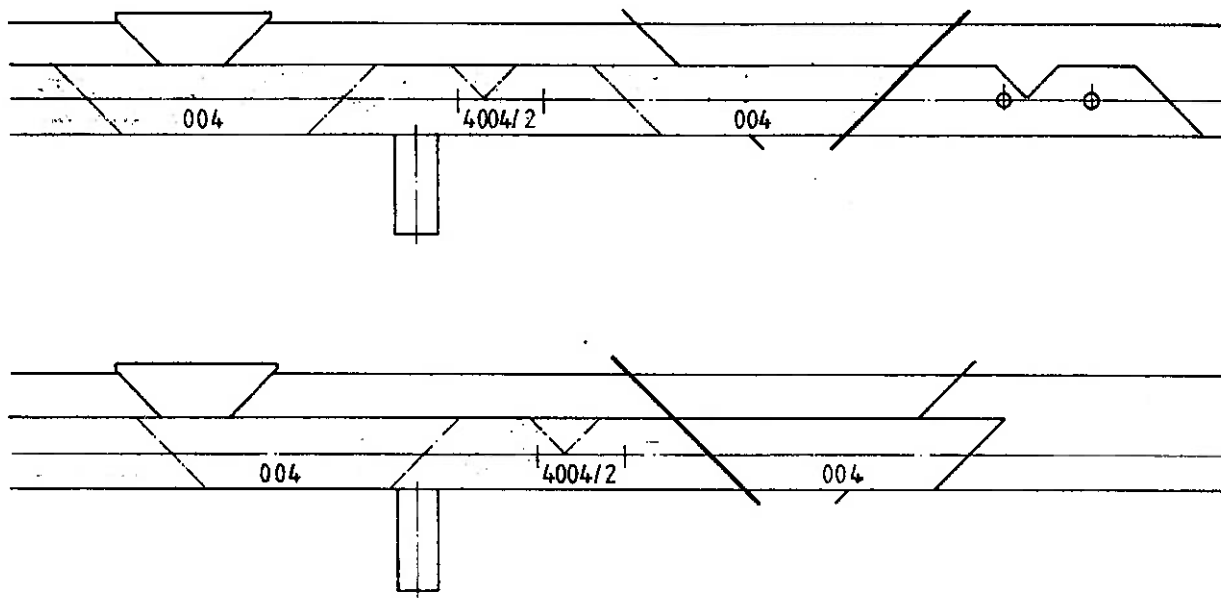
H.Münker

4-01064/2

Schrottsparendes „End - Programm“ Scrap saving „End - Programm“



Entsprechend dem Urherschulzvermerk
nach DIN 14 behalten wir uns für diese
Technische Unterlage und sämtliche Bei-
lagen alle Rechte vor.



Blatt 3
sheet 3

HEINRICH GEORG GMBH MASCHINENFABRIK
D - 5910 KREUZTAL

Maßstab

Tag

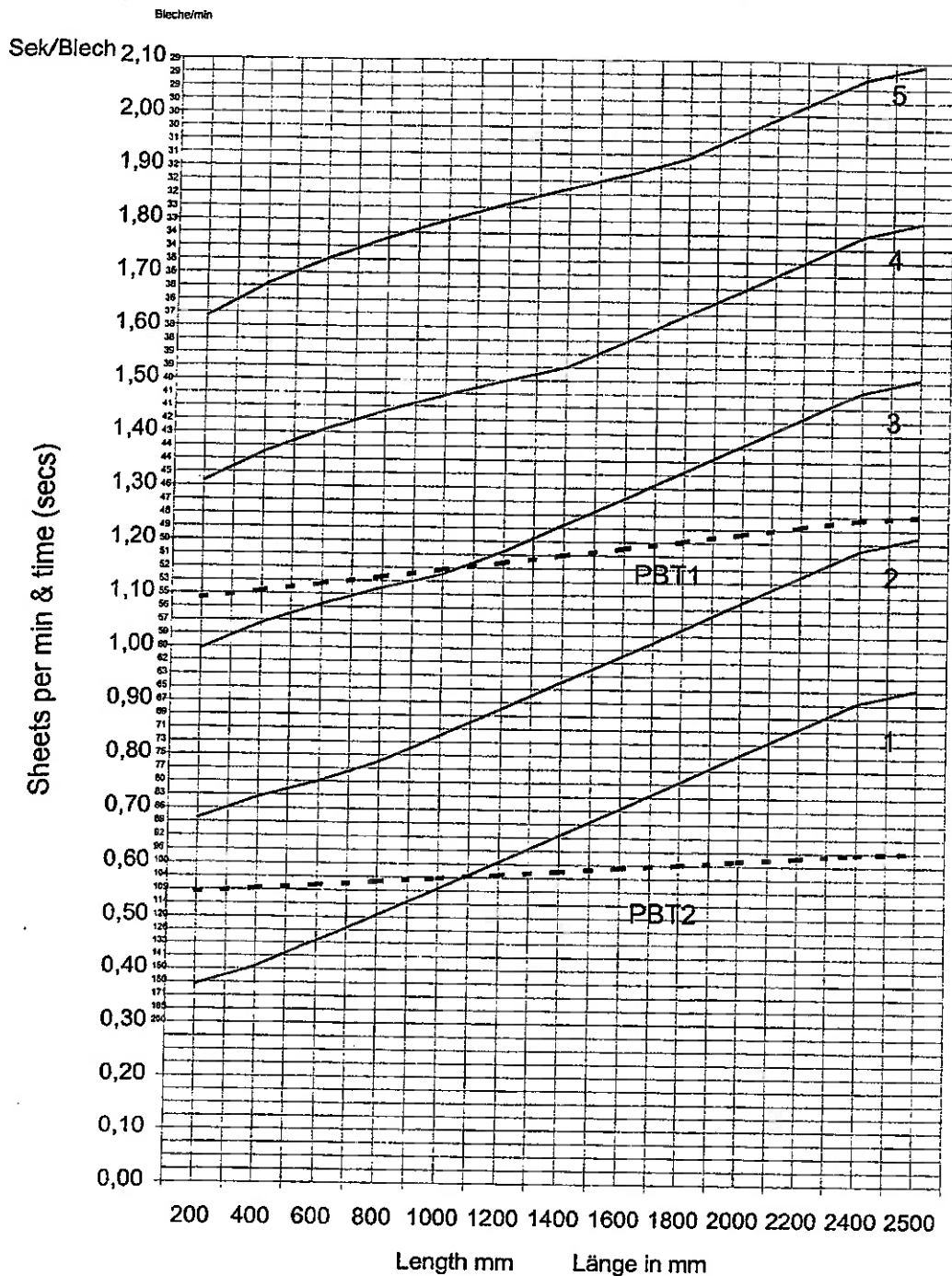
Name

1/1

13.11.84

H. Munker

4 - 01064/2



Kurven 1 bis 5 = Ausstoss für Blechformen mit 1 bis 5 Stops pro Blech
 Kurve PBT1 = PB/T Stapler bei Stapelung auf lediglich einer Ebene
 Kurve PBT2 = PB/T Stapler bei wechselweisem Stapeln auf beiden Ebenen
 Für HS/T Stapler besteht keine Ausstossbegrenzung
 Curves 1 to 5 = capacity of the cutting part depending on the number of stops
 Curve PBT1 = PB/T stacker capacity using one level
 Curve PBT2 = PB/T stacker capacity using two levels alternately
 For HS/T stacking there is no capacity limitation



Vmax = 240 m/min
 ta = 0,088 s
 tk = 0,19 s
 ts = 0,11 s
 ts-St = 0,10 s

TBA/ME/HY 400x2500
HS/T & PB/T
Ausstosssdiagramm
Output Diagram

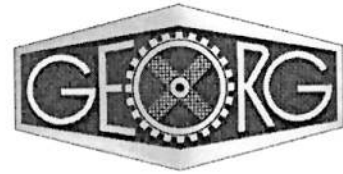
HEINRICH GEORG GMBH
 MASCHINENFABRIK

gez. A. Tschoelitsch
 Datum 18.10.01

No- K-4-063051

Technische Dokumentation

Technical Documentation



HEINRICH GEORG GMBH
MASCHINENFABRIK

Kapitel 5

Chapter 5

Inhaltsverzeichnis

Contents

1. **Anlagenaufbau**
Description of units

Seite 1 bis 9
Page 1 to 9



Kapitel 5

Chapter 5

TECHNICAL DESCRIPTION

1. HYDRAULIC DOUBLE SIDED DE-COILER

Type HDSP 4/2000 MOS

Coil ID	495 - 510 mm
Expansion range	470 - 520 mm (508 mm circular)
Coil OD max	1000 mm
Coil width max	440 mm
Coil weight max	2000 kg per side

The decoiler is made from a robust welded steel construction with cross head, mounted on roller bearings, with motor adjustment through 180 deg.

With two mandrels running in anti friction bearings. Each mandrel has 4 segments which are expanded hydraulically to grip the bore of the coil and they are each driven by a variable speed AC motor, gearbox and ring gear, which also acts as a brake. Emergency braking is provided by a fail -safe pneumatically operated brake.

The length of loop in the loop pit controls the mandrel with smooth accelerations and deceleration's so eliminating any strain on the transformer material.

During manual operation the maximum mandrel speed is only adjustable within a limited range in order to reduce the danger of an accident. When loading new strip the drive can be controlled forward and reversed for re-coiling part finished coils.

While decoiling the mandrel in use by the line the second one may be loaded.

Including small hydraulic power pack for the mandrels.

2. LOOP CONTROL

Consisting of:

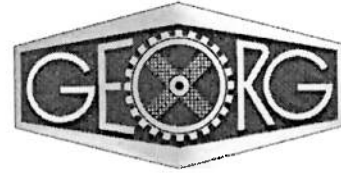
Strip side guides

Arrangement of 5 photocells for sensing the strip hanging in the pit between the decoiler and the line. The 3 inner photocells are used by the control system for normal control of the decoiler and the line. The two outer photocells are used as limit stops.

Electro-magnets are used to control the sideways movement of the strip.

An ultrasonic sensor is used to measure the outer diameter of the coil allowing predictive software to control the decoiler.

The system is designed so that the strip end is controlled safely and also stopping the strip feed in case of any material problems.



Kapitel 5

Chapter 5

3. TRANSPORT & CNC FEED CONTROL UNIT

For accurate strip feeding of each programmed length.

Feed speed: 0 to 240 m/min infinitely variable

TRANSPORT EQUIPMENT

The electronic roll feed consists of two rolls. The lower roll is driven by a direct coupled AC servo motor and low backlash planetary gearbox.

The upper roll is not driven and its pressure is pneumatically adjustable.

The measuring wheel runs on the lower surface of the strip and a pressure roll runs on the top surface ensuring very high accuracy of feed length. The measuring wheel is connected to an encoder.

All rotating parts are running in anti-friction bearings and covered with safety guards.

After the roll feed a jamming area is provided with a safety device which stops the line if the strip jams for any reason. Thus any material problems or jams the line will not run until the operator has cleared the obstruction.

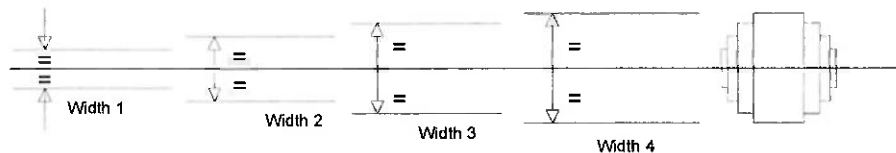
The transport equipment is mounted on a fabricated base frame.

Auto-Trim feature. Automatic calibration of the measuring system by feeding the strip between two fixed proximity switches. Ensures consistent length accuracy.

Kapitel 5

Chapter 5

SIDE GUIDES



The side guides are adjustable about the centre-line of the strip. This concept is the best for log building stacking and means even if the line is equipped with simpler stacking systems it can be easily upgraded later on.

The design of the side guide system is one of the most critical points in smooth and accurate running of a lamination line.

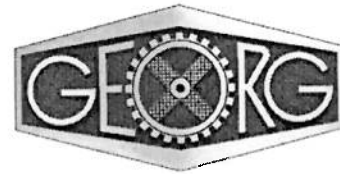
The side guides are made in a number of sections. Each guide is made from solid metal with a machined slot which guides the strip. A large number of ball bearings are set into the side guides and these are used to control the strip sideways. At each cutting tool there is a small moving guide actuated by pneumatic cylinder. These moving guides have solid carbide inserts.

The side guides are supported on linear bearings and moved by ballscrews which are mechanically linked to a single motor which powers the complete side guide system. A position feedback sensor is used by the control system when automatically setting the guides according to the programmed width.

Manual pushbuttons and a digital readout of side guide setting are located next to the feeder. They can be used to manually override the control system guide setting, necessary in case of poor slitting quality.

Careful attention has been given to maintenance when re-setting the guides relative to the centre datum of the line. The ball bearings are a wearing part and are designed to be easily changed.

Guide setting accuracy is to 0.1mm

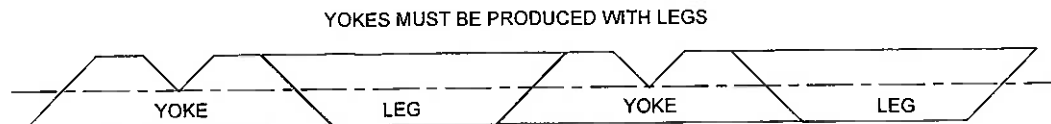


Kapitel 5

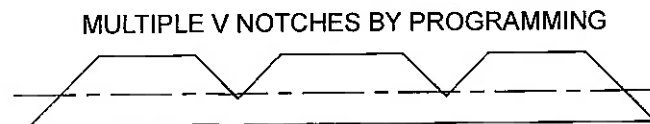
Chapter 5

4. V NOTCH E 400

The V notch is used to punch the V in the yoke sheets and also for cutting the rear tips of centre-leg sheets.



Fixed in longitudinal direction. The V notch is mounted on linear bearings and has CNC positioning drive with AC servo motor and absolute encoder for computer controlled cross adjustment. It is also possible to punch multiple V notches in a lamination by programming:-



For standard over-lap cores the V notch is positioned according to the program required. For step-lap cores with cross-step the V notch is automatically indexed across the strip step by step.

Overlap and longitudinal step-lap cores are automatically controlled by the strip feed and intermediate stops.

The V notch is electrically actuated by AC servo motor, eccentric and connecting rod. The eccentric uses a grease lubricated roller bearing designed for very low maintenance. The movement is controlled by absolute encoder. This ensures very fast punching with low noise.

The upper V blade is guided by precision anti-friction supports so allowing the blades to be adjusted to have very small clearance hence keeping the burr to the absolute minimum. Strippers hold the strip without damage when the upper blade is lifted.

The V notch has strip side guides. Adjustment of the guides, including those for the whole line, is done automatically by the control system according to strip width programmed.

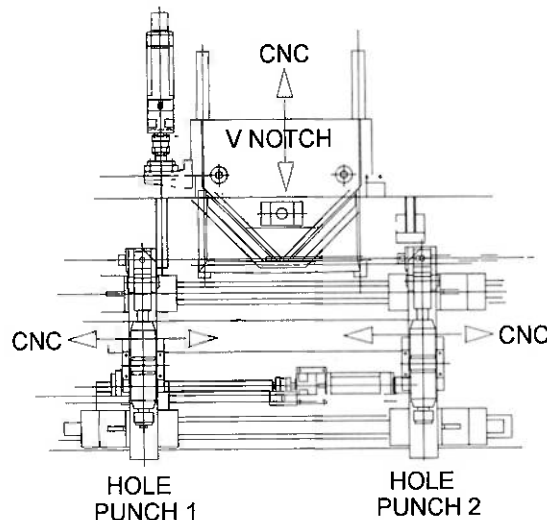
The scrap is taken to the rear of the line by a chute.

Max travel over centre-line = 25mm

Kapitel 5

Chapter 5

15. 2 x HOLE PUNCHING UNITS (CNC longitudinally adjustable)



2 hole punches mounted on longitudinal slideway system opposite the V notch. For punching holes on the strip centre-line.

For the **more efficient** production of laminations with one or more holes. Number of stops reduced wherever possible by operating the hole punch at the same time as V notch or shear, this is done automatically by the control system.

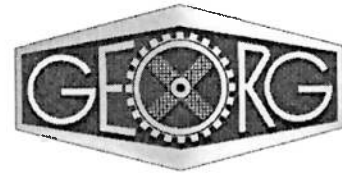
Both hole punches are fitted with separate CNC drive for computer controlled position along the line for both over-lap and step-lap production, as well as adjustment of the stacking pin hole position relative to the V notch.

Each hole punch is electrically actuated by AC servo motor, eccentric and connecting rod. The eccentric uses a grease lubricated roller bearing designed for very low maintenance. The movement is controlled by absolute encoder. This ensures very fast punching with low noise.

With precise pillar guides which guarantees high quality hole punching.

The punching tools are mounted in precise holders and are easily exchangeable.

The punching unit has strip side guides. The adjustment of the strip side guides is carried out automatically by the control system.



Kapitel 5

Chapter 5

6. SHEARING UNIT

Consisting of:

ELECTRIC SHEAR (I) E400/650

Blade length 650 mm

Adjustable 45 or 90 deg (automatically by control system)

The adjustment is done by pneumatic cylinder and includes actuation of strip support plate and cylinder locking of the shear in 45 or 90 deg positions.

The shear is electrically actuated by AC servo motor, eccentric and connecting rod. The eccentric uses a grease lubricated roller bearing designed for very low maintenance. The movement is controlled by absolute encoder. This ensures very fast punching with low noise.

The upper blade is guided by precision hardened bars and ball bushings which are adjusted to be virtually free of play. The blades can be adjusted with very small clearance hence keeping the burr to the absolute minimum.

Adjustable strippers hold the strip without damage when the upper blade is lifted.

Including 1 set of carbide blades = 2 pieces

ELECTRIC SHEAR (II) E400/650

Blade length 650 mm

Fixed at 45 deg to line

Design exactly as for shear I.

Kapitel 5

Chapter 5

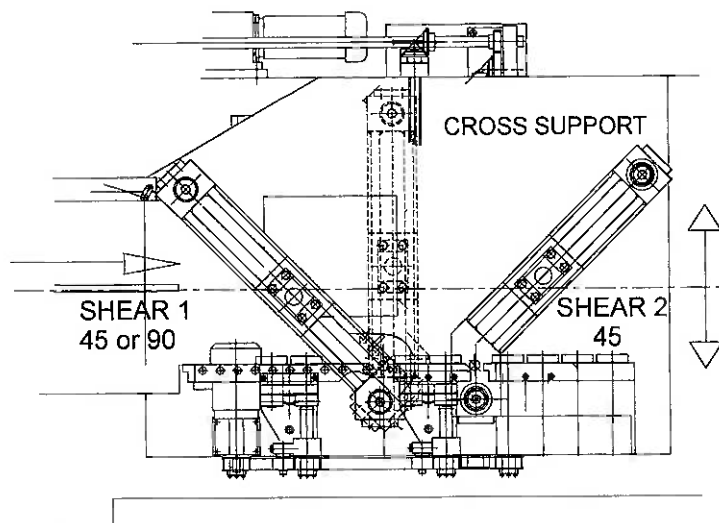
TRANSPORT AND GUIDING UNIT

For the transport and guidance of the laminations, consisting of:

6 pairs of rollers arranged in front of, between and after the shears. The polished lower rollers are driven from a single gear motor. The upper rollers are operated pneumatically to grip the strip when the strip is being moved.

The shearing unit has strip side guides. Adjustment of the guides, including those for the whole line, is done automatically by the control system according to strip width programmed.

CROSS SUPPORT UNIT



The two shears are assembled on a rigid plate which is mounted on linear bearings. The complete shear assembly is automatically moved crosswise in the ratio 2:1 when the strip side guides are adjusted - see drawing 4-01413/2. This configuration enables optimum output, strip guidance and strip transport especially in the case of small laminations.

Mounted on a welded fabricated base.

Kapitel 5

Chapter 5

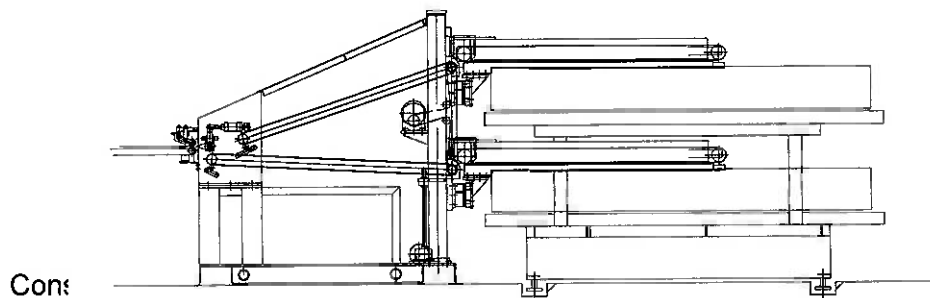
7. MAGNETIC TRANSPORT BELT

Max speed 240 m/min

Runout conveyor belt to transport the cut laminations from the shears to the stacking system after cutting.

Belt is driven by AC motor and with magnets mounted underneath the belt.

8. PB/T STACKING SYSTEM WITH POSITIONING BELTS AND SIDE GUIDES



2 magnetic conveyor belts

Diverting wedge, arranged in front of the magnetic conveyor belts to sort the cut laminations to the lower or upper levels automatically according to the cutting programme.

Each stacking level has:

- a pair of side guides which are overhung from the diverting unit. These guides control the sheet into the stacker and then by small sideways movement and accurately locate the sheet on the stack pile.
- Adjustment of the side guides is made together with the other line strip guides at the single adjustment point.
- A transport system with AC servo motor, switched magnets, timing belt drives etc. for transport and precisely stopping the sheet to be stacked.

The conveyors have infinitely variable speed drives with a max speed of 250 m/min. The drive is by timing belts and pulley drives.

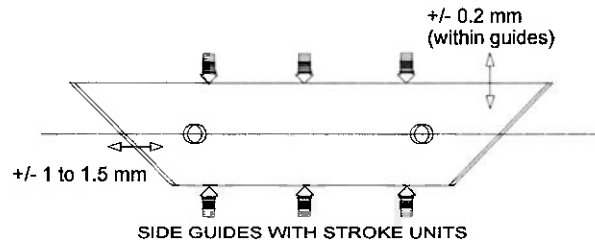
The stacking unit is automatically raised as the stack height increases.

Max stacking height is 450mm including pallet.

Kapitel 5

Chapter 5

Stacking tolerances:



With PB/T stacking (without pin) it is possible to stack in half logs, full logs and stacks of same sheet width. These are very neat stacks, but will require manual re-stacking later on. For accurate stacks it is necessary to stack using a stacking pin (option 14) and punch one small hole in each lamination.

The laminations can be stacked in step-lap and in this case would normally be punched with one or two holes. PB/T (without pin) is able to stack the laminations so that the holes are in line with each other. This means, when manually stacking the core, the step-lap packets can be handled easily and efficiently and eliminate any pre-stacking operation

PB/T stacking is upgradeable to STA/B at a later date

9. PNEUMATIC EQUIPMENT

see Chapter 10

10. HYDRAULIC EQUIPMENT

see Chapter 9

11. COMPLETE ELECTRICAL EQUIPMENT

see technical documentation part 2: ELECTRICAL



Kapitel 6
Chapter 6

Inhaltsverzeichnis
Contents

1.	Hinweise zur Instandhaltung Remarks concerning maintenance		Seite 1 bis 4 Page 1 to 4
2.	Schmierung und Wartung von Lagern Lubrication and Maintenance of Bearings	OP- 0139 OP- 0139	Seite 1 bis 13 Page 1 to 13
3.	Vorspannkräfte und Anziehdrehmomente für Schaftschrauben Prestressing forces and tightening torques for set screws	OP- 0155 OP- 0155	Seite 1 bis 7 Page 1 to 7
4.	Reibschlußverbindungen Frictional Connections and Clamping Units		Seite 1 Page 1
	• STÜWE • MASCHINENLAGER • RINGFEDER	- OP- 0132 - OP- 0182 - OP- 0247	- Page 1 to 8 - Page 1 to 4 - Page 1 to 8



Remarks
concerning

MAINTENANCE

Contents	Page
1. General:	2
2. Preventive maintenance	2
3. Stock of hydraulic filters and toothed belts	3
4. Driving chains and toothed belts	3
4.1 Driving chains	3
4.2 Toothed belts	4



**Before starting any maintenance work,
read and observe all safety regulations!**



1. General:

To make full use of the line capacity, regular maintenance and lubrication are indispensable. Lubrication is to be effected according to the enclosed lubrication plan and the lubrication instruction that describes all lubrication points. Suitable lubricants are listed in the lubrication chart. These lubricants should be compared to works standards and can be replaced, if necessary, by similar and equivalent lubricants.

The lubrication intervals stated apply to normal operating conditions. In case of unfavourable operating conditions, it might be necessary to shorten these periods. In addition, it is essential to clean the whole line in regular intervals, depending on the dust produced. Machine parts susceptible to corrosion should be covered with a suitable layer of lubricant.

Maintenance and cleaning of hydraulic and pneumatic filters also require special attention. These filters must be replaced in time.

2. Preventive maintenance

It is necessary to examine all line parts and to check all functions in regular intervals, however at least every 200 hours of operation.

Symptoms of wear have to be recorded and reasons for running noises must be determined. A few drops of oil could e.g. be sufficient to remove the running noise of toothed belt drives. Important screw connections have to be tightened and all rotating parts must be checked for truth of running.

Antifriction bearings can be checked during operation by monitoring the running noise, measuring the bearing temperature or controlling the lubricant. Although careful cleaning on the occasion of an inspection is generally sufficient, all bearings subjected to high loads, like bearings of levelling machines or transport units, should be dismantled and checked at every roll change.

All movable parts such as cylinders, piston rods, guides and spindles must be kept clean and have to be oiled. They are susceptible to dirt accumulation or corrosion, especially when stroke or travel ranges are never fully utilized in normal operation.



Important requirements for maintaining the operatability:

1. Heavily worn out parts have to be replaced immediately.
2. Wear parts permanently have to be kept on stock.
3. Spare parts have to be ordered in time.

3. Stock of hydraulic filters and toothed belts

To reduce downtimes to a minimum, a sufficient quantity of hydraulic filters and toothed belts should permanently be kept on stock.

Order designations are shown in our spare parts list.

4. Driving chains and toothed belts

4.1 Driving chains

Steel sprocket chains are usually connected by connection elements. If possible, chains with an even number of links should be used to get chains with inside elements at front and tail end which are connected by means of a straight connection element.

The spring must be mounted in moving direction!

Chains with an uneven number of links require the installation of a cranked link, which causes the breaking resistance of this chain to lower by approx. 20 %. When chains are made by cutting to length piece goods, it is important to note that the loosened outside link should not be used again.

In any case, the chain wheels must be exactly in alignment and should be mounted as close as possible to the bearing position. In addition, the shafts must be arranged parallel to each other. For positioning the shafts, an inclination of 60° up to horizontal line is recommended.

Shafts arranged upon another must be subject to permanent regulation of tension to prevent the chain from leaving the toothing of the lower wheel. Sagging of the chain must not exceed 2 % of the centre distance, however for peak loads, it should be as low as possible.

Sagging is adjusted either by moving one bearing position, by regulating the tension at the tension device or by displacing the pinion or the tensioning rail.



Tight tensioning of the chain should be avoided, as it entails an increased risk of wear, noisy running and higher loads acting on the bearing. The tension device should be movable within a range of 1.5 times the chain pitch to allow the exchange of a double chain element.

Chain drives do not require pre-tensioning.

4.2 Toothed belts

Toothed belts are sensitive to strong bending. The belts should be inserted without any force. The service life of damaged or overstrained belts is considerably reduced. During rotation, the toothed belts should only slightly contact the flanged wheel. Excessive contact will result in premature wear. A recommended value for pretension of toothed belt drives is approximately 0.8 times the peripheral force. The optimum value for each application must be determined under consideration of all factors of influence, like speed, capacity, vibrations, flywheel effect, conformability factors, wheel diameter, centre distance etc., if necessary, by using the empirical method.

Toothed belts must be stored in round condition at room temperature in dark and dry places.



Lubrication and Maintenance

of

BEARINGS

Contents

	Page
1. Anti-Friction Bearings	2
1.1 General	2
1.2 Separated Pedestal Bearings	2
1.3 Bearings Units, Casing Bearings	2
2. Sliding Bearings	3
2.1 Joint Bearing and Joint Heads	3
2.2 Bronze - Sliding Bearing	3
2.3 Composite Material - Sliding Bearing	3
3. Fitting and dismantling of ball bearings	4
4. Fitting and dismantling of needle roller bearings and cylindrical roller bearings	6
5. Fitting and dismantling of plummer block housed bearing units	8
6. Fitting and dismantling of bearing end caps for cast iron and plastic housings	9
7. Fitting and dismantling of spherical plain bearings, rod ends and cylindrical plain bushes	10



Lubrication and Maintenance of Bearings

1. Anti-Friction Bearing

1.1 General

Lubrication film structure

First of all anti-friction bearings are being lubricated in order to avoid wear and premature fatigue and by this way to guarantee continuous operation. Furthermore lubrication should help to achieve favourable antifrictional qualities, such as low noise expansion and low friction. The arising lubrication film between the load transmitting parts should avoid the metallic contact.

Grease Lubrication

Grease lubrication is used for 90% of all anti-friction bearings.

Essential advantages of grease lubrication are:

- Low constructional expenditure
- Good support of the seal by the grease
- High utilization by maintenance-free lubrication without expenditure for lubricating equipment

Re-Lubrication in proportional periods is only required in case of high stress (speed, temperature, load). Only commercially available anti-friction bearing greases on lithium-soap-basis should be used.

The double-sided sealed bearings and bearing units are already filled with lubricating grease in delivery condition. The filling quantity is coordinated with the bearing size. Ordinarily the utilization of the grease filling exceeds the expected lifetime so that maintenance (re-lubrication) is not necessary and also not provided.

Oil-Lubrication

A lubricating process with oil is useful when adjoining machine parts are already supplied with oil or heat should be carried away by lubricants.

1.2 Separated Pedestal Bearing Housings

Separated pedestal bearing housings are sealed housings, designated for the bearing of self aligning ball bearings, spherical roller bearings and swivel joint roller bearings. The removable upper part of the housing which is centered to the lower part by dowel pins, simplifies assembly and maintenance. It is not allowed to exchange the upper parts.

For the great majority of application the grease quantity supplied during assembly, is sufficient for lifetime. For housings there is no possibility of re-lubrication.

However, during a comprehensive inspection the grease filling should be replaced.

In case of normal speed and normal operating temperatures < 80° the bearings are filled completely and the free space of the housing up to 60%. In case of difficult operating conditions, please adhere to the instructions of bearing manufacturer.

If frequent re-lubrication is required, the housings are prepared with grease nipples.

1.3 Bearing Units, Casing Bearing

These bearing units are consisting of double sided sealed deep groove ball bearing with spherical outer ring surface area and a bearing housing out of gray cast iron or steel plate with hollow ball boring.

They are available as pedestal-, flange- or clamp bearing housings and enable the balancing of great aligning faults, however axial adjustment is not possible and due to this they are not suitable for movable bearings.

The bearing units are maintenance-free. Normally the standard grease filling is sufficient for the durability of bearing.

The bearing housings out of gray cast iron have a grease nipple and a grease groove in the boring. If, in special cases, re-lubrication is necessary, in this type of housings deep groove ball bearings with a lubrication hole in the outer ring can be assembled.



Lubrication and Maintenance of Bearings

2. Sliding Bearing

2.1 Joint Bearing and Joint Heads

Joint bearings which are subject to maintenance, of the sliding combination steel/steel

are above all suitable for the use during impact- and jerky alternating load, and are preferably used for hydraulic cylinders. They have always the possibility of re-lubrication.

Although these bearings receive a special surface treatment and molybdenic treatment, the behaviour with respect to function and wear is considerably depending on the quality of the maintenance. The lubricant is responsible for a reduction of friction, for protection against corrosion and for the effective separation of the metallic surfaces. Furthermore the grease could seal the bearing.

For a clearly arranged storing of lubricants, commercially available, corrosion protected and compression-proofed greases on lithium-soap basis with EP- and solid matter agents are recommended for general use. Useful are lubricants which contain either approx. 3% MoS₂, or solid matter components on the basis of a calcium- and zinc phosphat combination. Usually periodical re-lubrication of steel/steel joint bearings is necessary.

Maintenance-free joint bearings of the sliding combination hard chromium/PTFE

are preferably used in case of special requirements to the use and to a maintenance-free operation. These bearings are used for pneumatic cylinders and have no possibility for re-lubrication.

For non-lubricated, maintenance-free sliding bearings a transmission of PTFE particles from the outer ring sliding layer to the contra-running surface of the inner ring will happen during starting phase. By this the low surface roughness of the inner ring spherical surface is being filled out. Even this tribological even surface guarantees long lasting running times.

However, since the transmitted PTFE particles would not be sufficient adhesive on oil moistured surfaces, the requested smoothing effect would fail for lubricated bearings. Also for bearings with already completed running-up time, a re-lubrication would eliminate the already achieved transmission effect. Therefore maintenance-free joint bearings are supplied without re-lubricating device.

2.2 Bronze - Sliding Bearings

Sliding bearings of the sliding combination steel/bronze have always the possibility for re-lubrication and must be re-lubricated in regular intervals. The re-lubrication terms are depending on the kind of stress and the extent of load.

Maintenance of these bearings should be done with a commercially available, corrosion protected and water-proofed lithium-soap grease of normal consistency. In no case these greases are allowed to contain addition agents of MoS₂ or other solid lubricants.

2.3 Composite Material - Sliding Bearings

Maintenance-free composite material sliding bearings are used wherever a maintenance-free operation is required or e.g. for structural reasons a bearing position can not be lubricated. The very thin-walled bearings are consisting of three layers: A metal back, a bronze layer and a sliding layer.

The sliding layer is consisting out of a mixture of polytetrafluorethylene (PTFE) and lead (Pb) and is being rolled-in to the bronze layer.

Composite material sliding bearings are constructed for a dry running and have no possibility for re-lubrication. Lubrication will increase wear in the bearing.



3. Fitting and dismantling of ball bearings

Rolling bearings are precision products. These products must be very carefully handled before and during fitting. Their trouble-free operation depends largely on the care taken during fitting.

Delivery condition

Rolling bearings are preserved with:

- a corrosion protection on a mineral oil base or
- dry preservation with VCI paper or
- long-term preservation for overseas transport.

Storage

Bearings should be stored:

- in dry, clean rooms with as constant a temperature as possible and
- with a maximum relative humidity of 65%.

The storage period for greased and sealed bearings is limited by the shelf life of the grease

Removal

Perspiration from handling leads to corrosion. Hands should be kept clean and dry and gloves worn if necessary.

Bearings should only be removed from their original packaging immediately before assembly.

If only a few bearings are taken out of a multi-piece package preserved by volatile corrosion inhibitor paper, the package must be closed again immediately

- the protective vapour phase of the VCI paper can be maintained only in the closed package.
- The bearings which have been taken out must be greased or oiled immediately.

Compatibility and miscibility

The anti-corrosive preservation oil used for rolling bearings is compatible and miscible with oils and greases with a mineral oil base. Compatibility should be checked if the following are used:

- synthetic lubricants and
- thickeners other than lithium or lithium complex soaps.

If there is an incompatibility, the anti-corrosive oil should be washed out before greasing, particularly if:

- lubricants based on PTFE or alkoxyfluoroether or
- lubricants with a polycarbamide thickener are used or
- if the lubricant is changed or
- the rolling bearings are contaminated.

If in doubt, please contact the relevant lubricant manufacturer.

Cleaning

 Rolling bearings must be dried and then preserved or greased immediately after cleaning to avoid the danger of corrosion.

The following are suitable for degreasing and washing rolling bearings:

- aqueous cleaning media
 - neutral, acidic or alkaline.
 - Check compatibility of alkaline media with aluminium components before cleaning
- organic cleaning media
 - acid and water-free paraffin, benzene (not petrol), Freon 12 substitutes or cleaning products containing chlorinated hydrocarbons.

When cleaning, the following should be taken into consideration:

- legal requirements
 - environmental protection, health and safety at work etc.
- cleaning medium manufacturer's specifications
 - e.g. handling.

 The design and safety guidelines in the product descriptions must be taken into consideration.

Guidelines for fitting

- Keep assembly area as free from dust and clean as possible.
- Protect bearings from dust, contaminants and moisture
 - contaminants have a detrimental influence on the running and operating life of rolling bearings.
- Inspect housing bore and shaft seating for:
 - dimensional and geometrical accuracy and cleanliness.
- Lightly oil the bearing ring seating surfaces or rub with grease.
- Ensure shaft and housing bore have a lead chamfer of 10° to 15°.
- Do not cool the bearings excessively:
 - moisture due to condensation can lead to corrosion in the bearings and bearing seatings.
- After fitting:
 - charge rolling bearings with lubricant
 - inspect bearing arrangement for correct function.

Fitting tools

- Induction heater (see Figure 1).
 - INA catalogue or manufacturers instructions with respect to grease or seals must be taken into consideration.
- Heating cupboard
 - heating up to +80 °C
- Mechanical or hydraulic press
 - fitting sleeves should also be used which cover the whole circumference of the bearing ring end faces (see Figure 2).
- Hammer and fitting sleeve
 - light hammer blows should be centrally directed on the fitting sleeve.



Never direct fitting forces through the rolling elements. Direct blows on the bearing rings must be avoided.

Guidelines for dismantling

- Dismantling should be taken into consideration in the original design of the bearing location.
 - if the bearings are to be mounted with a tight fit, grooves should be provided in the shaft or housing bore to allow the rings to be removed (see Figure 3).
- If the bearings are to be reused:
 - direct blows on the bearing rings should be avoided,
 - dismantling forces should not be applied through the rolling elements,
 - bearings should be carefully cleaned once dismantled and
 - do not use "hard" flames.

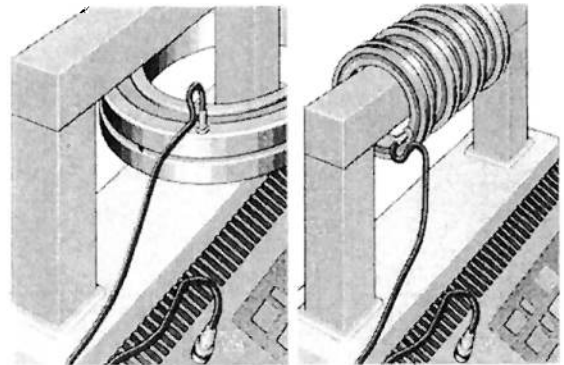


Fig. 1 - Heating with an induction heater

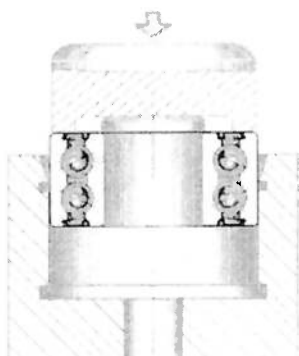


Fig. 2 - Fitting the bearing rings

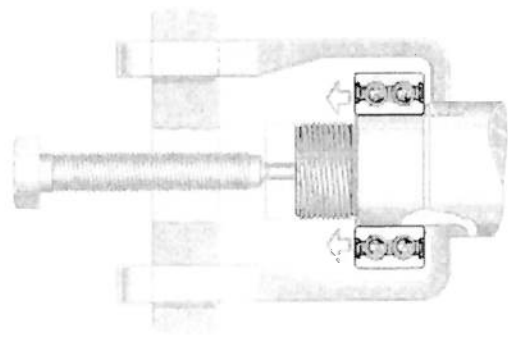


Fig. 3 - Extraction device for bearing rings



4. Fitting and dismantling of Needle roller bearings and Cylindrical roller bearings

Rolling bearings are precision products. These products must be very carefully handled before and during fitting. Their trouble-free operation depends largely on the care taken during fitting.

Delivery condition

Rolling bearings are preserved with:

- a corrosion protection on a mineral oil base or
- dry preservation with VCI paper or
- long-term preservation for overseas transport.

Storage

Bearings should be stored:

- in dry, clean rooms with as constant a temperature as possible and
- with a maximum relative humidity of 65%.

The storage period for greased and sealed bearings is limited by the shelf life of the grease.

Removal

Perspiration from handling leads to corrosion. Hands should be kept clean and dry and gloves worn if necessary.

Bearings should only be removed from their original packaging immediately before assembly.

If only a few bearings are taken out of a multi-piece package preserved by volatile corrosion inhibitor paper, the package must be closed again immediately:

- the protective vapour phase of the VCI paper can be maintained only in the closed package
- the bearings which have been taken out must be greased or oiled immediately.

Compatibility and miscibility

The anti-corrosive preservation oil used for rolling bearings is compatible and miscible with oils and greases with a mineral oil base. Compatibility should be checked if the following are used:

- synthetic lubricants and
- thickeners other than lithium or lithium complex soaps.

If there is an incompatibility, the anti-corrosive oil should be washed out before greasing, particularly if:

- lubricants based on PTFE or alkoxyfluoroether or
- lubricants with a polycarbamide thickener are used or
- if the lubricant is changed or
- the rolling bearings are contaminated.

If in doubt, please contact the relevant lubricant manufacturer.

Cleaning

 Rolling bearings must be dried and then preserved or greased immediately after cleaning to avoid the danger of corrosion!

The following are suitable for degreasing and washing rolling bearings:

- aqueous cleaning media
 - neutral, acidic or alkaline.Check compatibility of alkaline media with aluminium components before cleaning.
- organic cleaning media
 - acid and water-free paraffin, benzene (not petrol), Freon 12 substitutes or cleaning products containing chlorinated hydrocarbons

When cleaning, the following should be taken into consideration:

- legal requirements
 - environmental protection, health and safety at work etc.
- cleaning medium manufacturer's specifications
 - e.g. handling.

 The design and safety guidelines in the product descriptions must be taken into consideration.

Lubrication and Maintenance of Bearings

HEINRICH GEORG GMBH
MASCHINENFABRIK

Guidelines for fitting

- Keep assembly area as free from dust and clean as possible.
- Protect bearings from dust, contaminants and moisture
 - contaminants have a detrimental influence on the running and operating life of rolling bearings.
- Inspect housing bore and shaft seating for:
 - dimensional and geometrical accuracy and
 - cleanliness.
- Lightly oil the bearing ring seating surfaces or rub with grease.
- Ensure shaft and housing bore have a lead chamfer of 10° to 15°.
- Do not cool the bearings excessively:
 - moisture due to condensation can lead to corrosion in the bearings and bearing seatings.
- After fitting:
 - charge rolling bearings with lubricant
 - inspect bearing arrangement for correct function.

Fitting tools

- Induction heater (see Figure 1).
 - INA catalogue or manufacturers instructions with respect to grease or seals must be taken into consideration.
- Heating cupboard
 - heating up to +80 °C.
- Mechanical or hydraulic press
 - fitting sleeves should also be used which cover the whole circumference of the bearing ring end faces (see Figure 2).
- Hammer and fitting sleeve
 - light hammer blows should be centrally directed on the fitting sleeve.



Fitting forces must never be directed through the rolling elements. Direct blows on the bearing rings must be avoided.

Guidelines for dismantling

- Dismantling should be taken into consideration in the original design of the bearing location.
 - if the bearings are to be mounted with a tight fit, grooves should be provided in the shaft or housing bore to allow the rings to be removed (see Figure 3).
- If the bearings are to be reused:
 - direct blows on the bearing rings should be avoided,
 - dismantling forces should not be applied through the rolling elements,
 - bearings should be carefully cleaned once dismantled and
 - do not use "hard" flames.

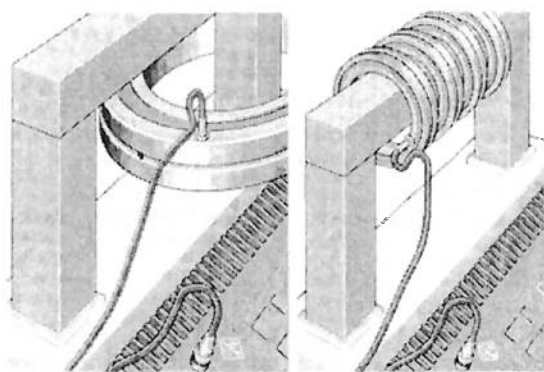


Fig. 1 - Heating with an induction heater

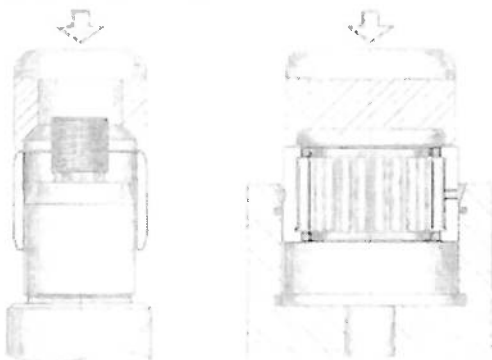


Fig. 2 - Fitting the bearing rings

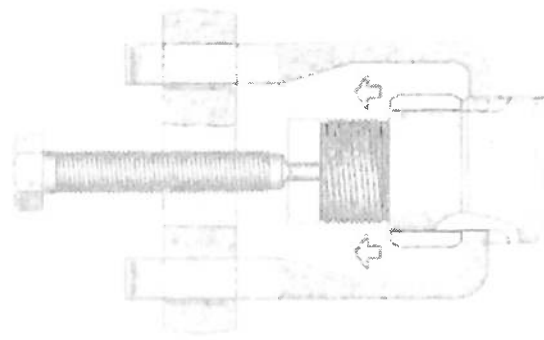
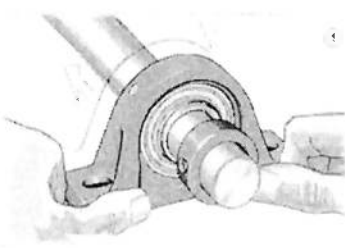
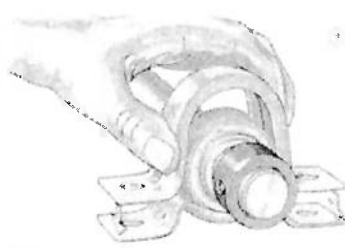
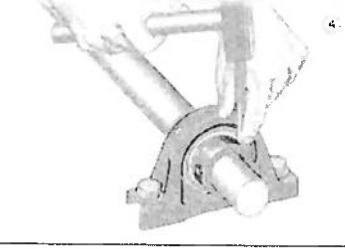
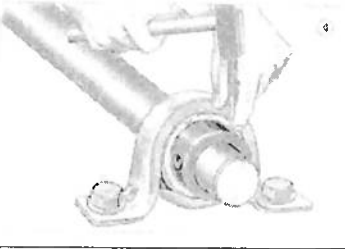
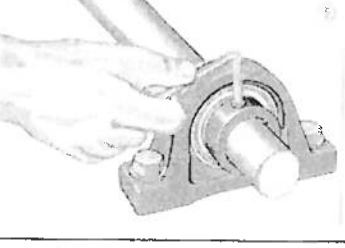
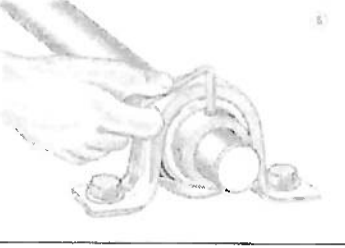
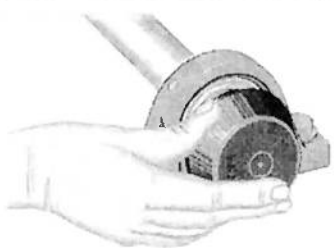
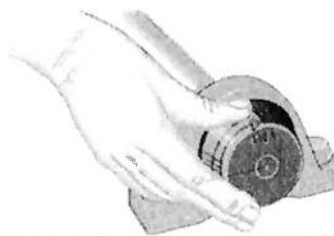
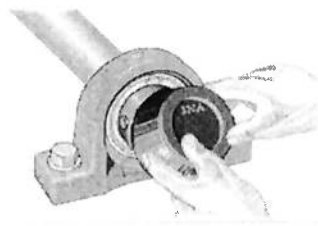
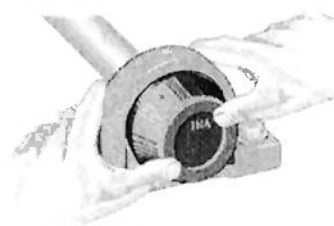
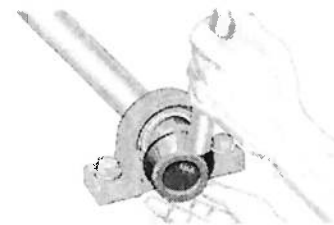


Fig. 3 - Extraction device for bearing rings

5. Fitting and dismantling of Plummer block housed bearing units

Fitting step	Housing material Cast iron or plastic housing	Sheet steel housing
For insert bearings with locking by two grub screws in the inner ring, steps as described in Figures (1), (2) and (5) apply. - Push housing onto shaft and align: - for housed bearing units made from sheet steel, the housing and insert bearing should first be assembled.		
Screw the housing to the surrounding structure using fixing screws: - tightening torque M_A must be observed - if the shaft is supported by several housed bearing units, screws should be tightened by hand, the shaft aligned and the screws then tightened to the tightening torque M_A.		
Push eccentric locking collar onto the collar locating diameter on the inner ring and tighten by hand, preferably in the direction of shaft rotation.		
Fully tighten the eccentric collar using a drift and hammer.		
Tighten grub screws with an Allen key: - tightening torque M_A must be observed Both grub screws in the inner ring should be tightened for bearings with grub screw locking method: - tightening torque M_A must be observed		

6. Fitting and dismantling of bearing end caps for cast iron and plastic housings

Housing material	Fitting step	
Bearing end caps for cast iron housings	⚠ Bearing end caps should not be fitted or dismantled while the shaft is rotating. - Position the end cap as shown in the figure - the lugs must locate in the slots provided in the housing - note the position of the INA logo.	
	- Rotate the end cap clockwise by 90° - note the position of the INA logo. - Check if the end cap is securely located in the housing. Dismantling - End caps can be loosened by rotating the end cap by 90° in the opposite direction.	
Bearing end caps for plastic housings	⚠ Bearing end caps should not be fitted or dismantled while the shaft is rotating. - Position the end cap at an angle: - the lip on the cap must fit into the upper part of the undercut in the housing.	
	- Push the end cap evenly with both thumbs as far as possible in the axial direction until it engages - Check if the end cap is securely located in the housing.	
	Dismantling End caps can be loosened by a light blow with a hammer handle.	



7. Fitting and dismantling of spherical plain bearings, rod ends and cylindrical plain bushes

Spherical plain bearings, rod ends and cylindrical plain bushes are high precision products requiring very careful handling both before and during assembly. Problem-free functioning is substantially dependent on the care taken in fitting.

Bearing failures will lead to:

- machine downtime
- expensive repairs.



If bearings are fitted incorrectly, no liability can be accepted!

Spherical plain bearings, rod ends and cylindrical plain bushes should only be fitted by personnel with sufficient and appropriate training. In case of doubt, please consult ELGES.

Delivered condition

Spherical plain bearings and cylindrical plain bushes are supplied with the surfaces (except the bore) preserved. Depending on their design, rod ends are supplied preserved or with a zinc plating.



Any change, irrespective of the bearing type, will reduce the operating life of the bearing.

Bearings must not be treated or cleaned using trichloroethylene, perchloroethylene, petroleum spirit or other solvents!

Substances containing oil will change the characteristics of the bearing!

Storage

Bearings should only be stored as follows:

- in the original packaging
- in dry, clean rooms with the temperature as constant as possible
- at a relative humidity of max. 65%.

Removal from packaging

Perspiration leads to corrosion; hands must be kept clean and dry, gloves should be worn if necessary.

Spherical plain bearings, rod ends and cylindrical plain bushes should only be removed from their original packaging immediately before fitting.

If the original packaging is damaged, the products must be checked.

If the products are contaminated, they must be wiped with a clean cloth only.

Tools for heat assisted fitting

In order to reduce the forces required for fitting, the spherical plain bearings can be heated:

- Localized heating must be avoided! The bearing temperature must be monitored using a thermometer!
- The information about grease and seals in the INA catalogue and manufacturer's instructions must be observed.

Suitable devices for achieving heating include:

- Hot cabinets with adjustable thermostat
- Induction heaters (Figure 1); these have the following advantages:
 - uniform heating
 - no contamination of the components
 - long preheating periods, etc. are not required.

Checking the adjacent construction (Figure 2)

- Quality of bearing seating surfaces
 - shaft and housing bore
- Dimensional and geometrical accuracy of seating and locating faces
- Shaft and housing seating in accordance with fitting drawing
- Lead chamfer on shaft/housing bore between 10° and 20°
- Any burrs must be removed
- If tight fits are used or the fitting conditions present difficulties, the surfaces of the shaft and housing bore should be lightly oiled.



Maintenance-free spherical plain bearings must always be fitted dry!

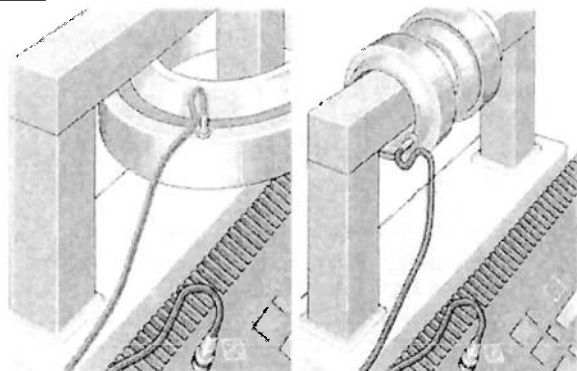


Fig. 1 - Heating using an induction heater

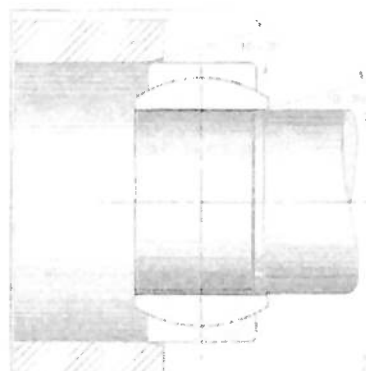


Fig. 2 - Lead chamfer

Rules and guidelines



The information given must be adhered to! If it is not, there is a direct or indirect hazard to personnel, the product and/or the adjacent construction!

- The assembly area must be kept clean and free from dust!
- The bearings must be protected against moisture and aggressive media!
- The bearings must always be located concentrically.

Mechanical and thermal assistance

- Direct blows using a hammer and drift on the end faces of the bearing rings must be avoided
 - Incorrect handling can damage the bearing and lead to microcracks in the bearing.
- Fitting forces must always be applied to the inner ring (Figure 3)
 - If these forces are directed through the sliding surfaces, the bearings may jam during fitting.
- If radial spherical plain bearings are fitted on the shaft and in a housing at the same time, fitting tools must be used which act simultaneously on the inner and outer ring (Figure 4).
- Larger bearings with steel/steel sliding contact surfaces must be fitted using special fitting tools (Figure 5)
 - The fitting forces required increase with the diameter. Simple tools are no longer sufficient in these cases.

Thermal assistance

- Spherical plain bearings must not be heated above 110°C
 - High temperatures damage the seals and change the MoS₂ treatment.
- Spherical plain bearings must not be heated in an oil bath
 - This impairs the tribological system of maintenance-free bearings
 - It changes the molybdenum disulphide concentration on the sliding surfaces in bearings with a steel/steel sliding contact surface.
- Bearings must not be heated using a naked flame
 - The material undergoes excessive localized heating and its hardness is decreased; furthermore, stresses are induced in the bearing
 - The seals could melt
 - Maintenance-free sliding surfaces could be damaged.

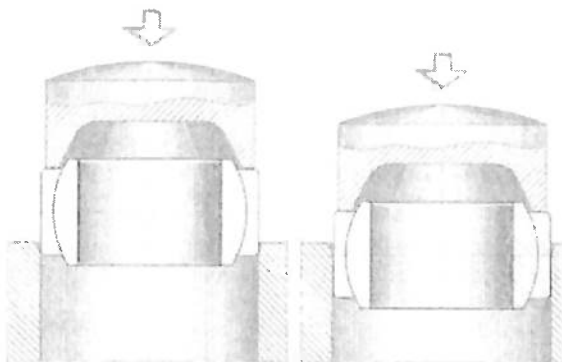


Fig. 3 - Fitting forces and bearing ring to be fitted

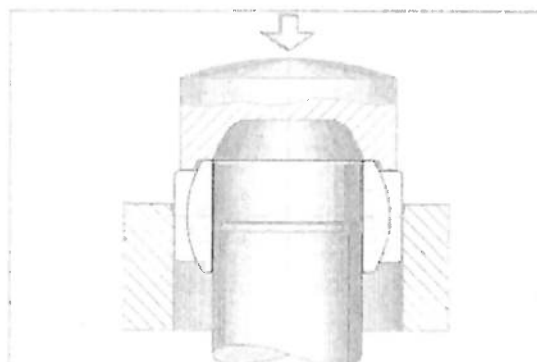


Fig. 4 - Simultaneous fitting on shaft and in housing

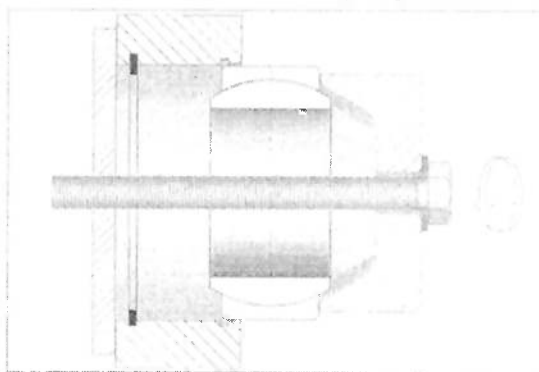


Fig. 5 - Special fitting device

Fitting by refrigeration

- The inner rings of radial spherical plain bearings with a steel/steel sliding contact surface undergo structural change at temperatures below $-51\text{ }^{\circ}\text{C}$. This may cause a volume increase; the bearing then no longer complies with the tolerances and may jam.
 - If this fitting method is to be used, the bearing rings can be supplied with appropriate heat treatment. Please consult the INA engineering service.

Adhesive bonding of bearing rings

- If the recommended fits are adhered to, it is not necessary to use adhesive on the bearing rings.
- Adhesives may only be used on spherical plain bearings with steel/steel sliding contact surfaces under the following conditions:
 - The surfaces to be bonded are clean and free from grease
 - The raceways are cleaned using a cleaning agent and well lubricated using a paste with a high MoS_2 content
 - It must be ensured that the lubricant ducts and lubricant holes are not blocked by adhesive.

Main load direction

- In radial spherical plain bearings with a split outer ring, the joint is offset at 90° from the main load direction (Figure 6)
 - The lubricant holes of bearings requiring maintenance are thus positioned in the load zone. This allows good lubricant distribution in the load zone area.

Transporting the bearings (Figure 7)

- Large spherical plain bearings must only be transported using the eye bolts supplied
 - The bearings have threaded holes on the end faces of the inner and outer rings.

Weld currents

- If welding work is carried out on the adjacent construction, welding currents must not be allowed to pass through the spherical plain bearing
 - This would cause immediate damage to the sliding surfaces.

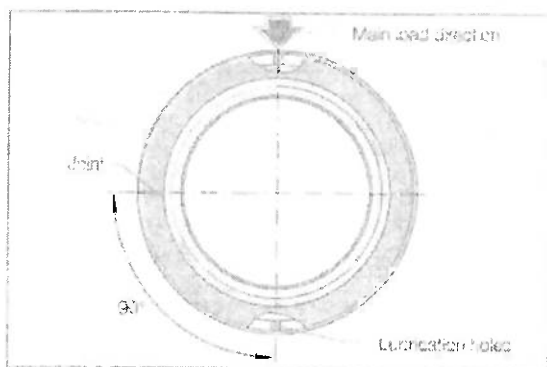


Fig. 6. Joint and main load direction

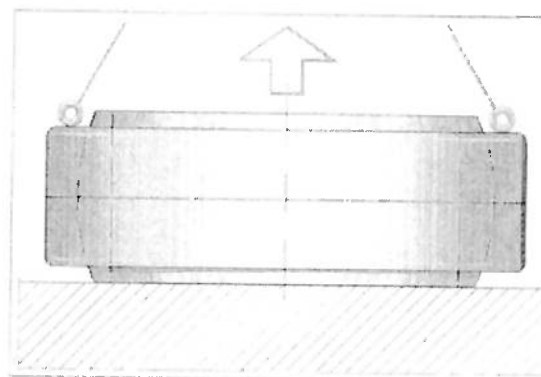


Fig. 7. Transporting large spherical plain bearings

Dismantling

Even if the load is applied in accordance with the specification to the ring to be dismantled, the frictional contact of the other ring due to the fit presents difficulties in dismantling (Figure 8).

Depending on the level of interference, the inner ring will be contracted and the outer ring will be expanded. The extraction forces also increase with increasing interference.

If the following precautions are taken during design, this will make dismantling of the bearings easier:

- a threaded hole for an extraction screw in the shaft (Figure 9)
- threaded holes for extraction screws in the housing (Figure 10)
- milled areas on the stud for the jaws of the extraction device (Figure 10).

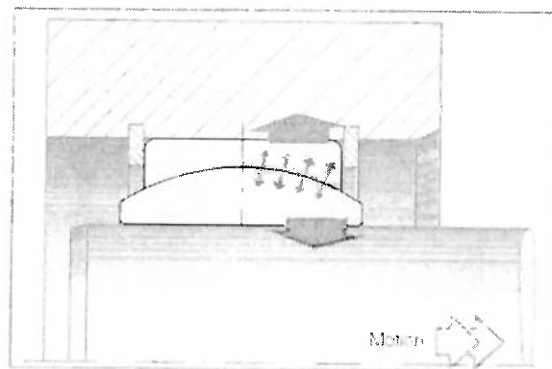


Fig. 8 - Construction of the inner ring and expansion of the outer ring

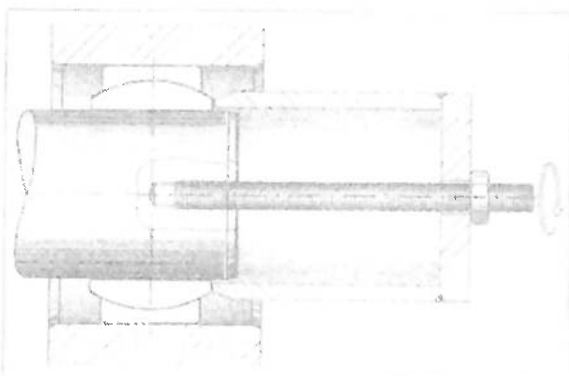


Fig. 9 - Threaded holes in the shaft and housing

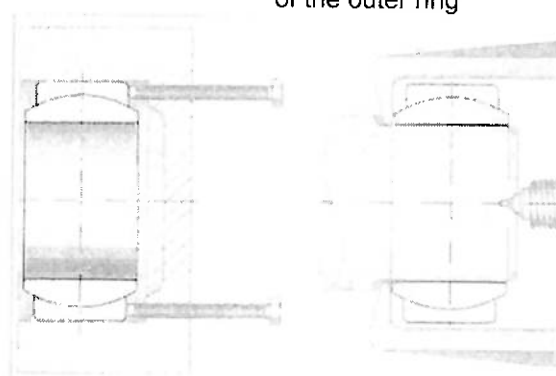


Fig. 10. Milled areas for extraction device



Prestressing forces and tightening torques

for

set screws¹

The following charts figure guide values for metric coarse pitch threads and fine threads according to DIN 13, page 13. These values are calculated based on reduced stresses and result in a tensile strength utilization factor of 90%.

Depending on the screw condition, different coefficients of friction require tightening torques that may differ up to 20 %. The indications of the screw manufacturers have priority in any case!

Assembly instructions for machine parts like clamping elements, guide rails, bearings etc. also have priority!



Prestressing forces and tightening torques for set screws

HEINRICH GEORG GMBH
MASCHINENFABRIK

1. Coefficient of friction $\mu_{\text{total}} = 0,10$ for lubricated screws

Dimension coarse pitch threads	Prestressing force F_v (N)			Tightening torque M_A (Nm)		
	8.8	10.9	12.9	8.8	10.9	12.9
M 4	4250	6200	7250	2,4	3,6	4,2
M 5	6900	10200	11900	4,8	7,1	8,3
M 6	9750	14300	16800	8,3	12	14
M 8	17900	26300	30700	20	30	35
M 10	28500	41800	48900	40	59	69
M 12	41500	61000	71500	69	100	120
M 14	57000	83500	98000	110	160	190
M 16	78500	115000	135000	170	250	290
M 18	98000	140000	164000	245	345	405
M 20	126000	180000	210000	340	490	570
M 22	158000	224000	263000	460	660	770
M 24	182000	259000	303000	590	840	980
M 27	239000	340000	398000	870	1250	1450
M 30	291000	414000	484000	1200	1700	1950

Dimension Fine threads	Prestressing force F_v (N)			Tightening torque M_A (Nm)		
	8.8	10.9	12.9	8.8	10.9	12.9
M 8 x 1	19600	28700	33600	22	32	37
M 10 x 1,25	30600	44900	52500	42	62	72
M 12 x 1,25	46600	68500	80000	75	110	130
M 12 x 1,5	44000	64500	75500	72	105	125
M 14 x 1,5	63000	92500	108000	120	175	200
M 16 x 1,5	85500	125000	147000	180	265	310
M 18 x 1,5	114000	163000	191000	270	385	450
M 20 x 1,5	144000	206000	241000	375	530	620
M 22 x 1,5	178000	253000	296000	500	710	830
M 24 x 2	203000	290000	339000	630	900	1050
M 27 x 2	264000	375000	439000	920	1300	1550
M 30 x 2	332000	472000	553000	1300	1850	2150

Prestressing forces and tightening torques for set screws

HEINRICH GEORG GMBH
MASCHINENFABRIK

2. Coefficient of friction $\mu_{\text{total}} = 0,125$ for slightly oiled screws

Dimension Coarse pitch threads	Prestressing force F_V (N)			Tightening torque M_A (Nm)		
	8.8	10.9	12.9	8.8	10.9	12.9
M 4	4000	5900	6900	2,8	4,1	4,8
M 5	6600	9650	11300	5,5	8,1	9,5
M 6	9300	13600	16000	9,6	14	16
M 8	17000	25000	29300	23	34	40
M 10	27100	39900	46600	46	67	79
M 12	39600	58000	68000	79	115	135
M 14	54500	80000	93500	125	185	220
M 16	74500	110000	128000	195	290	340
M 18	93500	133000	156000	280	400	470
M 20	120000	171000	201000	395	560	660
M 22	150000	214000	251000	540	760	890
M 24	173000	247000	289000	680	970	1150
M 27	228000	325000	380000	1000	1450	1700
M 30	277000	395000	462000	1350	1950	2300

Dimension Fine threads	Prestressing force F_V (N)			Tightening torque M_A (Nm)		
	8.8	10.9	12.9	8.8	10.9	12.9
M 8 x 1	18700	27400	32100	25	37	43
M 10 x 1,25	29200	42900	50000	49	71	83
M 12 x 1,25	44600	65500	76500	87	130	150
M 12 x 1,5	42000	61500	72000	83	120	145
M 14 x 1,5	60000	88500	103000	135	200	235
M 16 x 1,5	81500	120000	140000	210	310	360
M 18 x 1,5	110000	156000	183000	315	450	530
M 20 x 1,5	138000	197000	230000	440	630	730
M 22 x 1,5	170000	243000	284000	590	840	980
M 24 x 2	195000	277000	324000	740	1050	1250
M 27 x 2	253000	360000	421000	1100	1550	1800
M 30 x 2	318000	453000	530000	1500	2150	2500

Prestressing forces and tightening torques for set screws

HEINRICH GEORG GMBH
MASCHINENFABRIK

3. Coefficient of friction $\mu_{\text{total}} = 0,14$ for new screws, uncoiled

Dimension Coarse pitch threads	Prestressing force F_V (N)			Tightening torque M_A (Nm)		
	8.8	10.9	12.9	8.8	10.9	12.9
M 4	3900	5750	6700	3,0	4,4	5,1
M 5	6400	9400	11000	5,9	8,7	10
M 6	9000	13200	15500	10	15	18
M 8	16500	24300	28400	25	36	43
M 10	26300	38700	45200	49	72	84
M 12	38400	56500	66000	85	125	145
M 14	52500	77500	90500	135	200	235
M 16	72500	107000	125000	210	310	365
M 18	91000	129000	152000	300	430	500
M 20	117000	166000	195000	425	610	710
M 22	146000	208000	244000	580	820	960
M 24	168000	240000	281000	730	1050	1220
M 27	222000	316000	369000	1100	1550	1800
M 30	269000	384000	449000	1450	2100	2450

Dimension Fine threads	Prestressing force F_V (N)			Tightening torque M_A (Nm)		
	8.8	10.9	12.9	8.8	10.9	12.9
M 8 x 1	18100	26600	31200	27	39	46
M 10 x 1,25	28300	41600	48700	52	76	90
M 12 x 1,25	43300	63500	74500	93	135	160
M 12 x 1,5	40800	60000	70000	89	130	155
M 14 x 1,5	58500	86000	100000	145	215	255
M 16 x 1,5	79500	116000	136000	225	330	390
M 18 x 1,5	106000	152000	177000	340	485	570
M 20 x 1,5	134000	191000	224000	475	680	790
M 22 x 1,5	166000	236000	276000	630	900	1050
M 24 x 2	189000	270000	315000	800	1150	1350
M 27 x 2	246000	350000	409000	1150	1650	1950
M 30 x 2	309000	440000	515000	1650	2350	2750

Prestressing forces and tightening torques for set screws

HEINRICH GEORG GMBH
MASCHINENFABRIK

4. Tightening torques for locking screws with toothed contact surface

Tightening-up turning torques M_A (Nm) for VERBUS®-TENSILOCK® - Screw and nut · Table IV

Class	Material	M 5	M 6	M 8	M 10	M 12	M 14	M 16
VERBUS®-TENSILOCK®-screws 90	steel	9	16	34	58	97	155	215
VERBUS®-TENSILOCK®-nuts 8	grey cast iron	7	13	28	49	83	130	195
VERBUS®-TENSILOCK®-screws 100	steel $R_m = 500-1000 \text{ (N/mm}^2\text{)}$	12	21	44	75	120	185	280
VERBUS®-TENSILOCK®-nuts 10	grey cast iron	9,5	16	36	64	105	170	260
VERBUS®-TENSILOCK®-screws 12.9	steel $R_m = 500-1000 \text{ (N/mm}^2\text{)}$	14	25	52	90	145	220	340
VERBUS®-TENSILOCK®-nuts 12	grey cast iron	11	19	43	72	125	200	320

Tightening-up turning torques M_A (Nm) for VERBUS®-RIPP®-Screw and nut · Table V

Class	Material	M 5	M 6	M 8	M 10	M 12	M 14	M 16
VERBUS®-RIPP®-screws 100	steel $R_m < 800 \text{ (N/mm}^2\text{)}$	11	19	42	85	130	230	330
VERBUS®-RIPP®-nuts 8	steel $R_m > 800 \text{ (N/mm}^2\text{)}$	10	18	37	80	120	215	310
	grey cast iron	9	16	35	75	115	200	300
VERBUS®-RIPP®-screws 12.9 VERBUS®-RIPP®-nuts 12	steel $R_m < 800 \text{ (N/mm}^2\text{)}$	13	22	50	100	165	275	410
	steel $R_m > 800 \text{ (N/mm}^2\text{)}$	12	20	45	90	155	255	390
	cast iron	11	18	43	85	150	240	380

Tightening-up turning torques M_A (Nm) for DURLOCK®-Screws · Table VIII

Class	Material	M 5	M 6	M 8	M 10	M 12	M 14	M 16
DURLOCK®-screws 10.8	steel $R_m < 800 \text{ (N/mm}^2\text{)}$	9	15,1	37	70	123	193	300
	steel $R_m = 800-1100 \text{ (N/mm}^2\text{)}$	7,8	13,2	32	61	108	169	263
	grey cast iron	9	15,1	37	70	123	193	300
DURLOCK®-screws 12.9	steel $R_m < 800 \text{ (N/mm}^2\text{)}$	12,4	21	50	96	169	266	413
	steel $R_m = 800-1100 \text{ (N/mm}^2\text{)}$	10,8	18,2	44	84	148	233	362
	grey cast iron	12,4	21	50	96	169	266	413



Prestressing forces and tightening torques for set screws

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

5. Tightening torques and prestressing forces for screws that are secured chemically by conglutination.

Tightening-up turning torques M_A and prestressing forces F_V for INBUS PLUS® and VERBUS PLUS® - Screws

Table VII

Dimen- sion	Tightening-up turning torques M_A (Nm)						Prestressing forces F_V (N)					
	8.8		10.9		12.9		8.8		10.9		12.9	
	1. mom.	2.-3. mom.	1. mom.	2.-3. mom.	1. mom.	2.-3. mom.	1. mom.	2.-3. mom.	1. mom.	2.-3. mom.	1. mom.	2.-3. mom.
M 4	2,9	3,5	4,1	4,9	4,9	5,8	3900	3600	5450	5050	6550	6050
M 5	6	6,8	8,5	9,6	10	12	6350	5850	8950	8250	10700	9900
M 6	10	12	14	16	17	20	9000	8300	12600	11600	15100	14000
M 8	25	29	35	40	41	48	16500	15200	23200	21400	27900	25700
M 8X 1	27	31	38	44	45	52	18100	16700	25500	23500	30600	28200
M 10	49	57	69	81	83	97	26200	24200	36900	34100	44300	40900
M 10X 1	55	65	77	91	92	110	30400	28100	42800	39500	51400	47400
M 10X 1,25	52	61	73	86	88	105	28300	26100	39800	36700	47700	44100
M 12	86	99	120	140	145	165	38300	35300	54000	49700	64500	59600
M 12X 1,25	95	110	135	155	160	185	43300	40000	61000	56200	73000	67400
M 12X 1,5	90	105	125	145	150	175	40700	37600	57000	52900	68500	63500
M 14	135	160	190	220	230	265	52500	48500	74000	68200	88500	81900
M 14X 1,5	150	175	210	245	250	290	58500	53900	82500	75900	99000	91000
M 16	210	245	295	340	355	410	73000	66900	102000	94000	123000	113000
M 16X 1,5	225	260	315	370	380	445	79000	73200	111000	103000	133000	124000
M 18	290	330	405	465	485	560	88000	71200	124000	114000	148000	137000
M 18X 1,5	325	380	460	540	550	640	103000	95400	145000	134000	174000	161000
M 18X 2	310	355	440	500	525	600	95500	88100	134000	124000	161000	149000
M 20	410	470	580	660	690	790	114000	104000	160000	147000	192000	176000
M 20X 1,5	460	540	640	750	770	900	130000	121000	183000	170000	220000	203000
M 20X 2	430	500	610	710	730	850	122000	112000	170000	158000	205000	190000

Prestressing forces and tightening torques for set screws

HEINRICH GEORG GMBH
MASCHINENFABRIK

6. Coefficient of friction $\mu_{\text{total}} = 0,14$ for new screws, uncoiled

Extended list for larger screws and screws with lower strength. Foundation bolts usually belong to property class 4.6.

Values of property class 3.6 are to be applied.

 M	Set screws metric coarse pitch thread DIN 13 page 13 $\mu_{ges} = 0,14$												 mm
	3.6		5.6		6.9		8.8		10.9		12.9		
	prestressing force = P (F _M)						Torque = M _A						
	P _V N	M _A Nm	P _V N	M _A Nm	P _V N	M _A Nm	P _V N	M _A Nm	P _V N	M _A Nm	P _V N	M _A Nm	
M 2	284	0,123	378	0,162	731	0,314	863	0,373	1216	0,520	1461	0,628	4
M 2,3	407	0,196	544	0,265	1049	0,510	1245	0,598	1755	0,843	2099	1,010	4,5
M 2,6	525	0,284	701	0,373	1353	0,726	1598	0,863	2246	1,206	2697	1,451	5
M 3	726	0,441	966	0,588	1863	1,128	2206	1,344	3109	1,883	3727	2,256	5,5
M 3,5	971	0,677	1294	0,902	2501	1,736	2962	2,060	4168	2,893	5001	3,481	6
M 4	1255	1,000	1677	1,344	3226	2,599	3825	3,040	5374	4,315	6453	5,148	7
M 5	2059	1,961	2736	2,548	5286	5,099	6257	6,031	8806	8,483	10591	10,200	8-9
M 6	2903	3,432	3864	4,511	7453	8,728	8836	10,300	12405	14,710	14906	17,652	10
M 7	4236	5,590	5649	7,453	10885	14,220	12945	17,162	18191	24,517	21771	28,439	11-12
M 8	5315	8,238	7090	10,787	13680	21,575	16230	25,497	22751	35,304	27360	42,168	13-14
M 10	8473	16,67	11278	21,575	21771	42,168	25791	50,014	36284	70,608	43541	85,317	15-16
M 12	12356	28,44	16475	38,246	31773	73,550	37657	87,279	52956	122,60	63547	147,10	19-21
M 14	16965	45,11	22653	60,801	43639	116,70	51681	138,30	72667	194,20	87279	235,40	22-23
M 16	23340	69,63	31087	93,163	60016	178,50	71196	210,80	100027	299,10	120131	357,90	24-26
M 18	28341	95,12	37853	127,50	72961	245,20	86494	289,30	121602	411,90	146118	490,30	27
M 20	36481	135,3	48641	180,45	9349	384,10	111305	411,90	156415	578,60	187796	696,30	30
M 22	45601	182,4	60801	245,16	117189	470,70	139254	559,00	195642	784,50	234378	941,40	32
M 24	52563	230,5	70019	308,91	135331	598,20	160338	711,00	225552	1000	270662	1196	36
M 27	69235	343,2	92280	460,90	177990	887,50	210842	1049	296159	1481	355980	1775	41
M 30	84043	465,8	112286	622,72	215745	1206	255952	1422	359902	2010	432471	2403	46
M 33	10431	632,5	139744	848,30	269682	1628	319695	1932	449142	2716	539363	3266	50
M 36	123073	814,0	164261	1089	316753	2099	374612	2481	527595	3491	632526	4197	55
M 39	148080	1059	197113	1412	380496	2716	451104	3226	633506	4531	760992	5443	60
M 42	169164	1304	225552	1746	435413	3364	515827	3991	725688	5809	870826	6727	65
M 45	198093	1638	264778	2177	509943	4207	604087	4992	850232	7012	1019886	8414	70
M 48	222610	1981	297140	2638	573686	5080	679597	6021	956144	8473	1147372	10150	75
M 52	267720	2540	356960	3393	688423	6541	815909	7747	1147372	10885	1377827	13092	80
M 56	308908	3168	411877	4227	793354	8149	940453	9650	1323891	13582	1888669	16279	85
M 60	360883	3932	481504	5247	927704	10101	1098339	11964	1544540	16867	1853447	20202	90
M 64	407955	4737	544266	6306	1049306	12160	1245438	14416	1750478	20300	2098612	24320	95
M 68	467836	5780	668338	8257	1203008	14863	1425787	17615	2005013	24771	2406016	29725	100
M 72	531574	6917	759393	9882	1366905	17787	1620036	21081	2278175	29645	2733810	35575	105
M 76	599377	8194	856253	11706	1541255	21071	1826672	24973	2568758	35118	3082510	41441	110
M 80	671244	9618	958921	13741	1726057	24733	2045697	29314	2876762	41222	3452115	49467	115
M 90	868696	13953	1240994	19934	2233789	35880	2647453	42525	3722982	59801	4467578	71761	130
M 100	1091549	19425	1559355	27750	2806839	49950	3326624	59200	4678066	83250	5613679	99900	145
Set screws metric fine thread DIN 13 Blatt 13 $\mu_{ges} = 0,14$													
M 8 X 1					15004	22,5	17750	26,63	25007	37,51	30008	45,01	13
M 10 X 1,25					23438	43,13	27753	51,07	39030	71,82	46777	86,07	17
M 12 X 1,25					35794	78,39	42463	92,99	59820	131,0	71588	156,78	19
M 12 X 1,5					33637	74,00	39913	87,81	55898	122,98	67175	147,79	19
M 14 X 1,5					48543	123,78	57369	146,29	80904	206,30	970085	247,57	22
M 16 X 1,5					65214	186,51	77472	221,57	108853	311,31	130428	373,02	24
M 18 X 1,5					85317	269,6	101008	319,19	142196	449,34	170635	539,21	27
M 20 X 1,5					107873	381,87	127486	451,30	179461	635,29	215745	763,74	30
M 22 X 1,5					133370	505,47	157886	598,39	231629	877,87	285759	1007,23	32
M 24 X 2					151022	640,33	179461	760,91	252030	1068,61	303024	1284,82	36
M 27 X 2					197113	954,03	233397	1129,64	328521	1590,04	394225	1908,05	41
M 30 X 2					248107	1324,89	294198	1571,02	413839	2209,90	495214	2649,78	46

Technische Dokumentation

Technical Documentation



Spannverbindungen: Schrauben- Anzugsmoment

Clamping elements: Initial torques of fixing screws

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Nr. No.	Aggregat, Einbauort Unit, place of assembly	Type und Bezeichnung Type and designation	Schrauben (Anzahl, Größe, Festigkeitsklasse) Fixing screw (Number of screw, dimension, quality)	M _A (Anzieh- drehmoment) (required tightening torque)
1.	Abwickelhaspel, Spreizkopf Decoiler, mandrel	RINGFEDER RfN 7012, 130/ 180	20x M 12 DIN 912 – 12.9	145 Nm
2.	Vorschubaggregat Feed unit	STÜWE WK 40-12-40	M 10 DIN 931- 10.9	58 Nm
3.	V- Stanze - Antrieb V-punch - drive	STÜWE WK 20-12-24	M 8 DIN 931- 10.9	29 Nm
4.	V- Stanze Quersupport V-punch, cross support	STÜWE WKL 20-12-22	M 8 DIN 931- 10.9	29 Nm
5.	L- Stanze 1 und 2 - Antrieb L-punch - drive	STÜWE WK 20-12-24	M 8 DIN 931- 10.9	29 Nm
6.	L- Stanze, Quersupport L punch cross support	STÜWE WKL 20-12-22	M 8 DIN 931- 10.9	29 Nm
7.	L- Stanze, Längssupport L punch, longitudinal support	STÜWE WKL 20-12-22	M 8 DIN 931- 10.9	29 Nm
8.	Schere 1 und 2 – Antrieb Shear 1 and 2 - drive	STÜWE WK 20-12-24	M 8 DIN 931- 10.9	29 Nm
9.	Transportrollenantrieb zum Scherenaggregat Transport roll drive to the shear unit	MASCHINENLAGER ML 5000 / B22x47	6x M 6 DIN 912- 12.9	17 Nm
10.	Transportrollenantrieb zum Scherenaggregat Transport roll drive to the shear unit	MASCHINENLAGER ML 5000 / B20x47	6x M 6 DIN 912- 12.9	17 Nm
11.	Umlenkvorrichtung Diverting unit	MASCHINENLAGER ML 3000 20x 28	4x M 6 DIN 912- 12.9	17 Nm



HEINRICH GEORG GMBH
MASCHINENFABRIK

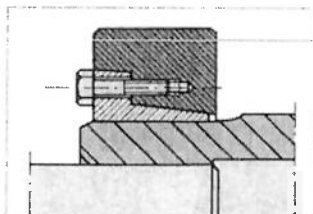
Frictional Connections

Type

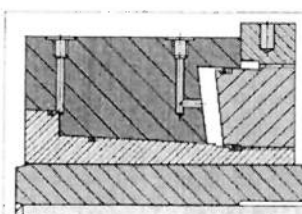
STÜWE¹

Contents²

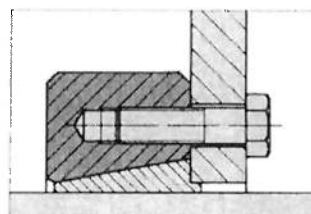
Mounting, demounting and lubricant instruction



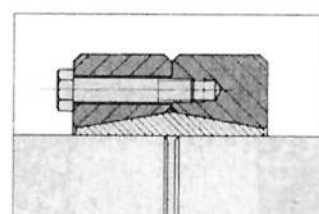
Type HSD, Page 2



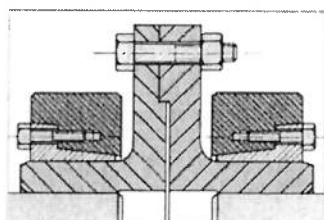
Type HYD, Page 3



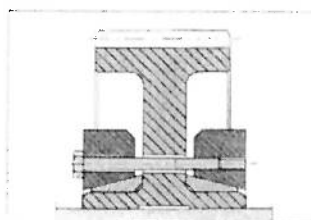
Type AS, Page 4



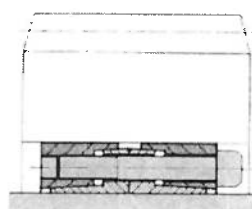
Type WK, WKL, Page 5



Type FKH; FK; HYD; GF, Page 6



Type SDG, Page 7



Type IS, Page 8



Screw tightening
torques
Page 8

¹ STÜWE GmbH & Co. KG · Zum Ludwigstal 35 · 45527 Hattingen

² Source: Frictional Connections 0495/1/StD



Frictional Connections Type STÜWE

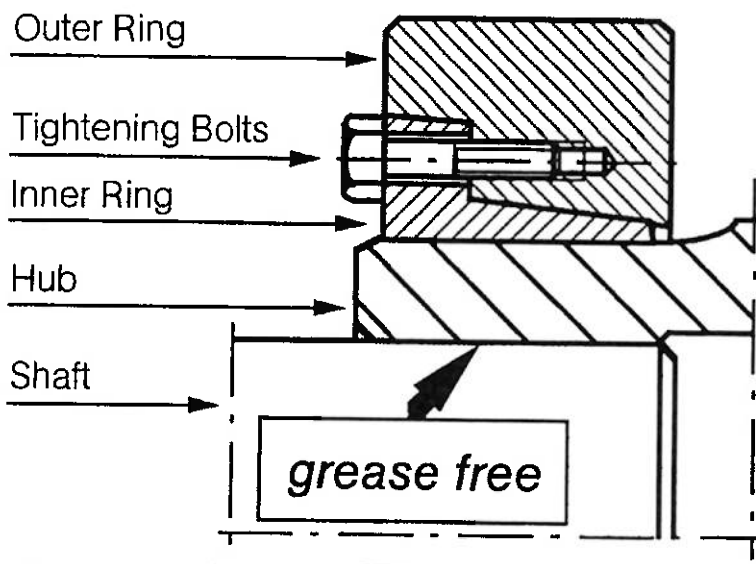
HEINRICH GEORG GMBH
MASCHINENFABRIK

Mounting and Removal Instructions for Shrink Discs of Type HSD

Mounting

The shrink discs are supplied ready to be installed. Therefore they should not be dismantled prior to employing the unit for the first time.

1. Degrease hub bore and shaft!
2. Push shrink disc on hub. The outer surface of the hub may be greased in the area of the shrink disc fit. Note: Do not tighten the tightening bolts before attaching the shaft!
3. Mount hub on the shaft.
4. Tighten all tightening bolts uniformly, one by one, over several revolutions until the outer ring and inner ring are in line.



Demounting

1. Loosen all tightening bolts uniformly one by one, at first about one quarter of a turn per revolution only. Do not turn out tightening bolts completely!
2. Dismount shaft or draw off hub. Remove rust which may have formed on the shaft in front of the hub.
3. Remove shrink disc from hub.

Cleaning and greasing

Dismantled shrink discs do not have to be taken apart and regreased before remounting.

The shrink disc has to be cleaned and regreased only if employed in dirty environment.

Use a solid lubricant with a coefficient of friction of $\mu = 0.04$.

Example	
Molykote 321 R (friction-reducing varnish)	Spray made by Dow Corning
Molykote spray (power spray)	Spray made by Dow Corning
Molykote G Rapid	Spray or paste made by Dow Corning
Aemasol MO 19 R	Spray or Paste made by A.C. Matthes
Molykombin UMFT 1	Spray made by Klüber Lubrication
Unimoly P 5	Powder made by Klüber Lubrication

Mounting and Demounting

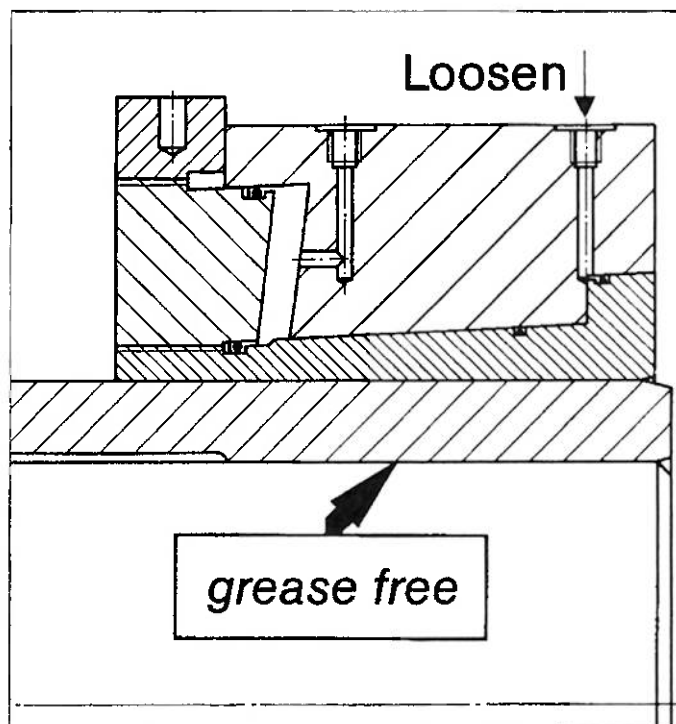
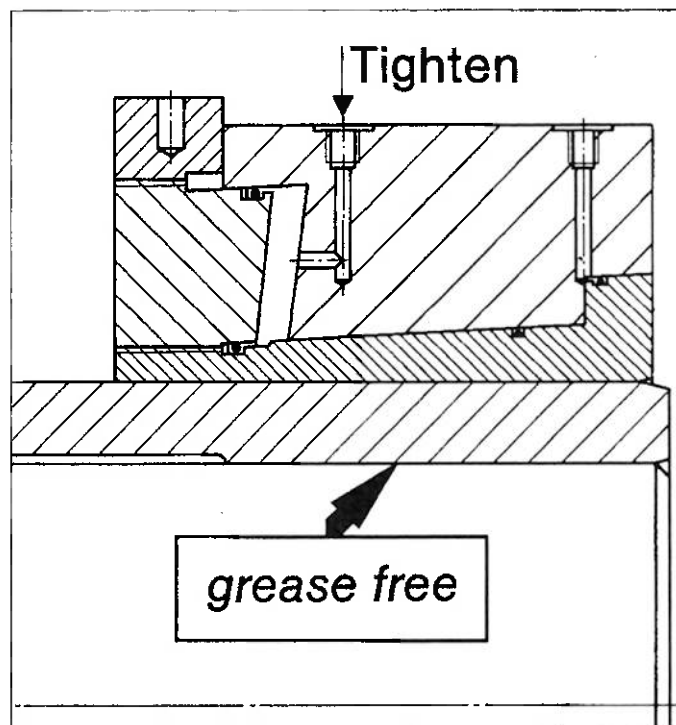
The shrink discs Type HYD are supplied ready to be installed.

Mounting

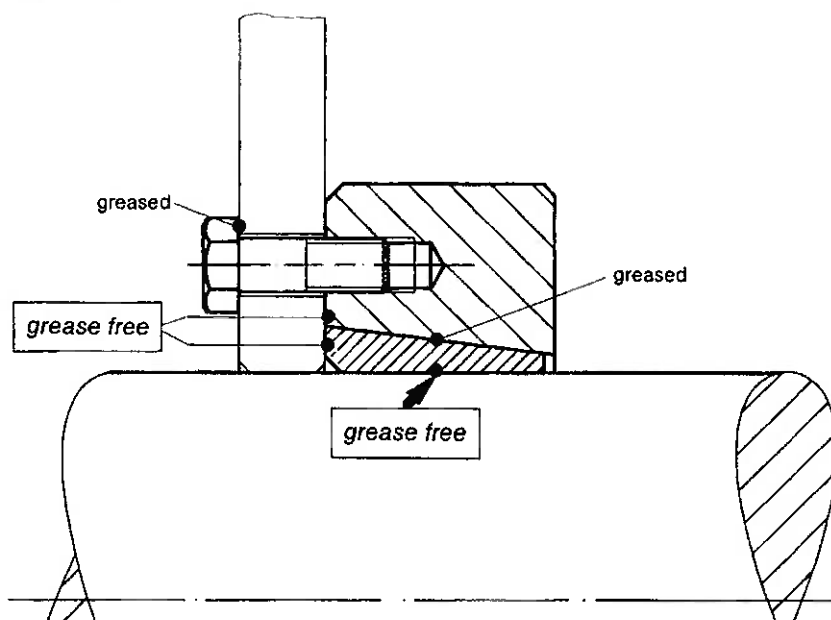
1. Push shrink disc on hub. The outer area of the hub may be greased in the area of the shrink disc fit. Do not tighten the shrink disc before attaching the shaft!
2. Degrease shaft and bore.
3. Mount hub on the shaft.
4. Connect the hydraulic pump to the shrink disc (connection "Tighten").
5. Tighten the shrink disc by using hydraulic pressure. The shrink disc is tightened up correctly when outer and inner ring are in line. Max. allowed pressure: 450 bar!
6. Tighten up the safety nut.
7. Release the hydraulic pressure.

Demounting

1. Connect the hydraulic pump to the shrink disc (connection "Tighten").
2. Increase the hydraulic pressure until the safety nut gets loose easily (max. 450 bar!).
3. Loose safety nut.
4. Release hydraulic pressure and put the pump to connection "Loosen".
5. Open the shrink disc by using hydraulic pressure.



Locking Unit Type AS



Locking units of type AS are used to mount disc-shaped components on shafts, for example standardized components such as chain sprockets.

Recessed or welded hubs are not required which adds to the benefits of the locking assemblies of type AS.

Shaft tolerance

Shaft tolerance in accordance with **quality h9**, so that commercially available shafts can be used.

Applications

Our units can be employed for example

- chain wheels
- flywheels
- levers
- cam wheels
- drums
- couplings
- brake discs
- pulleys etc.

Design

The locking unit of type AS consists of the outer ring, the inner ring and the tightening bolts. The conical surfaces are greased; the angle of the taper has been selected so to avoid self-locking.

Function

The torque is transmitted from the component via the outer ring and the inner ring of the unit to the shaft. The tightening bolts produce the required clamping force.

The design of all locking units features a clamping force reserve which is used to clamp outer ring and component securely after eliminating the clearance between outer ring and component (the clearance as well as the number of bolts is determined for each unit size).

Tightening bolts

All bolts are of quality 10.9 in accordance with DIN 931. They are permanently coated with a special frictionreducing varnish. We will supply matching bolts for the units based on dimension "S" (information required for model "A" to be furnished with the order).

Lubricant

Conical surfaces as well as bolts are permanently coated with a special MoS₂-varnish (reducing friction).

Varnish available: Molykote 321 R (Dow Corning) Molykote 3484 (Dow Corning) (heating temperature 170°C to 200°C).

Mounting

Our units are supplied ready to be installed.

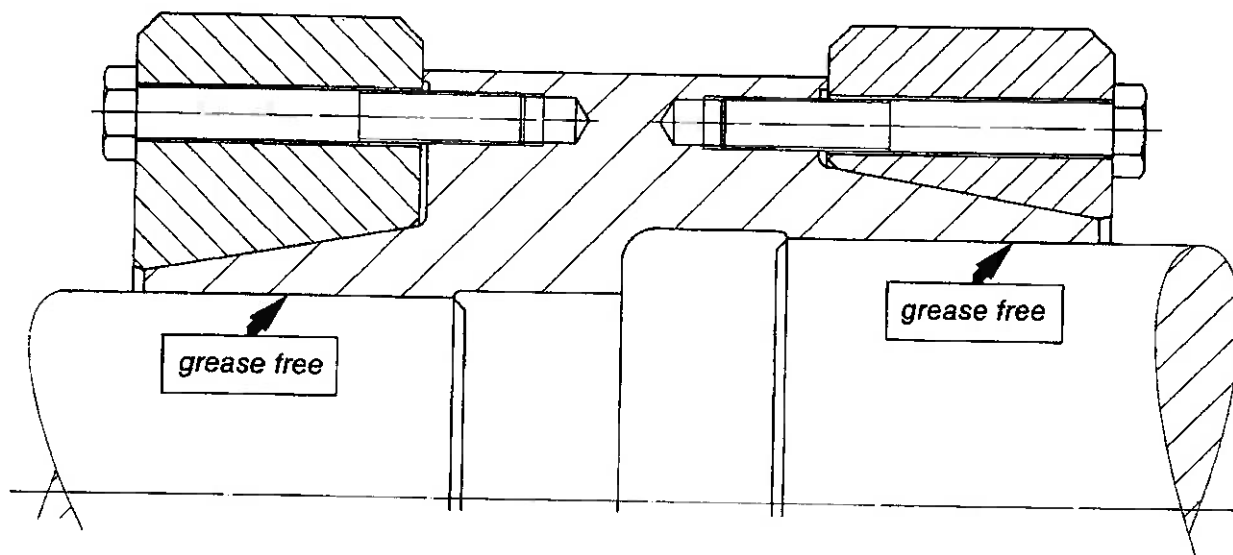
1. Degrease shaft as well as thrust surface of the component.
2. Bolt component and locking unit together and push both parts on the shaft.
3. Tighten bolt by bolt uniformly, until the full tightening torque is reached.

Removal

Loosen bolt by bolt in several revolutions.



Shaft Coupling with different Bores



To connect shafts with different diameters the shaft couplings Type WK and WKL are available with the corresponding bores.

Mounting

1. Degrease shaft ends as well as coupling bore using a solvent.
2. Push coupling on shaft ends.
3. Tighten bolts one by one, in several revolutions, until the required full tightening torque is reached. The correct mounting of the assembly can be checked easily: the clamping rings and the center section must be in tight contact.

Removal

The greased tapers are not self-locking. The shaft coupling is released by loosening the tightening bolts one by one in several revolutions.

Unscrew tightening bolts only as far as required.

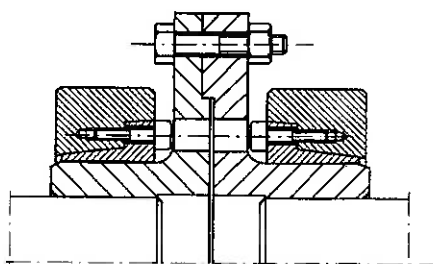
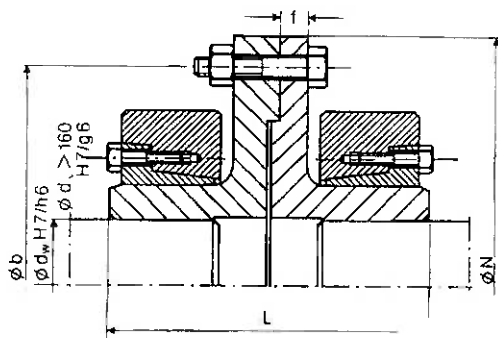
All locking units are oil-coated and supplied ready to be installed (do not use molybdenum disulfide!).

Flange Coupling Type FKH

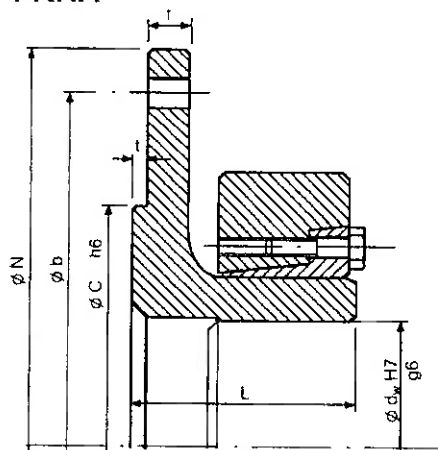
Type FKH

Designe A

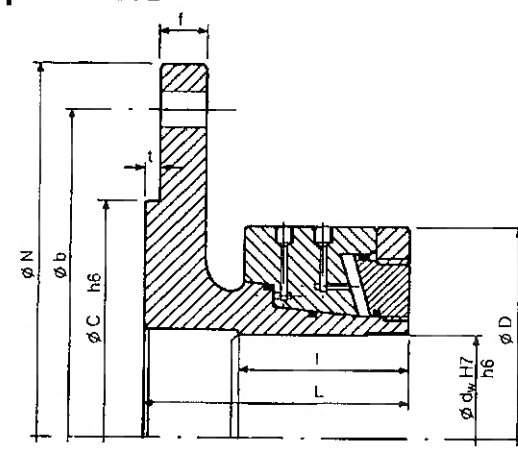
Designe B



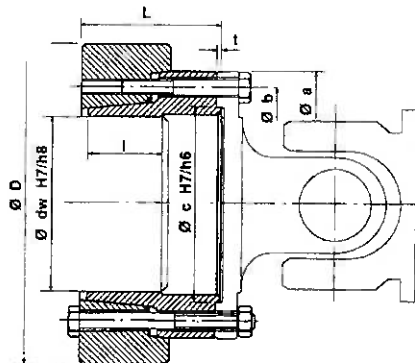
Type FKHA



Type FK HYD

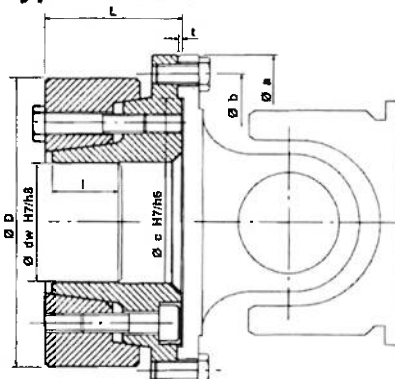


Type GF Series 21



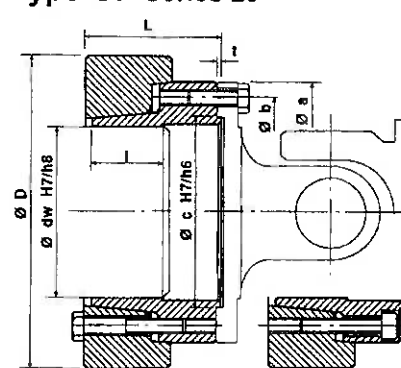
above: Design A
below: Design B

Type GF Series 22



above: Design A
below: Design B

Type GF Series 23



above: Design A
below: Design B

Mounting and Removal Instruction

Mounting

The shrink discs are supplied ready to be installed. Therefore they should not be dismantled prior to employing the unit for the first time.

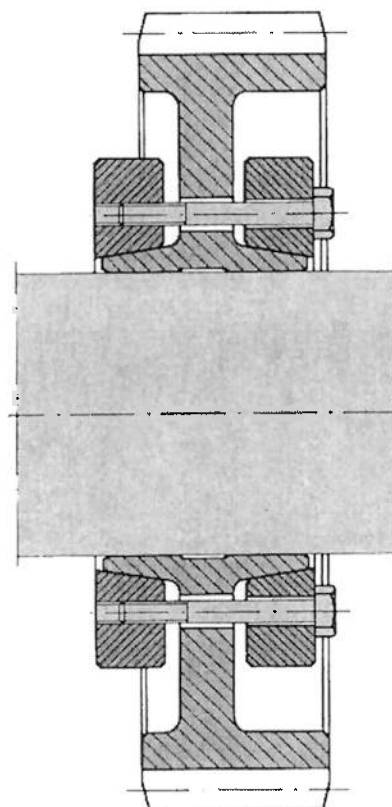
1. Remove spacers between the outer rings attached for shipping (in types SD only).
2. Degrease hub bore and shaft!
3. Push shrink disc on hub. The outer surface of the hub may be greased in the area of the shrink disc fit. Note: Do not tighten the tightening bolts before attaching the shaft!

▲ Mount hub on the shaft.

5. Tighten all tightening bolts uniformly, one by one, over several revolutions.

Check the correct full tightening torque of all bolts by means of a torque wrench.

When mounting shrink discs of type SD, make sure that the outer ring faces remain parallel.



Demounting

1. Loosen all tightening bolts uniformly, one by one, at first about one quarter of a turn per revolution only. Do not turn out tightening bolts completely!
2. Dismount shaft or draw off hub. Remove rust which may have formed on the shaft in front of the hub.
3. Remove shrink disc from hub.

Cleaning and greasing

Dismantled shrink discs do not have to be taken apart and regreased before remounting.

The shrink disc has to be cleaned and regreased only if employed in dirty environment.

Use a solid lubricant with a coefficient of friction of $\mu = 0.04$.

Example

Molykote 321 R (friction-reducing varnish)	Spray made by Dow Corning
Molykote spray (power spray)	Spray made by Dow Corning
Molykote G Rapid	Spray or paste made by Dow Corning
Aemasol MO 19 R	Spray or Paste made by A.C. Matthes
Molykombin UMFT 1	Spray made by Klüber Lubrication
Unimoly P 5	Powder. made by Klüber Lubrication

Mounting and Demounting Instruction

All locking units are oil-coated and supplied ready to be installed (do not use molybdenum disulfide!).

Mounting

1. Turn out all bolts a few threads and screw at least three bolts, uniformly spaced, into the forcing threads. Three bolts each are to be screwed into the forcing threads of the front thrust ring and the forcing threads of the sleeve on all units of type IS 2 and IS 3, which will avoid canting and jamming of the thrust ring when the unit is inserted (self-locking taper!).

2. Insert the locking unit.

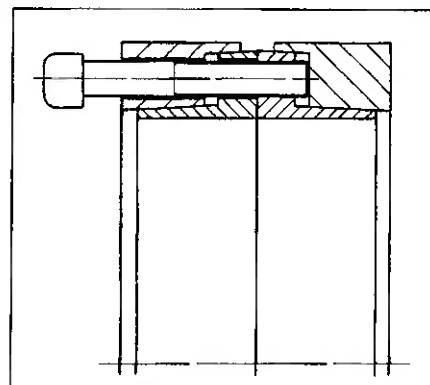
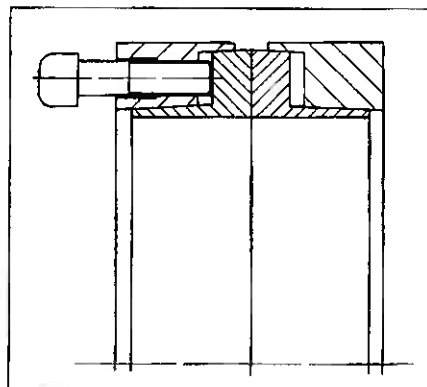
3. Screw bolts into the tightening holes

4. Tighten bolts crosswise by means of a torque wrench. Tighten the bolts to the right and left of the slot consecutively until the specified tightening torque for all bolts is reached.

Demounting

1. Loosen all bolts a few threads and turn out as many bolts as there are forcing threads. Then screw these bolts in.

2. Loosen the connection by tightening the forcing bolts step by step, uniformly (crosswise!). Tighten the forcing bolts to the left and right of the slot consecutively.



Screw tightening torques

required tightening torque of the tightening bolts (Nm)														
	M 5	M 6	M 8	M 10	M 12	M 14	M 16	M 18	M 20	M 22	M 24	M 27	M 30	M 33
HSD	-	12	29	58	100	160	240	-	470	-	820	1210	1640	2210
AS	-					-								-
WK, WKL	-					160								2650
SDG	5	-	-	-	-	-	-	-	-	-	-	-	-	-
FKH; FK, GF	-													-
IS	-													-
GF	9	15	35	70	120	160	240	340	470	640	820	1210	-	-



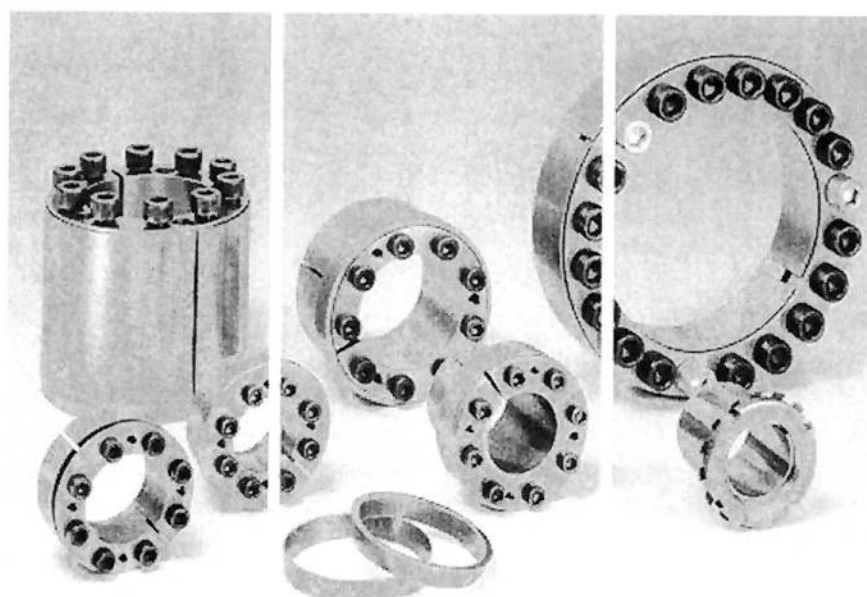
**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Clamping Elements

Type

MASCHINENLAGER ¹

Contents ²



¹ Maschinenlager Schwarzer Weg 100-106, 40593 Düsseldorf

² Source: Tension Sets, General Information



Clamping Elements Typ MASCHINENLAGER

HEINRICH GEORG GMBH
MASCHINENFABRIK

Mounting and Dismantling

Mounting and dismantling can be effected by tightening or respectively releasing the clamping screws by common tools. With the use of dynamometric keys an exact tightening moment can be achieved.

Batch the clamping elements before mounting. Do not use oil containing Molybden-disulfid or any kind of fat.

Great operating distances

Recommended fitting couples:

Tolerance of fin diameter:	$h\ 7 / h\ 9$
Tolerance of wheel hub drilling diameter:	$H\ 7 / H\ 9$
Surface roughness =	$R_t\ 16$, bei Type 2000 = $R_t\ 6$
The radial deviation is between 0,02 und 0,04 mm	

Backlash-free connection

By using clamping elements a frictional and backlash-free connection is built but can be released any time.

Overload protection

By exceeding the tightening moment which has to be transferred a of the clamping elements a slippage prevents damage of several connected parts. A multiple slip through has to be avoided.

Simple Adjustment

As there is no assignment of the conclusive profile necessary, the components can be mounted in exact angle at any position.

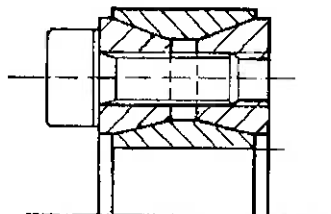
Various possibilities for application

for example flywheels, chain wheels, gears, pulleys, eccenters, couplings etc.

Types and tightening moments of the clamping screws (MS / Nm):

Type 1000

Clamping element which consists of several parts: one slitted inner and outer ring as well as two thrust collars connected by clamping screws – suitable for middle sized tightening torques. Simple mounting and dismantling, not self-centering.



Screw DIN 912 – 12.9	MS / Nm
M 6	15
M 8	37
M 10	70
M 12	127
M 14	195
M 16	300
M 18	410
M 20	590
M 22	790
M 24	1000

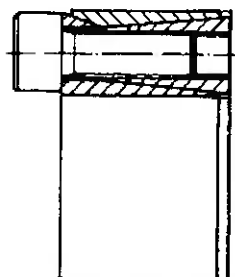


Clamping Elements Typ MASCHINENLAGER

HEINRICH GEORG GMBH
MASCHINENFABRIK

Type 1010

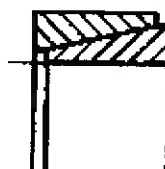
Clamping element which consists of several parts: one slitted inner cone flange ring, a slitted outer cone ring and a conical thrust collar - connected by screws between the inner cone flange ring and the thrust collar - suitable for middle sized tightening torques. Simple mounting and dismounting, not self-centering.



Screw	MS /
DIN 912 - 12.9	Nm
M 6	17
M 8	41
M 10	83

Type 2000

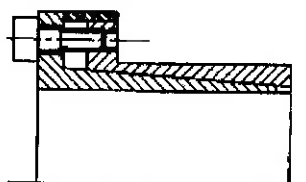
This clamping element consists of two conical rings, which are twisted between shaft and hub. Less space requirement, suitable for middle sized tightening torques.



Screw	MS /
DIN 912 - 12.9	Nm

Type 3000

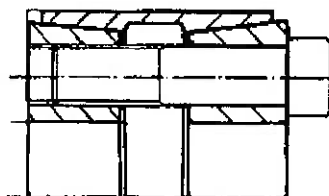
Clamping element which consists of several parts: one inner and outer cone flange ring and a distance ring (against axial shift of the hub) The two cone rings are twisted above the screw flange against one another. Because of its structural dimensions suitable for small hub diameters. Self-centering, suitable for middle sized tightening torques.



Screw	MS /
DIN 912 - 12.9	Nm
M 3	2
M 4	4,9
M 6	17
M 8	41
M 10	83
M 12	145

Type 4000, 7000

Clamping element which consists of several parts: one slitted outer ring and two slitted, conical inner rings with screws and a distance ring. Two overall lengths. Suitable for small hub diameters. Self-centering, suitable for high tightening torques.



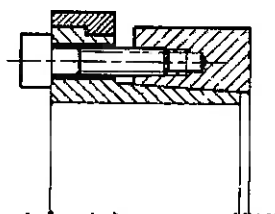
Screw	MS /
DIN 912 - 12.9	Nm
M 6; M 8	41
M 10	83
M 12	145
M 14	230
M 16	355
M 20	690
M 22	930

Clamping Elements Typ MASCHINENLAGER

HEINRICH GEORG GMBH
MASCHINENFABRIK

Type 5000

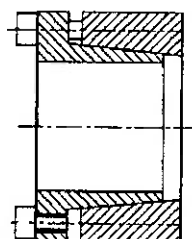
Clamping element which consists of several elements: performance A with a slitted, conical inner and outer ring, connected with clamping screws, performance B has an extra distance ring (against axial shift of the hub). Self-centering, allows an exact connection. Suitable for middleweight tightening torques.



Screw	MS /
DIN 912 - 12.9	Nm
M 6	17
M 8	41
M 10	83
M 12	145
M 14	230

Type 5006, 5007

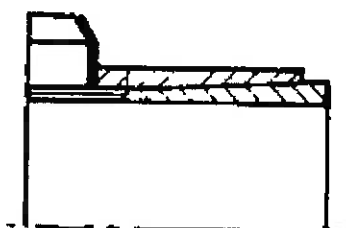
Clamping element which consists of several elements, type 5006 with a slitted conical inner and outer ring, connected with clamping screws. Type 5007 inner ring with flange (against axial shift of the hub) Small installation length. Self-centering. Suitable for middleweight tightening torques.



Screw	MS /
DIN 912 - 12.9	Nm
M 6	14
M 8	35
M 10	70
M 12	125
M 14	190

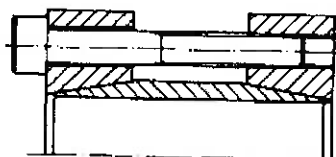
Type 6000, 6050

Clamping element which consists of several elements, type 5006 with a slitted conical inner and outer ring, a slotted nut and a lock plate. Two overall lengths. Quick installation, small requirement of space, suitable for little tightening torques. Not self-centering.



Type 9000

Fin coupling which consists of several elements: double faced cone shaped, slitted inner ring and two cone shaped outer rings with screws. Extremely well suitable for a quick and free from float connection between two fin ends in true alignment.



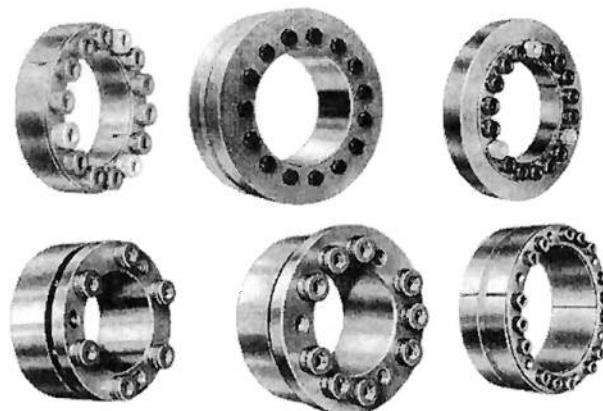
Screw	MS /
DIN 912 - 12.9	Nm
M 6	17
M 8	40
M 10	81
M 12	145
M 16	145



Frictional Connections

Type

RINGFEDER¹



Contents ²

Mounting and Removal:

	Page
Locking Assemblies RfN 7012	2
Locking Assemblies RfN 7013	3
Locking Assemblies RfN 7014	4
Locking Assemblies RfN 7015	5
Locking Elements RfN 8006	6
Shrink Disks RfN 4071, 4091, 4051, 4171	7
Required screw tightening torque	8

¹ RINGFEDER GmbH Duisburgerstr. 145 47829 Krefeld

² Source: RINGFEDER GmbH

Locking Assemblies RfN 7012 Installation

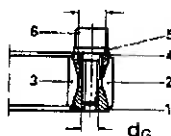
Since the force is transmitted by contact pressure and friction between functional surfaces, condition of contact surfaces and proper tightening of the locking screws are of great importance (see point 1).

1. All contact surfaces, including screw threads and screw head bearing surfaces, must be clean and slightly oiled. In this condition, the shaft, hub and Locking Assemblies are to be assembled. (Do not use Molybdenum Disulphide!)
2. Tighten locking screws lightly and align hub.
3. Tighten screws evenly in diametrically opposite sequence and do this in two or three stages up to the indicated tightening torque (TA).
4. Re-check tightening torque by applying it to all screws all the way around. When no screw will turn any more, the assembly is completed.

Dirty or used Locking Assemblies must be disassembled and cleaned before fitting. For reassembly the sequence as per fig. 6 is recommended.

The special marked screws are fitted with washers in order to protect the auxiliary threads in the front thrust ring. In all other respects they have the same function as the other screws and serve only to identify the position of the auxiliary threads.

Fig. 6
Locking Assemblies RfN 7012.
Designation of components.



- 1 rear thrust ring
- 2 outer ring
- 3 inner ring
- 4 front thrust ring
- 5 washers
- 6 locking screw

Removal

Locking Assemblies RINGFEDER RfN 7012 are not self-locking. The taper of the individual rings is such that the inner and outer rings spring apart on the last screw being loosened.

The washers under the special marked screws protect the auxiliary (removal) threads against damage; these washers must be replaced after having been used several times.

If relatively high forces are needed to extract a Locking Assembly that has already been loosened (e. g. if the Locking Assembly has to be pushed against the weight of a heavy boss or hub), any type of removal device may be used, but the screws must only be slackened and not screwed out too far. As long as this instruction is followed, there is no objection against the use of a removal device, provided the forces applied are kept low.

The auxiliary threads have only about 3-5 effective courses and are not cut right through.

Do not use these holes for Jack screws.

Fig. 7

If the rear thrust ring is not automatically released, the screws have to be turned out by a few threads. Light tapping against the screw heads causes the rear thrust ring to spring backwards.

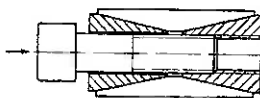
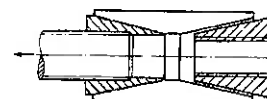


Fig. 8

Should the front thrust ring jam, it is released in a similar way. The special marked screws are removed to expose the auxiliary threads of the front thrust ring. The front thrust ring can be released and a Locking Assembly which is located deeply in the hub bore can be removed by corresponding screws.



Locking Assemblies RfN 7013

Mounting

Since the force is transmitted by contact pressure and friction between functional surfaces, condition of contact surfaces and proper tightening of the locking screws are of great importance (see point 1).

1. All contact surfaces, including screw threads and screw head bearing surfaces, must be clean and slightly oiled. (Do not use Molybdenum Disulphide!) in this condition, the shaft, hub and Locking Assemblies are to be assembled.
2. Tighten locking screws lightly and align hub.
3. Tighten screws evenly in diametrically opposite sequence and do this in two or three stages up to the indicated tightening torque (TA).
4. Re-check tightening torque by applying it to all screws all the way around. When no screw will turn any more, the assembly is completed.

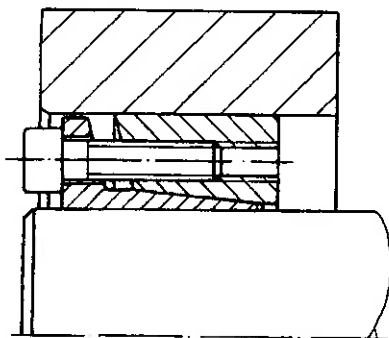


Fig. 9 Mounting of a Locking Assembly RfN 7013.0

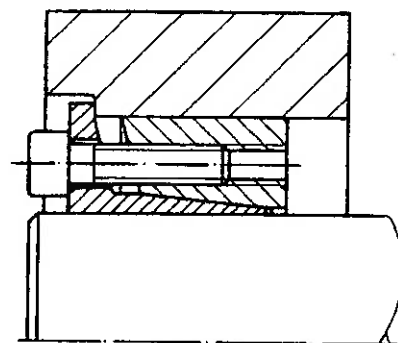


Fig. 10 Mounting of a Locking Assembly RfN 7013.1

Removing

The Locking Assemblies RfN 7013 are to be removed in the following sequence:

1. Loosen all screws by a few turns.
2. Remove the screws adjacent to each threaded bore and screw them into these bores pressing off the outer ring. The connection is then released.
3. The connection can be either re-adjusted or dis-assembled. Remove the jack screws only after the Locking Assembly has been taken out of the hub.

Dismount and clean dirty undamaged Locking Assemblies before re-use.

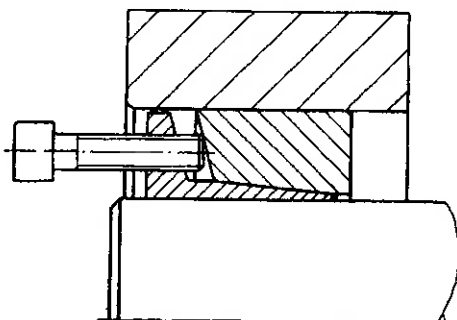


Fig. 11 Removing of a Locking Assembly RfN 7013.0

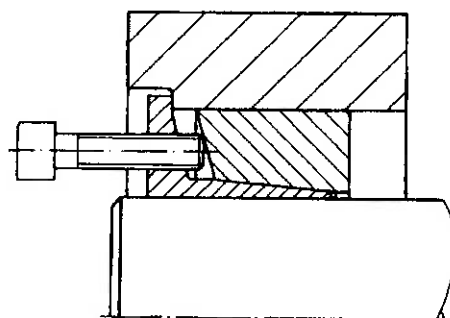


Fig. 12 Removing of a Locking Assembly RfN 7013.1

Locking Assemblies RfN 7014 Installation

Since the force is transmitted by contact pressure and friction between functional surfaces, condition of contact surfaces and proper tightening of the locking screws are of great importance (see point 2).

1. With originally packed Locking Assemblies, there are small metal pieces located in the slits of the inner and outer ring. They are for shipping purposes only and **MUST** be removed prior to installation.
2. All contact surfaces, including screw threads and screw head bearing surface, must be clean and slightly oiled (do not use molybdenum disulphide). In this condition, the shaft, hub and Locking Assemblies are to be assembled.
3. Tighten locking screws lightly and align hub.
4. Tighten screws evenly in diametrically opposite sequence and do this in two or three stages up to the indicated tightening torque (TA).
5. Re-check tightening torque by applying it to all screws all the way around. When no screw will turn any more, the assembly is completed.

Removal

The Locking Assemblies RfN 7014 are to be removed as follows:

1. Loosen all screws by a few turns.
2. Remove the screws adjacent to each threaded bore and screw them into these bores. Since the rear thrust ring rests against either shaft or hub shoulder, the jack screws will automatically push apart both tapers, thus releasing the connection.
3. The connection can be either re-adjusted or dis-assembled. Remove the jack screws only after the Locking Assembly has been taken out of the hub.

Used Locking Assemblies have to be cleaned and slightly oiled prior to installation. Note that the release threads of the front thrust ring have to be positioned opposite to undrilled spaces of the rear thrust ring. These threads are used for removal.

Fig. 4 Locking Assembly not tightened

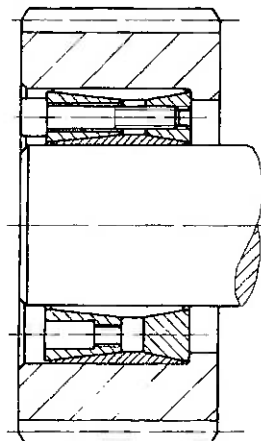
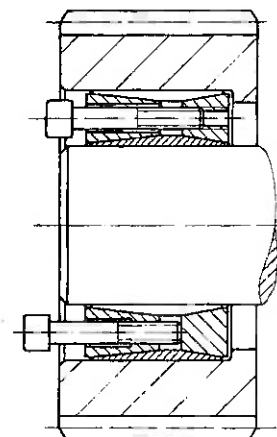


Fig. 5 Locking Assembly with a screw in one of the release threads



Frictional Connections Type RINGFEDER

HEINRICH GEORG GMBH
MASCHINENFABRIK

Locking Assemblies RfN 7015 Installation

Spannsätze RfN 7015 Installation

1. Since the force is transmitted by contact pressure and friction between functional surfaces, condition of contact surfaces and proper tightening of the locking screws are of great importance (see point 1). All contact surfaces, including screw threads and screw head bearing surface, must be clean and slightly oiled. (Do not use Molybdenum Disulphide!) In this condition, the shaft, hub and Locking Assemblies are to be assembled. Unscrew all locking screws far enough so that only few threads are engaged in the rear thrust ring. For shipping purposes, these screws have been screwed in quite deep. With larger Locking Assemblies, it is advantageous to insert several locking screws into the corresponding threads of the front thrust ring according to Fig. 7 and to push against them.
2. After the Locking Assembly is placed in position, slightly tighten all locking screws (screwed into the rear thrust ring) and make final alignment and adjustment of the connection.
3. Tighten screws evenly in diametrically opposite sequence and do this in two or three stages up to the indicated tightening torque (TA).
4. Re-check tightening torque by applying it to all screws all the way around. When no screw will turn any more, the assembly is completed.

When re-assembling, it is important to make sure that all threaded holes of the rear thrust ring (1) are in line with the holes in web of inner ring (3) and front thrust ring (4). Threaded removal holes in front thrust ring must be located opposite blank spaces in web of inner ring, and the threaded removal holes in web of inner ring must be located opposite blank spaces of rear thrust ring.

To correctly execute the assembly the index bores of the thrust rings 1 and 4 have to point in direction of the screw heads and to be in line with the index bore of the inner ring 3, whereas the marking groove of the inner ring must point in opposite direction.

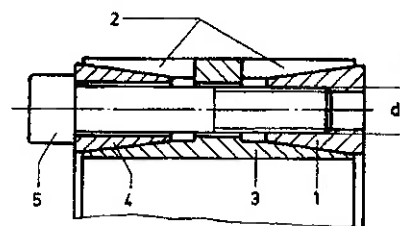


Fig. 6

Used Locking Assemblies have to be cleaned and slightly oiled prior to installation and re-assembled according to Fig. 6.

Removal

The Locking Assemblies RfN 7015 are to be removed as follows:

1. Loosen all screws by a few turns.
2. Remove the screws adjacent to each threaded bore and screw them into these bores.
 - 2.1 The front thrust ring is released by having the jack screws pressed against the web of the inner ring (see Fig. 7).
 - 2.2 The rear thrust ring is released by having the jack screws inserted in the threaded bore of the inner ring web and thus pushing it out (Fig. 8).
3. Pull or push hub and Locking Assemblies off the shaft. The jack screws should be removed only after the Locking Assembly has been taken out of the hub.

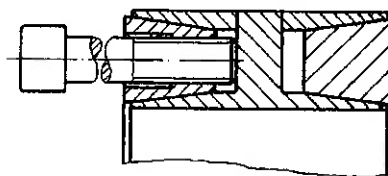


Fig. 7

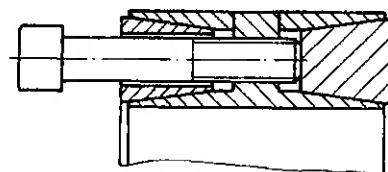


Fig. 8

Dis-assemble and clean dirty, undamaged Locking Assemblies before re-use.

Frictional Connections Type RINGFEDER

HEINRICH GEORG GMBH
MASCHINENFABRIK

Locking Elements RfN 8006

Mounting

Since the force is transmitted by contact pressure and friction between functional surfaces, condition of contact surfaces and proper tightening of the locking screws are of great importance (see point 1).

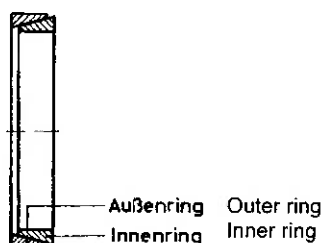
1. All contact surfaces, including screw threads and screw head bearing surface, must be clean and slightly oiled.
2. Fit the parts in the following order:
 - a) Hub. b) Spacer sleeve to bridge the undercut.
 - c) Outer ring/inner ring corresponding to the installation drawing (both parts must have an easy sliding fit—they must not jam).
 - d) Sleeve and thrust ring or thrust ring with collar. Ensure that both parts have an easy sliding fit.
 - e) Locking screws.

Carefully oil the locking screws before fitting. This applies in particular to the screw head seat. Do not use molybdenum disulphide. The screws must turn easily and to an adequate depth. Do not use spring washers or serrated locking washers.

3. Tighten locking screws lightly and align hub.
4. Tighten screws evenly in diametrically opposite sequence and do this in two or three stages up to the indicated tightening torque (TA)
5. Re-check tightening torque by applying it to all screws all the way around. When no screw will turn any more, the assembly is completed.
6. Check distance x.

The thrust ring must never contact the face of the hub.
The gap between thrust ring and hub face should be as uniform as possible.

Fig. 12 Locking Element RfN 8006, view and section



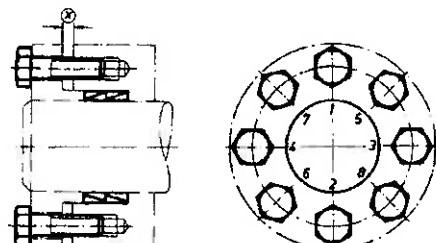
Removing

Locking Elements RfN 8006 are not self-locking. The taper of the individual rings is such that the connection is automatically released on the locking screws being loosened. If this is not the case, light tapping (light jarring blows) is sufficient to make the Locking Element rings spring apart. Normally, the use of extractors leads to destruction of the shaft seat (longitudinal scoring). If against all expectations the Locking Element Connection proves difficult to release, the cause will probably be found in this list:

1. The joint has seized because the torque exceeded the calculated value of the connection.
2. The recommended fits for shafts, spacer sleeves, thrust ring or hub bore have not been adhered (clearances too small).
3. Shaft/hub surfaces were too rough.
4. The friction coefficient exceeds 0,15 (e.g. heavy contamination of the friction surfaces). Chrome steels "smear" and have a higher coefficient of friction.
5. The Locking Elements have been overstressed (e.g. hub dimensions inadequate).
6. Heavy corrosion of shaft and/or hub bore in front of or behind the Locking Element seat area (the seat as such cannot corrode).
7. Very uneven tightening of the locking screws.

As all the above factors are connected with the materials used and/or the fitting procedure, difficulties in releasing Locking Element Connections can always be avoided.

Fig. 13 Tightening of the locking screws and distance x.



Frictional Connections Type RINGFEDER

HEINRICH GEORG GMBH
MASCHINENFABRIK

Shrink Discs RfN 4071, 4091, 4051, 4073

The following instructions are valid for the Shrink Discs RINGFEDER.

Standard-Series RfN 4071
Heavy Duty-Series RfN 4091
Light Duty-Series RfN 4051
Mini-Series RfN 4073

General instructions

Shrink Discs RINGFEDER as well as Locking Assemblies RINGFEDER are delivered in a ready-toinstall condition. Only the bigger and heavier Shrink Discs should be dismantled for easier installation.

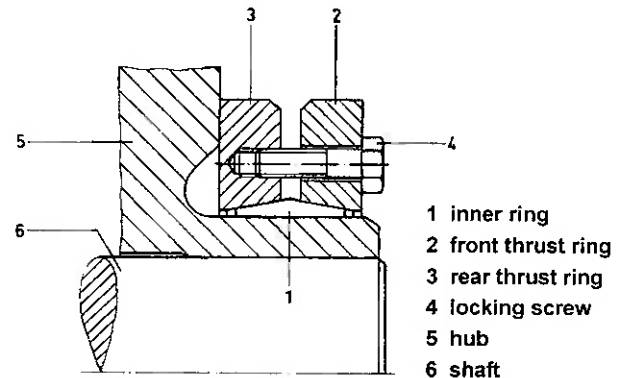


Fig. 28 Shrink Disc RINGFEDER designation of the parts.

Installation

1. The contact area for the Shrink Disc on the hub extension has to be cleaned and greased.
2. Distance pieces which have been used for shipping purposes only must be removed.
3. Do not tighten screws before the Shrink Disc is positioned on the hub extension.
4. Before the Shrink Disc and hub are positioned on the shaft, do not start to tighten the screws. Otherwise deformations may occur.
5. For easy positioning the contact surfaces of the shaft and the hub (dia.dw) should be oiled. (On these surfaces no MoS₂ should be used).
6. Before final tightening of the screws both thrust rings should be squarely positioned by preloading the locking screws.
7. Finally the locking screws have to be tightened in several steps clockwise (not in a diametrically opposite sequence). The screws have to be tightened in two, three or more stages up to the indicated tightening torque TA.

Removal

1. For dismantling the screws should be released clockwise in several stages to avoid tilting of the thrust rings. Under no circumstances should the locking screws be taken out of the threads, as due to pretensioning the Shrink Disc could jump apart.
2. The shaft can be taken out of the hub i.e. the hub can be withdrawn from the shaft. For easier dismantling the shaft should be cleaned and oiled.
3. The Shrink Disc can now be removed from the hub extension.

Cleaning and Re-lubrication

The following hints are only valid for Shrink Discs RINGFEDER.

After having been in use Shrink Discs should be dismantled and cleaned. The cones have been lubricated with greases containing MoS₂ (e.g. Molykote G Rapid). If the tapered working surfaces are not damaged, they have to be relubricated with Molykote BR 2. Also the screws (threads and contact areas for the heads) have to be lubricated with Molykote BR 2.



Frictional Connections Type RINGFEDER

HEINRICH GEORG GMBH
MASCHINENFABRIK

Screw tightening torque

1. Locking Assemblies RfN 7012

Required tightening torque per locking screw (Nm) DIN 912 - 12.9

d _G	M 6	M 8	M 10	M 12	M 14	M 16	M 18	M 20	M 22	M 24
TA (Nm)	14	35	70	125	190	295	405	580	780	1000
d _D	M 8	M 10	M 12	M 14	M 16	M 20	M 22	M 24	M 27	M 30

2. Locking Assemblies RfN 7013

Required tightening torque per locking screw (Nm) DIN 912 - 12.9

d _G	M 6	M 8	M 10	M 12						
TA (Nm)	17	41	83	145						

3. Locking Assemblies RfN 7014

Required tightening torque per locking screw (Nm) DIN 912 - 12.9

d _G				M 12	M 14	M 16	M 18	M 20	M 22	M 24
TA (Nm)				145	230	355	485	690		

4. Locking Assemblies RfN 7015.0 und RfN 7015.1

Required tightening torque per locking screw (Nm) DIN 912 - 12.9

d _G		M 10	M 12	M 14	M 16	M 18	M 20	M 22	M 24	M 27
RfN 7015.0 TA (Nm)			145	230	355	485	690	930	1200	1600
RfN 7015.1 TA (Nm)		83	145	230	355	485	690			



Kapitel 7

Chapter 7

Inhaltsverzeichnis

Contents

1.	Hinweise zur Schmierung und Wartung Information on lubrication and maintenance	Seite 1- 2 Page
2.	Schmieranweisung Lubrication instruction	Seite 1- 12 Page
3.	Schmierplan Lubrication plan	
	Abwickelhaspel, Vorschubaggregat Decoiler, Feed unit	K-3- 061928
	Stanzaggregat Punching unit	K-3- 062229
	Scherenaggregat, und Auslauftransport Shear unit and runout conveyor belt	K-3- 062230
	Umlenkvorrichtung Diverting unit	K-3- 061973
	Positionierbänder Diverting unit - Positioning belts	K-3- 061974
	Stapelwagen Stacking car	K-3- 062450
4.	Hinweise zur Ölqualität/ Ölsorte Remarks concerning oil quality/ oil type	Seite 1 Page
	Schmiermittelspezifikation Lubrication material specification	4- 49480.0
	Hydrauliköl- Herstellervergleich Hydraulic oil	4- 49480.1
	Getriebeöl- Herstellervergleich Gear oil	4- 49480.2
	Fette- Herstellervergleich Greases	4- 49480.3
5.	SKF – LGWA 2 Schmierstoff für großen Temperaturbereich SKF - LGWA 2 wide temperature range grease	OP- 0474



Information
on
lubrication and maintenance

The machine / line must be lubricated and cleaned at regular intervals. Please see the following documents:

1. The lubrication instruction for this line
2. The lubrication plans for this line
3. Information on oil quality
4. Lubricant specification and lubricant comparison tables



Before starting any maintenance work, read and observe all safety regulations listed in chapter 1 !



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

General:

To make full use of the line capacity, regular maintenance and lubrication are indispensable.

Prior to commissioning check all gears, containers and tanks with regard to proper grease resp. oil fillings, if necessary, refill and lubricate all grease and oil lubricating points.

Lubrication is to be effected according to the enclosed lubrication plan and the lubrication instruction that describes all lubrication points.

Suitable lubricants are listed in the lubrication chart. These lubricants should be compared to works standards and can be replaced, if necessary, by similar and equivalent lubricants.

For trouble-free operation of the machine / plant a careful lubrication is essential to prevent expensive maintenance work. Special care must be taken to the proper lubrication of antifriction and slide bearings.

The lubrication intervals stated apply to normal operating conditions. In case of unfavourable operating conditions, it might be necessary to shorten these periods.

In addition, it is essential to clean the whole line at regular intervals, depending on the dust produced. Machine parts susceptible to corrosion should be covered with a suitable layer of lubricant.

As for the rest, please observe the separate inspection and maintenance instructions of the various manufacturers. (See Technical Documentation chapter 13 and 14)

Maintenance and cleaning of hydraulic and pneumatic filters also require special attention. These filters must be replaced in time.

Technical Documentation

Chapter 7

Lubrication instruction



Line: TBA / ME / EL 400 x 2000 PB / T

HEINRICH GEORG GMBH
MASCHINENFABRIK

Ident-Nr.: 4295-2 Anwe.doc Revision 0 07.11.07 Page 1 of 12

1.0 Decoiler, Feed unit	Com.: 4295-2-06
Lubrication plan no.: K-3- 061928	

No.	Description	Lubricant		Frequency	Remarks
		No.	Symb.		
1.1	decoiler drive spur gear motor RX 87 DV 132 M4, Co.. SEW	4		3000 h check at least twice a year, oil change after 10.000 h, max. after 3 years	approx 4,8 l ISO VG 220 see OP- 0013
1.2	decoiler drive braking tongue DH 30 P				see OP- 0188
1.3	decoiler mandrel drive	2		100 h clean and grease pinion and gear rim	thin grease film
1.4	decoiler expanding mandrels	3		100 h grease all wedge shoes and slideways	1-2 strokes with grease gun
1.5	decoiler mandrel support	2		500 h grease bearings positions	2-3 strokes with grease gun
1.6	decoiler slewing ring	3		500 h grease pinion and gear rim	2-3 strokes with grease gun see OP- 0089
1.7	decoiler - rotary drive planet gear P5-25 Co. Brinkmann	4		first filling after 300 h then every 1000 h	approx. 0,6 l, ISO VG 150 see OP- 0076
1.8	decoiler - rotary drive oil motor EPRM 80 C Fa. Jahns	6			see OP- 0168 (429)
1.9	shaft coupling WK 40-12x40 Co. Stüwe				see OP- 0132 in chapter 6
1.10	feed drive planet gear Alpha SP 140 Co. ALPHA	4		8.000 h – 10.000 h	approx.. 0,2 l synthetic gear oil ISO VG 68 see OP- 0043
1.11	material side guides all spindles, guide columns	1 3	 	100 h clean and oil resp. grease.	thin oil or grease film
1.12	motor guide adjustment	3		100 h	grease all bevel gears thin grease film

Lubrication instruction



Ident-Nr.: 4295-2 Anwe.doc	Revision 0 07.11.07	Page 2 of 12
----------------------------	---------------------	--------------

Com.: 4295-2-06

Lubrication plan no.: K-3- 061928

[illegible]

Technical Documentation

Chapter 7

Lubrication instruction

Line: TBA / ME / EL 400 x 2000 PB / T



HEINRICH GEORG GMBH
MASCHINENFABRIK

Ident-Nr.: 4295-2 Anwe.doc Revision 0 07.11.07 Page 3 of 12

2.0 Punching unit

Com.: 4295-2-06

Lubrication plan no.: K-3- 062229

No.	Description	Lubricant		Frequency	Remarks
		No.	Symb.		
1.1	motor guide adjustment spur gear motor R 17 DT 71 D4 Co. SEW	4		3000 h check at least twice a year, oil change after 10.000 h, max. after 3 years	approx. 0,6 l, ISO-VG 220 see OP- 0013
1.2	motor guide adjustment sliding hub co. KTR				see OP- 0104
1.3	motor guide adjustment bevel gears, toothed wheels	3		100 h	thin grease film
1.4	motor guide adjustment ball- and socket joints, multiple spline shafts, roller chain	3		500 h	thin grease film see OP- 0142
1.5	material side guides all spindles, guide pillars	1 3	 	100 h clean and oil resp. grease	thin oil resp. grease film
1.6	" V"-punch, ball guide bushing Co. Steinel	2		100 h	2- 3 strokes with grease gun see OP- 0175
1.7	V- punch - cross support angle gear WPLS 90-4 Co. Neugarts, M2	5		lifetime lubrication visual check every 5.000 h	synthetic gear lubricant see OP- 0191
	L- punch - cross support , longitudinal support planet gear PLS 90-3 Fa. Neugarts, M2	5		lifetime lubrication visual check every 5.000 h	synthetic gear lubricant see OP- 0191
1.8	cross support - longitudinal support V- and L- punch ball screw KGT 40x10 Co. Rexroth Star	2		1500 h	first filling approx. 12 g regreasing quantity: 6 g see OP - 0054
1.9	cross support - longitudinal support V- and L- punch linear guide size: 45 co. Rexroth Star	2		1500 h first greasing in 3 partial greasing regreasing in 2 partial greasing. After each greasing move the car. Check whether the grease film is visible on the rails	grease KP2K DIN 51825 first lubrication: $3 \times 4,7 \text{ cm}^3 = 14,1 \text{ cm}^3$ regreasing: $2 \times 2,35 \text{ cm}^3 = 4,7 \text{ cm}^3$ see OP- 0183
1.10	hole punching -die guide linear guides co. INA	2		1500 h	check lubrication, if necessary, cleaning and regreasing

Technical Documentation

Chapter 7

Lubrication instruction



Line: TBA / ME / EL 400 x 2000 PB / T

HEINRICH GEORG GMBH
MASCHINENFABRIK

Ident-Nr.: 4295-2 Anwe.doc Revision 0 07.11.07 Page 4 of 12

2.0 Punching unit	Com.: 4295-2-06
Lubrication plan no.: K-3- 062229	

No.	Description	Lubricant No.	Symb.	Frequency	Remarks
1.11	motor guide adjustment shaft coupling Co. Helical			maintenance free	see OP-0330
1.12	guides inside the punching unit linear unit SLT 20-10-P-A Co. Festo	2		500 h	1- 2 strokes with grease gun see OP- 0353
1.13	guides inside the punching unit ball screw KGT 25x5 co. Rexroth Star			1500 h	first filling approx. 2,8 g regreasing quantity: 1,4 g see OP – 0054
1.14	guides inside the punching unit linear guide size: 25 co. Rexroth Star	2		1500 h first greasing in 3 partial greasing regreasing in 2 partial greasing. After each greasing move the car. Check whether the grease film is visible on the rails	grease KP2K DIN 51825 first lubrication: $3 \times 1,4 \text{ cm}^3 = 4,2 \text{ cm}^3$ regreasing: $2 \times 0,7 \text{ cm}^3 = 1,4 \text{ cm}^3$ see OP- 0183
1.15	V-punch, L-punch cross support Longitudinal support shaft coupling WKL 20-12-22 Co. Stüwe				see OP- 0132 in chapter 6
1.16	V-punch, L-punch shaft coupling WK 20-12x24 Co. Stüwe				see OP- 0132 in chapter 6
1.17	eccentric bearing, connecting rod	2		1000 h	1-2 strokes lubricant LGWA 2 until grease is flowing out, clean lubrication points in advance, see OP- 0474

Technical Documentation

Chapter 7

Lubrication instruction



Line: TBA / ME / EL 400 x 2000 PB / T

HEINRICH GEORG GMBH
MASCHINENFABRIK

Ident-Nr.: 4295-2 Anwe.doc Revision 0 07.11.07 Page 5 of 12

3.0 Shear unit and runout conveyor belt

Com.: 4295-2-06

Lubrication plan no.: K-3- 062230

No.	Description	Lubricant		Frequency	Remarks
		No.	Symb.		
1.1	blade carriage shear I and II ball guide bushing co. Steinel	2		500 h	2- 3 strokes with grease gun see OP- 0304
1.2					
1.3	pressure rolls in front of and behind the shear - lifting	1		100 h oil all bearings	thin oil film
1.4	drive - transport units spur gear motor R 17 DT 80 N4, Co. SEW	4		3000 h check at least twice a year, oil change after 10.000 h, max. after 3 years	approx. 0,25 l, ISO-VG 220 see OP- 0013
1.5	material side guides shear adjustment gears, bevel gears, sprockets	3		100 h	thin grease film
1.6	material side guides all spindles, guide columns	1 3	 	100 h clean and oil resp. grease	thin grease or oil film
1.7					
1.8	runout conveyor belt - drive spur gear motor R 17 DT 80 N4, B6/270°, Co. SEW	4		3000 h check at least twice a year, oil change after 10.000 h, max. after 3 years	approx. 0,25 l, ISO-VG 220 see OP- 0013
1.9	pressure roll arrangement	1		100 h oil all bearings	thin oil film
1.10					
1.11	hydraulic equipment for the complete line				see separate Documentation chapter 9
1.12	pneumatic equipment for the complete line				see separate Documentation chapter 10

Technical Documentation

Chapter 7

Lubrication instruction



Line: TBA / ME / EL 400 x 2000 PB / T

HEINRICH GEORG GMBH
MASCHINENFABRIK

Ident-Nr.: 4295-2 Anwe.doc Revision 0 07.11.07 Page 6 of 12

3.0 Shear unit and runout conveyor belt

Com.: 4295-2-06

Lubrication plan no.: K-3- 062230

No.	Description	Lubricant		Frequency	Remarks
		No.	Symb.		
1.13	cross carriage ball screw KGT 32x5 Co. Star	2		1500 h	first filling approx. 4 g regreasing quantity: 2 g see OP - 0054
1.14	energy chain Co. Kabelschlepp			250 h	check with regard to wear and damage, if necessary exchange see OP-0306
1.15	timing belt drive	1		500 h	check with regard to damage see OP- 0086
1.16					
1.17					
1.18	cross support linear guide size: 45 Co. Rexroth Star	2		1500 h first greasing in 3 partial greasing regreasing in 2 partial greasing. After each greasing move the car. Check whether the grease film is visible on the rails	grease KP2K DIN 51825 first lubrication: $3 \times 4,7 \text{ cm}^3 = 14,1 \text{ cm}^3$ regreasing: $2 \times 2,35 \text{ cm}^3 = 4,7 \text{ cm}^3$ see OP- 0183
1.19	guide ball screw KGT 25x5			1500 h	first filling approx. 2,8 g regreasing quantity: 1,4 g see OP - 0054
1.20	guide linear guide size: 25 Fa. Rexroth Star	2		1500 h first greasing in 3 partial greasing regreasing in 2 partial greasing. After each greasing move the car. Check whether the grease film is visible on the rails	grease KP2K DIN 51825 first lubrication: $3 \times 1,4 \text{ cm}^3 = 4,2 \text{ cm}^3$ regreasing: $2 \times 0,7 \text{ cm}^3 = 1,4 \text{ cm}^3$ see OP- 0183
1.21	drive Transport unit clamping elements ML 5000 / B 20x47 , ML 5000 / B 22x47 Co. Maschinenlager				see OP- 0182 in chapter 6
1.22	eccentric bearing, connecting rod	2		1000 h	1-2 strokes lubricant LGWA 2 until grease is flowing out, clean lubrication points in advance, see OP- 0474

Technical Documentation

Chapter 7

Lubrication instruction



Line: TBA / ME / EL 400 x 2000 PB / T

HEINRICH GEORG GMBH
MASCHINENFABRIK

Ident-Nr.: 4295-2 Anwe.doc Revision 0 07.11.07 Page 7 of 12

3.0 Shear unit and runout conveyor belt

Com.: 4295-2-06

Lubrication plan no.: K-3- 062230

No.	Description	Lubricant		Frequency	Remarks
		No.	Symb.		
1.23	Cross support spur gear motor R 17 DT 71DN4, Co. SEW	4		3000 h check at least twice a year, oil change after 10.000 h, max. after 3 years	approx. 0,25 l, ISO-VG 220 see OP- 0013
1.24	runout conveyor belt conveyor belt Transilon Co. Siegling				see OP- 0156
1.25	transport unit grease nipple	2		2000 h	1-2 strokes with grease gun
1.26	transport unit oil level check	1		500 h check oil level replenish oil as necessary marking at oil stick = max. filling quantity	max. oil quantity approx. 0,4 liter
1.27					
1.28					
1.29					
1.30					
1.31					
1.32					
1.33					

Technical Documentation

Chapter 7

Lubrication instruction



Line: TBA / ME / EL 400 x 2000 PB / T

HEINRICH GEORG GMBH
MASCHINENFABRIK

Ident-Nr.: 4295-2 Anwe.doc	Revision 0 07.11.07	Page 8 of 12
----------------------------	---------------------	--------------

4.0	Diverting unit	Com.: 4295-2-06
4.1	Diverting unit	Lubrication plan no.: K-3- 061973

No.	Description	Lubricant		Frequency	Remarks
		No.	Symb.		
1.1	diverting unit linear guide size: 45 co. Rexroth Star	2		1500 h first greasing in 3 partial greasing regreasing in 2 partial greasing. After each greasing move the car. Check whether the grease film is visible on the rails	grease KP2K DIN 51825 first lubrication: $3 \times 4,7 \text{ cm}^3 = 14,1 \text{ cm}^3$ regreasing $2 \times 2,35 \text{ cm}^3 = 4,7 \text{ cm}^3$ see OP- 0183
1.2	height adjustment - diverting unit spindle lifting element SHZ 25 with ball screw,, co. ZIMM	2		100 h spindle clean and grease every 1.500 h (1y.)	spindle: thin grease film, see OP- 0216
		2		500 h lifting gear clean and refill every 1.500 h (1y.)	gear: 5-6 strokes with grease gun, see OP- 0216
1.3	height adjustment - diverting unit guide pillars	1		100 h clean and oil	thin oil film
1.4	separating wedge pedestal bearing - slideways	2		100 h	clean and slightly grease
1.5	conveyor belts for diverting unit spur gear motor R 17 DT 80 N4, B5, Co. SEW	4		3000 h check at least twice a year, oil change after 10.000 h, max. after 3 years	approx. 0,6 l, ISO-VG 220 see OP- 0013
1.6	Conveyor belt endless Co. Habasit				see OP- 0326
1.7	motor guide adjustment spur gear motor R 17 DT 71N4, B8, Co. SEW	4		3000 h check at least twice a year, oil change after 10.000 h, max. after 3 years	approx. 0,6 l, ISO-VG 220 see OP- 0013
1.8					
1.9	guide adjustment sprocket wheels, roller chain	3		100 h	thin grease film
1.10	guide adjustment ball screw KGT 16x5 co. Star	2		1500 h	first filling approx.. 1,2 g regreasing quantity: 0,6 g see OP - 0054

Technical Documentation

Chapter 7

Lubrication instruction



Line: TBA / ME / EL 400 x 2000 PB / T

HEINRICH GEORG GMBH
MASCHINENFABRIK

Ident-Nr.: 4295-2 Anwe.doc Revision 0 07.11.07 Page 9 of 12

4.0 Diverting unit	Com.: 4295-2-06
4.1 Diverting unit	Lubrication plan no.: K-3- 061973

No.	Description	Lubricant		Frequency	Remarks
		No.	Symb.		
1.11	Energy chain Co. IGUS			250 h	check with regard to wear and damage, if necessary exchange see OP-0436
1.12	lifting bars high holding bars	2		250 h	clean and slightly grease
1.13	linear bushings co. Rexroth Star	2		500 h	2- 3 strokes with grease gun see OP- 0175
1.14	guide ball screw KGT 25x5 Co. Rexroth Star	2		1500 h	first filling approx 2,8 g regreasing quantity 1,4 g see OP – 0054
1.15	suspension linear guide size: 20 Co. Rexroth Star	2		1500 h first greasing in 3 partial greasing regreasing in 2 partial greasing. After each greasing move the car. Check whether the grease film is visible on the rails	grease KP2K DIN 51825 first lubrication: $3 \times 0,7 \text{ cm}^3 = 2,1 \text{ cm}^3$ regreasing $2 \times 0,35 \text{ cm}^3 = 0,7 \text{ cm}^3$ see OP- 0183
1.16	shaft coupling Co. Helical			maintenance free	see OP-0330
1.17	ML 3000 / 20 x 28 Co. Maschinenlager				see OP- 0182 in chapter 6
1.18	guide Linear guide Size: 35 Co. Rexroth Star	2		1500 h first greasing in 3 partial greasing regreasing in 2 partial greasing. After each greasing move the car. Check whether the grease film is visible on the rails	grease KP2K DIN 51825 first lubrication: $3 \times 2,2 \text{ cm}^3 = 6,6 \text{ cm}^3$ regreasing: $2 \times 1,1 \text{ cm}^3 = 2,2 \text{ cm}^3$ see OP- 0183

Technical Documentation

Chapter 7

Lubrication instruction



Line: TBA / ME / EL 400 x 2000 PB / T

HEINRICH GEORG GMBH
MASCHINENFABRIK

Ident-Nr.: 4295-2 Anwe.doc Revision 0 07.11.07 Page 10 of 12

4.0	Diverting unit		Com.: 4295-2-06
4.2	Positioning belts	Lubrication plan no.: K-3- 061974	

No.	Description	Lubricant		Frequency	Remarks
		No.	Symb.		
1.1	positioning belts planet gear PLS 115-4 Co. Neugarts	5		lifetime lubrication visual check every 5.000 h	synthetic gear lubricant see OP- 0191
1.2	positioning belts shaft coupling Smartflex co. Mayr				see OP- 0308
1.3	conveyor belt Habasit				see OP- 0326
1.4	linear bushings co. Star	2		500 h	2- 3 strokes with grease gun see OP- 0175
1.5	guide adjustment spur gear motor R 17 DT 71N4, B8, Co. SEW	4		3000 h check at least twice a year, oil change after 10.000 h, max. after 3 years	approx. 0,6 l, ISO-VG 220 see OP- 0013
1.6	bevel gears, toothed wheels	3		100 h	thin grease film
1.7	stacking pin cylinder DZF 25-90 P-A	2		100 h	clean and slightly grease see OP- 0366
1.8	stacking pin arrangement ball guide bushing, co. STAR	2		100 h	1-2 strokes with grease gun see OP- 00175
1.9	Strip side guide – diverting unit. linear guide size: 35 co. Rexroth Star	2		1500 h first greasing in 3 partial greasing regreasing in 2 partial greasing. After each greasing move the car. Check whether the grease film is visible on the rails	grease KP2K DIN 51825 first lubrication: $3 \times 2,2 \text{ cm}^3 = 6,6 \text{ cm}^3$ regreasing $2 \times 1,1 \text{ cm}^3 = 2,2 \text{ cm}^3$ see OP- 0183
1.10	strip side guide – diverting unit. Ball screw KGT 25x5 co. Rexroth Star	2		1500 h	first filling approx. 2,8 g regreasing quantity 1,4 g see OP – 0054
1.11	strip side guide – diverting unit. lever rods	2		100 h check for ease of moment	clean and grease

Lubrication instruction



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Page 11 of 12

4.0	Diverting unit		Com.: 4295-2-06
4.2	Positioning belts	Lubrication plan no.: K-3- 061974	

[illegible]

Technical Documentation

Chapter 7

Lubrication instruction

Line: TBA / ME / EL 400 x 2000 PB / T



HEINRICH GEORG GMBH
MASCHINENFABRIK

Ident-Nr.: 4295-2 Anwe.doc Revision 0 07.11.07 Page 12 of 12

5.0 Stacking car	Com.: 4295-2-06
Lubrication plan no.: K-3- 062231	

No.	Description	Lubricant		Frequency	Remarks
		No.	Symb.		
1.1	stacker car - traversing drive wheel block, Co. Demag	2		lifetime grease lubrication	see OP- 0060
1.2					
1.3	Energy chain Co. Kabelschlepp			250 h	check with regard to wear and damage, if necessary exchange
1.4	rails			50 h	clean, check with regard to bare objects, if necessary remove them
1.5	compact gear braking unit AF 08 ZBA 90 A4 co. Demag	4		At the latest Brake check after 3000 operating hours Every 10000 hours inspect the motor and clean cooling air ways	approx. 1,5 l ISO VG 220 see OP- 0328
1.6					
1.7					
1.8					
1.9					
1.10					
1.11					
1.12					

Es werden die Schmierstellen mit
nachfolgenden Nummern und
Frequenzen beschriftet und
sind für die Wartung zu
beachten.

5000 h -

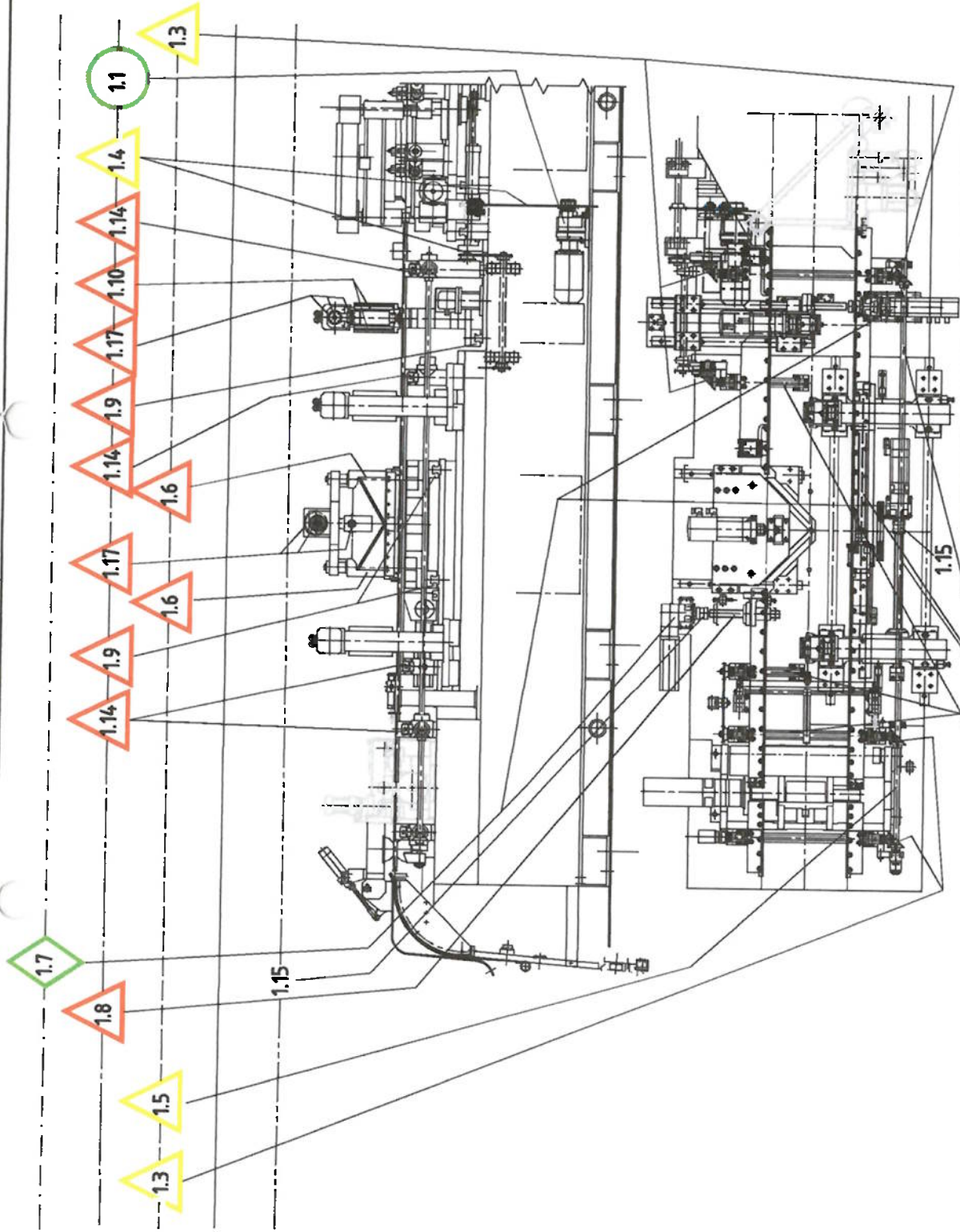
500 - 3000 h

100 - 250 h

wartungsfrei
maintenance free

100 - 250 h

500 - 3000 h



Identnummer drawing-no. K-3-062229		Meßst. scale	
K-3-062229			
Gez. 19.05.2005	Zopf	Druck. date	Index
Gepr. 19.05.2005	Zopf	Art.-Nr.	
HEINRICH GEORG GMBH MASCHINENFABRIK D - 57223 KREUZTAL		Schmierplan- Stanzaggregat Lubrication schedule - notching unit	

5000 h

500 - 3000 h

100 - 250 h

wartungsfrei
 maintenance free

1.4

1.15

1.1

1.1

1.1

1.22

1.3

1.9

1.12

1.11

1.8

1.23

1.19

1.20

1.13

500 - 3000 h

1.20

1.19

1.18

1.25

1.26

1.25

HEINRICH GEORG GMBH

MASCHINENFABRIK
 D - 57223 KREUZTAL



Bezeichnung
 designation

Bez. 03.08.2005

Exp. 07.12.2005

Art.-Nr.

Masst. state

Zeichn.

Zeichn.

Blatt

von

Zeichnungsnummer drawing no. k-3-062230-01-ESP

K - 3-062230

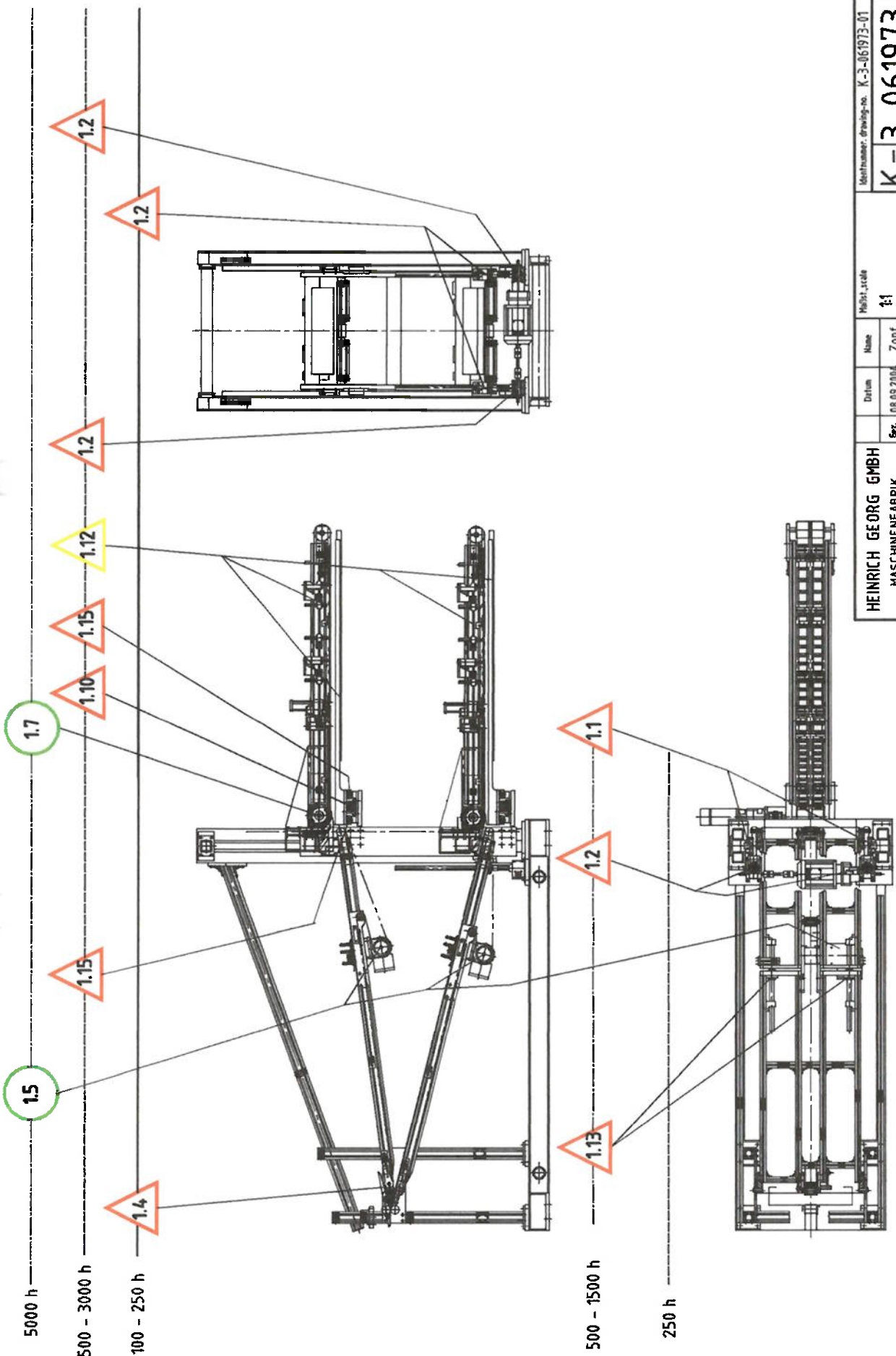
Formel

Blatt

von

Schmierplan - Scherenaggregat
 Tabla de lubrication - Grupo de cizallamiento

Eintrag des Bauteils in die Bauteilliste
 1. Bauteilnummer und Bauteilname
 2. Zeichnungsnummer und Blattnummer
 3. Maßstab und Einheit

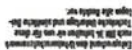


HEINRICH GEORG GMBH
 MASCHINENFABRIK
 D - 57223 KREUZTAL



Bezeichnung	Art.-Nr.	Blatt	von	Index
Schmierplan - Umlenkvorrichtung	Zopf	1	1	1
Lubrication - plan diverter unit	Zopf	1	1	1
Zeichnungsnummer	Blatt	von	Index	
K-3-061973-01	K-3-061973	1	1	1

Schmierplan - Umlenkvorrichtung
 Lubrication - plan diverter unit



HEINRICH GEORG GMBH
MASCHINENFABRIK
D - 57273 KREUZTAL



	Date	Name	Multiscale	Kontinuum drawing no.	K-3-061974
Bes.	08.09.2004	Zopf	1:1		
Erg.	08.09.2008	Zopf		K-3-061974	
			Art.-Nr.	From date	To date
				from	to
					Index

Schmierplan Positionierhänder zur Stapelenebene
lubrication plan - positioning belts

5000 h -

500 - 3000 h

100 - 250 h

wartungsfrei

maintenance free

1.5

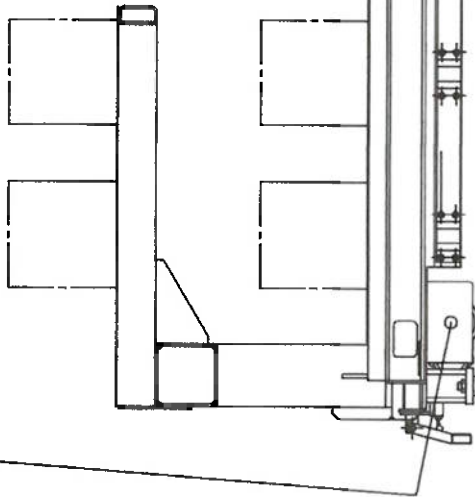
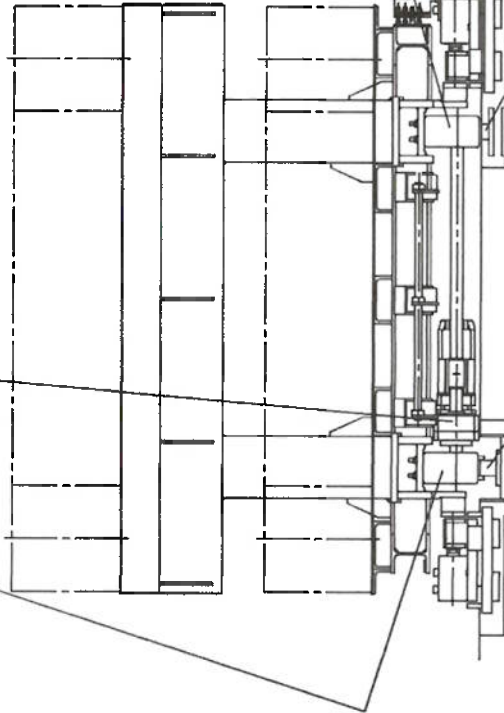
1.1

1.1

1.1

1.4

1.1



HEINRICH GEORG GMBH
 MASCHINENFABRIK
 D - 57223 KREUZTAL



Meßnummer: drawing-no. K-3-062450

K-3-062450

Meßst. stunde

Datum

Gez. 25.10.2005

Gepr. 25.10.2005

Meßst. stunde

Datum

Gez. 25.10.2005

Gepr. 25.10.2005

Meßst. stunde

Datum

Gez. 25.10.2005

Gepr. 25.10.2005

Meßst. stunde

Datum

Gez. 25.10.2005

Gepr. 25.10.2005

Schmierplan - Stapelwagen
 Lubrication schedule - stacking car



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

General remarks

concerning

OIL QUALITY / OIL TYPE

Please take notice of the attached lubrication material specification. This specification includes general information on oil and grease qualities.

However, manufacturers of gears and gear motors have stipulated individual oil and grease qualities for their products. Please observe the corresponding special instructions.

This is generally applicable, i. e. the instructions of the respective manufacturer are valid also for other units.

Please take notice of the information given on manufacturers' type plates.

Schmierstoff Matière lubrificante Lubricating material		Kennzeichnung nach: Désignation selon: Designation as per:			Schmiermittel- Spezifikation Spécification des matières de lubrification Lubrication material specification	
Nr. No.	Zeichen - Signe Sign		Werksnorm	Beschreibung - Description - Description		
1	rot- rouge- red 	DIN 51517-1 DIN 51517-2	CG 220	Mineralöl mit Zusätzen zur Verringerung des Verschleißes und zur Vermeidung von Stick- Slip. Huile minérale avec additifs pour réduction de l'usage et pour éviter le Stick- Slip. Mineral oil with additifs for reduction of wear and to avoid Stick- Slip.		
	Walzlagerfett Graisse de roulements à galets Antifricition bearing grease 	DIN 51825	KP 2 K	Schmierfett auf Lithiumbasis mit EP- Zusätzen. Graisse de lubrification à base lithium avec additifs EP. Lubrication grease on lithium basis with EP additifs.		
3	gelb-jaune-yellow 		K 2 K	Kalkseifenfett wasserabweisend. Graisse de savon de chaux résistent à l'eau. Lime soap grease water resistant.		
	Getriebeöl (mineralisch) Huile d'engrenage Gear oil 	DIN 51517-3	CL, CLP 46, 68, 100, 150, 220, 460, 680	Getriebeöl mit EP- Zusätzen für schwere Bedingungen. Huiles d'engrenage avec additifs EP pour conditions difficiles. Gear oil with EP additifs for green difficult condition.		
4	Getriebeöl (synthetisch) Huile d'engrenage (synthétique) Gear oil (synthetic) 			Synthetische Getriebschmieröle für extreme Belastungen, meistens mit verschleißhemmenden Zusätzen. NICHT MIT MINERALISCHEN ÖLEN MISCHEN! Huile lubrifiante d'engrenage synthétique pour des charges extrêmes; normalement l'huile contient des additifs ralentissants à l'usure. NE PAS MELANGER DE L'HUILE MINÉRALE. Synthetic gear oil for extreme stress, mostly with wear retarding additifs. DO NOT MIX WITH MINERAL OIL		
	Getriebeöfett Graesse d'engrenage Gear grease 	DIN 51826	G 0 F	Natriumverseiftes Getriebeöfett halbflüssig oder Getriebeherstellerangaben. Graisse d'engrenage Sodium-saponifié semi-fluide, ou selon instructions du producteur d'engrenage Sodium saponified gear grease semi-fluid, or gear manufacturer's instructions.		
5	Getriebeöfett (synthetisch) Graisse d'engrenage (synthétique) Gear grease (synthetic) 			Synthetische Getriebschmieröfette für extreme Belastungen, meistens mit verschleißhemmenden Zusätzen. NICHT MIT MINERALISCHEN FETTEN MISCHEN! Graisse lubrifiante d'engrenage synthétique pour des charges extrêmes; normalement l'huile contient des additifs ralentissants à l'usure. NE PAS MELANGER DE L'GRAISSE MINÉRALE. Synthetic gear grease for extreme stress, mostly with wear retarding additifs. DO NOT MIX WITH MINERAL GRAISSE		
	Hochleistungs- Hydrauliköl Huile hydraulique de haute performance. High performance hydraulic oil 	DIN 51514-1 DIN 51514-2 HLP ... siehe Hydraulik-plan	voir plan Hydraulique see Hydraulic plant	Legiertes Mineralöl, das der Gruppe HLP nach DIN 51524- 2 oder der API Klassifikation SC, SD, SE (most severe) entspricht. Das wesentliche Merkmal ist ein ausreichender Anteil verschleißhemmender Zusätze. Huile minérale avec additifs selon groupe HLP du DIN 51524- 2 ou selon classification API SC, SD, SE (most severe). Caractéristiques importantes sont assez d'additifs réduisant l'usage. Mineral oil with additives as per group HLP of DIN 51524- 2 or as per API classification SC, SD, SE (most severe). Important characteristic is a sufficient percentage of wear reducing additifs.		
Viskositätskennzahl nach DIN 51517 Bezugstemperatur 40°C. Die Beschreibung der einzelnen Eingriffstellen ist der Schmieranweisung zu entnehmen. Chiffre de désignation selon DIN 51517 température de référence 40°C. La description des parties d'engrenements individuels se dans les directions de lubrification.						

Hydrauliköl - Hydraulic Oil - Huiles hydrauliques HLP

4- 49480- 1

DIN 51524 - 2

Symbol nach DIN 51502

HLP

VG	Agip	Aral	BP	Castrol	Elf	Esso	Fina	Fuchs	Mobil	Shell	Texaco
10	Oso 10	Vitam DE 10 Vitam GF 10	Energol HLP 10	Hyspin AWS 10	----- elf	Nuto H 10	Hydran 10	Renolin B 3 Renolin MR 3	DTE 21	Tellus 10	Rondo Oil HDA-10
22	Oso 22	Vitam DE 22 Vitam GF 22	Energol HLP 22 Energol HLP-D 22	Hyspin AWS 22	Olina 22 Hydrelf 22	Nuto H 22	Hydran 22	Renolin B 5 Renolin MR 5	DTE 22 Hydr.-Öl HLPD 22	Tellus 22 Hydrol DO 22	Rondo Oil HDA- 22 Alcor Öl DD 22
32	Oso 32	Vitam DE 32 Vitam GF 32	Energol HLP 32 Energol HLP-D 32	Hyspin AWS 32	Olina 32	Nuto H 32 HLPD- Öl 32	Hydran 32 Hydrauliköl D 3011-32	Renolin B 10 Renolin MR 10	DTE 24 Hydr.-Öl Light Hydr.-Öl HLPD 32	Tellus 32 Hydrol DO 32	Rondo Oil HDA- 32 Alcor Öl DD 32
46	Oso 46	Vitam DE 46 Vitam GF 46	Energol HLP 46 Energol HLP-D 46	Hyspin AWS 46	Olina 46 Hydrelf 46	Nuto H 46 HLPD- Öl 46	Hydran 46 Hydrauliköl D 3011-46	Renolin B 15 Renolin MR 15	DTE 25 Hydr.-Öl Medium Hydr.-Öl HLPD 46	Tellus 46 Hydrol DO 46	Rondo Oil HDB- 46 Hydr.-Öl HDW 46 Alcor Öl DD 46
68	Oso 68	Vitam DE 68 Vitam GF 68	Energol HLP 68 Energol HLP-D 68	Hyspin AWS 68	Olina 68 Hydrelf 68	Nuto H 68	Hydran 68 Hydrauliköl D 3011-68	Renolin B 20 Renolin MR 20	DTE 26 Hydr.-Öl Heavy Medium	Tellus 68 Hydrol DO 68	Rondo Oil HDC- 68
100	Oso 100	Vitam DE 100 Vitam GF 100	Energol HLP 100 Energol HLP-D 100	Hyspin AWS 100	Olina 100	Nuto H 100	Hydran 10	Renolin B 30 Renolin MR 30	DTE 27 Hydr.-Öl Heavy	Tellus 100 Hydrol DO 100	Rondo Oil HDE-100

Getriebeöl - Gear Oil - Huiles pour engrenages CL, CLP

Getriebeöl - Gear Oil - Huiles pour engrenages CL

4- 49480- 2

Bez. nach Design. acc. design. selon DIN 51517	Visk. Visc. 40° C mm ² /s (cSt)	Visk. Visc. 50° C mm ² /s (cSt)	Aral 	BP 	Castrol 	Esso 	Mobil 	Shell 	Texaco 
CL 32	32	25	Aral Vitam GF 32	BP Energol HL 32, BP Energol THB 32	CASTROL HYSPIN VG 32	NUTO H 32	Mobil DTE Oil Light, Mobil Vactra Oil Light	Shell Tellus Oel C 32	Regal Oil R&O 32, Rando Oil 32
CL 46	46	36	Aral Vitam GF 68	BP Energol HL 46, BP Energol THB 46	CASTROL HYSPIN VG 46	NUTO H 46	Mobil DTE Oil Medium, Mobil Vactra Oil Medium	Shell Tellus Oel C 46, Shell Tellus Oel 46	Regal Oil R&O 46, Rando Oil 46
CL 68	68	49	Aral Degol TU 68	BP Energol RC 68, BP Energol THB 68	CASTROL HYSPIN VG 68	NUTO H 68	Mobil DTE Oil Heavy Medium, Mobil Vactra Oil Heavy	Shell Tellus Oel C 68	Regal Oil R&O 32, Rando Oil 32
CL 100	100	68	Aral Degol TU 100	BP Energol RC 100, BP Energol THB 100	CASTROL HYSPIN VG 100	NUTO H 100	Mobil DTE Oil Heavy, Mobil Vactra Oil Heavy	Shell Tellus Oel C 100	Regal Oil R&O 68, Rando Oil 68
CL 150	150	92	Aral Degol TU 150	BP Energol RC 150, BP Energol THB 150	CASTROL HYSPIN VG 150	NUTO H 150	Mobil DTE Oil Extra Heavy, Mobil Vactra Oil Extra	Shell Tellus Oel C 150	Regal Oil R&O 100, Rando Oil 100
CL 220	220	114	Aral Degol TU 220	BP Energol IC 220	CASTROL HYSPIN VG 220	NUTO H 220	Mobil DTE Oil BB	Shell Tellus Oel C 220	Regal Oil R&O 220, Rando Oil 220
CL 460	460	225	Aral Degol TU 460	BP Energol THB 460, BP Energol IC 460	CASTROL HYSPIN VG 460	NUTO H 460	Mobil DTE Oil HH	Shell Tellus Oel C 460, Shell Tellus Oel 460	Regal Oil HD 460 Omnitus P-460

Getriebeöl - Gear Oil - Huiles pour engrenages CLP

CLP 46	46	36	Aral Degol BG 46, Aral Degol BMB 46	BP Energol GR-XP 46	CASTROL HYSPIN VG 46, CASTROL ALPHA SP 46	NUTO H 46	Mobil DTE 25, Mobil DTE 15	Shell Tellus Oel 46	Rando Oil B-46
CLP 68	68	49	Aral Degol BG 68	BP Energol GR-XP 68	CASTROL HYSPIN VG 68, CASTROL ALPHA SP 68	SPARTAN EP 68	Mobilgear 626, Mobil Compound AA	Shell Omala Oel 68	Meropa 68, Rando Oil HD C-68
CLP 100	100	68	Aral Degol BG 100, Aral Degol BMB 100	BP Energol GR-XP 100	CASTROL HYSPIN VG 100, CASTROL ALPHA SP 100	SPARTAN EP 100	Mobilgear 627, Mobil Compound BB	Shell Omala Oel 100	Meropa 100, Rando Oil HD E-100
CLP 220	220	114	Aral Degol BG 220, Aral Degol BMB 220	BP Energol GR-XP 220	CASTROL HYSPIN VG 220, CASTROL ALPHA SP 220	SPARTAN EP 220	Mobilgear 630, Mobil Compound EP	Shell Omala Oel 220	Meropa 220, Universal Gear Lubricant EP SAE 85 W/90
CLP 460	460	225	Aral Degol BG 460, Aral Degol BMB 460	BP Energol GR-XP 460	CASTROL HYSPIN VG 460, CASTROL ALPHA SP 460	SPARTAN EP 460	Mobilgear 634, Mobil Compound FF	Shell Omala Oel 460	Meropa 220, Universal Gear Lubricant EP SAE 140
CLP 680	680	324	Aral Degol BG 680, Aral Degol BMB 680	BP Energol GR-XP 680	CASTROL HYSPIN VG 460, CASTROL ALPHA SP 460	SPARTAN 680	Mobilgear 636, Mobil Compound GG	Shell Omala Oel 680	Meropa 680

Fette - Greases, Graises

4- 49480-3

Fett Nr. Grease No.	Bez. nach Design. acc. design. selon DIN 51502, DIN 51825	Pene- tration Pene- tration Péné- -tration	Seifen- basis Soap base Base de savon	Einsatzort	Aral	BP	Castrol	Esso	Mobil	Shell	Texaco
D	K 2 r	265-295	Gel	Wälzlager Roller bearing Paliers à roulement Hochtemperaturfett High temperature grease Graisse pour températures élevées	Aral Aralub HTR 2	BP Energrase HTB 2	Castrol Spheerol BNS	UNIREX N 3	Mobiltemp SHC 100, Mobiltemp SHC 32, Mobiltemp 78	Shell Darina Fett 2	Thermatex EP 2 Texando FO 20
B	K 2 r	265-295	Li	Gleit- und Wälzlager Slide and roller bearing Paliers lisses et à roulement (Universalfett) (Gaisse universelle)	Aral Aralub HL 2	BP Energrase LS 2	Castrol Spheerol AP 2	BEACON 2	Mobilux 2	Shell Alvania Fett R 2	Multifak 2, Multifak 20
F	K 3 r	220-250	Li		Aral Aralub HL 3	BP Energrase LS 3	Castrol Spheerol AP 3	BEACON 3	Mobilux 3	Shell Alvania Fett R 3	Regal Starfak Premium 3, Multifak 30
E	KF 2 k	265-295	Li + Mo S ₂	Gleitlager, Gelenke Slide bearings, linkages Paliers lisses, embiellages	Aral Aralub HL 2	BP Mehrzweckfett L 21 M	Castrol Spheerol LMM CASTROL MS 3 Castrol Spheerol EPL 2	ESSO Mehr- zweckfett M, ESSO MP GREASE (MOLY) BEACON EP 2	Mobilgrease Spezial Mobilux EP 2	Shell Rentinax AM Fett 2	Molytex Grease EP 2 Multifak EP 2
C	KP 2 k	265-295	Li + EP	Gleit- und Wälzlager hochbelastet Slide and roller bearings at high load Paliers lisses et à roulement à charge pleine British Timken zugelassen British Timken approved British Timken approuvé	Aral Aralub HLP 2	BP Energrase LS-EP 2					
G	M 1 b	310-340	Ca	Gleitlager, Gleitstellen, Gelenke Slide bearings, slide faces, linkages Paliers lisses, surfaces de glissement, embiellages	Aral Aralub FM 2	BP Abschmierfett C 1, BP Energrase PR 1	CASTROL LZV	CAZAR K 1	Sovarex Grease L 1	Shell Unedo Fett 2 Shell Unedo Grease 1	Novatex Grease EP 1, Cup Grease 1, Glissando FK 100
H	M 2 e	265-295	Ca	Gleitlager, Gleitstellen, Gelenke, niedrig belastete Wälzlager Slide bearings, slide faces, linkages, roller bearings at low load Paliers lisses, surfaces de glissement, embiellages, paliers à roulement à charge bas	Aral Aralub FM 2	BP Energrase PR 2	CASTROL LZV	CAZAR K 2	Sovarex Grease L 2	Shell Rhodina Fett 2	Novatex Grease 2, Cup Grease 2
A	G 0 f	355-385	Na	Getriebemotore Geared motors Moteurs à engrenages	Aral Aralub FDP 00	BP Energrase HT 0, BP Energrase HT-EP 00 BP Energrase FG 00-EP	CASTROL CLS-Grease	FIBRAX EP 370, FIBRAX 370	Gargoyle Fett 1200 W	Shell Spezial- Getriebefett H, Shell Simnia Grease 0	Marfak 0, Glissando FG 30
Erklärung: Na = Natrium verseift - nicht wasserbeständig Li = Lithium - wasserbeständig Ca = Calcium - voll wasserbeständig				Comment: Na = sodium soap - not water resistant Li = lithium soap - water resistant Ca = calcium soap - full water resistant		Commentaire: Na = sodium savon - non résistance d' eau Li = lithium savon - résistance d' eau Ca = calcium savon - résistance d' eau garantie					



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

LGWA 2 wide temperature range grease

Type

SKF¹

Contents²

Technical data

Seite
2

Safety data sheet

3 - 6

¹

² Source: SKF Maintenance Products

SKF wide temperature range bearing grease LGWA 2

LGWA 2 is a premium quality mineral oil based lithium complex grease. LGWA 2 has such properties that it can be recommended for a wide range of industrial and automotive applications.



This grease offers:

- Excellent lubrication at peak temperatures up to 220 °C (428 °F) for short periods
- Protection of wheel bearings operating under severe conditions
- Effective lubrication in wet conditions
- Good water and corrosion resistance
- Excellent lubrication under high loads and low speeds

Available pack sizes

SYSTEM 24	35 g tube	200 g tube	420 ml cartridge	1 kg can	5 kg can	50 kg drum	180 kg drum
-----------	--------------	---------------	---------------------	-------------	-------------	---------------	----------------

Technical data

DIN 51825 code	: K2N-30	
NLGI consistency class	: 2	i
Soap type	: lithium complex	i
Colour	: amber	
Base oil type	: mineral	
Operating temperature range, °C (°F)	: -30 to 140 (-22 to 284)	
Dropping point DIN ISO 2176, °C (°F)	: >250 (482)	i
Base oil viscosity		i
40 °C, mm ² /s	: 185	
100 °C, mm ² /s	: 15	
Penetration DIN ISO 2137		i
60 strokes, 10 ⁻¹ mm	: 265-295	
100,000 strokes, 10 ⁻¹ mm	: +50 max. (325 max.)	
Mechanical stability		i
Roll stability, 50 hours at 80 °C, change 10 ⁻¹ mm	: +50 max. change	
Roll stability, 72 hours at 100 °C, change 10 ⁻¹ mm	: -	
SKF V2F test	: 'M'	
Corrosion protection		i
SKF Emcor: - standard ISO 11007	: 0 - 0	
- water washout test	: 0 - 0	
- salt water test (100% seawater)	: -	
Water resistance		i
DIN 51 807/1, 3 hrs at 90 °C	: 1 max.	
Oil separation		i
DIN 51 817, 7 days at 40 °C, static, %	: 1 - 5	
Lubricating ability		i
SKF R2F, running test B	: pass at 100 °C (212 °F)	
Copper corrosion		
DIN 51 811, 100 °C	: 2 max. (110 °C/230 °F)	
Rolling bearing grease life		i
SKF R0F test L50 life at 10 000 rpm, hrs	: -	
EP performance		i
Wear scar, DIN 51350/5, 1400 N, mm	: 1,6 max.	
4 ball test, welding load, DIN 51350/4	: 2600 min.	
Designation	: LGWA 2/(pack size)	

More information

Safety data sheet



Print this page



SAFETY DATA SHEET

MATERIAL SAFETY DATA SHEET

LGWA 2

Last changed: 2003-08-21

1. IDENTIFICATION OF SUBSTANCE AND COMPANY ☐

TRADE NAME LGWA 2
APPLICATION SKF wide temperature range grease

Producer/importer SKF Maintenance Products
Address Postbus 1008
Postal code NL-3430 BA Nieuwegein
Country The Netherlands
Telephone +31 30 6307200
Fax +31 30 6307205
Contact pers. Ebbe Malmstedt, ebbe.malmstedt@skf.com

2. COMPOSITION/INFORMATION ON INGREDIENTS ☐

No	Ingredient name	EC No.	CAS No.	Conc. (wt%)	Classification
1	Baseoil - unspecified			50-100	
2	Lithium saponified fattyacids	298-817-6	91001-47-7		
3	Zink dialkyldithiophosphate	272-028-3	68649-42-3	<1	XiN,38-41-51/53
4	Alkylated diphenylamines	270-128-1	68411-46-1	<1	N,51/53
Legend: T+=Very toxic, T=Toxic, C=Corrosive, Xn=Harmful, Xi=Irritant, E=Explosive, O=Oxidising, F+=Extremely flammable, F=Highly flammable, N=Dangerous for the environment					

INGREDIENT COMMENTS

COMMENTS ON COMPOSITION

Baseoil - unspecified: DMSO-content < 3% DMSO-Content < 3%

3. HAZARDS IDENTIFICATION ☐

HEALTH

May be irritating. May cause redness, blisters and rash on protracted or repeated exposure.

ENVIRONMENT

The product contains substances that are considered to be harmful to the environment.

4. FIRST AID MEASURES ☐

INHALATION

Move the exposed person to fresh air at once. Rest. In the event of irritation in the respiratory tract, breathing difficulties, headache, tiredness, nausea or unconsciousness, seek immediate medical attention. Show this product information leaflet, if possible.

SKIN CONTACT

Wash the skin immediately with soap and water. Use appropriate hand lotion to prevent defatting and cracking of skin. Contact physician if irritation persists. Show this product information leaflet, if possible.

EYE CONTACT

Rinse immediately with plenty of water. Remove contact lenses. Contact physician if irritation persists. Show this product information leaflet, if possible.

INGESTION

Do not induce vomiting. If vomiting occurs, the head should be kept low so that stomach vomit doesn't enter the lungs. Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Contact physician if symptoms appears. Show this product information leaflet, if possible.

5. FIRE-FIGHTING MEASURES ☐

EXTINGUISHING MEDIA

Can be extinguished with water, powder, foam, sand or carbon dioxide.

IMPROPER EXTINGUISHING MEDIA

Do not use a direct water jet that could spread the fire.

FIRE AND EXPLOSION HAZARDS

Fire causes formation of toxic gases.



SAFETY DATA SHEET

MATERIAL SAFETY DATA SHEET

LGWA 2

Last changed: 2003-08-21

PROTECTIVE EQUIPMENT FOR FIRE FIGHTERS

Put on protective equipment prior to entering danger zone.

6. ACCIDENTAL RELEASE MEASURES



PERSONAL PRECAUTIONS

Avoid contact with the skin, eyes and respiratory tract. Bear in mind the risk of slipping. Spillage may cause slipperiness.

ENVIRONMENTAL PRECAUTIONS

Prevent discharge into the sewage system or the immediate environment.

METHODS FOR CLEANING UP

Absorb in inert material (sand, vermiculite, etc.). Clean with a suitable cleaning agent.

7. HANDLING AND STORAGE



HANDLING ADVICE

Avoid all unnecessary contact with chemicals. Wear appropriate clothing to prevent repeated or prolonged skin contact. Good personal hygiene is important. Use mechanical ventilation in case of handling which causes formation of vapours.

STORAGE

Keep in a cool place. Keep container in a well-ventilated place.

8. EXPOSURE CONTROL/PERSONAL PROTECTION



Ingredient name	Cas nr.	Interval	ppm	mg/m3	Year	Notes
Oil mist, mineral		8 h		5,0	2001	

EXPOSURE CONTROL

Ensure good general ventilation. Provide sufficient ventilation during operations which cause vapour formation. Good personal hygiene is important. Wash promptly with soap & water if skin becomes contaminated. Use appropriate skin cream to prevent drying of skin.

RESPIRATORY PROTECTION

If ventilation is insufficient, use a respirator with A2/P2 filter. Respirator in dust-raising operations.

EYE PROTECTION

Use safety goggles and face shield in case of splash risk.

HAND PROTECTION

Use suitable protective gloves.

PROTECTIVE CLOTHING

Wear appropriate clothing to prevent any possibility of skin contact. Apron or other light protective clothing and boots.

OTHER INFORMATION

Wash at the end of each work shift and before eating, smoking and using the toilet. Isolate contaminated clothing and wash before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES



Physical State:	Grease.	Density:	< 1,00
Colour:	Amber.	Solubility in water:	
Odour:	Oil smell.	Saturation conc.:	
Solubility:	Insoluble in water	Rel. dens. sat. air (air=1):	
Melting point/range:		Boiling point/range:	
Expl. limit LEL-UEL%:		pH concentrate:	
Vapour pressure:		Viscosity:	
Decomposition temp.:		Odour threshold value:	
pH solution:		Rel. evap. velocity:	
Flash point:	> 150°C	Water reactive:	
Molar weight:			
Ignition temp.:			
Rel.vap.dens.(air=1):			
Air reactive:			



SAFETY DATA SHEET

MATERIAL SAFETY DATA SHEET

LGWA 2

Last changed: 2003-08-21

10. STABILITY AND REACTIVITY



STABILITY

Stable under normal temperature conditions.

MATERIALS TO AVOID

Keep away from heat, sparks and open flame. Avoid: Strong oxidizing agent.

HAZARDOUS DECOMPOSITION PRODUCTS

Formation of toxic gases if heated.

11. TOXICOLOGICAL INFORMATION



INHALATION

Inhalation of vapours may cause irritation in the respiratory tract. May cause coughing and breathing difficulties.

SKIN CONTACT

May be irritating. May cause redness, blisters and rash on protracted or repeated exposure.

EYE CONTACT

Avoid direct contact. May be irritating.

INGESTION

May cause discomfort. May be irritating in the mouth, gullet and gastrointestinal system. Apart from intentional ingestion, swallowing of major quantities is improbable.

12. ECOLOGICAL INFORMATION



MOBILITY

The product is insoluble in water.

DEGRADABILITY

Decomposes slowly.

ECOTOXICITY

The product contains substances that are considered to be harmful to the environment.

13. DISPOSAL CONSIDERATIONS



GENERAL REGULATIONS

Confirm disposal procedures with environmental engineer and local regulations.

CATEGORY OF WASTE

EWG-Code: 13 02 02

14. TRANSPORT INFORMATION



Classified as Dangerous Goods:

☐ Yes

☒ No

☐ N/A

OTHER INFORMATION

The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).

15. REGULATORY INFORMATION



EC-Label

☐ Yes

☒ No

Xxxx15-5 N/A

S-PHRASES

Safety data sheet available for professional user on request.

REFERENCES

Directive 67/548/EEC, Directive 1999/45/EC, Directive 68/379/EEC, Directive 75/442/EEC, Directive 2001/59/EC (28 ATP), Directive 91/155/EEC.



SAFETY DATA SHEET

MATERIAL SAFETY DATA SHEET

LGWA 2

Last changed: 2003-08-21

16. OTHER INFORMATION



VENDOR NOTES

The information on this data sheet represents our current data and is accurate to the best of our knowledge as to the proper handling of this product under normal conditions and in accordance with the application specified on the packaging and/or technical guidance literature. Any other use of the product which involves using the product in combination with any other product or any other process is the responsibility of the user.

LIST OF RELEVANT R-PHRASES

Nr.	R-Phrase text
R38	Irritating to skin.
R41	Risk of serious damage to eyes.
R51/53	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

TRAINING ADVICE

The user must be instructed in the proper work procedure and be familiar with the contents of these instructions.

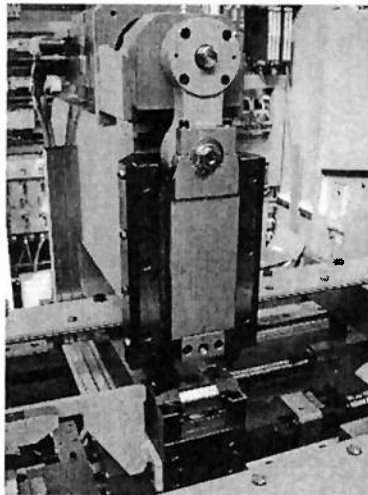


Kapitel 8
Chapter 8

Inhaltsverzeichnis
Contents

1.	Einbau und Schleifen von Lochwerkzeugen Assembly and grinding of hole punching tools	OP- 0478	Seite 1 bis 7 page 1 to 7
2	Messerwechsel an der V-Stanze Blade exchange on a V-notch	OP- 0476	Seite 1 bis 5 page 1 to 5
3.	Messerwechsel an der Schere Blade exchange on a shear	OP- 0477	Seite 1 bis 4 page 1 to 4
4.	Nachschleifen der Hartmetallmesser grinding of carbide blades	OP- 0479	Seite 1 bis 11 Page 1 to 11
5.	Zeichnungen zu den Schneidwerkzeugen Drawings for cutting tools		Seite 1 bis 6 Page 1 to 6
6.	Hinweise zu den Seitenführungen Instruction to side guide	TBA/M- 0011	Seite 1 bis 4 Page 1 to 4
7.	Hinweise zum Meßrollenaggregat Instruction to measuring unit	TBA/M- 0012	Seite 1 bis 3 Page 1 to 3

Assembly and grinding
of
hole punching tools (EL-L-ST)



Contents

	page
1. Assembly of hole punching tools	3
Drawings of stamp, matrix, inset	3
2. Function test, regrinding adjustment	6
3. Grinding instruction for carbide hole tools (K-4-071540)	7
4. Regrind adjustment (K-4-065126)	8
5. Instructions for grinding of carbide hole tools	9
drawing 4- 40148 (diamond grinding wheel)	10

Technical Documentation

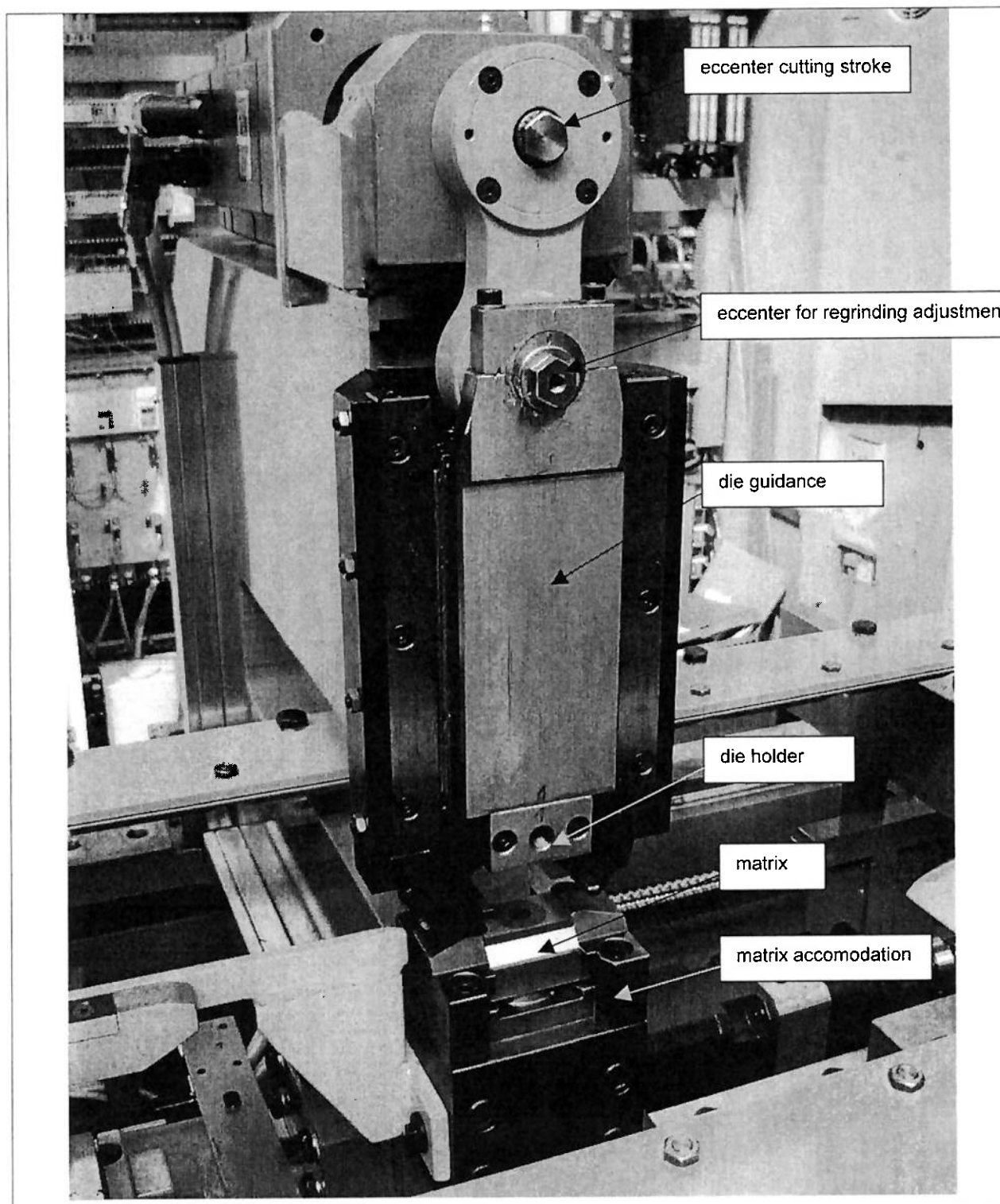


Assembly and Grinding of Hole Punching Tools

HEINRICH GEORG GMBH
MASCHINENFABRIK

1. Change of hole punching tools; new principle for el. systems

Attention: Do not carry out any tool changing works before the line is switched to maintenance mode !



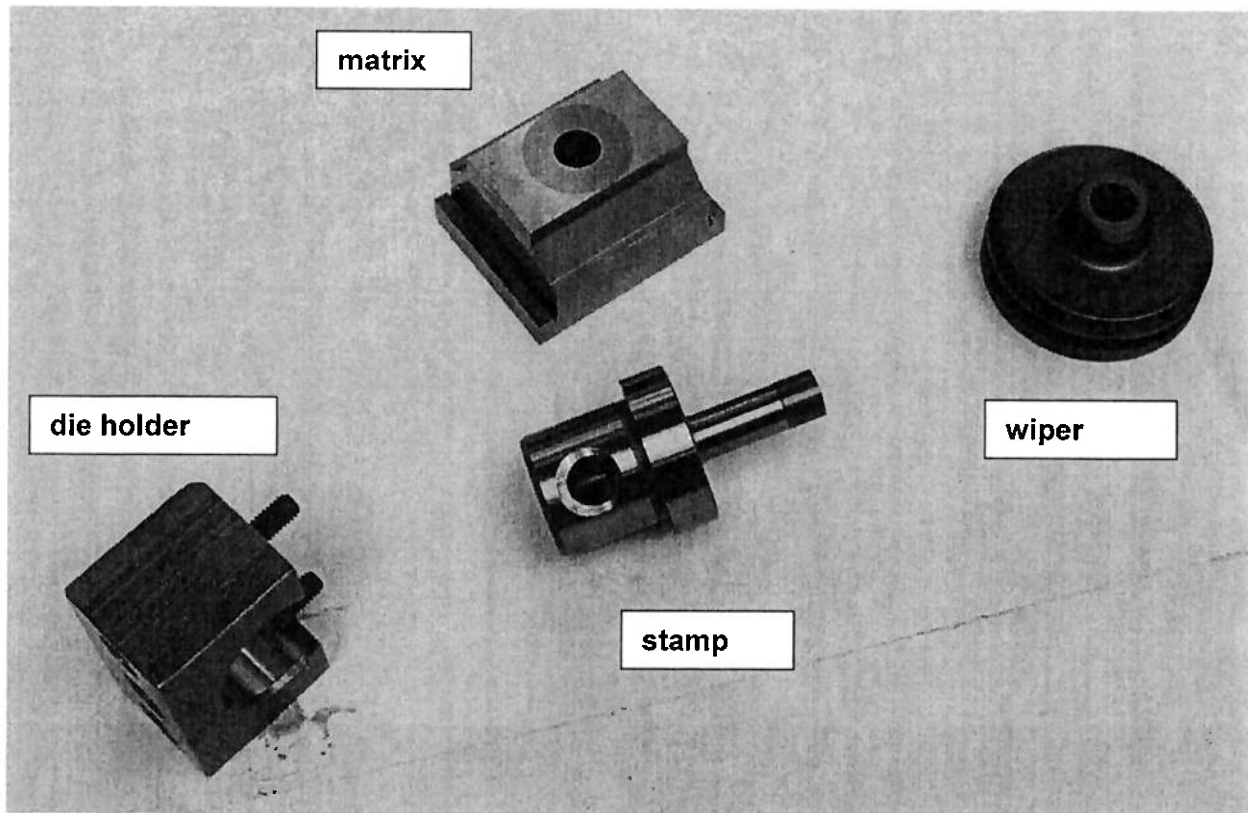


Fig. 1: hole punching tools

Required tools: combination wrench SW 17, hexagon-socket wrench SW 5 and 6

home position: There is no hole punching tool in the notch press

Installation of stamp with wiper:

1. Prior to the installation of tools it is important to thoroughly clean all mounting- and mating surfaces and to slightly grease them.
2. It has to be observed that only mating stamps and matrixes are installed which have to be marked by the manufacturing company.
3. Insert the stamp in the die holder outside the line. Fig. 2
4. Tighten the threaded cone pin; torque = 12 Nm, thus fixing the stamp in the holder. Fig. 2

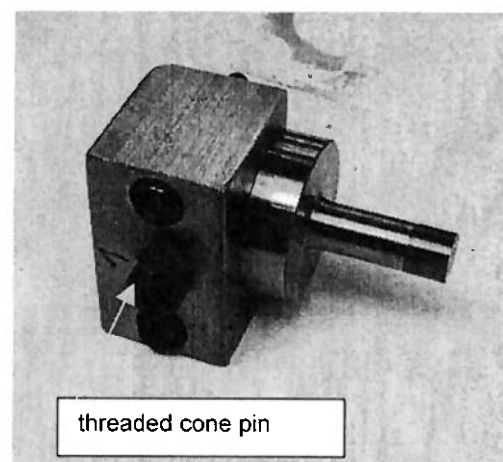


Fig. 2:

Technical Documentation



HEINRICH GEORG GMBH
MASCHINENFABRIK

Assembly and Grinding of Hole Punching Tools

5. After that the suitable wiper can be pushed onto the die. Fig. 3
6. Then carefully mount the unit to the die guidance, seeing to the correct position of the annular slot of wiper in the holder. Fig. 4
7. Tighten the fixing bolts of the die holder. Torque 12 Nm; the holder must fit closely to the upper contact surface. (Fig. 5)

Installation of the matrix:

Turn the eccentric for the cutting stroke with the combination wrench SW 17 to upper dead centre position.

Please avoid that the eccentric is turned unintentionally.

1. Loosen the safety bolt for the threaded ring. Fig. 4
2. Turn the threaded ring for clamping of matrix downwards for approx 1mm. Fig. 4
3. Push the matrix into the matrix holder until it stops (cylindrical pins).
4. Turn the threaded ring upwards with the wrench, at the same time press the matrix towards the cylindrical pins and clamp them.
5. Secure the threaded ring against twisting by means of the safety bolt.

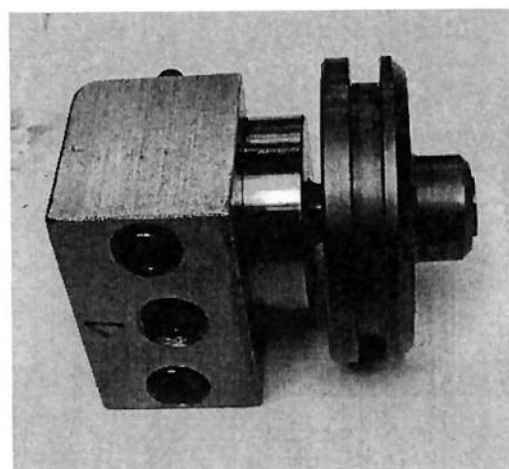
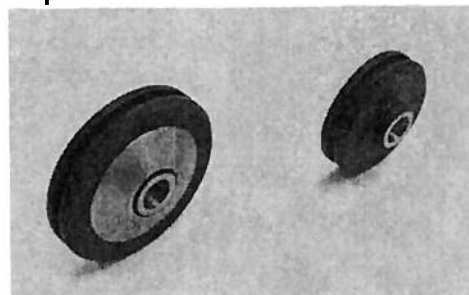


Fig. 3

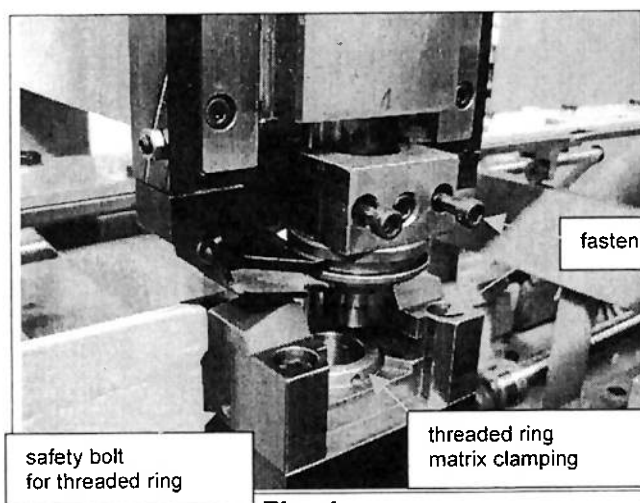


Fig. 4

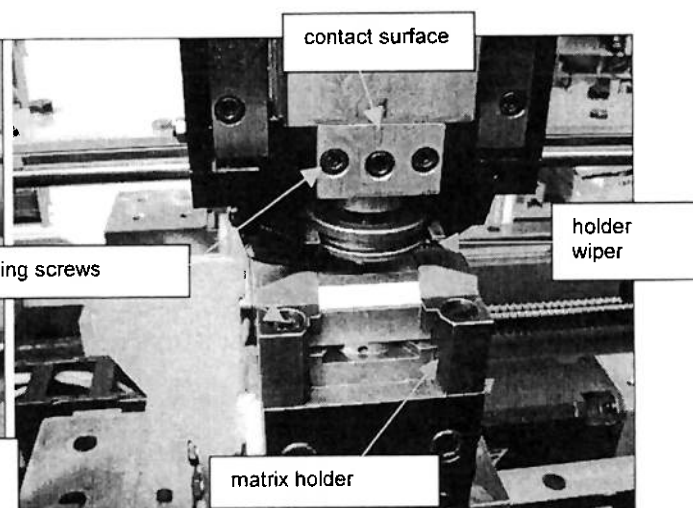


Fig. 5



2. Function test / Regrind adjustment

1. Carefully turn the cutting stroke eccentric with the box wrench SW 17, thus moving the stamp downwards.
2. When the stamp can be immersed into the matrix without perceptible resistance another piece of paper should be manually cut afterwards to check the cutting gap.
If this paper is cleanly cut no further action will become necessary.
3. The stamp cannot be immersed at all or with difficulties only, resp. the paper is not cleanly cut:

Loosen the 4 fastening bolts of the matrix in order to shift the holder. Then position the matrix holder in a way that the stamp is perfectly immersing into the matrix.
Re-tighten the fastening bolts. Repeat the procedure as described under item 2 once more.

Regrinding of hole punching tools. See K-4-071540

Attention:

Subsequent to each installation of new or reground hole punching tools the immersion depth which depends on the overall length L of the stamp needs to be checked.
See drawing K-4-065126 regrinding adjustment.

Guide value: The immersion depth of the stamp in the matrix should be 1 mm.

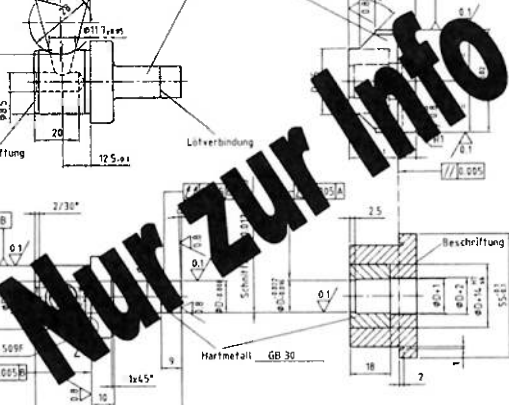
In case the hole punch has been reground too much so that the overlap of stamp and matrix in dead centre position is not sufficient it is possible to modify the position of the cutting stroke for regrinding adjustment by the eccentric bolt.

This way a regrind of stamp of max. 6 mm can be achieved.

The logo for GEORGE is a diamond-shaped emblem. It features the word "GEORGE" in a stylized, bold, sans-serif font. The letter "O" is replaced by a circular gear or cogwheel design. The entire logo is set against a dark background within the diamond shape.

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Zeichnungs -Nr.:
Drawing- No.:



Zeichnungs -Nr.:
Drawing- No.:



Technical Documentation



Assembly and Grinding of Hole Punching Tools

HEINRICH GEORG GMBH
MASCHINENFABRIK

3. Grinding instruction for carbide hole tools

22-01 Maß muss bei jedem Nachschleifen der Matrize eingehalten werden !
dimension must be observed after every regrinding of the die

HEINRICH GEORG GMBH MASCHINENFABRIK D - 57223 KREUZTAL 		Datum	Name	Maßst., scale	Identnummer, drawing-no.										
		Gez	24.05.2005	Friedrich	1:1	K - 4 - 071540									
Gepr	Mai 2005	JF	Art.-Nr.	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Formal size</td> <td>Bohr diameter</td> <td>von</td> <td>Index</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>						Formal size	Bohr diameter	von	Index		
Formal size	Bohr diameter	von	Index												
Benennung designation		Schleifanweisung Lochwerkzeuge													
		grinding instruction for carbide hole tools													

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without explicit authorization is prohibited. Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design. DIN ISO 9001:2002-05

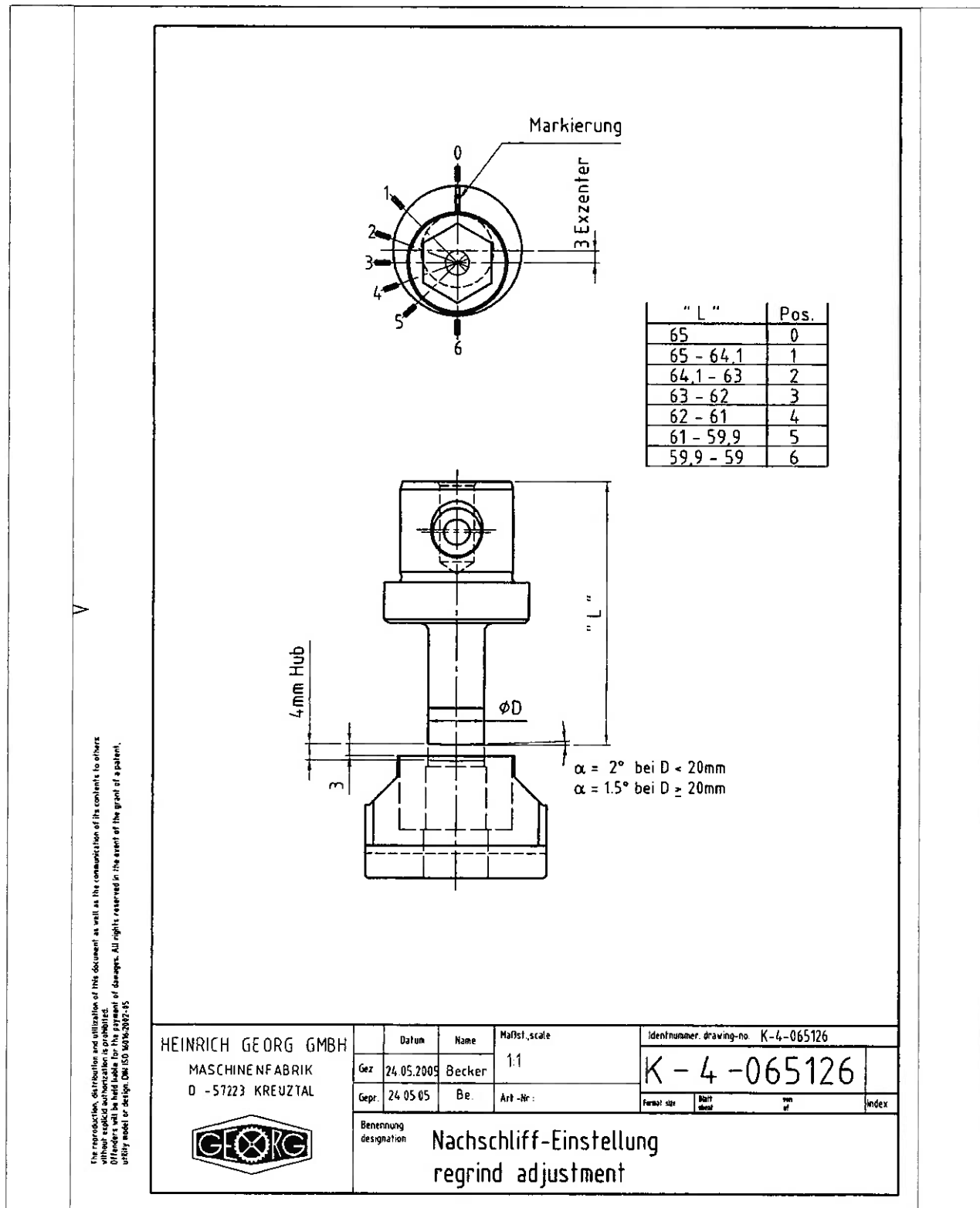
Technical Documentation



Assembly and Grinding of Hole Punching Tools

HEINRICH GEORG GMBH
MASCHINENFABRIK

4. Regrind adjustment



The reproduction, distribution and utilization of this document as well as the communication of its content to others without the written permission of Heinrich Georg GmbH is prohibited. Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design. DMI ISO 9001:2002-45



5. Re-grinding of carbide punching tools is performed on a surface grinding machine.

Re-grinding of carbide punching tools is performed on a surface grinding machine.

Stamp:

Regrinding of the stamp has to be performed beyond the visible cutting depth. When installing the stamp it has to be considered that the cutting depth corresponds to **2- 3x the sheet thickness (max. 1,0 mm)**.

Matrix:

Usually, this re-grinding is a slight grinding between 0,1 and 0,2 mm. Just when punching tools break out, larger thickness is being removed. The grinding process is completed when a finger nail test at the cutting edge will show no marking.

Grinding of the tools is performed with a diamond wheel according to drawing no. E-40148. Grinding speed is 20 - 22 m/sec., travel of table should approx. be 6 - 9 m/min.

For cooling of carbide tools during grinding process, water mixable cooling lubricants with a low content of mineral oil are being used. This emulsion should be free of nitrite and means of preservation, also should have protection against rust and good washing- and flushing abilities.

Good washing- and flushing abilities are necessary in order to avoid quick "loading" of diamond wheel.

Mixture: 95% Water 5% Emulsion

Grinding of punching die is only performed at the face side (Grinding see drawing K-4-071540, sketch 1).

Grinding of matrix is also performed only at the upper surface. Feed should not be too large because of simultaneous grinding of the steel reception of carbide (Grinding see drawing K-4-071540, sketch 2).

Sketch 1:

Adjusting of punching die in angular position in order to achieve a roof grinding by "180° turning" of punching die.

Sketch 2:

Tensioning of matrix.

The outer diameter of the punching die and the inner diameter of the matrix are not to be ground since this would change the cutting gap. A larger cutting gap as provided will immediately lead to the formation of burr during punching of transformer material.

Technical Documentation



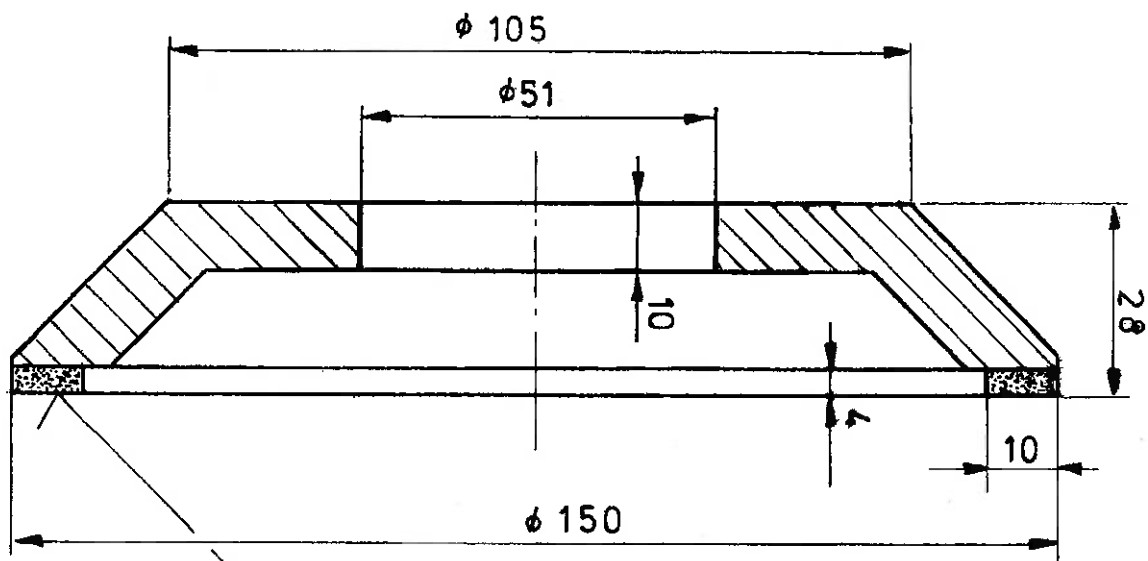
Assembly and Grinding of Hole Punching Tools

HEINRICH GEORG GMBH
MASCHINENFABRIK

Diamantschleifscheibe Diamond Grinding Wheel

Zeichnungs -Nr.:
Drawing- No.:
E - 40148

Typ:	12 A 2	-S 45°	-D 150	-W 10	-X 4	-H 51	-D 64	-C 50	-KR 219	
Form design										Kunstharzbindung resinoid- bonded
Schräge slope										Konzentration concentration
Durchmesser diameter										Korngröße grain size
Belagbreite linig width										Bohrung boring
Belaghöhe linig height										



Schleifscheibe hier nachschärfen
Dress this face of the grinding wheel

Drehzahl der Schleifscheibe: $2800 \text{ min}^{-1} = 20-22 \text{ m/s}$

Number of revolutions of grinding: wheel speed 2800 rpm = 20-22 m/sec.

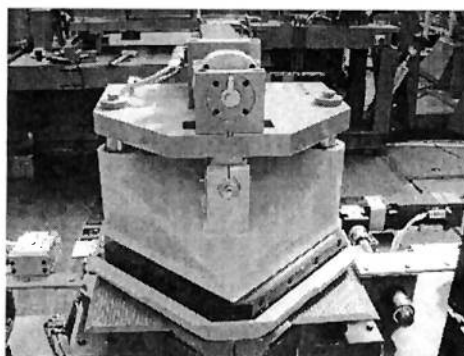


HEINRICH GEORG GMBH
MASCHINENFABRIK

Blade exchange

on a

V-notch ¹



contents ²

page

¹

² source:



V-notch

Blade exchange on a V - notch



**Please wear safety gloves and safety shoes
during these works!**

The blade exchange on a V - notch must be exceptionally carried out by trained or authorized persons.

The pictures of this manual were taken from a similar machine / plant.

The blades of a V - notch have to be disassembled for regrinding upon request, but at the latest after 1.5 millions of cuts have been performed.

The following tools and auxiliary means are required for changing the cutters on a V - notch:

- wrench: SW 17;
- Allan key: 5 mm; 6 mm;
- torque wrench for hexagon socket screw (Allan) and hexagon bolts;
- foil: 0,01 mm;
- grindstone;
- cleaning cloths;

For depositing of blades provide a wooden or plastic support.

Preparations for blade exchange.

- Move transformer strip backwards out of the machine / plant and wind it up with the decoiler head.
- Position V - notch.
- Adjust side guides to approx. 75 % of the maximum strip width.
- Open entry gates to the danger area.
- Stop the machine / plant and safely disconnect it from the power supply.
- Make available tools and auxiliaries.

Attention ! The V - punching tools are sharp - edged.

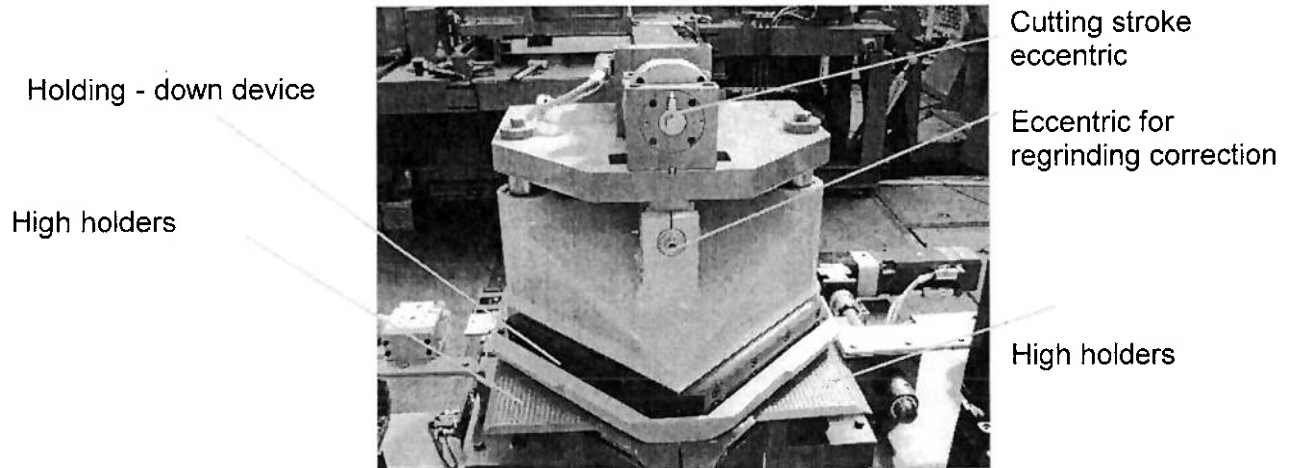


Tools, knives might fall down. Therefore wear safety shoes and safety gloves. For works that cannot be performed from the hall floor, safe climbing aids have to be used. Keep the working area always clean. Tools that are scattered on the floor might cause accidents.

Attention ! Any time a new or reground blade has been installed the overlap of blades needs to be checked by means of manual turning of the eccentric. The upper blade must not contact the lower blade. (minimum distance 0.01 mm) In case upper and lower blade are contacting each other hard metal pieces might chip off during cutting movements.



V-notch



- Clean working range. Especially remove all transformer scrap pieces.

The following machine parts on the V - notch are obstructing the blade change and have to be disassembled first.

- holding - down device;
- high holders;

Blade exchange

Unscrew lower blades and remove them from the V - notch. Place them on the prepared deposit.

- Lift upper blade carriage
- Unscrew upper blades and remove them out of the V - notch.
- Place them on the prepared deposit.

installation of blades - v-notch: see drawing K-4-071534

The upper blade holding strips aren't dismantled at the blade exchange !

The blade carriage is in lower dead centre position

Prior to installation the contact surfaces of the ground blades have to be honed and then carefully be cleaned. Slightly oil, see to uniform oil distribution.

1. mount the left upper blade onto the holding strip, just finger-tighten the bolts,
2. fit the left lower blade without gap to the upper blade
3. mount the right upper blade by moving towards the left lower blade, without gap, tightening torque 18 Nm
4. left upper blade, loosen bolts, move blade towards the right upper blade, without gap, tightening torque 18 Nm
5. left lower blade, loosen fixing bolts, push blade with foil 0.01 mm towards the left upper blade and tighten the bolts, tightening torque 18 Nm
6. push right lower blade with foil 0.01 mm towards the right upper blade, simultaneously push without gap towards the left lower blade. Tighten fixing bolts, tightening torque 18 Nm



V-notch

- turn upper blade carriage to the top and remove foil.
- Check overlap of blades by turning the eccentric with the wrench SW 17 and lowering and lifting the upper blade carriage. The upper blade must not contact the lower blade. (minimum distance 0.01 mm) In case upper and lower blade are contacting each other hard metal pieces might chip off during cutting movements.
- Check with regard clean cut of paper

Please note:

Any time new or reground blades have been installed it is necessary to check the overlap.
Guide value: overlap should be 1 mm.

In case the blades have been reground in a way that in lower dead centre position they do not overlap sufficiently, the position of cutting stroke may be modified by the eccentric bolt for regrinding adjustment. This way it is possible to equalize a regrind of blades of max. 4 mm.

Tightening torques MA (Nm).

hexagon socket screw	4 mm / M6	6 mm / M8
torque	7	18

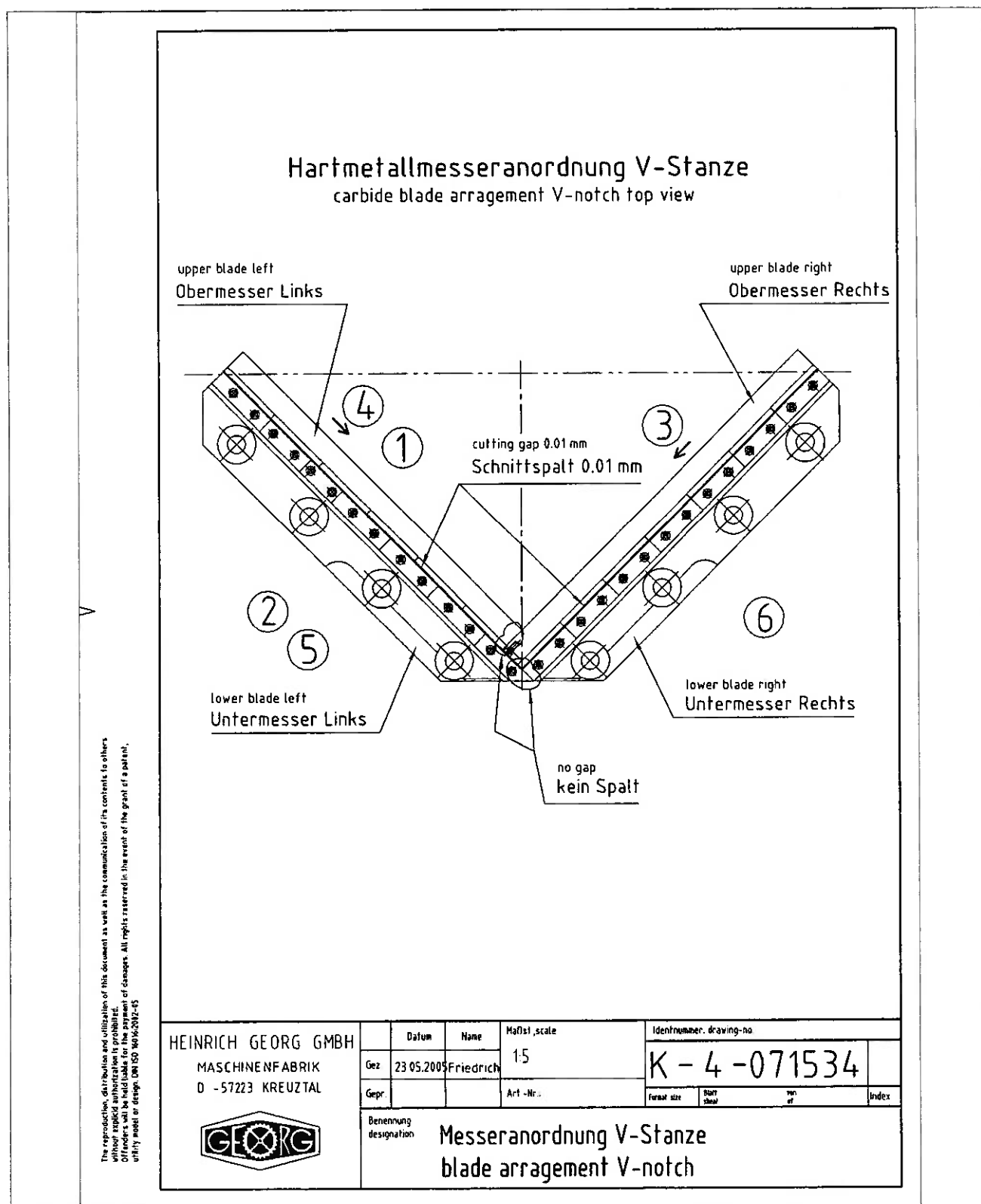
- Re-install all disassembled machine parts and, if possible, check their functions.
- Clear away tools and auxiliaries out of the V - notch area.
- Check the regular completion of works.



V-notch

HEINRICH GEORG GMBH
MASCHINENFABRIK

picture 1: blade arrangement



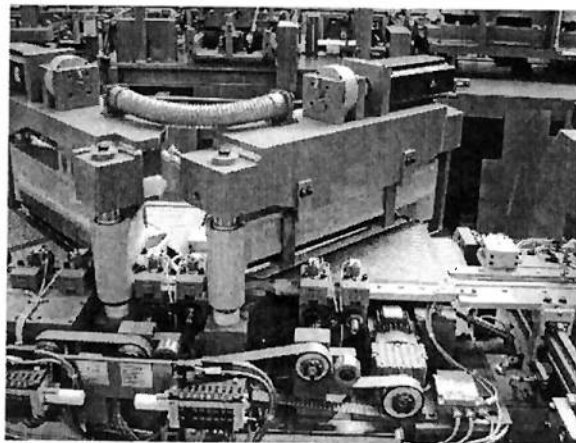


HEINRICH GEORG GMBH
MASCHINENFABRIK

Blade exchange

on a

shear ¹



contents ²

page

¹

² source:



Shear

Blade exchange on a shear



**Please wear safety gloves
during these works !**

The blade exchange on a shear must be exceptionally carried out by trained or authorized persons. In case only one trained or authorized person is available, it is necessary to be assisted by qualified helpers.

The pictures of this manual were taken from a similar machine / plant.

The blades of a swing shear have to be disassembled for regrinding upon request, but at the latest after 1.5 millions of cuts have been performed.

The following tools and auxiliary means are required for changing the blades on a swing shear:

wrench: SW 13; SW 17

Allan key: 3 mm; 5 mm; 6 mm;

torque wrench for hexagon socket screw (Allan) and hexagon bolts;

base foil: 0,01 mm;

grindstone;

cleaning cloths;

For depositing of blades provide a wooden or plastic support.

Preparations for blade exchange.

- Move transformer strip backwards out of the machine / plant and wind it up with the decoiler head.
- Adjust side guides to approx. 30% of the maximum strip width.
- Open entry gates to the danger area.
- Stop the machine / plant and safely disconnect it from the power supply.
- Make available tools and auxiliaries.

Attention ! The shear blades are sharp - edged.



Tools, knives, etc. might fall down. Therefore wear safety shoes and safety gloves. For works that cannot be performed from the hall floor, safe climbing aids have to be used. Keep the working area always clean. Tools laying anywhere on the machine / floor might cause accidents.

Attention! Any time a new or reground blade has been installed, the overlap of blades needs to be checked by lowering and lifting the upper blade carriage. The upper blade must not contact the lower blade. (minimum distance 0.01 mm) In case upper and lower blade are contacting each other hard metal pieces might chip off during cutting movements.

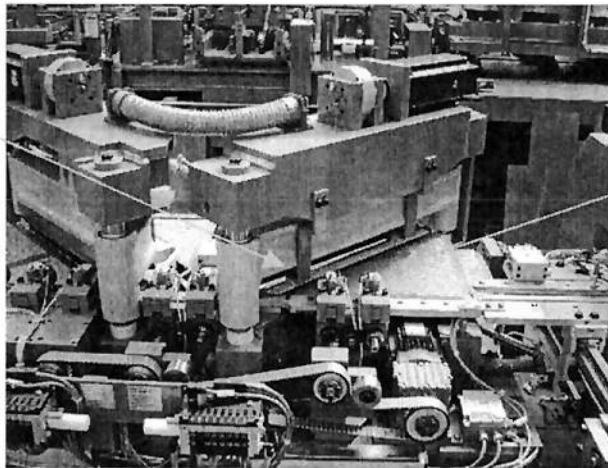


Shear

The following machine parts within the shear area are obstructing the cutter change and have to be disassembled first.

1. holding - down device;
2. holding - up plate;

holding - down device;



holding - up plate

- Clean working range. Especially remove all transformer scrap pieces.

Unscrew the bottom blade together with holding plate for the bottom blade and remove from the shear. Place it on the prepared deposit.

- Unscrew the top blade, remove it from the shear and put it on the prepared deposit.

Prior to installation the contact surfaces of the ground blades have to be honed and then carefully be cleaned. Slightly oil, see to uniform oil distribution.

First install upper blades. (reverse order of the several steps for removal of blades)

- Strongly press the top blade against the top blade slide and screw the fastening screws with the prescribed torque.
- Install bottom blade and adjust it to the highest possible distance to the top blade. Do not yet fasten the screws.

Lower upper blade carriage by means of the wrench SW 17 until upper and lower blade are overlapping.

- Insert foil (0,01 mm) at at both ends of the blades between upper and lower blade.
- Slightly press the lower blade to the upper blade by shifting the lower blade holding strip and hold it tight.
- After that tighten the fixing screws of the lower blade holding strip by the given torque.
- Move upper blade carriage to the top and remove foil.
- Check overlap of blades by means of the wrench SW 17 by lowering and lifting the upper blade carriage. The upper blade must not contact the lower blade. (minimum distance 0.01 mm) In case upper and lower blade are contacting each other hard metal pieces might chip off during cutting movements.



Shear

Please note:

Any time new or reground blades have been installed it is necessary to check the overlap.
Guide value: overlap should be 1 mm.

In case the blades have been reground in a way that in lower dead centre position they do not overlap sufficiently, the position of cutting stroke may be modified by the eccentric bolt for regrounding adjustment. This way it is possible to equalize a regrind of blades of max. 4 mm.

Tightening torques MA (Nm).

hexagon socket screw	4 mm / M6	6 mm / M8
torque	7	18

- Re-install all disassembled machine parts and, if possible, check their functions.
- clear away tools and auxiliaries out of the shear area.
- Check the regular completion of works.

Further information on f. ex. grinding of blades, set-up of blades, special cutting gap adjustments etc.



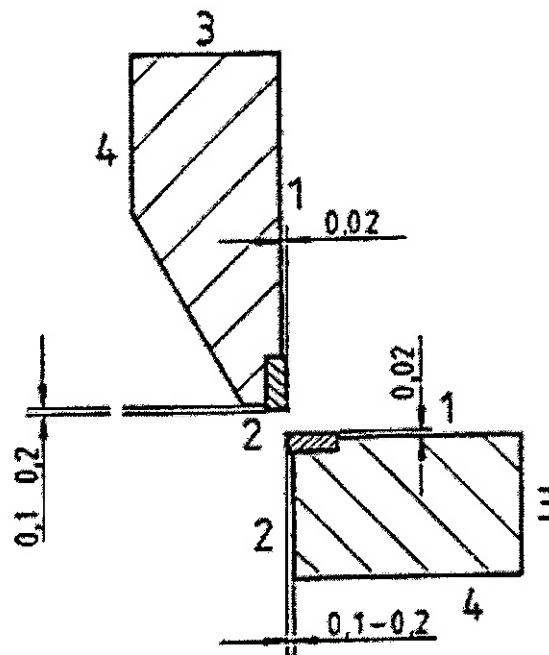
grinding
of
CARBIDE BLADES

Contents	Page
1.0 Instructions for Re-Grinding of the Carbide Blades	2
1.1 Additional Guide-Lines for Grinding the V- and X-Notchings Blades	3
2.0 Instructions for Exchange of the Carbide Blade Segments	4
2.1 General Indication	4
2.2 Additional Grinding Instructions	5
3.0 Drawings and sketches	
• Production instructions for carbide blades acc. to drawing 4- 41375	6
• Blade segment acc. to drawing 4- 11642	7
• Grinding instruction for upper blades of V-punch acc. to drawing 3- 40007	8
• Diamond - grinding wheel acc. to drawing E- 40148	9
Technical instruction for blade segment bonding agent	10



1.0 Instructions for Re-Grinding of the Carbide Blades

It is recommended that the carbide blades should be re-ground on a surface grinder. The faces 3 and 4 indicated by the dash-to-dash line should be held on the magnetic chuck. The surface must be absolutely straight. This has to be checked by means of guiding plates. The blades must be aligned accurately in lengthwise direction.

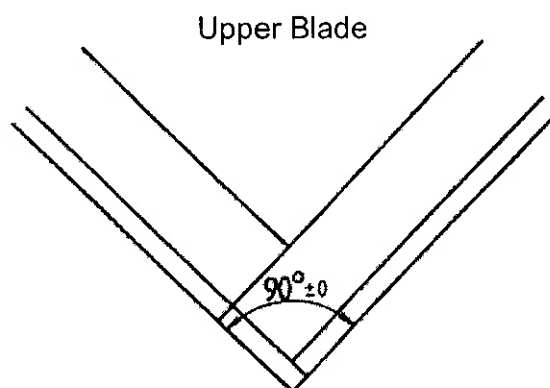


First the surfaces 1 and 2 of the holder (St 70) must be ground sufficiently with a grinding wheel (special fused alumina wheel, 46 Jot) suitable for this material, in order to ensure that during following grinding of the carbide cutting edge, the grinding wheel will not come into contact with the holder.

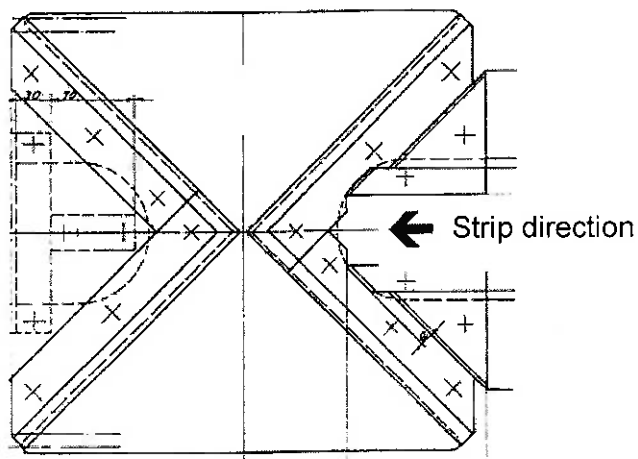
For re-grinding of carbide cutting edge a diamond wheel E-40148 (face wheel) should be used. Sizes stated in sketch no. 1 must be adhered to. The surfaces 2 are ground so far that the diamond wheel will just touch the holder.



1.1 Additional Guide-Lines for Grinding the V-Notching Blades and X-Notching Blades



The upper blade which forms the corner of the V-notch will also require grinding at the head, in accordance with the previous instructions. It is important to maintain the angle of 90°. Since the upper blades are constructed conical it is necessary to prepare a grinding gib for re-grinding. See drwg. no. 3-40007.



For the lower blade it is important to notice that the blade at the run-out side must be ground by approx. 0,2 mm more, in order to avoid stopping of a sheet.



2.0 Instructions for Exchange of the Carbide Blade Segments

2.1 General Indication

The blade segments have the dimensions 50 x 5 x approx. 14.3 mm. With the exception of one surface, all surfaces are ground. The surface which is not ground must be located at the outside, in order to enable grinding after assembly. The length of the carbide segments is varying by 0.02 mm in the range of 50.02 - 50.00 mm. As a rule, the tolerance for segments of one set is only 0.01 mm. During exchange this tolerance must be considered.

First of all the damaged segments are dismantled. This is difficult, as the screws are glued in with DELO- ML. It may happen that the hexagonal screw head gets round. In this case first loosen the screw head by means of a twist drill of 4.5 mm $\varnothing$. After this the screw piece M 4 is cut out with a twist drill of 3.4 mm $\varnothing$. Even if the head of the screw breaks off, the screw piece can be removed by this way. The segments are as a rule assembled tightly. The best way to loosen and separate them is by a piece of wood and a light hammer.

After dismantling the segments first clean the gap and then assemble the new segments accurately. Measure the length of the gap and the segments by means of a micrometer gauge. The new segments must be assembled "tightly". If, however, they are too long, a segment has to be shortened by grinding.

The "tight" assembly can be obtained by means of a piece of wood and a hammer, however, carefully and accurately. The segments are not glued.

The flat head hexagonal socket screws M 4 x 10 DIN are glued in by DELO- ML 5249 so as to avoid them getting loose. Before glueing, the screws have to be degreased with acetone or another cleaning agent.

After the new segments are assembled, their protuberant surface must be ground and subsequently all segments of that blade. Follow the operating instructions for grinding the blades.

Technical Documentation

CARBIDE BLADES



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

2.2 Additional Grinding Instructions

The top blades as well as the bottom blades have to be ground on their vertical cutting surface. Use a cup shaped plated grinding wheel 150 mm $\varnothing$, diamond-tipped, see drwg. no. E-40148. Grinding speed of the face wheel = 2800 rpm.

The soft "steel blade body" is not allowed to be ground with this diamond cup shaped plated wheel. A special fused alumina wheel, 46 Jot, should be used.



3.0 Drawings and sketches

Fertigungsrichtlinien für Hartmetallmesser

Production Instructions for Carbide Blades

Zeichnungs -Nr.:

Drawing- No.:

E - 41375

1. Grundkörper spannungsarm gegläht	Basic body annealed stress- relieved
2. Messergrundkörper vorgehobelt	Basic blade body pre- planed
3. Messergrundkörper spannungsarm gegläht	Basic blade body annealed stress- relieved
4. Messergrundkörper fertiggehobelt Nennmaße X und Y gemäß Einzelteilzeichnung Fasen: 0,6x 45°	Basic blade body finish- planed Nominal dimensions X and Y as per component drawing Bevel: 0,6x 45°
5. Befestigungslöcher gebohrt	Fixation holes bored
6. Messergrundkörper vorgeschliffen Nennmaße X und Y gemäß Einzelteilzeichnung	Basic blade body pre- ground Nominal dimensions X and Y as per component drawing
7. Montage der Messersegmente	Assembly of blade segments
8. Messerschneidkante fertiggeschliffen	Blade cutting edge finish ground
geschliffen $R_a \leq 4 \mu m$ ground	

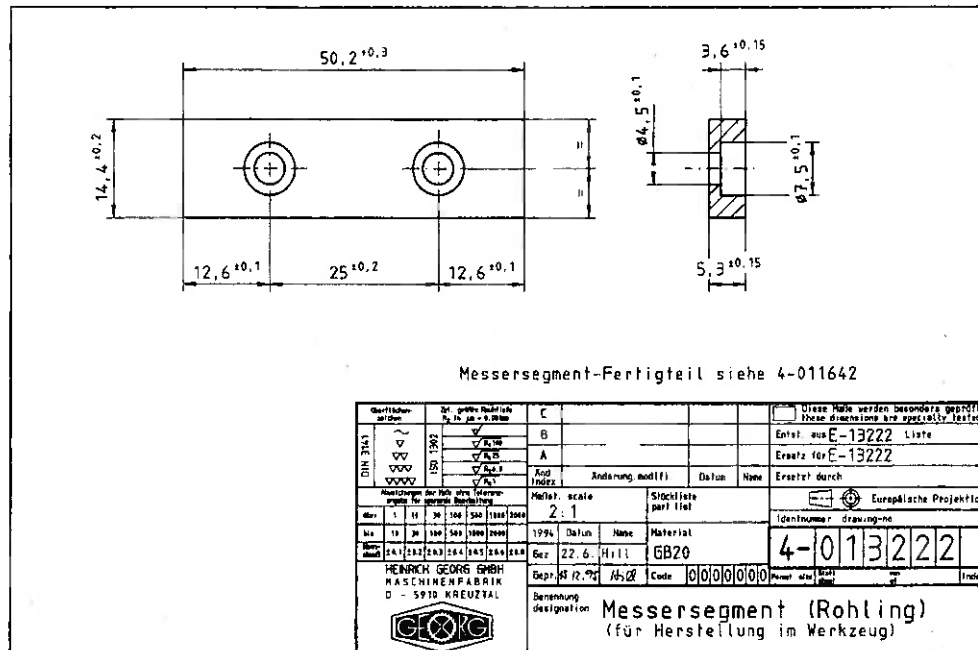
CARBIDE BLADES



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

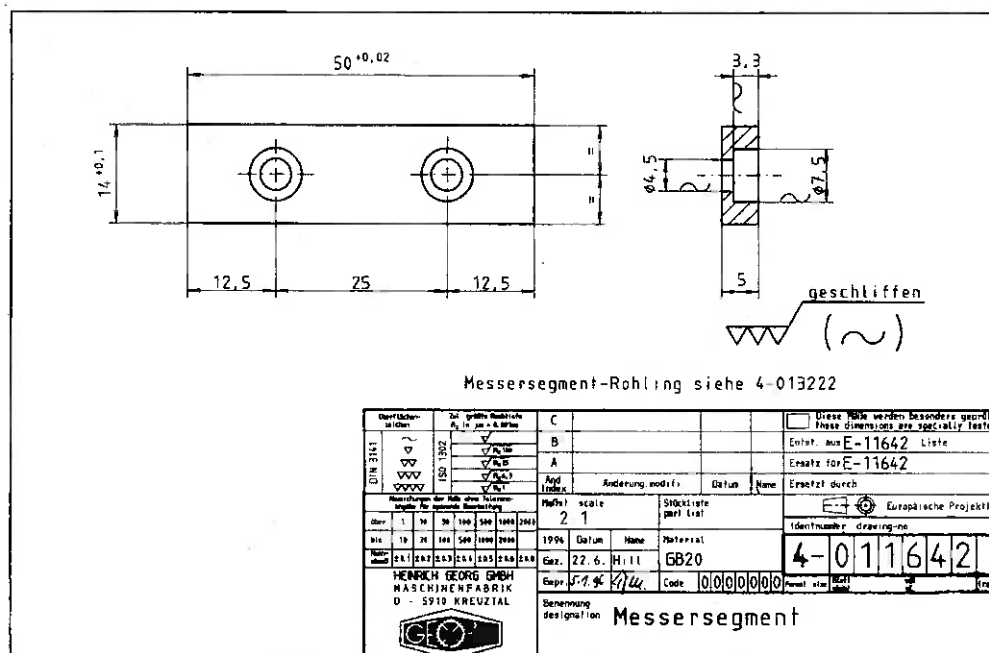
Messersegment (Rohling, für Herstellung im Werkzeug)
Blade segment (blank, for production in the tool)

Zeichnungs -Nr.:
Drawing- No.:
E - 13222



Messersegment
Blade segment

Zeichnungs -Nr.:
Drawing- No.:
E - 11642





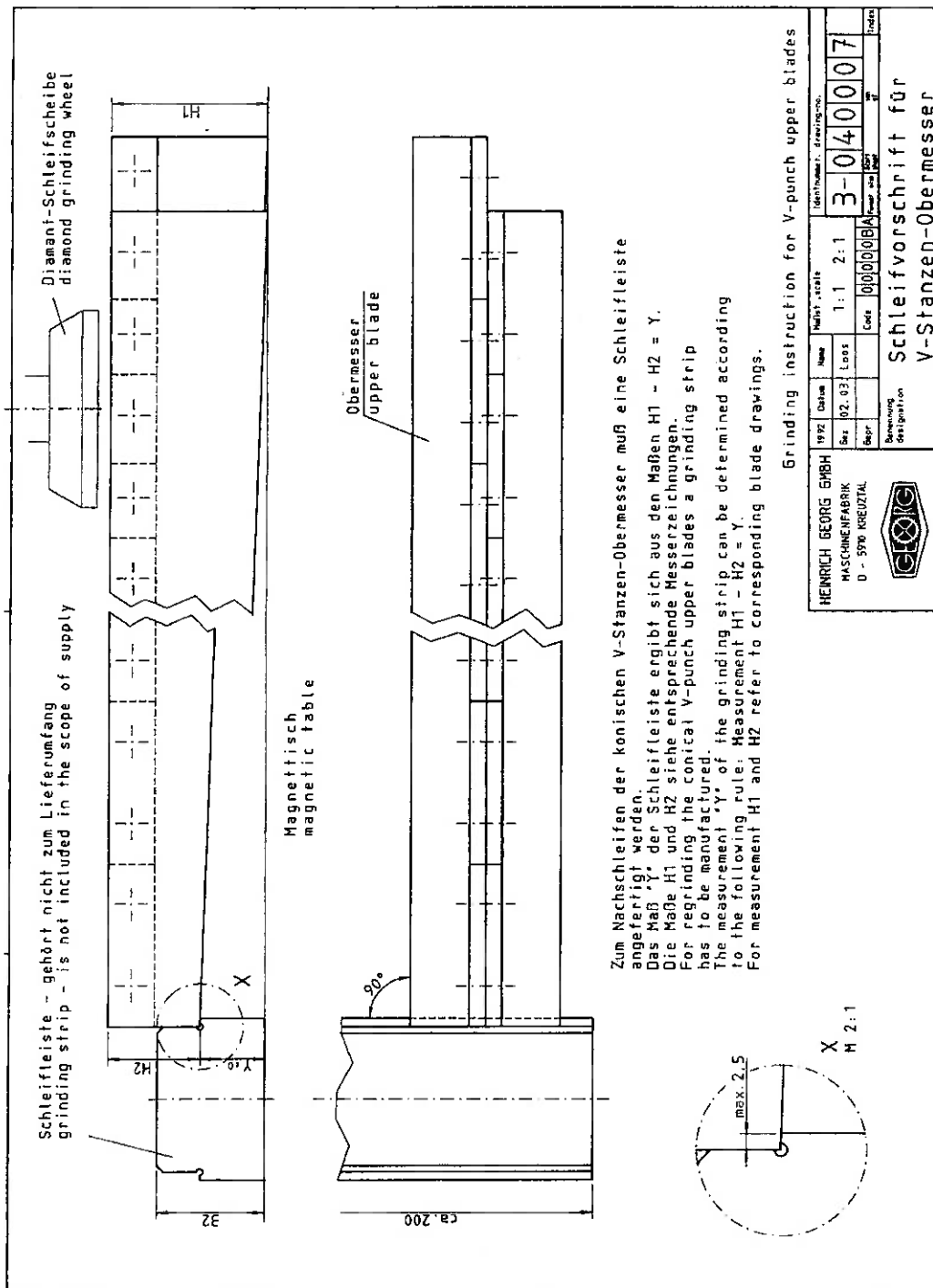
HEINRICH GEORG GMBH
MASCHINENFABRIK

Schleifvorschrift für V-Stanzen- Obermesser Grinding instruction for V-punch top blade

Zeichnungs -Nr.:

Drawing- No.:

3 - 40007





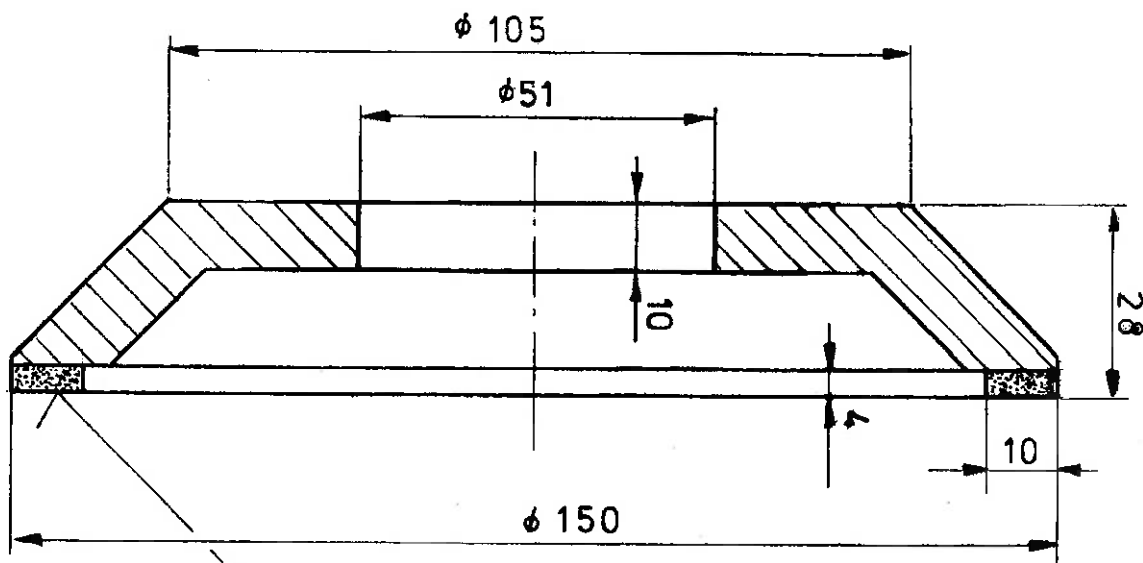
Diamantschleifscheibe Diamond Grinding Wheel

Zeichnungs -Nr.:

Drawing- No.:

E - 40148

Typ:	12 A 2	-S 45°	-D 150	-W 10	-X 4	-H 51	-D 64	-C 50	-KR 219
Form design									Kunstharzbindung resinoid- bonded
Schräge slope									Konzentration concentration
Durchmesser diameter									Korngröße grain size
Belagbreite linig width									Bohrung boring
Belaghöhe linig height									



Schleifscheibe hier nachschärfen
Dress this face of the grinding wheel

Drehzahl der Schleifscheibe: $2800 \text{ min}^{-1} = 20-22 \text{ m/s}$

Number of revolutions of grinding: wheel speed 2800 rpm = 20- 22 m/sec.

Technical Documentation

CARBIDE BLADES



HEINRICH GEORG GMBH
MASCHINENFABRIK

Industrial adhesive

Make

DELO¹

¹ DELO GmbH & Co. KG · Ohmstr. 3 · 86899 Landsberg
² 3340196

DELO- ML[®] 5249 (former designation DELO ML 113)
Anaerobic adhesive, medium strength, medium viscosity
Standard product for locking screws

Base

DELO- ML 5249 is a one-part, solvent-free, anaerobic cured adhesive with a methylacryl ester base, coloured blue.

Use

Locking screws: all threads

Sealing: threaded connections, pipe fittings

Properties

DELO- ML 5249 is optimized for locking screws. To determine the on-torque considering the moment of friction of the threads, the following total coefficient of friction can be used for calculation.

μ total 0,10- 0,13 at steel threads, bright

μ total 0,13- 0,17 at steel threads, phosphated

Flowability is adjusted in such a way that the product is distributed across the thread but does not run out of the thread. DELO- ML 5249 cures at room temperature.

The accelerator DELOQUICK No. 32 substantially shortens curing. On highly passivated surfaces a thorough cure is achieved by addition of DELO-TOP or by activation of the surfaces with DELOQUICK No. 32.

Application

DELO- ML 5249 is applied directly from the tube. Automatic dispensing with DELO DISPENSING UNITS is recommended. The cleaner DELOTHEN is ideally suited for optimum pretreatment of the surfaces to be bonded. Threaded connections must always be tightened firmly. A further improvement of the strength is achieved by means of pickling, abrading or sandblasting. The DELO-SACO-System lengthens the life of the bond. For further information see our Technical Information No. E960

Technical Documentation

CARBIDE BLADES



HEINRICH GEORG GMBH
MASCHINENFABRIK

Technical data

Chemical base		methylacrylester
Curing mechanism		anaerobic
Strength grade		medium strength
Viscosity at room temperature		approx. 1000 mPas (thixotropic)
Colour		blue
Compressive/shear strength Γ_B acc. to DIN 54452		15 N/mm ²
Compressive/shear strength Γ_B acc. to DIN 54452 after 1 h		approx. 2 N/mm ²
Off-torque ML	at M_A 46 Nm acc. to ISO 10964 screw M 10 / 8.8	50 Nm
Off-torque	without M_A	approx. 18 Nm
Curing time		firm to touch: 5- 20 minutes
at room temperature, anaerobic		operationally firm: 24 h
Curing time		firm to touch: 5 minutes
at room temperature, with DELOQUICK No. 32 accelerator for DELO-ML at V2A screws		
Max. possible gap filling capability		0,25 mm
Optimum clearance (D - d)		0,08 mm
Thread		all threads
Temperature range for use		- 60° to + 150° C
Chemical resistance		very good (see resistance list)
Suggestion for application		DELOMAT 941, DELOMAT 944
Storage life		12 months
after delivery in unopened original packing, cooled at approx. 5°C		

Recommendations to Working and Health protection:

The product is not restricted.

Description of the product code:

5249 product type: anaerobic

5249 property: medium strength

5249 viscosity range: medium viscosity, thixotropic

This information and these data have been developed from laboratory tests and extensive practical experience. No obligation can be inferred therefrom, however. We recommend that each user himself investigates the possible uses of the product in his own area.



Kapitel 8

Chapter 8

Schneidwerkzeuge TBA / ME / EL 400

Cutting tools

	Benennung Designation	Zeichnung Drawing	Bemerkung Note
1.	V- Stanze - V-notch		
	Obermesser upper blade	K-3-023483	
	Obermesser upper blade	K-3-023484	,
	Untermesser bottom blade	K-2-018425	
	Untermesser bottom blade	K-2-018426	
2.	Lochstanze - hole punch		
	Stempel und Matrice die and matrix	K-3-062011	
	Einsatzstück insert	K-4-065089	
3.	Scherenaggregat – shear unit		
	Obermesser Schere I und II upper blade	K-3-032222	
	Untermesser Schere I bottom blade	K-2-018583	
	Untermesser Schere I bottom blade	K-2-026136	
	Untermesser Schere II bottom blade	K-2-018584	

Gleiches Istmaß bei Messergegenstück
K-3-023484

Messersegment siehe K-4-063399 u K-4-063402
Fertigungsrichtlinien für Hartmetallmesser
siehe K-4-041375

Oberflächen		1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100		101		102		103		104		105		106		107		108		109		110		111		112		113		114		115		116		117		118		119		120		121		122		123		124		125		126		127		128		129		130		131		132		133		134		135		136		137		138		139		140		141		142		143		144		145		146		147		148		149		150		151		152		153		154		155		156		157		158		159		160		161		162		163		164		165		166		167		168		169		170		171		172		173		174		175		176		177		178		179		180		181		182		183		184		185		186		187		188		189		190		191		192		193		194		195		196		197		198		199		200		201		202		203		204		205		206		207		208		209		210		211		212		213		214		215		216		217		218		219		220		221		222		223		224		225		226		227		228		229		230		231		232		233		234		235		236		237		238		239		240		241		242		243		244		245		246		247		248		249		250		251		252		253		254		255		256		257		258		259		260		261		262		263		264		265		266		267		268		269		270		271		272		273		274		275		276		277		278		279		280		281		282		283		284		285		286		287		288		289		290		291		292		293		294		295		296		297		298		299		300		301		302		303		304		305		306		307		308		309		310		311		312		313		314		315		316		317		318		319		320		321		322		323		324		325		326		327		328		329		330			
-------------	--	---	--	---	--	---	--	---	--	---	--	---	--	---	--	---	--	---	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	--	--

Technische Dokumentation

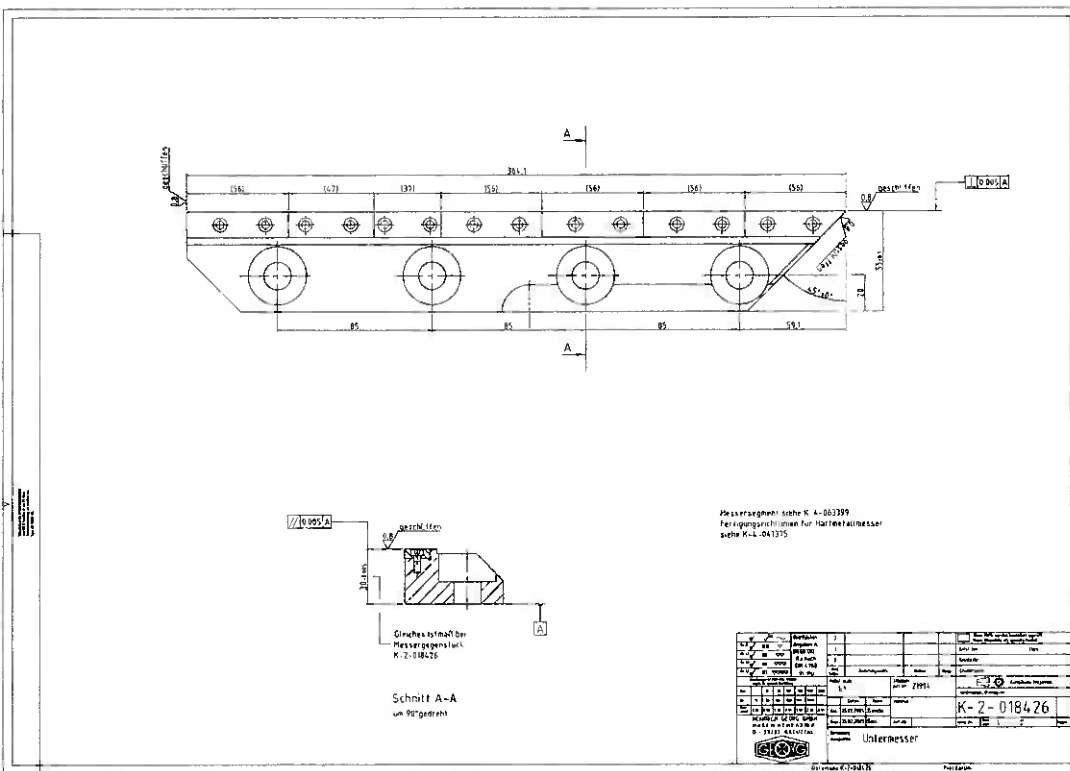
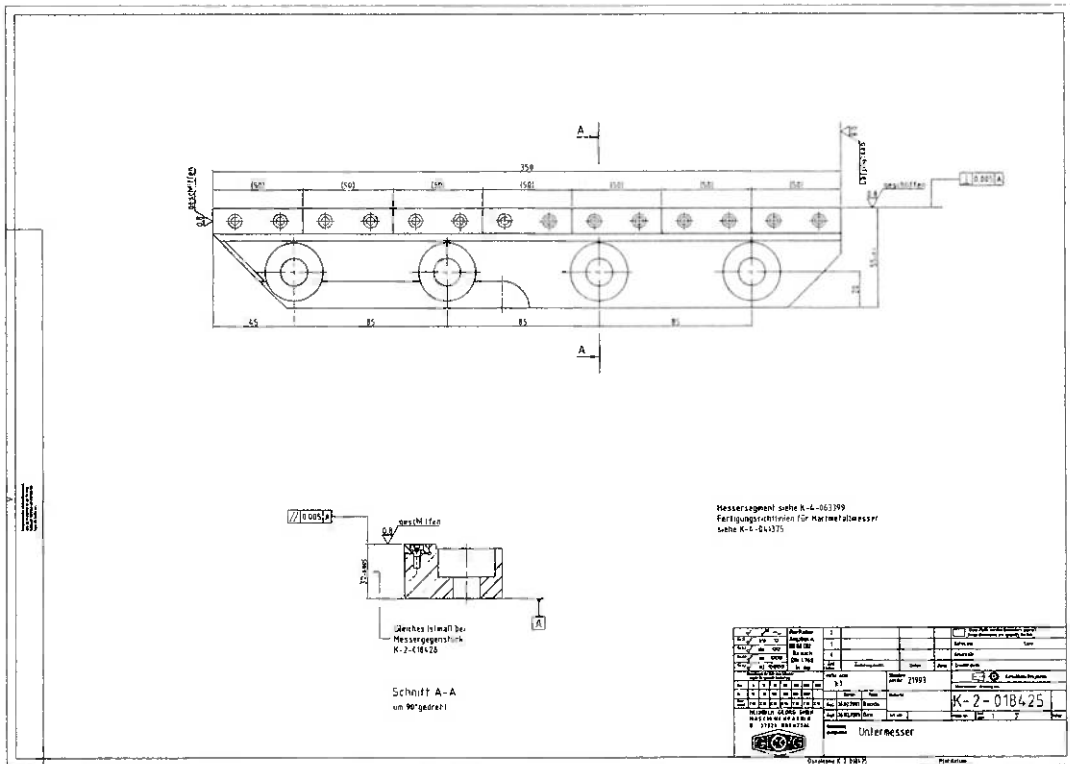
Technical Documentation



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Kapitel 8

Chapter 8



Technische Dokumentation

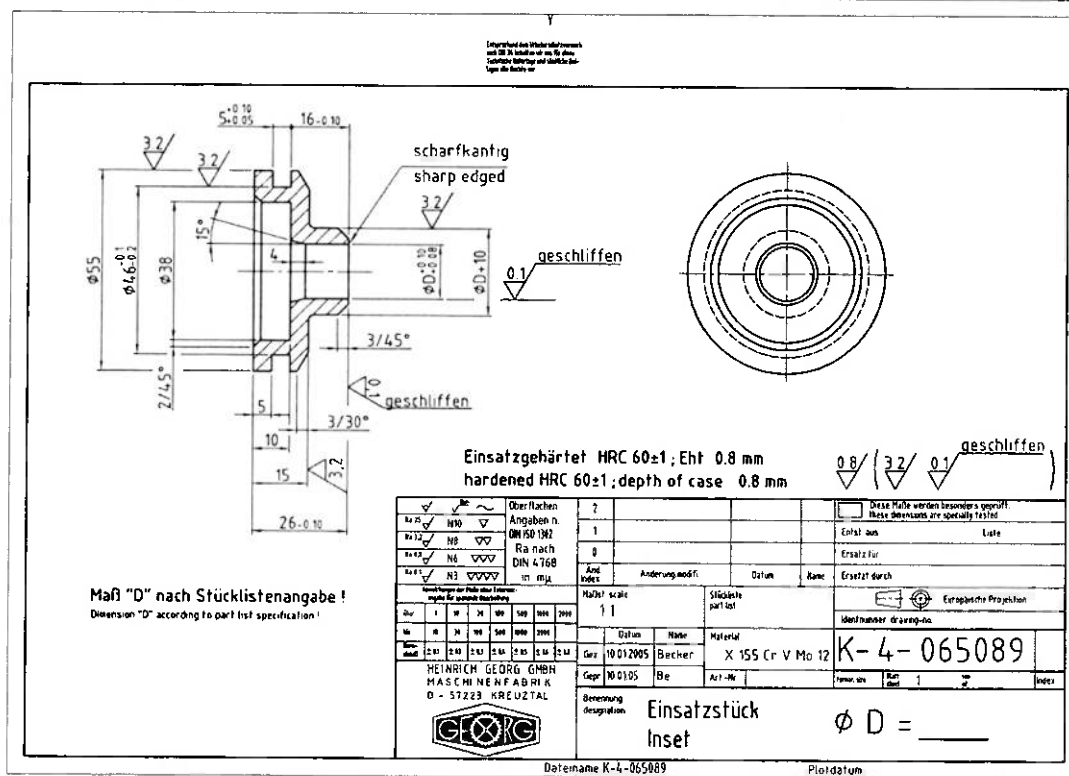
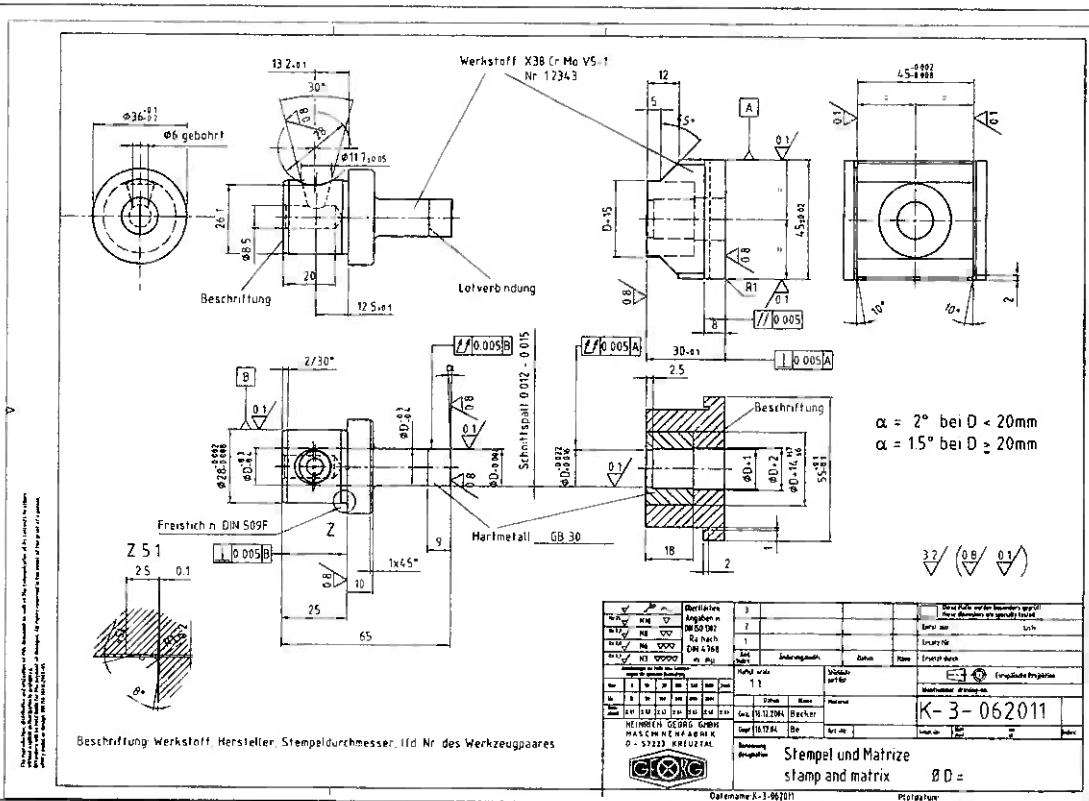
Technical Documentation



Kapitel 8

Chapter 8

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

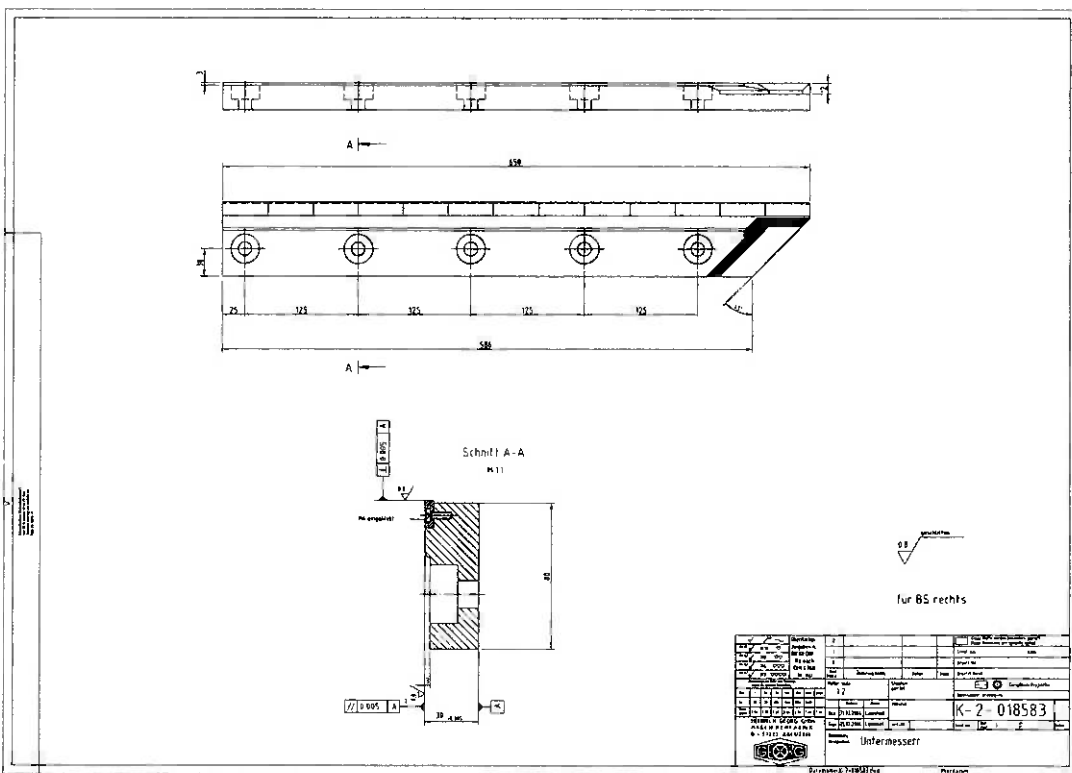
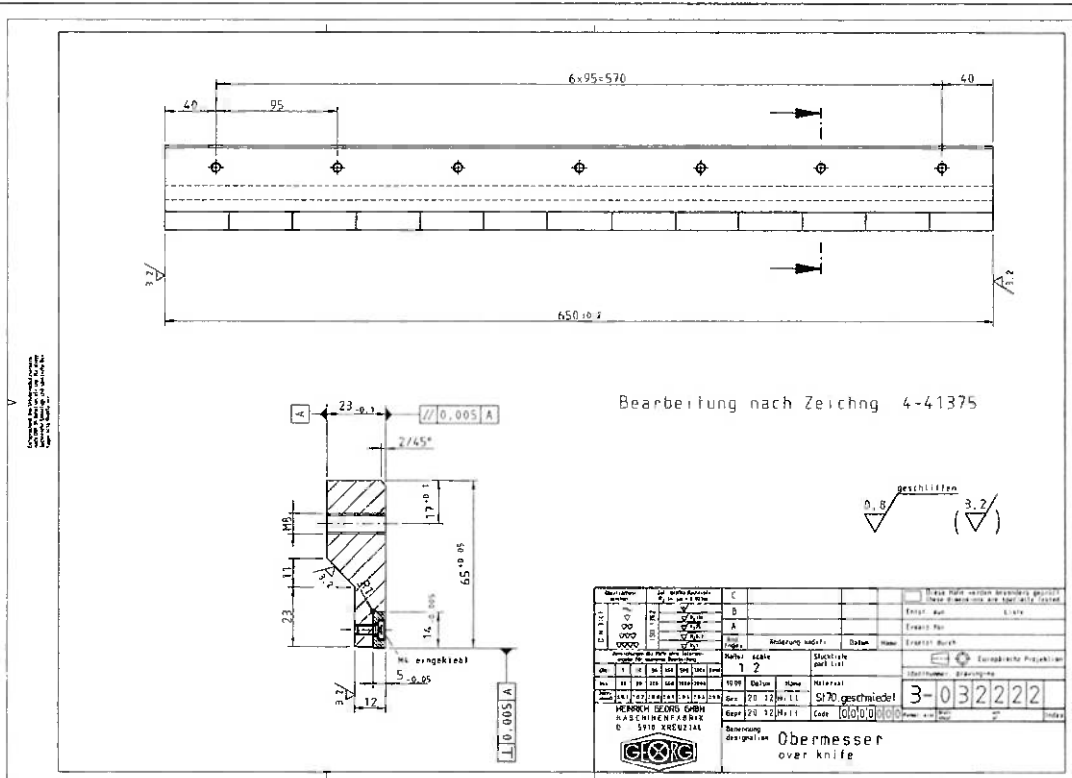


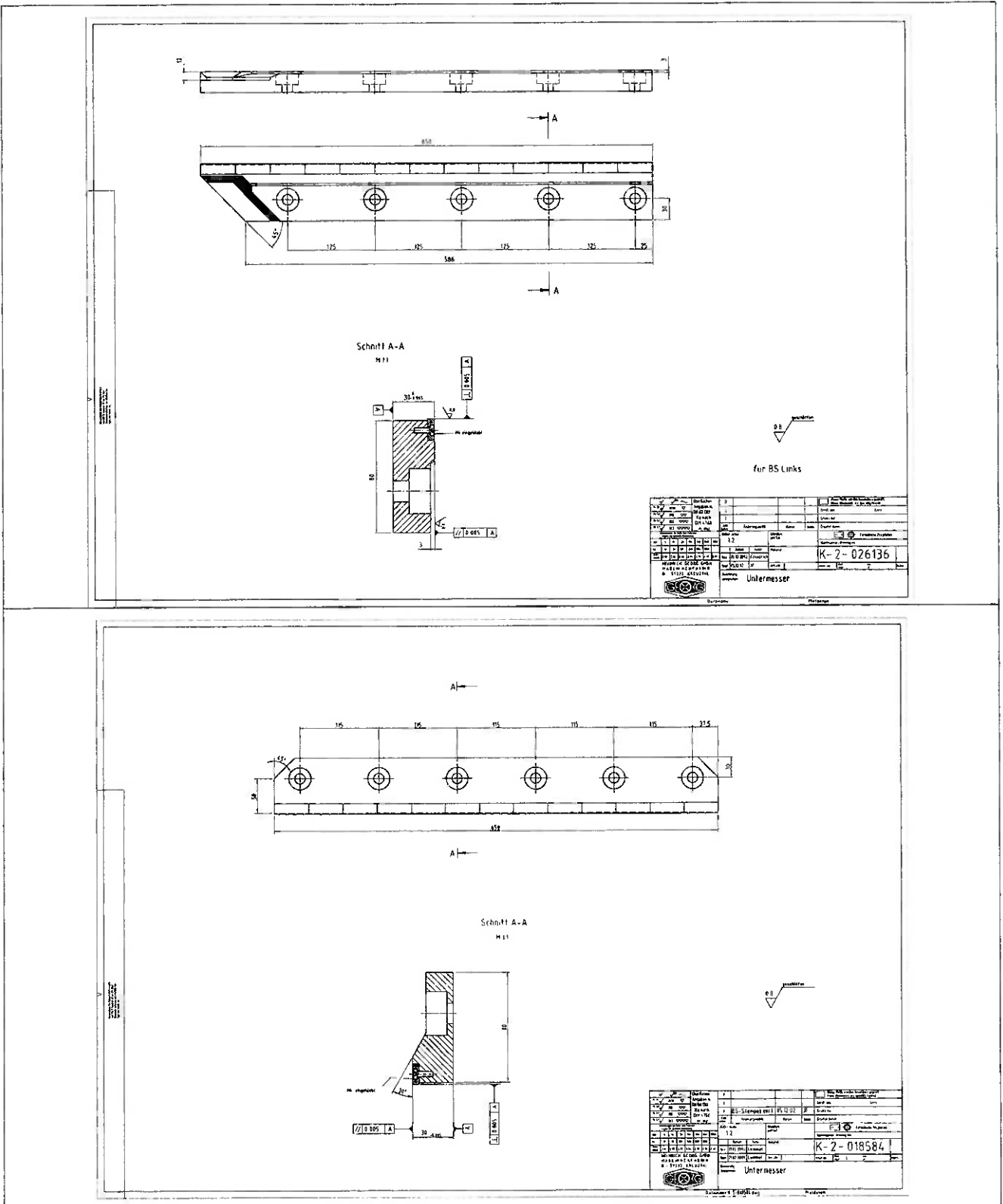


Kapitel 8

Chapter 8

HEINRICH GEORG GMBH
MASCHINENFABRIK







Instruction

to

SIDE GUIDE

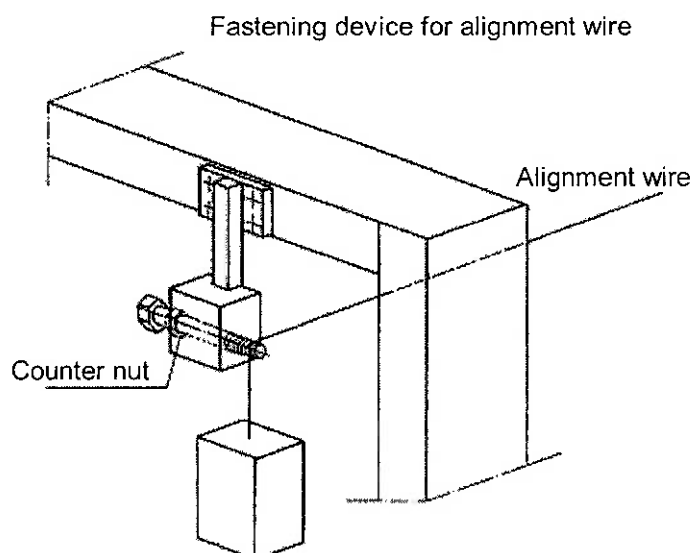
Contents

	Page
	2
1.0 Re-Adjustment of the Side Guides	2
1.01 Line without Drive II	3
1.02 Line with Drive II	3
2.0 Slip Clutches	3



1.0 Re-Adjustment of the Side Guides

During installation and commissioning of the line, the side guides are aligned exactly. However, due to wear and possibly improper operation, it may be necessary to re-adjust the side guides. Re-adjustment is done by using an alignment wire and the frames made out of string. One end of the wire is situated inside of the feed unit, under the measuring roll. The opposite end is situated at the run-out table, near the run-out conveyor roll. The alignment wire (a thin steel cable) is set into both frames made out of string 100 mm left to the theoretical middle of the line, and is kept tight by using a weight. The adjusting value of the guides at the read-out should be 400 mm. Now all guides on the left side of the line, from the feed unit drive to just in front of the swing shear, have to be adjusted to a distance of 100.1 mm to the alignment wire. The guide gibs on the right side of this line part are adjusted to a size of 300.1 mm.



1.0.1 Line without Drive II

The guide gibs behind the swing shear could be adjusted to 100.2 respectively 300.2 mm. Behind the swing shear, the guide gibs have no function for positioning. The plain guide gibs at the tail pulley (diverting roll) even should have a lateral backlash of 0.7 to 1.0 mm at each side.



1.0.2 Line with Drive II

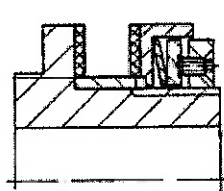
For lines with II drive the guides are constructed as stroke guides.

2.0 Slip Clutches

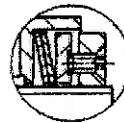
The following drives are equipped with slip clutches:

1. Motor driven adjustment of side guides

Slip Hubs



single
layer



double
layer

Slip clutches are adjustable safety clutches. By exceeding the adjusted torque due to jerking loads, overload and blocking, they will slip.

Any wear is equalized as far as possible in order to avoid expensive downtimes.

Working method of slip clutches is performed by adjustable spring-mounted friction disks actuating a built-in chain wheel, a toothed wheel or a pulley.

The required even axial load of the friction area is obtained by the cup springs. They could be assembled single- or double-stacked. By using double-stacked springs, the transmissible torque is twice compared to the single-stacked arrangement. All slip clutches are cadmium-plated and bronze-covered in several layers at the surfaces exposed to corrosion, except from the cup springs and friction layers. This achieves a long lasting rust-protection even between the friction surfaces and moreover gives a better look.

In order to ensure exact functioning of the safety clutches, the friction disks have to be kept absolutely free from grease and prior to starting of the line, a short running-in period of the line should happen. During this running-in period every unevenness caused by mechanical treatment is being removed.



Recommendation to adjustment

The torque is approximately proportionate to the set spring force. It seems to be easy to adjust any high value. However, this could have negative effect.

Increase of the specific surface pressure at the friction areas will increase the wear of the friction coating. Therefore slip clutches should always be adjusted according to the safety requirements of the drive.

The cup springs are laid out with rather soft characteristics so there is great wear path without an important decrease of torque for the individual re-setting periods.



Instruction

to

MEASURING UNIT

Inhaltsverzeichnis	Page
1.0 Adjustment of the Measuring Roll	2
1.0.1 Securing of Measuring Roll Unit at the Center of the Line (If assembled at the center of the line)	2
1.0.2 Adjusting the Turning Angle Limit	2
1.0.3 Parallel Adjustment of the Pressure Roll	3



1.0 Adjustment of the Measuring Roll

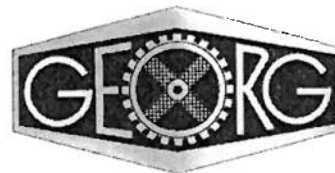
The measuring roll is provided for actual positioning and information of the real feed length. The encoder or pulse generator issues a multiple number of pulses per revolution which are transformed by the electronic system into control signals for the feed drive. Both the measuring roll and the upper pressure roll are revolving in bearings and are adjustable in the direction of the lamination. Adjustment screws on both sides of the rolls limit the rotating angle so that the reverse movement of the lamination is possible without damage to the material. Should re-adjustment be necessary after repair or damage to roll area, the following instruction should be observed.

1.0.1 Securing of Measuring Roll Unit at the Center of the Line (If assembled at the center of the line)

After the measuring- and pressure rolls have been secured temporarily in designed threaded holes, insert a lamination of the average or middle size (approx. 200 mm) into the line and move it forward with the feed drive in order to allow the rolls to turn and align themselves into the proper transport direction. In doing this, the adjustment screws which limit the rotating alignment movement must be open wide. Once the rolls have been aligned into the proper transport direction, the adjusting screws are carefully tightened in order to have this position secured. The lamination is taken out of the line and the roll units are levelled to line centre and fixed within a tolerance of 0.3 mm. The best way is measuring the center with a measuring tape from the rolls towards the side guides.

1.0.2 Adjusting the Turning Angle Limit

The adjustment screws for the turning angle limit are now opened and again coil material is moved forward in the line in order to allow the rolls to locate and adjust themselves in the direction of the transport material. Following this, the adjustment screws should be set so that a tolerance of 0.3 mm is achieved on both sides.



1.0.3 Parallel Adjustment of the Pressure Roll

For this purpose please put a sheet of carbon paper with the carbon side on the electrical steel, just in front of the measuring roll. The pressure roll should be set at a pneumatic pressure of 1 bar. Then drive the material with the carbon paper through the rolls. An inprint will be shown on the material. Now the adjusting screws are being adjusted so long until an even distribution of the inprint is obtained over the complete roll width. Be certain that the pressure roll is positioned exactly over the measuring roll.



Kapitel 9

Chapter 9

Inhaltsverzeichnis

Contents

1.	Hinweise zur Hydraulik Remarks concerning hydraulic system	Seite 1- 3 Page
2.	Hydraulikplan und Stückliste Hydraulic plan and part list	K-3-062535 / 29930
3.	Hydraulikkomponenten hydraulic components	
	Ersatzteilzeichnung für Hydraulik-Zylinder spare part drawing for hydraulic cylinder	OP- 0214 Seite 1- 2 Page
	BOSCH-REXROTH • Proportionalventile NG 6; NG 10 BOSCH-REXROTH • Proportional control valves NG 6; NG 10	OP- 0468 Seite 1- 18 Page
	SAUER-BIBUS • Axialkolben-Verstellpumpen Baureihe J-V SAUER-BIBUS • Variable displacement axial piston pumps Series J-V	Seite 1- 14 Page
	HYDAC • Druckfilter DF / MDF / LF HYDAC • Pressure Filters DF / MDF / LF	Seite 1- 10 Page
	HYDAC • Flüssigkeitskontrolle FSK HYDAC • Fluid Level Sensor FSK	Seite 1 -10 Page
	HYDAC • Tankpack HYDAC • Tankpack	Seite 1 -4 Page



Remarks

concerning the

HYDRAULIC SYSTEM

Please observe the following documents:

- "Operating and maintenance instructions"
- Hydraulic plan and parts list
- Documentation of the used components



**Before starting any maintenance work,
read and observe all safety regulations!**

()

(



Operating and maintenance instructions for the hydraulic - decoiler

Com.	4295-2-06
Hydraulic plan	K- 3- 062535- 01- 03
Parts list	29930

The hydraulic unit consists of a 7,0 l oil tank with filler and aeration filter, oil level indicator with level switch and thermostat.

The level switch controls the oil level and switches off the pump in case of oil deficiency.

The thermostat switches off the pump at a temperature exceeding $> 70^{\circ}\text{C}$.

A pressure-controlled axial piston pump, 0-10 l/min, $p=20$ bar, is attached to the oil tank. This pump includes an oil-air cooler for cooling the leakage oil of the pump.

The oil which flows back from the hydraulic consumers is conducted through a double filter to filter dirt out of the hydraulic system. A soiling display indicates the change of filter elements which should be done after 2 years at the latest.

The hydraulic pump is permanently switched in, because according to the design, the rotatable oil supply lines of the decoiler are not tight.

Putting into operation

The hydraulic unit has to be filled with hydraulic oil through the filler-aeration filter. For this switch in the electric motor for a short time and check the motor direction. The pump pressure is adjusted with the pump controller (if necessary). See the separate pump specification.



INSPECTION AND SERVICING INTERVALS FOR HYDRAULIC UNIT

during running- in		during cont. operation					
(1) acc. to dirt indicator, after two years at the latest	continuously	weekly	monthly	every three months	every six months	yearly	every two years
(2) other checks according to legal requirements	resp. daily	40 h	160 h	500 h	1000 h	2000 h	4000 h
Fluid							
Level							
Temperature							
Condition (samples)							
Changes (as per status)							
Filters							
Changing of filters without blockage indicator							
Changing of filters with blockage indicator (1)							
Check of blockage indicator							
Cleaning of breather filters							
Accumulator							
Check gas pressure check mounting (2)							
Adjustment							
Pressure control valves, flow control valves, pump regulation, signalling device							
Coolers							
oil- air cooler, heat exchanger cleaning							
oil- water cooler, heat exchanger cleaning							
Miscellaneous checks							
External leaks							
Dirt							
Damage							
Noises							
Instruments							
pump motor; couplings; control and exchange							

FILTERELEMENTS:

RETURNLINE FILTER
AIR FILTER

EXCHANGE ELEMENTS ACC. TO DIRT INDICATION

LATEST EVERY 2 YEARS

OIL CHANGE

AFTER 15000 OPERATING HOURS
OR BETTER ACC. TO OIL ANALYSIS
HEAVY-DUTY HYDRAULIC OIL

HLP 32/46 DIN 51524 T2

VISCOSITY CLASS ISO-VG 32/46
AS PER DIN 51519 - ISO 3448
CENTRE VALUE VISCOSITY AT 40°C=46 cSt

MOTOR VOLTAGE

VALVE VOLTAGE

COLOR RAL 6011 reseda green
TUBE yellow, chromatiert E02

FILTERELEMENTE:

Rücklauffilter Pos.122: 0060 D 010 BN3HC
Luftfilter Pos.107: BF 4 G 10

Filterelemente nach Verschmutzungsanzeige wechseln!

oder spätestens nach 2 Jahren

OELWECHSEL

nach 15000 Betriebsstunden
oder besser gemäß Analyse
Hochleistungs Hydrauliköl

HLP 32/46 gem. DIN 51524 T2
Viskositätsklasse ISO-VG 32/46
nach DIN 51519 - ISO 3448

Mittelpunktsviskosität 32/46 cSt bei 40°C

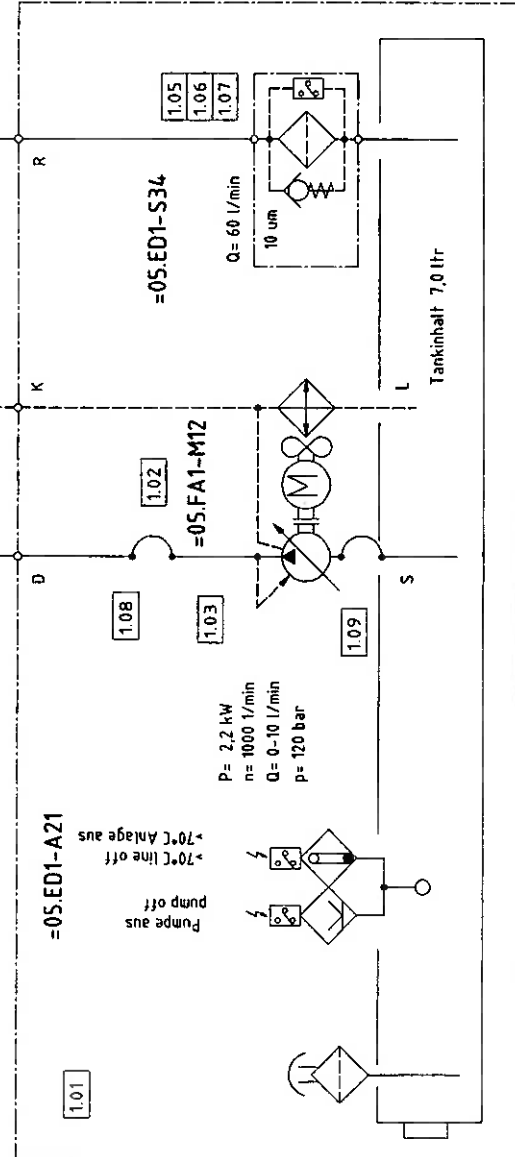
Motorspannung: 400 V, 50 Hz

Ventilspannung: 24 V=

Farbe: RAL 6011 reseda grün
Rohre: gelb chromatiert E02

Hydraulik Abhaspel Hydraulic Unit Decoiler

Tankpack TPF 2



Anschluss: Blatt 02
connection: page 02



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Gez	15.07.07	H.Röcher	15.02.07	29930	4.295
Gepr	15.02.07	R.O.			

Benennung designation
Hydraulikschema
HYDRAULIC SCHEMATIC DIAGRAM

Zeichnungsnummer drawing-no

K-3-062535-01

Blatt Nr. Blatt no. 03

Werk

Häsel schwenken DECOILER SWING

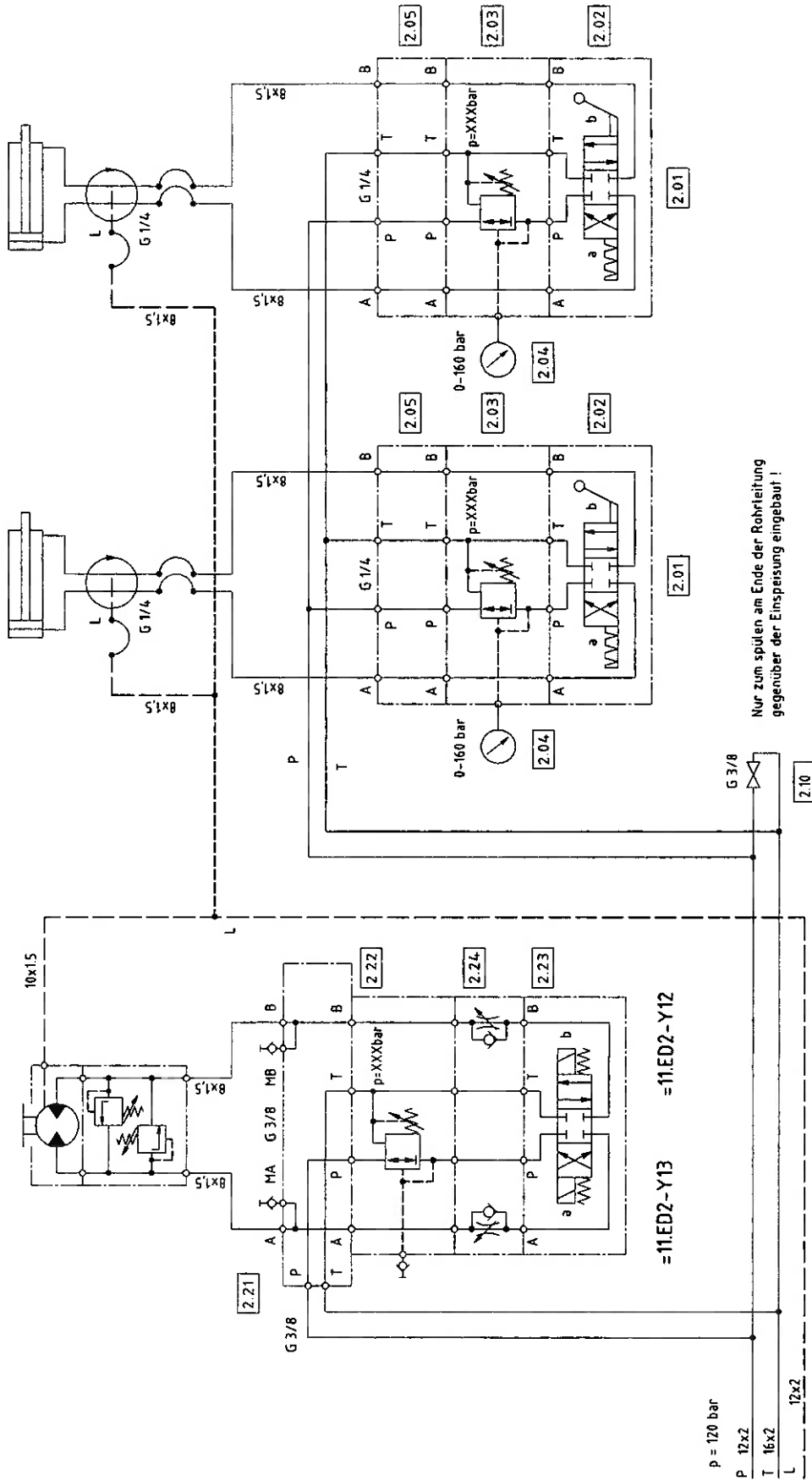
Gerätor NG 80			
dröhen	links	rechts	
vu (n/min)	5,0	6,0	
n (l/min)	0,53 / 13	0,53 / 19	
Q (l/min)	1,02	1,02	

Häsel spreizen DECOILER EXPANDING

Zylø 80/ 40x 130			
Bewegung	spreizen	lösen	
t (sec.)	30	3,0	
v (mm/s)	4,3	4,3	
Q (l/min)	10	13	

Häsel spreizen DECOILER EXPANDING

Zylø 80/ 40x 130			
Bewegung	spreizen	lösen	
t (sec.)	30	3,0	
v (mm/s)	4,3	4,3	
Q (l/min)	10	13	



Nur zum spülen am Ende der Rohrleitung gegenüber der Einspeisung eingebaut !

connection: page 01

connection: page 03



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Datum: 15.02.07
Gez.: H. Röcher
Name: R. G.

Stand: 15.02.07
Stückliste part list: 29930

Kom: 4295

Benennung: designation

Hydraulikschema
HYDRAULIC SCHEMATIC DIAGRAM

Zeichnungsnummer: drawing-no

K-3-062535-02

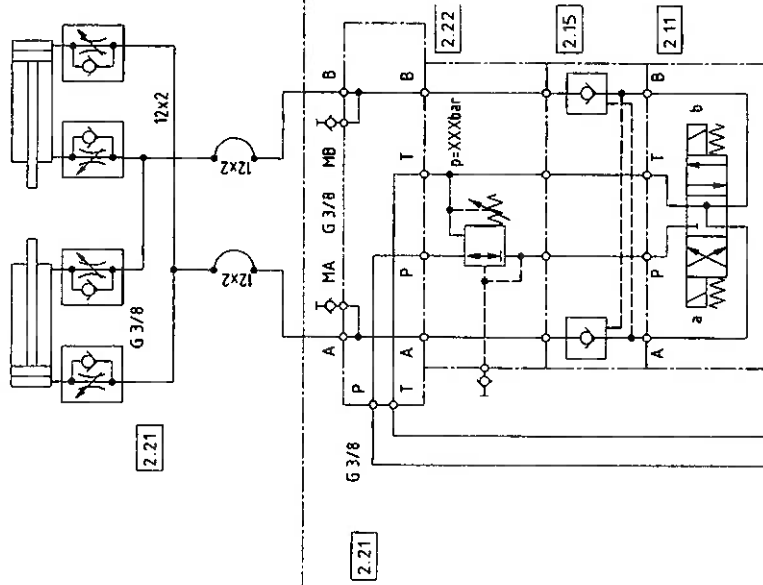
Blatt Nr: 03

Blatt 02

Blatt 03

Stapelwagen arretieren STACKING CAR FIXING

Zyl Ø 80 / 50 x 80			
Bewegung	aus	ein	
t (sec.)	3.1	3.1	
v (mm/s)	25	25	
Q (l/min)	11	16	



Lieferanteil: Kunde
supply by customer

in der Umlenkung
eingebaut !

Integrated in
Diverting unit !

p = 120 bar
P 12x2
T 16x2

=61ED2-Y13 =61ED2-Y12
aus ein

Anschluß: Blatt 02 connection: page 02



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

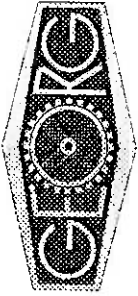
Datum	Name	Stand	Stückliste part list	Kom.
15.02.07	H. Röcher	15.02.07	29930	4295
15.02.07	R6			

Benennung designation
Hydraulikschemata
HYDRAULIC SCHEMATIC DIAGRAM

Zeichnungsnummer drawing-no			
K-3-062535-03			
Blatt sheet	03	von of	03
Blatt Nr. sheet no.			

Es ist zu beachten, dass die
Lieferantenangaben und Lieferzeiten
keine Gewährleistung darstellen.
Es ist zu beachten, dass die
Lieferantenangaben und Lieferzeiten
keine Gewährleistung darstellen.

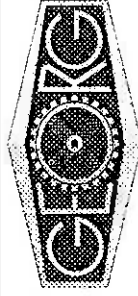
Heinrich Georg GmbH Maschinenfabrik



57223 Kreuztal
Germany

1	2	3	4	5	6	7	8	9
Teil Part	Stück pc.	Benennung Designation	Artikel-Nr. Part No.	Bestellbezeichnung Order Designation	Hersteller Manufacturer	Mag.	Bemerkung Remark	Ersatz. Sp. part
1.00	1	Hydraulikaggregat	050004449	7,0 ltr. 2,2kW, 0-10 l/min	OERTER		7,0 ltr. 2,2kW, 0-10 l/min	1.B
1.04	4	hydraulic power unit						0
2.01	2	Schwingmetall-Puffer	03002749	Form 20291/A	CONTINENTAL	x		
2.02	0	Handsteuerblock	05000028	NG 6 NG 6 2010 360 100		x		
2.03	0	Wegeventil	05000654	4/3-handbet., NG 6 0810 091 380	BOSCH			3.B
2.04	0	way directional control valve	05000664	0811 150 234	BOSCH			0
2.05	0	Druckminderventil	05000656	0,00 bis 160,00 bar G1/4 unten MGF-N-63-G10-160	OERTER		in P, 20-160 bar, mit Handrad	3.A
2.06	1	pressure reducing valve	05000657	NG 6 1815 503 340	BOSCH			0
2.07	1	Manometer	03002187	RHD12S	ERMETO	x		
2.08	1	pressure gauge	05000140	Ø 63, 0,00 bis 160,00 bar G1/4 hinten Dreilochflansch (Frontl	WIK	x		3.A
2.09	1	manometer	05000037	KH-12-PS verzinkt	ERMETO	x		0
2.10	1	Kugelhahn HD	05000677	4/3-el.magn., NG 6 0810 091 212	BOSCH			
2.11	1	ball stop valve	05000674	entsperrb. NG 6 0811 024 105	BOSCH			2.A
2.12	1	Wegeventil	05001921	NG 6 3815 017 001	OERTER			0
2.13	1	way directional control valve	05003632	0811 150 234	BOSCH		in P, 20-160 bar	3.A
2.14	1	Druckminderventil	05000665	4/3-el.magn., NG 6 0810 091 203	BOSCH			0
2.15	1	pressure reducing valve						3.A
2.16	1	Wegeventil						0
2.17	1	way directional control valve						
2.18	1	Druckminderventil						
2.19	1	pressure reducing valve						
2.20	1	Wegeventil						
2.21	1	way directional control valve						
2.22	1	Druckminderventil						
2.23	1	pressure reducing valve						
2.24	1	Wegeventil						
2.25	1	way directional control valve						
2.26	1	Druckminderventil						
2.27	1	pressure reducing valve						
2.28	1	Wegeventil						
2.29	1	way directional control valve						
2.30	1	Druckminderventil						
2.31	1	pressure reducing valve						
2.32	1	Wegeventil						
2.33	1	way directional control valve						
2.34	1	Druckminderventil						
2.35	1	pressure reducing valve						
2.36	1	Wegeventil						
2.37	1	way directional control valve						
2.38	1	Druckminderventil						
2.39	1	pressure reducing valve						
2.40	1	Wegeventil						
2.41	1	way directional control valve						
2.42	1	Druckminderventil						
2.43	1	pressure reducing valve						
2.44	1	Wegeventil						
2.45	1	way directional control valve						
2.46	1	Druckminderventil						
2.47	1	pressure reducing valve						
2.48	1	Wegeventil						
2.49	1	way directional control valve						
2.50	1	Druckminderventil						
2.51	1	pressure reducing valve						
2.52	1	Wegeventil						
2.53	1	way directional control valve						
2.54	1	Druckminderventil						
2.55	1	pressure reducing valve						
2.56	1	Wegeventil						
2.57	1	way directional control valve						
2.58	1	Druckminderventil						
2.59	1	pressure reducing valve						
2.60	1	Wegeventil						
2.61	1	way directional control valve						
2.62	1	Druckminderventil						
2.63	1	pressure reducing valve						
2.64	1	Wegeventil						
2.65	1	way directional control valve						
2.66	1	Druckminderventil						
2.67	1	pressure reducing valve						
2.68	1	Wegeventil						
2.69	1	way directional control valve						
2.70	1	Druckminderventil						
2.71	1	pressure reducing valve						
2.72	1	Wegeventil						
2.73	1	way directional control valve						
2.74	1	Druckminderventil						
2.75	1	pressure reducing valve						
2.76	1	Wegeventil						
2.77	1	way directional control valve						
2.78	1	Druckminderventil						
2.79	1	pressure reducing valve						
2.80	1	Wegeventil						
2.81	1	way directional control valve						
2.82	1	Druckminderventil						
2.83	1	pressure reducing valve						
2.84	1	Wegeventil						
2.85	1	way directional control valve						
2.86	1	Druckminderventil						
2.87	1	pressure reducing valve						
2.88	1	Wegeventil						
2.89	1	way directional control valve						
2.90	1	Druckminderventil						
2.91	1	pressure reducing valve						
2.92	1	Wegeventil						
2.93	1	way directional control valve						
2.94	1	Druckminderventil						
2.95	1	pressure reducing valve						
2.96	1	Wegeventil						
2.97	1	way directional control valve						
2.98	1	Druckminderventil						
2.99	1	pressure reducing valve						
2.100	1	Wegeventil						
2.101	1	way directional control valve						
2.102	1	Druckminderventil						
2.103	1	pressure reducing valve						
2.104	1	Wegeventil						
2.105	1	way directional control valve						
2.106	1	Druckminderventil						
2.107	1	pressure reducing valve						
2.108	1	Wegeventil						
2.109	1	way directional control valve						
2.110	1	Druckminderventil						
2.111	1	pressure reducing valve						
2.112	1	Wegeventil						
2.113	1	way directional control valve						
2.114	1	Druckminderventil						
2.115	1	pressure reducing valve						
2.116	1	Wegeventil						
2.117	1	way directional control valve						
2.118	1	Druckminderventil						
2.119	1	pressure reducing valve						
2.120	1	Wegeventil						
2.121	1	way directional control valve						
2.122	1	Druckminderventil						
2.123	1	pressure reducing valve						
2.124	1	Wegeventil						
2.125	1	way directional control valve						
2.126	1	Druckminderventil						
2.127	1	pressure reducing valve						
2.128	1	Wegeventil						
2.129	1	way directional control valve						
2.130	1	Druckminderventil						
2.131	1	pressure reducing valve						
2.132	1	Wegeventil						
2.133	1	way directional control valve						
2.134	1	Druckminderventil						
2.135	1	pressure reducing valve						
2.136	1	Wegeventil						
2.137	1	way directional control valve						
2.138	1	Druckminderventil						
2.139	1	pressure reducing valve						
2.140	1	Wegeventil						
2.141	1	way directional control valve						
2.142	1	Druckminderventil						
2.143	1	pressure reducing valve						
2.144	1	Wegeventil						
2.145	1	way directional control valve						
2.146	1	Druckminderventil						
2.147	1	pressure reducing valve						
2.148	1	Wegeventil						
2.149	1	way directional control valve						
2.150	1	Druckminderventil						
2.151	1	pressure reducing valve						
2.152	1	Wegeventil						
2.153	1	way directional control valve						
2.154	1	Druckminderventil						
2.155	1	pressure reducing valve						
2.156	1	Wegeventil						
2.157	1	way directional control valve						
2.158	1	Druckminderventil						
2.159	1	pressure reducing valve						
2.160	1	Wegeventil						
2.161	1	way directional control valve						
2.162	1	Druckminderventil						
2.163	1	pressure reducing valve						
2.164	1	Wegeventil						
2.165	1	way directional control valve						
2.166	1	Druckminderventil						
2.167	1	pressure reducing valve						
2.168	1	Wegeventil						
2.169	1	way directional control valve						
2.170	1	Druckminderventil						
2.171	1	pressure reducing valve						
2.172	1	Wegeventil						
2.173	1	way directional control valve						
2.174	1	Druckminderventil						
2.175	1	pressure reducing valve						
2.176	1	Wegeventil						
2.177	1	way directional control valve						
2.178	1	Druckminderventil						
2.179	1	pressure reducing valve						
2.180	1	Wegeventil						
2.181	1	way directional control valve						
2.182	1	Druckminderventil						
2.183	1	pressure reducing valve						
2.184	1	Wegeventil						
2.185	1	way directional control valve						
2.186	1	Druckminderventil						
2.187	1	pressure reducing valve						
2.188	1	Wegeventil						
2.189	1	way directional control valve						
2.190	1	Druckminderventil						
2.191	1	pressure reducing valve						
2.192	1	Wegeventil						
2.193	1	way directional control valve						
2.194	1	Druckminderventil						
2.195	1	pressure reducing valve						
2.196	1	Wegeventil						
2.197	1	way directional control valve						
2.198	1	Druckminderventil						
2.199	1	pressure reducing valve						
2.200	1	Wegeventil						
2.201	1	way directional control valve						
2.202	1	Druckminderventil						
2.203	1	pressure reducing valve						
2.204	1	Wegeventil						
2.205	1	way directional control valve						
2.206	1	Druckminderventil						
2.207	1	pressure reducing valve						
2.208	1	Wegeventil						
2.209	1	way directional control valve						

Heinrich Georg GmbH Maschinenfabrik



57223 Kreuztal
Germany

[illegible]



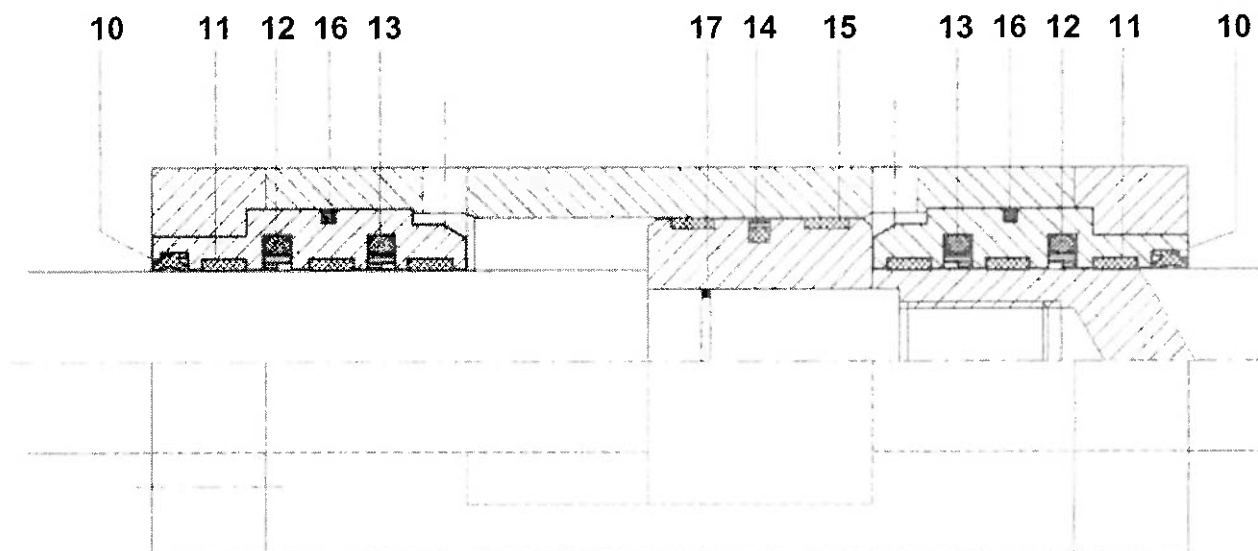
HEINRICH GEORG GMBH
MASCHINENFABRIK

Spare Part Drawing

for

Hydraulic Cylinder

Ersatzteilzeichnung - Spare part drawing





Zylinder - Cylinder Ø 50 / 32 / 32				
Teil - Part	Stck - Pce.	Benennung - Designation	Abmessung - Dimension	Typenbezeichnung - Type
10	2	Abstreifer - Stripper	Ø 32 x 40 x 8	DA 17, WD 1700320
11	6	Führungsband - Guide belt	9,7 x 2,5 x Ø 32	GR 6900320-Z 61 (rod)
12	2	ZURCON Rimseal	Ø 32 x 43 x 4,2	RR 1300320 - Z52N
13	2	TURCON Stepseal	Ø 32 x 43 x 4,2	RS 1300320 - T46N
14	1	TURCON Glydring	Ø 50 x 39 x 4,2	PT 0200500 - Z51N
15	2	Führungsband - Guide belt	5,6 x 2,5 x Ø 50	FB 5,6 x 2,5- 050 (piston)
16	2	O- Ring	Ø 50 x 2,0	ORNO 050 x 2,0
17	1	O- Ring	Ø 20 x 2	ORNO 020 x 2,0

Zylinder - Cylinder Ø 55 / 40 / 40				
Teil - Part	Stck - Pce.	Benennung - Designation	Abmessung - Dimension	Typenbezeichnung - Type
10	2	Abstreifer - Stripper	Ø 40 x 48 x 8	DA 17, WD 1700400
11	6	Führungsband - Guide belt	9,7 x 2,5 x Ø 40	GR 6900400-Z 61 (rod)
12	2	ZURCON Rimseal	Ø 40 x 55 x 6,3	RR 1300400 - Z52N
13	2	TURCON Stepseal	Ø 40 x 55 x 6,3	RS 1300400 - T46N
14	1	TURCON Glydring	Ø 55 x 44 x 4,2	PT 0200550 - Z51N
15	2	Führungsband - Guide belt	10 x 2,5 x Ø 55	FB 10,0 2,5- 055 (piston)
16	2	O- Ring	Ø 62 x 2,5	ORNO 062 x 2,5
17	1	O- Ring	Ø 26 x 2	ORNO 026 x 2,0

Zylinder - Cylinder Ø 63 / 40 / 40				
Teil - Part	Stck - Pce.	Benennung - Designation	Abmessung - Dimension	Typenbezeichnung - Type
10	2	Abstreifer - Stripper	Ø 40 x 48 x 8	DA 17, WD 1700400
11	6	Führungsband - Guide belt	9,7 x 2,5 x Ø 40	GR 6900400-Z 61 (rod)
12	2	ZURCON Rimseal	Ø 40 x 55 x 6,3	RR 1300400 - Z52N
13	2	TURCON Stepseal	Ø 40 x 55 x 6,3	RS 1300400 - T46N
14	1	TURCON Glydring	Ø 63 x 52 x 4,2	PT 0200630 - Z51N
15	2	Führungsband - Guide belt	10 x 2,5 x Ø 63	GP 6900630 - Z61 (piston)
16	2	O- Ring	Ø 62 x 2,5	ORNO 062 x 2,5
17	1	O- Ring	Ø 26 x 2	ORNO 026 x 2,0

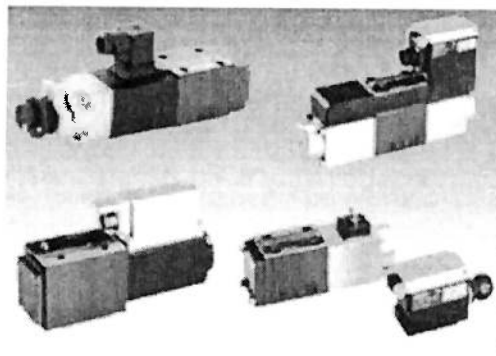
Zylinder - Cylinder Ø 80 / 50 / 50				
Teil - Part	Stck - Pce.	Benennung - Designation	Abmessung - Dimension	Typenbezeichnung - Type
10	2	Abstreifer - Stripper	Ø 50 x 58 x 8	DA 17, WD 1700500
11	6	Führungsband - Guide belt	9,7 x 2,5 x Ø 50	GR 6900500-Z 61 (Stange/rod)
12	2	ZURCON Rimseal	Ø 50 x 65 x 6,3	RR 1300500 - Z52N
13	2	TURCON Stepseal	Ø 50 x 65 x 6,3	RS 1300500 - T46N
14	1	TURCON Glydring	Ø 80 x 64 x 6,3	PT 0200800 - Z51N
15	2	Führungsband - Guide belt	10 x 2,5 x Ø 80	FB 10,0 x 2,5- 080 (Kolben/piston)
16	2	O- Ring	Ø 77 x 2,5	ORNO 077 x 2,5
17	1	O- Ring	Ø 36 x 2,5	ORNO 050 x 2,5



Proportional control valves NG 6; NG 10

Type

BOSCH-REXROTH ¹



Contents ²

Proportional control valves

Pages

1- 4
148
156- 161
230- 232
234- 236

¹

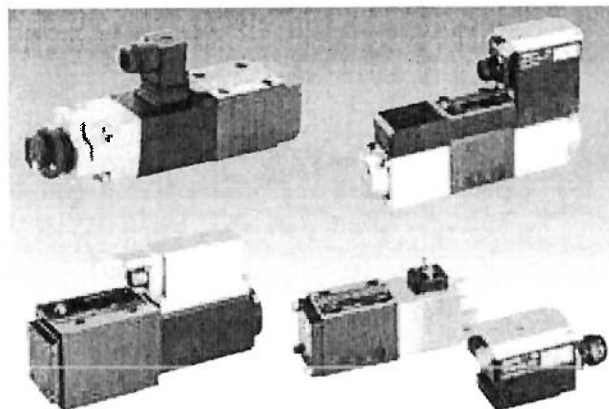
² Source: 1 987 761 317/06.02

1 987 761 317/06.02

Ersetzt: 1 987 761 317/12.00

Proportionalventile
Proportional control valves
Valves proportionnelles

NG 6, 10

**Merkmale**Proportionalventile
direkt gesteuert

- Druckventile
- Stromregelventile
- Wegeventile

Ausführung

- mit/ohne Lageregelung

Elektronik

- Verstärker oder eingebaute OBE
- Stecker

Zubehör

- Anschlussplatten
- Test- und Service-Geräte

FeaturesProportional control valves
direct operated

- Pressure valves
- Flow control valves
- Directional control valves

Version

- with/without position control

Electronics

- Amplifier or integrated OBE
- Plugs

Accessories

- Subplates
- Testing and service equipment

Caractéristiques spécifiquesValves proportionnelles
à commande directe

- Valves de pression
- Régulateurs de débit
- Distributeurs

Exécution

- avec/sans régulation de position

Electroniques

- Amplificateurs ou OBE intégré
- Connecteurs

Accessoires

- Embases
- Appareil de test et de service



© 2002

by Bosch Rexroth AG, Industrial Hydraulics, D-97813 Lohr am Main

Alle Rechte vorbehalten. Kein Teil des Werkes darf in irgendeiner Form ohne vorherige schriftliche Zustimmung von Bosch Rexroth AG, Industrial Hydraulics reproduziert oder unter Verwendung elektronischer Systeme gespeichert, verarbeitet, vervielfältigt oder verbreitet werden. Zuwiderhandlungen verpflichten zu Schadensersatz.

Dieses Werk wurde mit größter Sorgfalt erstellt und alle Angaben auf ihre Richtigkeit hin überprüft. Aus Gründen der ständigen Produkt-Weiterentwicklung müssen Änderungen vorbehalten bleiben. Für etwaige fehlerhafte oder unvollständige Angaben kann keine Haftung übernommen werden.

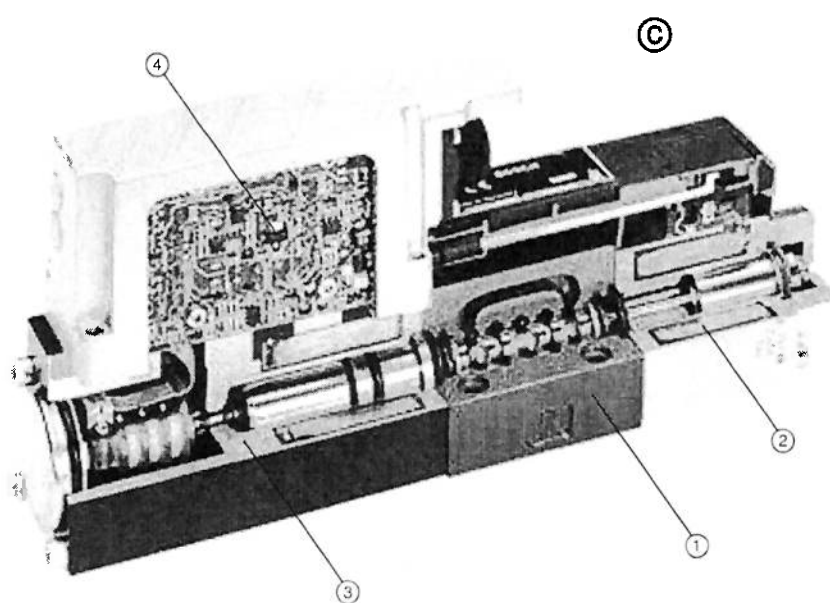
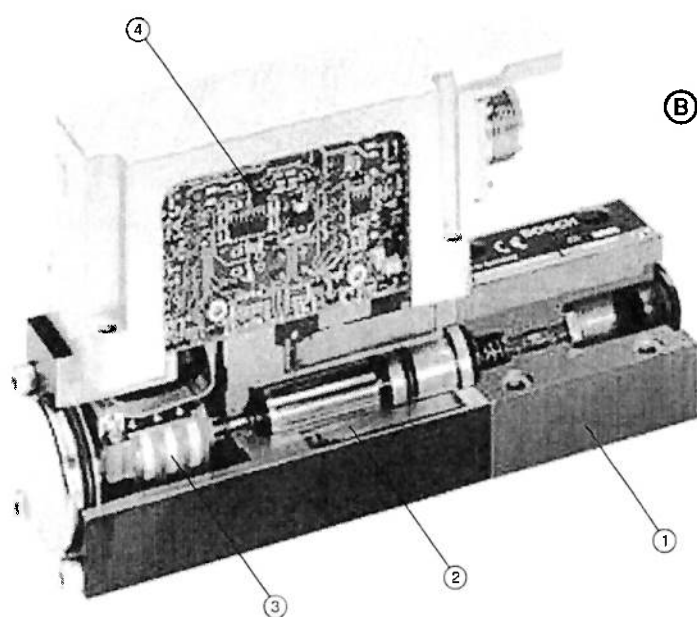
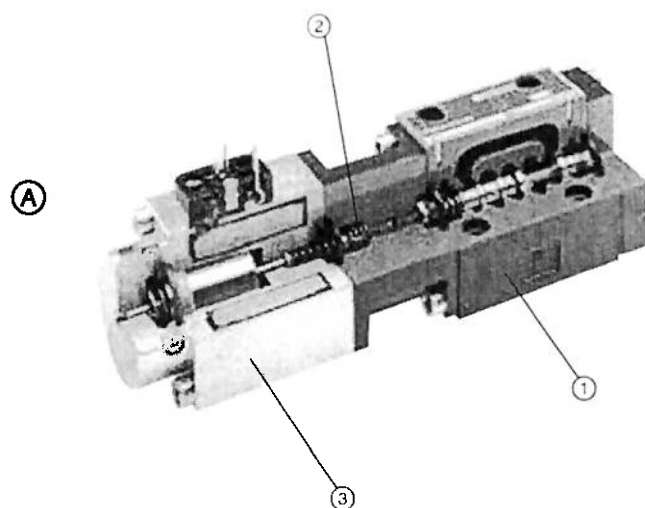


Bild (A)

**Druckbegrenzungsventil,
vorgesteuert NG 6**

- ① Gehäuse für max. 40 l/min
- ② Vorsteuerventil mit Kegel-Sitzfunktion
- ③ Magnet ohne Lageregelung, mit Entlüftungsschrauben

Picture (A)

**Proportional pressure relief valve,
pilot operated NG 6**

- ① Housing for max. 40 l/min
- ② Pilot valve with conical seat function
- ③ Solenoid without position control, with bleeder screws

Photo (A)

**Limiteur de pression,
pilote NG 6**

- ① Corps pour max. 40 l/min
- ② Valve pilote avec fonction siège conique
- ③ Aimant sans régulation de position, avec vis de purge

Bild (B)

**Druckventil, mit eingebauter
Elektronik NG 6**

- ① Gehäuse mit Kegel-Sitzfunktion
- ② Magnet
- ③ Wegaufnehmer
- ④ Verstärker für lagegeregelte Magnetposition

Picture (B)

**Pressure valve, with integrated
amplifier NG 6**

- ① Housing with conical seat function
- ② Solenoid
- ③ Position transducer
- ④ Amplifier for position-controlled solenoid position

Photo (B)

**Valve de pression,
avec amplificateur intégré NG 6**

- ① Corps avec fonction siège conique
- ② Aimant
- ③ Capteur de position
- ④ Amplificateur pour régulation de position de l'aimant

Bild (C)

**Wegeventil, mit eingebauter
Elektronik NG 6**

- ① Gehäuse mit 4/3-Wege-Funktion
- ② Magnet b
- ③ Magnet a mit Wegaufnehmer
- ④ Verstärker für lagegeregelte Magnetposition

Picture (C)

**Directional control valve,
with integrated amplifier NG 6**

- ① Housing with 4/3-way function
- ② Solenoid b
- ③ Solenoid a with position transducer
- ④ Amplifier for position-controlled solenoid position

Photo (C)

**Distributeur,
avec amplificateur intégré NG 6**

- ① Corps avec fonction 4/3
- ② Aimant b
- ③ Aimant a avec capteur de position
- ④ Amplificateur pour régulation de position de l'aimant

Hinweis

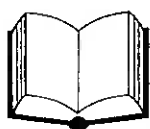
Weitere Kataloge und Informationen
über Proportional- und Regelventile:

Note

Further catalogues and information on
proportional valves and servo solenoid
valves:

Remarque

Autres catalogues et informations
sur les valves proportionnelles et les
servo-distributeurs:



Proportionalventile, vorgesteuert, NG 10 bis NG 50 Proportional valves, pilot operated, NG 10 to NG 50 Valves proportionnelles, pilotées, NG 10 à NG 50	AKY 013/3 1 987 761 328
Regelventile Servo solenoid valves Servo-distributeurs	AKY 013/2 1 987 761 323
Elektronik-Zubehör und Sensoren Electronic accessories and sensors Accessoires électroniques et capteurs	AKY 013/4 1 987 761 327

Proportionalventile, mit oder ohne Lageregelung

Proportionalventile setzen ein elektrisches Eingangssignal stufenlos in ein proportionales hydraulisches Ausgangssignal um. Entsprechend der verschiedenen Aufgaben unterscheidet man:

- Proportional-Druckventile
- Proportional-Drossel- und Stromregelventile
- Proportional-Wegeventile.

Diese Ventile werden sowohl mit externem Ventilverstärker als auch mit eingebautem Ventilverstärker oder mit Aktivstecker angeboten.

Bei Ventilen ohne Lageregelung

basiert die Wirkung auf dem eingestellten Magnetstrom und damit die Kraftabgabe des Magnetes gegen eine Feder. Die daraus resultierende Position im hydraulischen Teil kann durch Laständerungen in der Hydraulik beeinflusst werden. In der Regel werden Ventile ohne Lageregelung in Anwendungen mit niedrigen Genauigkeitsanforderungen eingesetzt. Die Hysterese dieser Ventile liegt im Bereich von 2 ... 4 %.

Ventile mit Lageregelung haben zusätzlich einen Wegaufnehmer am Ventil. Die Soll-Position wird mit diesem Wegaufnehmer verglichen. Bei kleinster Abweichung regelt der Ventilverstärker den Magnetstrom/die Kraft nach, damit die Position erhalten bleibt. Die Leistungsdaten dieser Ventile sind dadurch auf einem höheren Niveau und die Hysterese nur noch im 0,2 ... 0,5 %-Bereich.

Proportional valves, with or without position control

Proportional valves ensure the stepless conversion of an electrical input signal into a proportional hydraulic output signal. A range of functions are performed by the following different types of valve:

- Proportional pressure valves
- Proportional throttle and flow control valves
- Proportional directional control valves.

These valves are available both with external and integrated valve amplifier or with plug amplifier.

The function of valves without

position control is based on the set solenoid current and therefore the force exerted by the solenoid against a spring. The resulting position in the hydraulic section can be influenced by changes in load in the hydraulic system. As a rule, valves without position control are employed in applications with low accuracy requirements. These valves have a hysteresis ranging from 2 ... 4 %.

Valves with position control also feature a position transducer on the valve. The position setpoint is compared by this position transducer. If there is the smallest deviation, the valve amplifier readjusts the solenoid current/force, so that the position is maintained. The performance data of these valves are therefore on a higher level, and hysteresis lies only in the range of 0.2 ... 0.5 %.

Valves proportionnelles avec ou sans régulation de position

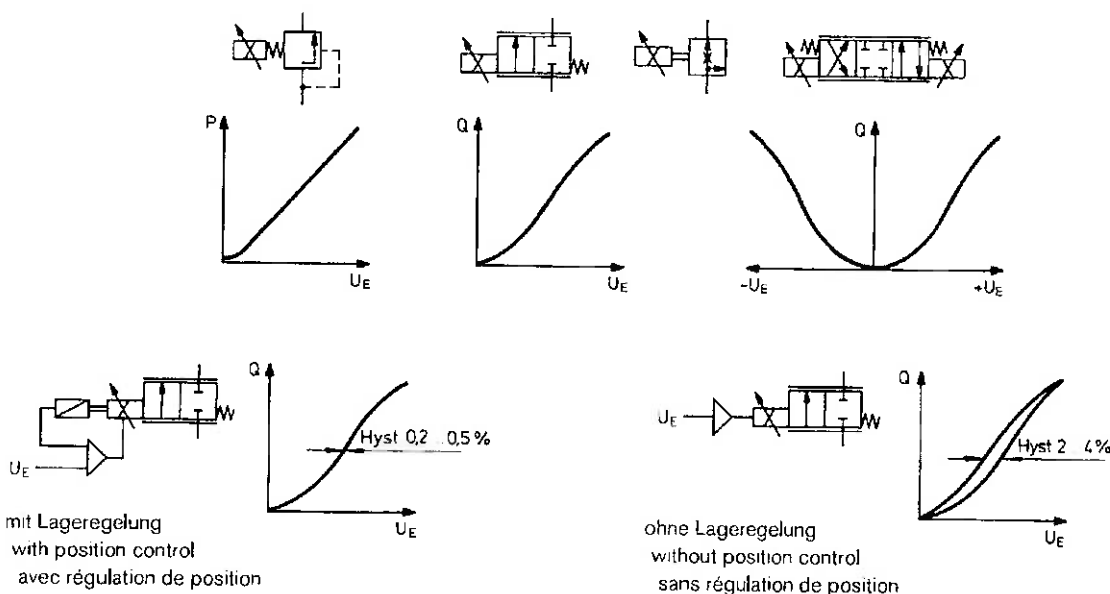
Une valve proportionnelle permet de transposer en continu un signal d'entrée électrique en un signal de sortie hydraulique proportionnel. Selon les différentes opérations à réaliser, on distingue:

- Les valves de réglage de pression proportionnelles
- Les limiteurs et régulateurs de débit proportionnels
- Les distributeurs proportionnels.

Ces valves sont proposées aussi bien avec un amplificateur de valve externe qu'avec un amplificateur de valve intégré ou un amplificateur connectable.

Le principe des valves **sans régulation de position** est basé sur la régulation du courant de l'électro-aimant et donc sur la délivrance de la force de l'aimant contre un ressort. La position en résultant dans la partie hydraulique peut être influencée par des modifications de charge dans le système hydraulique. En règle générale, les valves sans régulation de position sont utilisées pour des applications présentant de faibles exigences en matière de précision. L'hystérésis de ces valves se situe dans la plage de 2 ... 4%.

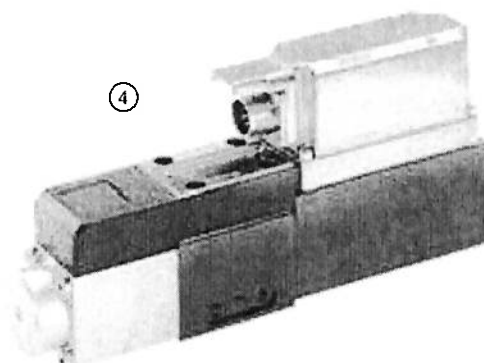
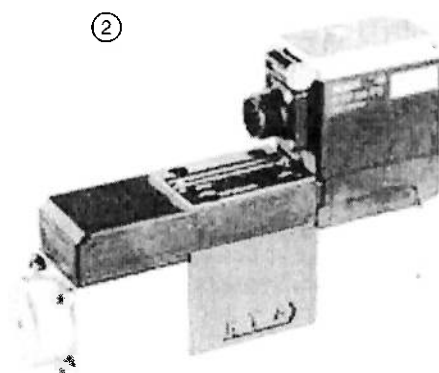
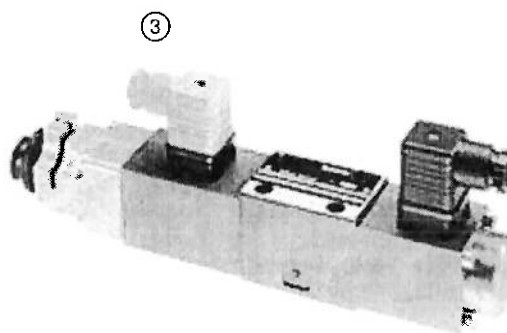
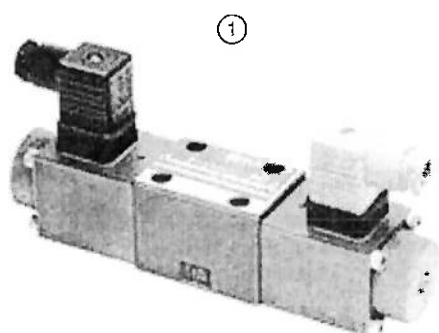
Les valves **avec régulation de position** sont dotées d'un capteur de position monté directement sur la valve. La position théorique est comparée avec ce capteur de position. En cas d'écart minime, l'amplificateur de valve règle le courant de l'aimant/la force de manière à conserver la position. Les caractéristiques de ces valves sont donc d'un meilleur niveau et leur hystérésis n'est plus que de 0,2 ... 0,5 %.



Proportional-Wegeventile

Proportional directional control valves

Distributeurs proportionnels



① ohne Lageregelung
Version: Standard 2,5 A

② ohne Lageregelung und
eingebauter Elektronik – OBE

③ mit Lageregelung
Version: LVDT – AC

④ mit Lageregelung und
eingebauter Elektronik – OBE

① without position control
Version: Standard 2.5 A

② without position control and
on-board electronics – OBE

③ with position control
Version: LVDT – AC

④ with position control and
on-board electronics – OBE

① sans régulation de position
Version: Standard 2,5 A

② sans régulation de position et
amplificateur intégré – OBE

③ avec régulation de position
Version: LVDT – AC

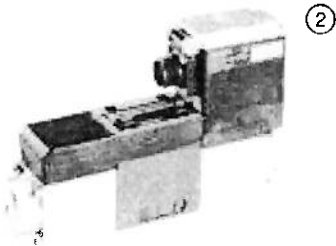
④ avec régulation de position et
amplificateur intégré – OBE

Bauart: Schieberventil

Construction: Spool type valve

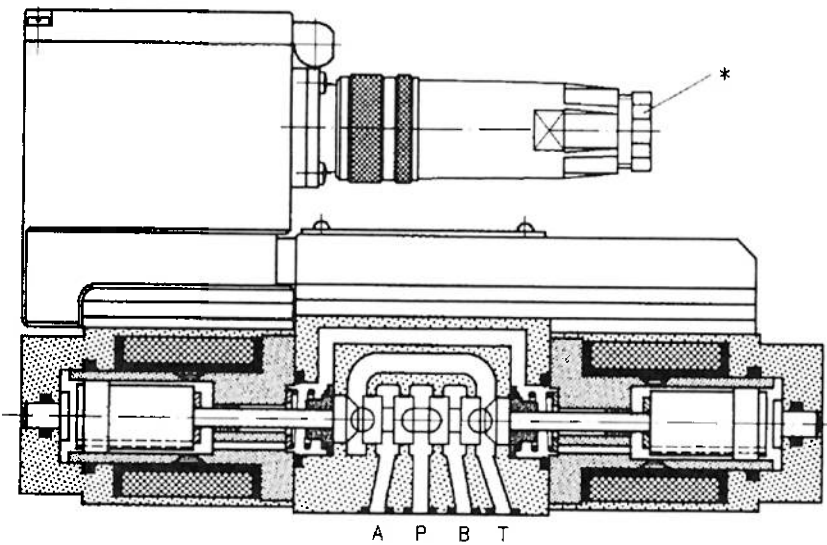
Construction: Distributeur à tiroir

Wegeventile mit OBE
Directional control valves with OBE
Distributeurs avec OBE

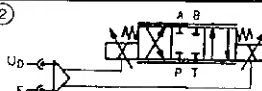
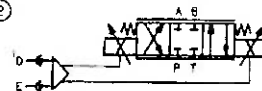


Funktion
Function
Fonction

CE EN 50 081-1
EN 50 082-2



ohne Lageregelung without position control sans régulation de position

Sinnbild Symbol Symbole		Δp [bar]	$Q_{nom.}$ [l/min] Q_A Q_B	$p_{max.}$ [bar]		[kg]	
②  OBE	24 V= 35 VA max $U_{D-E} 0 \dots \pm 10 V$	5	18 18	P, A, B: 315 T: 250		3,1	0 811 404 151
②  OBE			32 32				0 811 404 150
②  OBE			18 18				0 811 404 153
②  OBE	24 V= 35 VA max $I_{D-E} 4 \dots 20 mA$						0 811 404 152
(4 x)  M 5 x 30 DIN 912-10.9							0 811 404 154
							2 910 151 166
Stecker 7-polig				KS	1 834 482 022		
Plug 7-pole				KS	1 834 482 026		
Connecteur 7 pôles				MS	1 834 482 023		
Seite				MS	1 834 482 024		
Page 241				KS 90°	1 834 484 252		

Kenngrößen

Allgemein		
Bauart	Schieberventil	
Betätigung	Proportionalmagnet ohne Lageregelung und mit eingebauter Elektronik	
Anschlussart	Plattenanschluss, Lochbild NG 6 (ISO 4401)	
Einbaulage	beliebig	
Umgebungstemperatur	-20 ... +50 °C	
Rüttelfestigkeit, Prüfbedingung	max. 25 g, Raumschüttelprüfung in allen Richtungen (24 h)	
Hydraulisch		
Druckmittel	Hydrauliköl nach DIN 51 524 ... 535, andere Medien nach Rückfrage	
Viskosität, empfohlen	20 ... 100 mm ² /s	
max. zulässig	10 ... 800 mm ² /s	
Druckmitteltemperatur	-20 ... +70 °C	
Filterung	Zulässige Verschmutzungsstufe des Druckmittels nach NAS 1638	Zu erreichen mit Filter $\beta_x = 75$
Entsprechend Betriebssicherheit und Lebensdauer	7	X = 5
	8	10
	9	15
Durchflussrichtung	siehe Sinnbild	
Max. Betriebsdruck (statisch)	Anschluss P, A, B: 315 bar Anschluss T: 250 bar	
Nenndurchfluss (bei $\Delta p = 5$ bar)*	18	32 l/min (pro Steuerkante)
	Q_A bei 8 V	15 ± 1 l/min 26 $\pm 1,5$ l/min
Einsatzgrenze	siehe Diagramm	
Lecköl/Steuerkante ($\Delta p = 100$ bar)		A → T = 80 cm ³ /min B → T = 80 cm ³ /min
Leckölenlastung ($\Delta p = 5$ bar)		A → T = 0,8 ... 1,6 l/min B → T = 0,8 ... 1,6 l/min
Statisch/Dynamisch		
Hysterese	≤ 6%	
Ansprechempfindlichkeit	≤ 3%	
Stellzeit 100% Signalsprung (Rampe = T_{ramp})	50 ms  100 ms 	
Elektrische Kenngrößen	siehe Seite 230 (OBE)	

* Nenndurchfluss

Dieser bezieht sich immer auf eine Druckdifferenz an der Drosselstelle von $\Delta p = 5$ bar.
Der Durchfluss bei anderen Differenzdrücken berechnet sich nach:

$$Q_x = Q_{\text{nom.}} \cdot \sqrt{\frac{\Delta p_x}{5}}$$

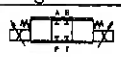
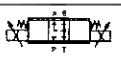
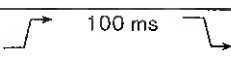
Hierbei sind jedoch die **Einsatzgrenzen** zu beachten. Bei Überschreitung der Einsatzgrenzen treten Strömungskräfte auf, die zu unkontrollierbaren Schieberbewegungen führen. Durch die Verwendung von **Druckwaagen** wird Δp sicher begrenzt.

Characteristics

General

Construction	Spool type valve
Actuation	Proportional solenoid without position control and with on-board electronics
Connection type	Subplate, mounting hole configuration NG 6 (ISO 4401)
Mounting position	optional
Ambient temperature range	-20 ... +50 °C
Vibration resistance, test condition	max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic

Pressure medium	Hydraulic oil as per DIN 51 524 ... 535, other fluids after prior consultation	
Viscosity, recommended	20 ... 100 mm²/s	
max. permitted	10 ... 800 mm²/s	
Pressure medium temperature	-20 ... +70 °C	
Filtration	Permissible contamination class of pressure medium as per NAS 1638	Achieved using filter $\beta_x = 75$
In line with operational reliability and service life	7	$X = 5$
	8	10
	9	15
Flow direction	cf. symbol	
Max. working pressure (static)	Ports P, A, B: 315 bar Port T: 250 bar	
Nominal flow (at $\Delta p = 5$ bar)*	18	32 l/min (per metering edge)
	Q_A at 8 V	15 ± 1 l/min 26 ± 1.5 l/min
Operating limits	see diagram	
Leakage/Metering edge ($\Delta p = 100$ bar)		A → T = 80 cm³/min B → T = 80 cm³/min
Leakage drain ($\Delta p = 5$ bar)		A → T = 0.8 ... 1.6 l/min B → T = 0.8 ... 1.6 l/min
Static/Dynamic		
Hysteresis	≤ 6%	
Response sensitivity	≤ 3%	
Response time 100% signal change (Ramp = T_{mn})	50 ms  100 ms	
Electrical characteristics	see page 230 (OBE)	

* Nominal flow

This is always based on a pressure differential of $\Delta p = 5$ bar at the throttle point.

Where other pressure differentials are involved, flow is calculated according to the following formula:

$$Q_x = Q_{nom} \cdot \sqrt{\frac{\Delta p_x}{5}}$$

However, the **operating limits** must be borne in mind here.

When the operating limits are exceeded, the ensuing flow forces lead to uncontrollable spool movements.

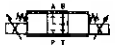
To achieve effective limitation of Δp , use is made of **pressure compensators**.

Caractéristiques

Générales

Construction	Distributeur à tiroir
Commande	Aimant à action proportionnelle sans régulation de position avec amplificateur intégré
Raccordement	Embase selon plan de pose NG 6 (ISO 4401)
Position de montage	indifférente
Température ambiante	-20 ... +50 °C
Vibrations, condition du test	max. 25 g, 3 dimensions (24 h)

Hydrauliques

Fluide	Fluide hydraulique selon norme DIN 51 524 ... 535, autre fluide sur demande	
Viscosité, conseillée	20 ... 100 mm²/s	
max. admissible	10 ... 800 mm²/s	
Température du fluide	-20 ... +70 °C	
Filtration	Classe de pollution admissible du fluide selon NAS 1638	Avec un filtre $\beta_x = 75$
Selon sécurité de fonctionnement et durée de vie	7	X = 5
	8	10
	9	15
Sens d'écoulement	voir symbole	
Pression de service max. (statique)	Orifice P, A, B: 315 bar Orifice T: 250 bar	
Débit nominal (pour $\Delta p = 5$ bar)*	18	32 l/min (par arête de distribution)
	Q_A à 8 V	15 ± 1 l/min $26 \pm 1,5$ l/min
Limites d'utilisation	voir diagramme	
Fuites internes/Arête de distribution ($\Delta p = 100$ bar)		A → T = 80 cm³/min B → T = 80 cm³/min
Drainage de fuites internes ($\Delta p = 5$ bar)		A → T = 0,8 ... 1,6 l/min B → T = 0,8 ... 1,6 l/min

Statiques/Dynamiques

Hystérésis	≤ 6%
Seuil de réponse	≤ 3%
Temps de réponse pour une course de 100% (Rampe = T_{mn})	50 ms  100 ms 
Caractéristiques électriques	voir page 230 (OBE)

* Débit nominal

Toujours par rapport à une différence de pression à l'étranglement de $\Delta p = 5$ bar.
Le débit pour d'autres différences de pression se calcule comme suit:

$$Q_x = Q_{nom.} \cdot \sqrt{\frac{\Delta p_x}{5}}$$

Il faut néanmoins tenir compte des **limites d'utilisation**.

En cas de dépassement de ces plages d'utilisation, une pression trop élevée entraîne des déplacements de tiroir non contrôlés. L'utilisation de **balances de pression** permet de limiter en toute sécurité le Δp .

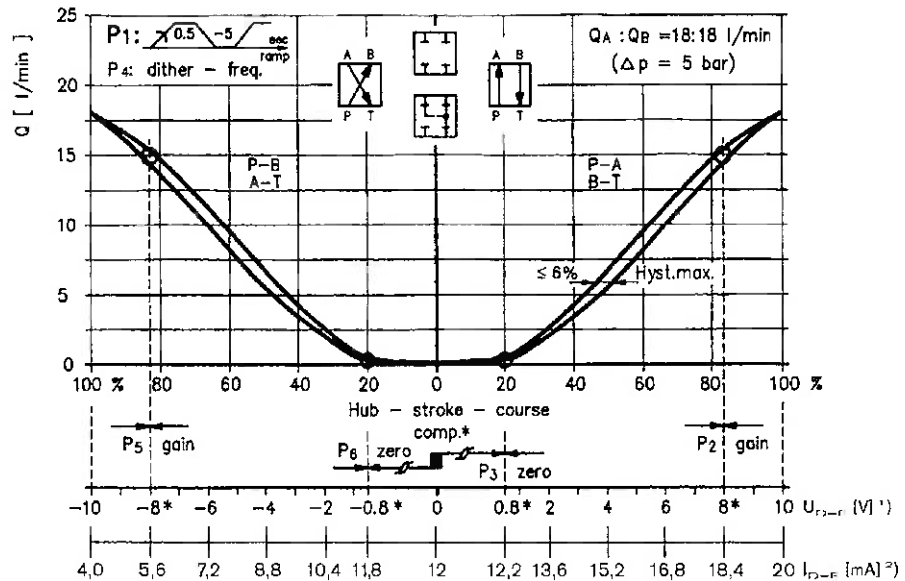
Kennlinien

Performance curves

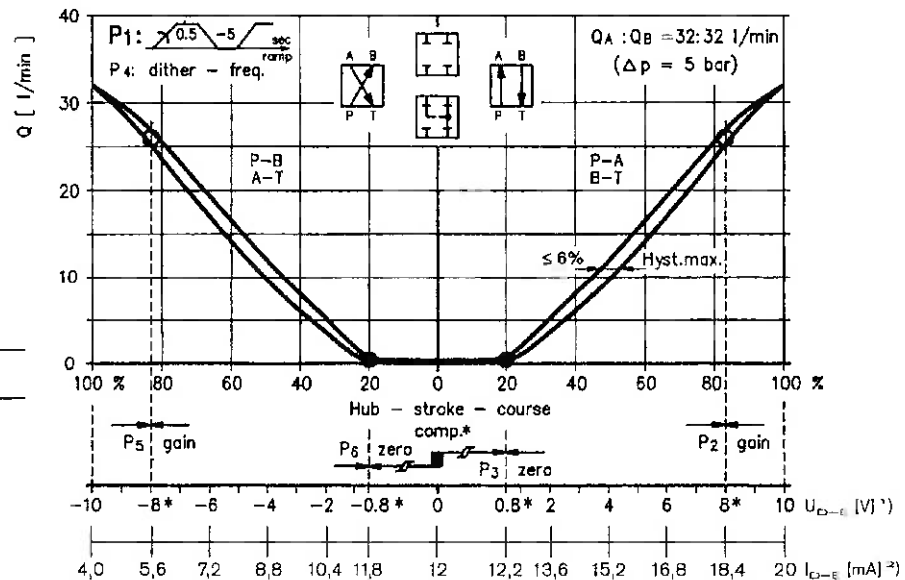
Courbes caractéristiques

$v = 35 \text{ mm}^2/\text{s}$

$Q_{\text{nom.}} = 18 \text{ l/min}$



$Q_{\text{nom.}} = 32 \text{ l/min}$



Hinweis/Remark/Note:

	P1 ramp
	P2 ... P6
	* Ab Werk eingestellt
	* Factory calibrated
	* Réglage par l'usine

Elektronikabgleich

siehe Seite 230

1) Version: $U_E = 0 \dots \pm 10 \text{ V}$

2) Version: $I_E = 4 \dots 20 \text{ mA}$

Electronics adjustment

see page 230

1) Version: $U_E = 0 \dots \pm 10 \text{ V}$

2) Version: $I_E = 4 \dots 20 \text{ mA}$

Tarage de l'électronique,

voir page 230

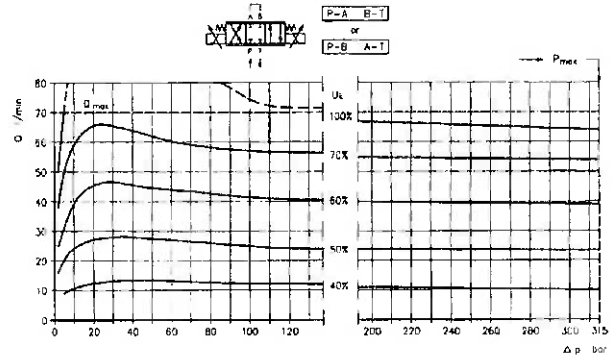
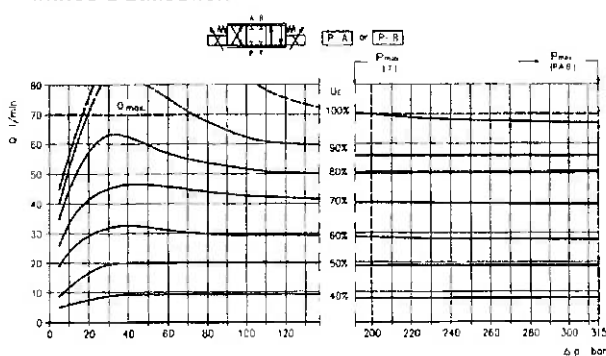
1) Version: $U_E = 0 \dots \pm 10 \text{ V}$

2) Version: $I_E = 4 \dots 20 \text{ mA}$

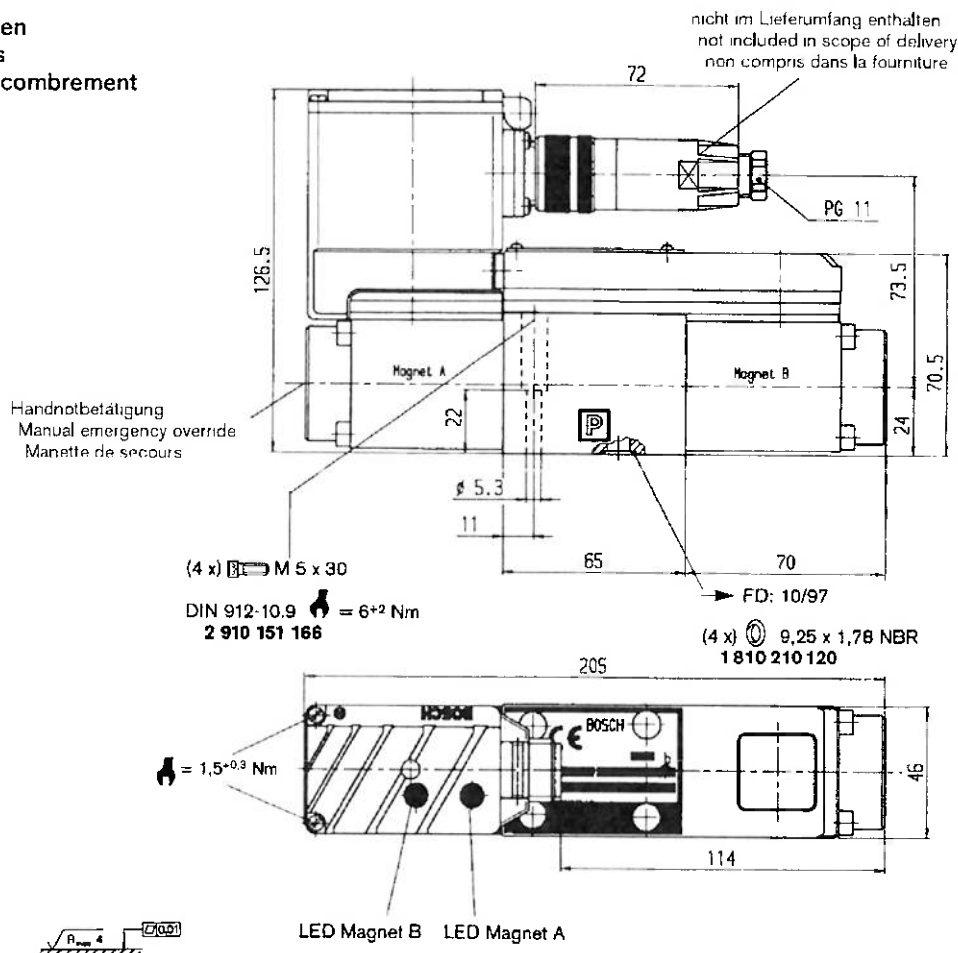
Einsatzgrenzen

Operating limits

Limites d'utilisation



Abmessungen
Dimensions
Cotes d'encombrement



Abmessungen des Anschluss-
 lochbildes NG 6 ISO 4401
 siehe Seite 212

Dimensions of mounting hole
 configuration NG 6 ISO 4401
 see page 212

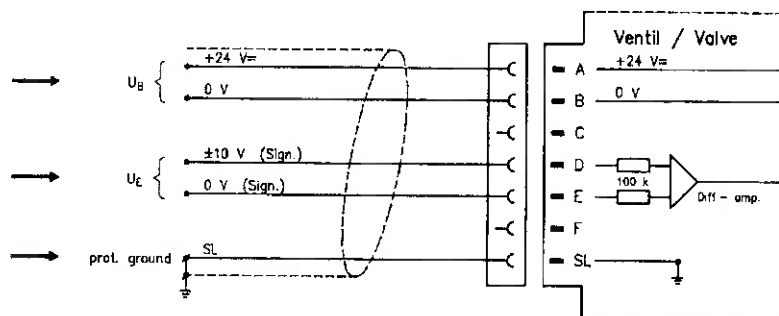
Cotes du plan de pose
 NG 6 ISO 4401
 voir page 212

Steckerbelegung
ohne Lageregelung

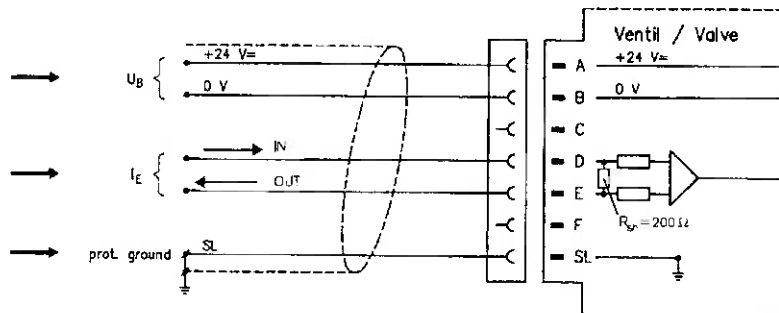
Pin assignment
without position control

Affectation du connecteur
sans régulation de position

Version: $U_E = 0 \dots \pm 10 \text{ V}$
 $R_i = 100 \text{ k}\Omega$



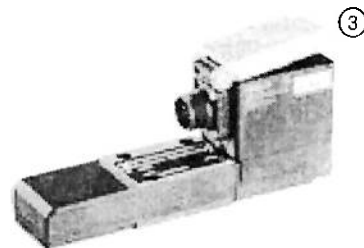
Version: $I_E = 4 \dots 12 \dots 20 \text{ mA}$



Eingebaute Elektronik – OBE

On-board electronics – OBE

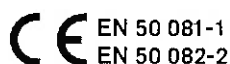
Amplificateur intégré – OBE



Für Wegeventile NG 6, 10
 – ohne Lageregelung
 – mit zwei Magneten
 – ab Werk voreingestellt.

For directional control valves NG 6
 and 10
 – without position control
 – with two solenoids
 – factory-presetting.

Pour distributeurs NG 6, 10
 – sans régulation de position
 – avec deux aimants
 – pré-réglés à l'usine.



Kenngrößen

Elektrisch	NG 6	NG 10
Relative Einschaltdauer	100% ED	
Schutzart	IP 65 nach DIN 40 050 und IEC 14 434/5	
Anschluss	Stecker, 7-polig, DIN 43 563	
Versorgungsspannung 24 V _{nom.}	Batteriespannung 10,2 ... 31 V	
Klemme A:	gleichgerichtete Spannung 10,2 ... 27 V	
B: 0 V	Restwelligkeit max. 2 V _{ss}	
Leistungsaufnahme	Magnet ■ 45 mm = 40 VA max.	Magnet ■ 60 mm = 60 VA max.
Absicherung, extern	2,5 A _F	
Eingang, Version „Standard“	Differenzverstärker, R _{sh} = 100 kΩ	
Klemme D: U _E	0 ... ±10 V	
E: 0 V	0 V	
Eingang, Version „mA-Signal“	Bürde, R _{sh} = 200 kΩ	
Klemme D: I _{D-E}	4 ... (12) ... 20 mA	
E: I _{D-E}	Stromschleife I _{D-E} Rückführung	
Max. Spannung der Differenzialeingänge gegen 0 V	$\left. \begin{matrix} D \rightarrow B \\ E \rightarrow B \end{matrix} \right\} \text{max. } 18 \text{ V=}$	
Schutzleiter	siehe Steckerbelegung (CE-gerechte Installation)	
Kabelempfehlung	siehe Steckerbelegung bis 20 m 5 x 0,75 mm ² bis 40 m 5 x 1 mm ²	
Besondere Merkmale	LED-Anzeigen, Magnet A/B justierbare Elektronik ab Werk voreingestellt siehe Ventil-Kennlinie Nullpunkt, Q _{max,1} Rampe	
Rampe (T _{min.})	≈ 50 ms	≈ 90 ms
Ditherfrequenz	≈ 180 Hz	≈ 160 Hz

Hinweis:

Versorgungsspannung 24 V_{nom.},
 max. 31 V_{max.}, max. Welligkeit 2 V_{max.}

Ventil in Mittelstellung:
 Version 0 ... ±10 V
 bei U_{D-E} ≤ ±0,2 V

Version 4 ... 20 mA
 bei I_{D-E} = 12 mA
 ≤ ±0,4 mA.

Characteristics

Electrical	NG 6	NG 10
Cyclic duration factor	100% ED	
Degree of protection	IP 65 as per DIN 40 050 and IEC 14 434/5	
Connection	7-pole plug, DIN 43 563	
Voltage supply 24 V DC _{nom.}	Battery voltage 10,2 ... 31 V Rectified voltage 10,2 ... 27 V Ripple max. 2 V _{SS}	
Terminal A: B: 0 V		
Power consumption	Solenoid ■ 45 mm = 40 VA max.	Solenoid ■ 60 mm = 60 VA max.
External fuse	2,5 A _F	
Input, "Standard" version Terminal D: U _E E:	Difference amplifier, R _i = 100 kΩ 0 ... ±10 V 0 V	
Input, "mA-Signal" version Terminal D: I _{D-E} E: I _{D-E}	Load, R _{sh} = 200 kΩ 4 ... (12) ... 20 mA Current loop I _{D-E} feedback	
Maximum differential input voltage at 0 V	D → B } max. 18 V DC E → B }	
Protective conductor	see pin assignment (installation conforms to CE)	
Recommended cable	see pin assignment up to 20 m 5 x 0,75 mm ² up to 40 m 5 x 1 mm ²	
Special features	LED displays, solenoid A/B adjustable amplifier factory-presetting, see valve performance curve zero, Q _{max} , ramp	
Ramp (T _{min})	≈ 50 ms	≈ 90 ms
Dither frequency	≈ 180 Hz	≈ 160 Hz

Important:

Supply voltage 24 V DC nom.,
max. 31 V DC, max. ripple 2 V DC.

Valve in central position:
Version 0 ... ±10 V
at U_{D-E} ≤ ±0,2 V

Version 4 ... 20 mA
at I_{D-E} = 12 mA
≤ ±0,4 mA.

Caractéristiques

Electriques	NG 6	NG 10
Facteur de marche réelle	FM 100%	
Degré de protection	IP 65 selon DIN 40 050 et IEC 14 434/5	
Branchement	par connecteur à 7 pôles, DIN 43 563	
Tension d'alimentation 24 V _{nom.} borne A: B: 0 V	Tension de batterie 10,2 ... 31 V Tension redressée 10,2 ... 27 V Ondulation résiduelle max. 2 V _{SS}	
Puissance absorbée	Aimant ■ 45 mm = 40 VA max.	Aimant ■ 60 mm = 60 VA max.
Protection externe par fusibles	2,5 A _F	
Signal d'entrée, version «Standard» borne D: U _E E:	Amplificateur différence, R _i = 100 kΩ 0 ... ±10 V 0 V	
Signal d'entrée, version «mA-Signal» borne D: I _{D-E} E: I _{D-E}	Charge, R _{sh} = 200 kΩ 4 ... (12) ... 20 mA boucle de courant I _{D-E} retour	
Tension max. des entrées différentielles vers 0 V	D → B } max. 18 V= E → B }	
Conducteur de protection	voir affectation du connecteur (installation conforme à CE)	
Câble conseillé	voir affectation du connecteur jusqu'à 20 m 5 x 0,75 mm ² jusqu'à 40 m 5 x 1 mm ²	
Particularités	Affichages LED; électro-aimant A/B électronique ajustable préréglage à l'usine, voir courbe caractéristique de la valve point zéro, Q _{max} , rampe	
Rampe (T _{min})	≈ 50 ms	≈ 90 ms
Fréquence Dither	≈ 180 Hz	≈ 160 Hz

Remarque:

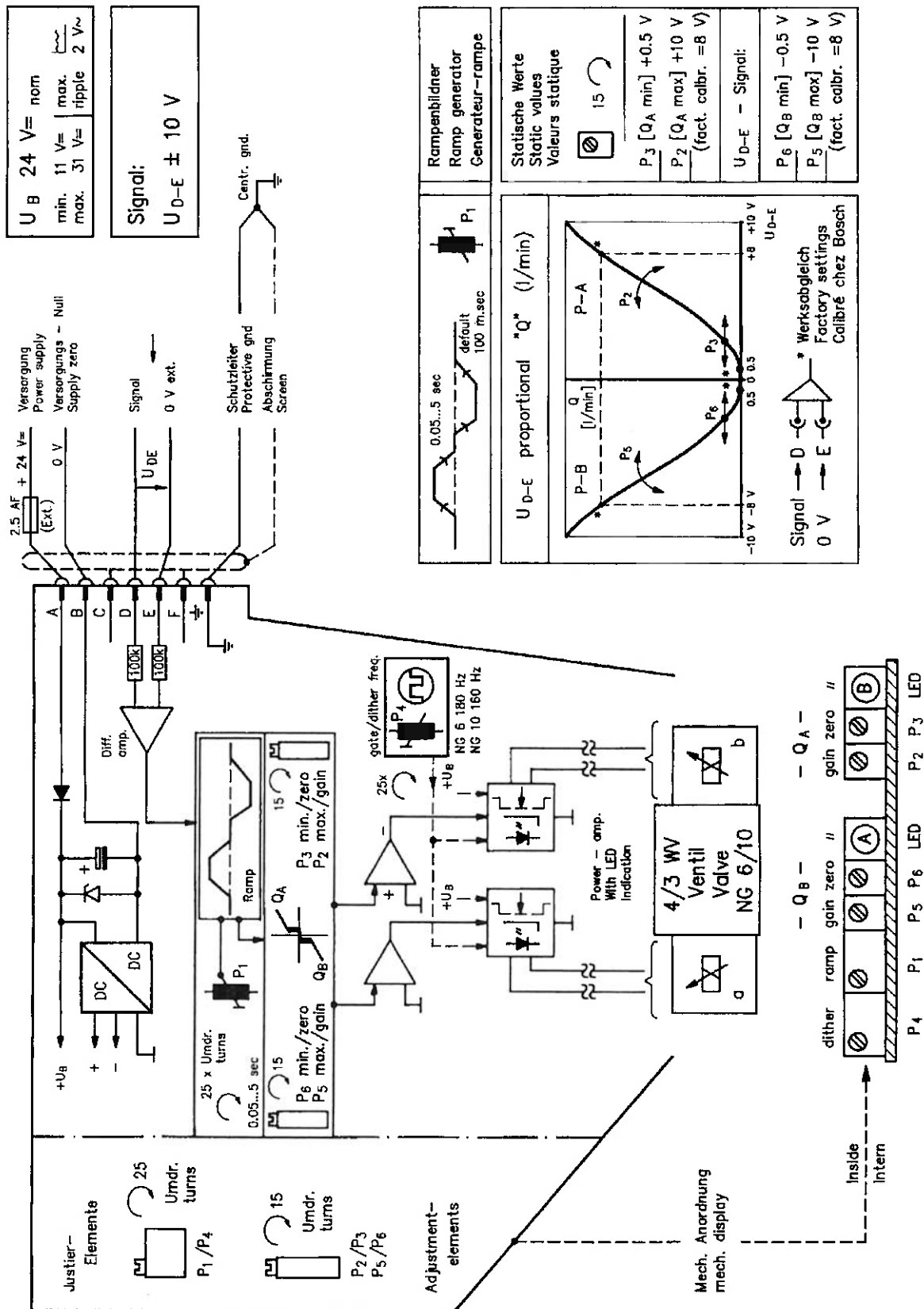
Tension d'alimentation 24 V_{nom.},
max. 31 V_{nom.}, max. Ondulation 2 V_{nom.}

Valve en position médiane:
Version 0 ... ±10 V
à U_{D-E} ≤ ±0,2 V

Version 4 ... 20 mA
à I_{D-E} = 12 mA
≤ ±0,4 mA.

Blockschaltbild
Block diagram
Schéma synoptique

Version: $U_{D-E} = 0 \dots +10 \text{ V}$



Ventilabgleich

4/3-Proportional-Wegeventile mit eingebauter Elektronik ohne Lageregelung werden im Werk voreingestellt. Ventile ohne Lageregelung unterliegen größeren Toleranzen als Ventile mit Lageregelung. Daher wurde bei der Konstruktion der Ventile eine Möglichkeit für die Nachjustierung an der Maschine vorgesehen.
Nach Lösen der Schrauben kann der Deckel, zum Einstellen der Parameter mittels Potentiometer, aufgeklappt werden.
Einstellpotentiometer P1 bis P6
siehe Seite 232 und 235.

Hinweis

Kennlinie und Ditherfrequenz sind ab Werk eingestellt.
Empfehlung P2 ... P6 nicht ändern (nur wenn erforderlich).
P1-Rampe einstellbar:
0,05 ... 5 s für 0,8 ... 10 V, oder
12,6 ... 20 mA Signalsprung.
Sonstiges siehe Ventilkennlinien.

Valve adjustment

4/3 proportional directional control valves with on-board electronics without position control are preset at the factory.
Valves without position control are subject to larger tolerances than valves with position control. For this reason, these valves have been designed to allow their readjustment when installed in the machine.
When the screws have been loosened, the cover can be opened and the parameters set by means of the potentiometers.
For the setting potentiometers P1 to P6, see page 232 and 235.

Note

The characteristic curve and dither frequency are factory-set.
Do not change recommended settings P2 ... P6 (only if necessary).
P1 ramp can be set as follows:
0,05 ... 5 s for 0,8 ... 10 V, or
12,6 ... 20 mA signal jump. For other points please refer to the valve curves.

Tarage des distributeurs

Les distributeurs proportionnels 4/3 avec amplificateur intégré sans régulation de position sont préréglés à l'usine.
Les distributeurs sans régulation de position sont soumis à de plus grandes tolérances que les distributeurs avec régulation de position. C'est la raison pour laquelle une possibilité de réajustage a été prévue au niveau de la machine lors de la construction de ces distributeurs.
Après desserrage des vis, le couvercle peut être ouvert pour régler les paramètres au moyen de potentiomètres.
Pour les potentiomètres de réglage P1 à P6, voir page 232 et 235.

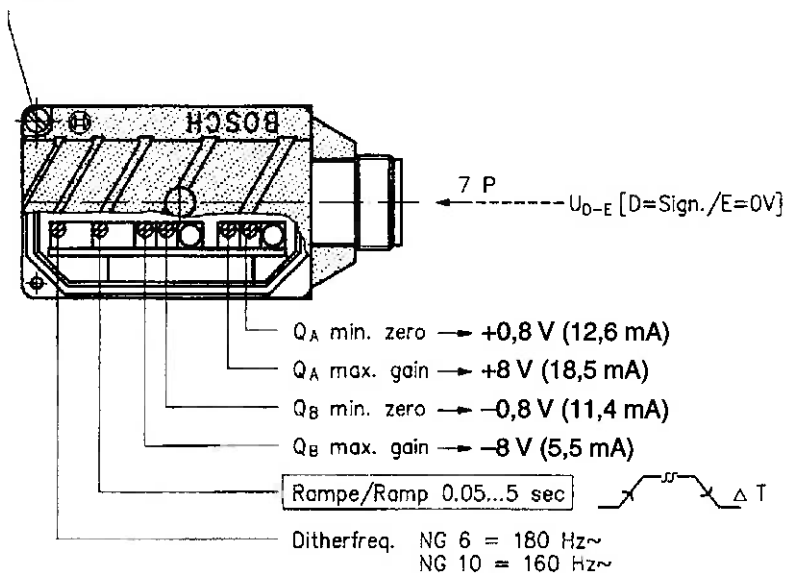
Remarque

La courbe caractéristique et la fréquence Dither sont réglées à l'usine. Il est recommandé de ne pas modifier P2 ... P6 (uniquement si nécessaire).
Rampe P1 réglable:
0,05 ... 5 s pour saut de signal de 0,8 ... 10 V, ou 12,6 ... 20 mA.
Autres informations, voir courbes caractéristiques des valves.

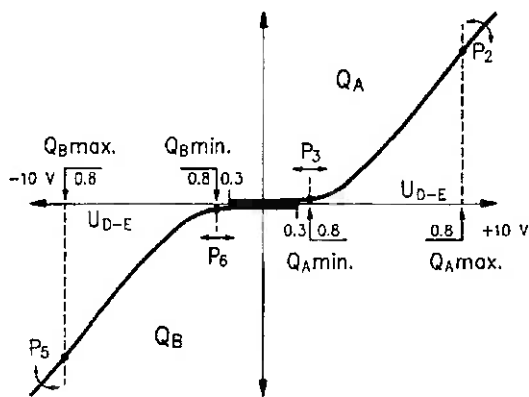
Elektronikabgleich
Electronics adjustment
Tarage de l'électronique

Nach dem Lösen der Schrauben kann der Deckel, zum Einstellen der Parameter, aufgeklappt werden.
 When the screws have been loosened, the cover can be opened and the parameters set.

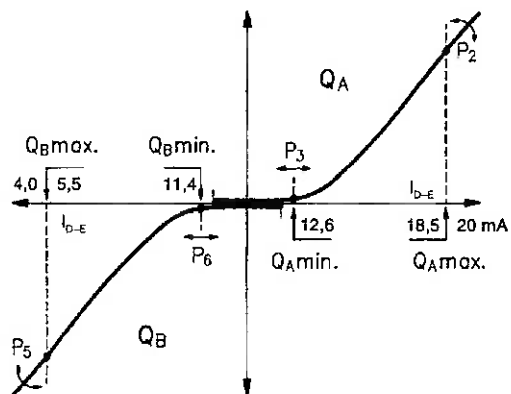
Après desserrage des vis, le couvercle peut être ouvert pour régler les paramètres.



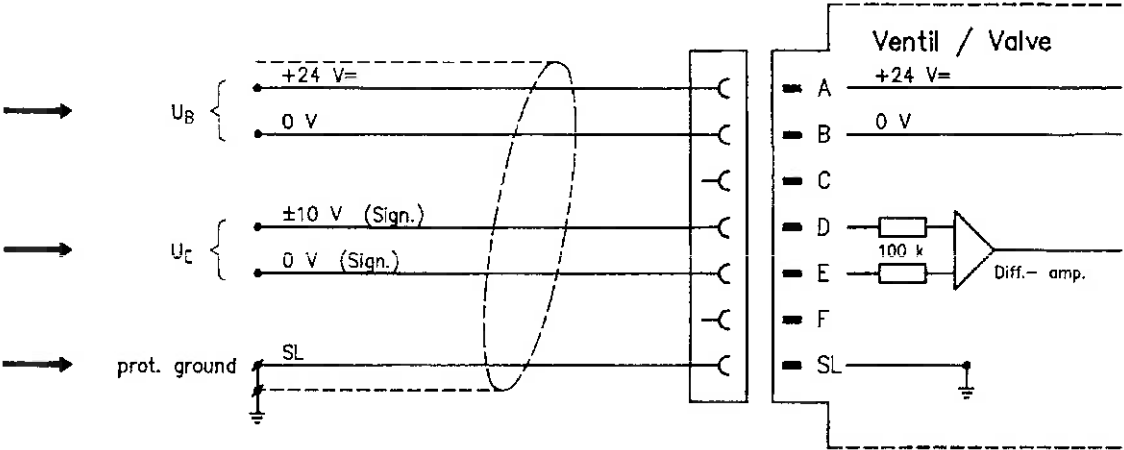
Version: $U_{D-E} = 0 \dots +10 \text{ V}$



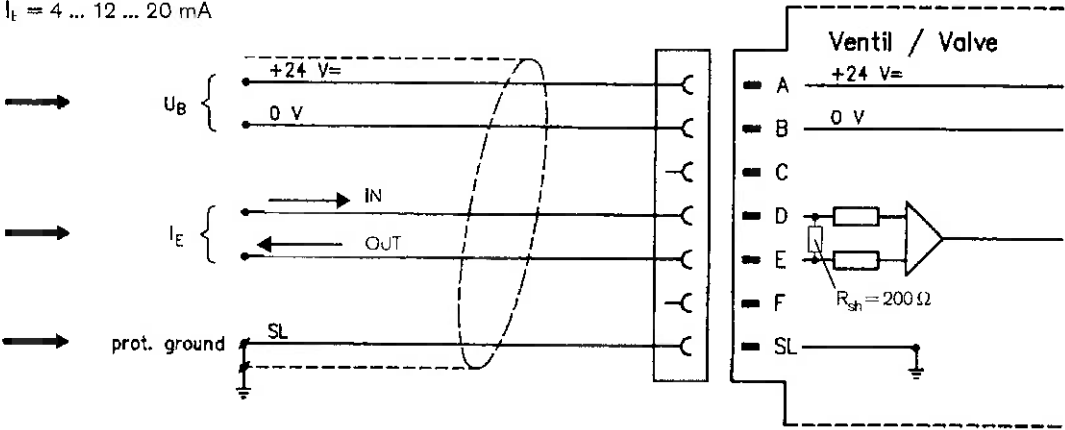
Version: $I_{D-E} = 4 \dots 20 \text{ mA}$



Version: $U_E = 0 \dots +10 \text{ V}$
 $R_i = 100 \text{ k}\Omega$



Version: $I_E = 4 \dots 12 \dots 20 \text{ mA}$

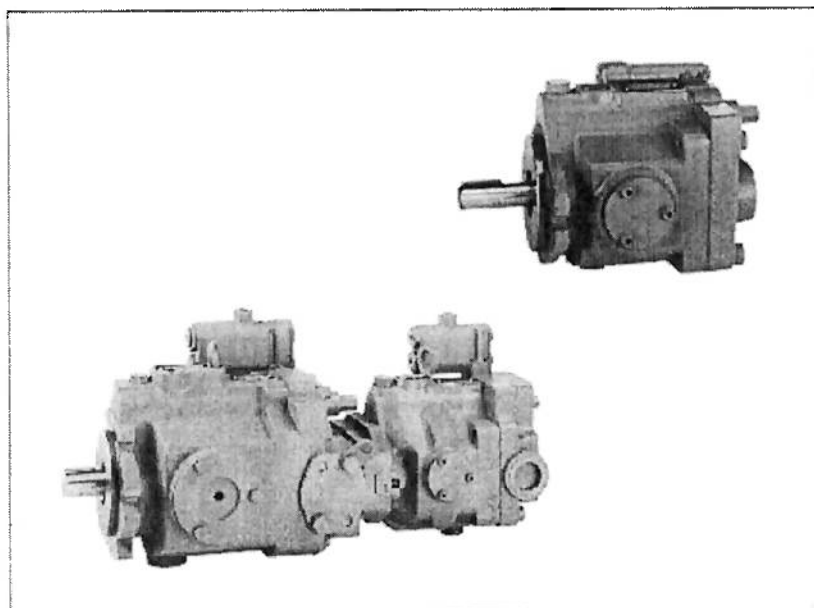


0

*Axialkolben-Verstellpumpen Baureihe J-V
Betriebsanleitung*

*Variable displacement axial piston pumps Series J-V
Operating instructions*

*Pompe da regolazione a pistoncini assiali, Serie J-V
Istruzione per l'uso*



SAUER  **BIBUS**

Axialkolben-Verstellpumpen Variable displacement axial piston pumps Pompe variabili a pistonni assiali

Baureihe J-V
Series J-V
Serie J-V

Allgemeine Beschreibung · General description · Descrizione generale

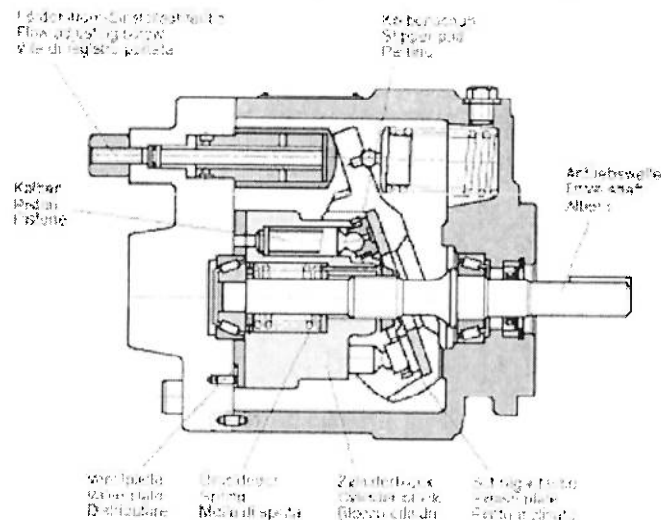


Bild / Fig. 1:

Die SAUER BIBUS Axialkolben-Verstellpumpen der Baureihe J-V in Schrägscheibenbauart sind Einheiten für den offenen Kreislauf mit verstellbarem oder geregelterm Förderstrom. Sie wurden speziell für den Einsatz in stationären Anwendungen entwickelt.

The SAUER BIBUS variable displacement axial piston pumps series J-V swash plate construction are suited for open loop circuits with adjustable or regulated delivery flow. These units are specially designed for use in industrial applications.

Le pompe variabili a pistonni assiali SAUER BIBUS serie J-V a pignone inclinato sono componenti per circuito aperto a cilindrata variabile e regolabile. Sono state specificatamente concepite per impiego in applicazioni industriali.

Besondere Merkmale

- extrem niedrige Geräuschwerte über den gesamten Druckbereich durch gezielte Triebwerks- und Lagerentwicklung
- ein marktgerechtes Regelprogramm führt zu Energieersparnis durch optimale Anpassung von Druck- und Förderstrom und zu einem geringeren Kostenanwuchs durch Wegfall von Ventilen in bisher ausgeführten Hydraulikkreisen.
- die niedrige Verdrängung der Einheiten, insbesondere im Nullhubbetrieb, führt zu einer geringeren Überwärmung und damit zu kompakter, platzsparenden Bauweise der Bauelemente.
- kurze Regelzeiten und hohe Wiederholgenauigkeiten bei der Druck- und Förderstromregelung reduzieren Zykluszeiten von Maschinen bei gleichzeitiger Erhöhung der Zuverlässigkeit
- einfache Erstbefüllung der Einheit mit dem Betriebsmedium im betriebsbereiten, verschliffenen Zustand, ohne Absenken der Ladoberfläche durch zusätzlich verfügbare Verschleißschraube
- das mechanisch einstellbare Förderolumenbegrenzung erlaubt die stufenlose Anpassung des Förderstroms an die Forderung einer Anwendung
- servicefreundliche Gesamtkonstruktion

Special Characteristics

- low external noise levels across the entire pressure range because of specially developed mechanism and bearing design
- a nonpressure sensitive control system assures energy saving through optimal adjustment of pressure and delivery flow, lower unit cost because valves used in conventional hydraulic circuit designs are superfluous in this system
- low oil heat generation because of low dissipation loss, especially during dead head operation, facilitates compact space-saving reservoir design
- fast response time and high repetition accuracy for pressure and delivery flow reducing machine cycle times while at the same time improving reliability
- simple first filling with hydraulic medium in mounted state without dismantling any lines, because of an extra locking screw
- mechanical adjustment to allow adjustment of delivery flow to suit the application
- simple construction for ease of service

Caratteristiche specifiche

- rumorosità estremamente contenuta in tutto il campo di pressione grazie alla progettazione mirata del rotore e della supportatura
- un esclusivo sistema di controllo assicura risparmio di energia attraverso la regolazione ottimale di pressione e portata e porta a un costo di realizzazione inferiore poiché valvole utilizzate in circuiti convenzionali diventano superflue in questo sistema
- bassa generazione di calore grazie a dissipazione minima, specialmente in fase di pompaggio, consente di realizzare serbatoi più piccoli
- tempo di risposta breve con elevata precisione nella ripetizione dei valori di pressione e portata, con conseguente riduzione del ciclo macchina e miglioramento dell'affidabilità
- facile riempimento della pompa con il fluido in condizione di tubazioni collegate senza disconnettere il drenaggio, grazie all'apposita foratura tipo di chiusura
- il limitatore meccanico di cilindrata permette una regolazione continua con adattamento della portata richiesta dall'utilizzo
- semplicità di realizzazione e facilità di manutenzione

Regel- und Verstellorgane – Axialkolben-Verstellpumpen

Control devices – Variable displacement axial piston pumps

Elementi di regolazione e adattamento - Pompa da regolazione a pistoncini assiali

Der Nullhubdruckregler sorgt für konstanten Druck im Hydrauliksystem. Der Förderstrom der Pumpe wird so geregelt, daß dieser dem Erreichen des eingestellten Nullhubdrucks nur noch den Ölbedarf des Verbrauchers entspricht.

Bild 2 zeigt das Funktionsprinzip des mechanisch einstellbaren Nullhubdruckreglers.

Solange der Systemdruck kleiner ist als der eingestellte Druck, steht die Schrägschabe (5) auf max. Schwenkwinkel, so daß die Pumpe max. Förderstrom liefert.

Bei Erreichen des eingestellten Nullhubdrucks wird der Regelschieber (1) gegen die Feder (2) bewegt, wodurch eine Steuerkante öffnet, und der mit dem Druckfall Δp des Betriebsdrucks belastete Verschiebzylinder (4) vermindert den Winkel der Schrägschabe (5) so lange, bis der Förderstrom dem Bedarf des Systems entspricht. Solange der Verbraucher keinen Ölstrom aufnehmen wird der im Regler eingestellte Druck konstant gehalten, wobei die Pumpe lediglich die Leckverluste des Systems ersetzt.

Sinkt der Systemdruck unter den eingestellten Druck ab, schließt die Druckfeder (2) den Regelschieber (1) zurück in die Ausgangsstellung. Der Arbeitsraum (4) des Verschiebzylinders (5) ist mit dem Leckraum verbunden, so daß die Feder (2) die Schrägschabe (5) wieder auf max. Schwenkwinkel stellt.

The pressure compensator ensures constant pressure within the hydraulic system. The flow from the pump is regulated in a way that on reaching the preset pressure setting the flow is governed to the requirements of the user.

Fig. 2 shows the principle of operation of the mechanically adjusted pressure compensator control.

Providing the system pressure is less than the preset pressure, the swash plate (5) remains at maximum angle and the pump provides maximum flow.

On reaching the preset pressure compensator setting the control spool (1) acts against the spring (2) so that the metering edge opens allowing oil flow into the cylinder (4) under pressure drop Δp which is taken from the system operating pressure. This turns reduces the angle of the swash plate (5) to the reduced flow requirements of the system. As long as the users require no oil flow, the pressure set on the compensator will remain constant, so that the pump only makes up the leakage losses within the system.

If the system pressure drops below the preset value, the spring (2) moves the control spool (1) back to its original position. The passageway (4) of the actuating cylinder (5) is again connected with the leakage oil line, and the spring (2) returns the swash plate (5) to the maximum angle.

La regolazione della pressione di azzeramento garantisce una pressione costante nel sistema idraulico. La portata viene regolata in modo che raggiunta la pressione di azzeramento prescelta, la portata corrisponda solo al consumo di olio del singolo utente.

La fig. 2 mostra il principio di funzione del compensatore di pressione a regolazione meccanica.

Finché la pressione di sistema è più bassa della pressione prescelta, la piastra inclinata (5) rimane sotto l'angolo massimo di inclinazione e la pompa fornisce la portata massima.

Raggiunta la pressione di azzeramento prescelta, il cursore (1) si muove verso la molla (2). Quando così si apre una spigola di comando, il cilindro (4) sollecitato da la perdita di pressione Δp della pressione d'esercizio riduce l'inclinazione della piastra (5) finché la portata non corrisponde al bisogno del sistema. Finché i singoli utenti non richiedono nessun flusso d'olio, la pressione prescelta nel compensatore rimane costante. Così la pompa integra solo le perdite di trafilamento nel sistema.

Se la pressione del sistema scende sotto la pressione prescelta, la molla (2) spinge il cursore (1) indietro nella posizione iniziale. Lo spazio di movimento (4) del cilindro (5) è collegato con il vano dell'olio di trafilamento in modo che la molla (2) faccia tornare la piastra (5) all'inclinazione massima.

Bild 3 Schaltbild für mechanisch einstellbaren Nullhubdruckregler A

Fig. 3 Circuit diagram for mechanically adjusted pressure compensator control A

Fig. 3 Circuito per il compensatore di pressione a regolazione meccanica A

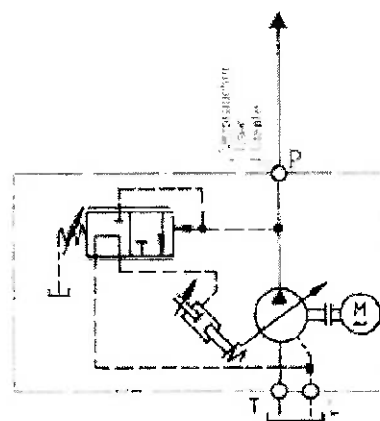
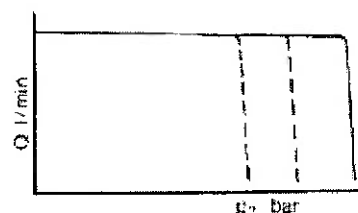


Bild 4 Kennlinie des Nullhubdruckreglers A

Fig. 4 Characteristics of pressure compensator control A

Fig. 4 Linea caratteristica del compensatore di pressione A



Regel- und Verstellorgane – Axialkolben-Verstellpumpen

Control devices – Variable displacement axial piston pumps

Elementi di regolazione e adattamento - Pompa da regolazione a pistoncini assiali

Einstellanweisung für den Nullhubdruck

Zur mechanischen einstellbaren Nachdruckregel:
regler, Standardregler, Zweistufen-Nachdruckregler oder kombinierter Förderschirm-Nachdruckregler kann der Druck durch Drehen der Einstellschraube am Regler eingestellt werden.

Druckrichtung rechts : Druckerhöhung
Druckrichtung links : Druckerhöhung

Instructions for the adjustment to the pressure compensator

On mechanically, remote-controlled pressure or pressure controls (demand controls), low stage pressure compensator controls, in combined flow and pressure compensative controls, the pressure may be set by four or five stages of control on the compressor.

turning to clockwise increases pressure
turning to counter-clockwise decreases pressure

Istruzione per la selezione della
pressione di azzeramento

Nel compensatore di pressione a regolazione meccanica (il compensatore standard) nel compensatore di pressione a due ugelli e nel compensatore a orologio (a lettura diretta) si può selezionare la pressione quando la vite di taratura del regolatore

Senso di rotazione a destra: l'incremento di λ produce
Senso di rotazione a sinistra: l'incremento di λ produce

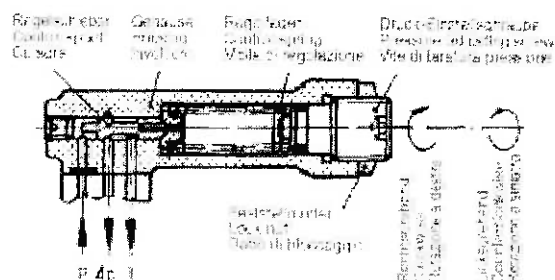


Bild 21

Fig. 21

Die Nulldruckdruckeinstellung kann sofortiges
Zwischen 1b und 2b erfolgen. Bedingung ist,
daß für den jeweils gewünschten Einstell-
bereich entsprechend der nachfolgenden Ta-
belle 1 unterestrichliche Fokuss im Nullhori-
zont druckregler verwendet werden müssen.

The compensator pressure setting may be adjusted between 15 and 200 bar, depending. For reduced spring is selected in accordance with table 1.

Per la pressione di azzeramento si può adottare qualsiasi valore fra 15 e 20 bar. È necessario usare diverse molle nel compensatore a seconda del campo di taratura considerato, vedi la seguente tabella 1.

Feder No. Spring No. / Molle n°	Einstellbereich (bar) Adjustment range (bar) / Campo di taratura (bar)
1	15 - 70
2	15 - 140
3	35 - 210
4*	55 - 250

Tabelle 1

Table 1

Tabella 1

^a get run for i only for i value set to get J V 25, 36.

Ein evolutionärer Wechsel der Faser ist durch
große Plastizität möglich:

Die nachfolgenden Diagramme (Bild 22) zeigen die Zusammenhänge zwischen Umdrehungen der Einstellschraube und dem Feingestellern Nullhubdruck in Abhängigkeit von jeweils verwendeten Federn.

It is possible to change the spring quite easily. The following diagram (Fig. 22) shows the relationship between rotation of the adjusting screw and the resulting pressure compensating pressure depending upon the spring which is fitted.

Un eventuale cambio della molla è possibile
grazie ai grandi molitori.

I seguenti diagrammi (figura 22) mostrano per ogni molea usata il rapporto fra μ_{gr} della vite di taratura e la risultante pressoria.

gestrichelte Linie für 1-4 und 1-6, 70

taken, there is for ΔV 0.330 J V⁻¹

1006 a-trab-y-jzta pñ 3-y 50 s 3-y 71

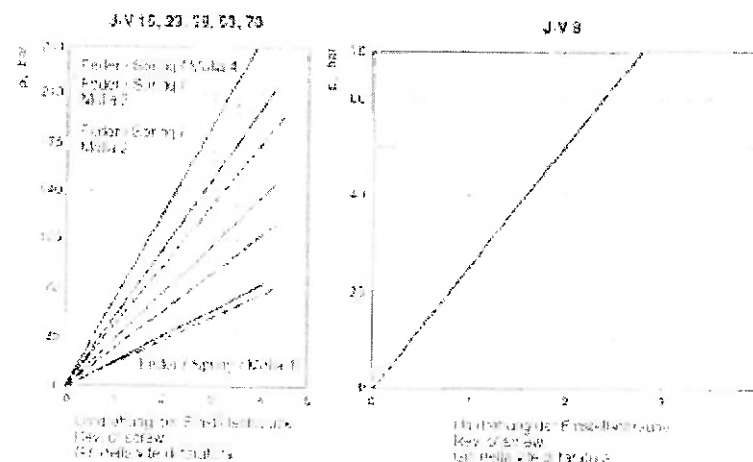


Bild 22 Einstellung unterschiedlicher Nullhubdrücke in Abhängigkeit von Umdrehungen der Einstellschraube

Fig. 22 Setting range of pressure compensator relative to number of revolutions of the screw.

Fig. 22 Selezione di pressioni di azzeramento diversi in rapporto ai giri della vite di taratura

Regel- und Verstellorgane – Axialkolben-Verstellpumpen

Control devices – Variable displacement axial piston pumps

Elementi di regolazione e adattamento - Pompa da regolazione a pistoncini assiali

2.2 Leckölleitung

Beachte folgende Punkte beim Verlegen der Leckleitung:

- Die Leckleitung soll direkt in den Tank zurückgeführt werden, unter das Ölniveau im Öltankhalter eintauchen und so weit wie möglich vom Ansaugrohr entfernt sein.
- Der maximale mögliche Rohrdurchschnitt soll festgelegt werden.
- Die Länge der Leckleitung sollte nicht länger als 1 m sein.
- Der Gehäusedruck darf auf den maximalen Gehäusedruck (0,35 bar) nicht übersteigen (siehe Punkt 5).
- Der Leckstrom beträgt bei normalen Arbeitsbedingungen max. 1,6 l/min für J-V 15, J-V 23, J-V 35 bei 250 bar und max. 2,0 l/min für J-V 50 und J-V 70 bei 210 bar. Bei Erreichen des Nulldruckes (Leck) steigt der Leckstrom rapide an, so daß auch der Gehäusedruck ansteigt (siehe Punkt 5).
- Im Falle, daß die Pumpe vertikal eingebaut wird, ist die Leckleitung darauf zu montieren, daß sie über den höchsten Punkt des Pumpengehäuses ragt. Dadurch wird gewährleistet, daß die Pumpe immer mit Öl gefüllt ist und sich keine Luft einschleusen kann.

2.2 Drain piping

Install the drain piping under consideration of the points below:

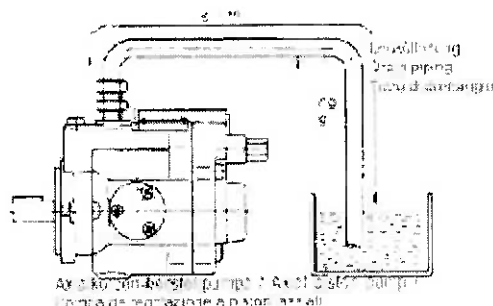
- The return line of the drain piping should lead to the tank directly, be submerged lower than the tank oil level and be as far as possible from the suction pipe.
- Pipe diameter should be as large as possible.
- Length of drain pipe should not exceed 1 m.
- Case drain pressure shouldn't exceed the max. allowable case drain pressure (0.35 bar) (see point 5).
- In normal working conditions, drain volume is max. 1.6 l/min (J-V 15, J-V 23, J-V 35) at 250 bar or max. 2.0 l/min (J-V 50, J-V 70) at 210 bar. However, upon reaching the compensated pressure the drain volume increases rapidly, and case drain pressure becomes higher (see point 5).
- In case the pump is mounted in vertical position, part of the drain piping should exceed the highest point of the pump body in order to be sure that the pump is always filled with oil and that no air is collected in the pump body.

2.2 Tubo di drenaggio

Fare attenzione ai seguenti punti nel posare il tubo di drenaggio:

- Il tubo di drenaggio dovrebbe essere ricondotto direttamente nel serbatoio, immergere sotto il livello d'olio nel serbatoio ed essere il più possibile lontano dall'aduttore di aspirazione.
- Il diametro del tubo deve essere il massimo possibile.
- La lunghezza del tubo di drenaggio non deve superare 1 m.
- Non superare l'ammessa pressione di vuoto ammessa di 0,35 bar (vedi punto 5).
- La portata di drenaggio in condizioni di lavoro normale è al massimo 1,6 l/min per J-V 15, J-V 23, J-V 35 con 250 bar e al massimo 2,0 l/min per J-V 50 e J-V 70 con 210 bar. La portata di drenaggio può aumentare rapidamente quando si raggiunge la pressione di azzeramento. Così aumenta anche la pressione di vuoto (vedi punto 5).
- Quando la pompa viene montata verticalmente, il tubo di drenaggio è da posare in modo che superi il punto più alto dell'involucro della pompa. Facendo così la pompa rimane sempre piena di olio e non si formano cavità d'aria.

Bild 40
Fig. 40



2.3 Empfohlene Ögeschwindigkeiten

2.3 Recommended oil speed

2.3 Velocità dell'olio consigliate

Saugleistungen Suction rates Tubi di aspirazione	Rücklaufleistungen Return rates Tubi di ritorno	Druckleistungen / Pressure lines / Tubi di pressione					
		bis / until / fino a 35 bar	bis / until / fino a 70 bar	bis / until / fino a 105 bar	bis / until / fino a 140 bar	bis / until / fino a 210 bar	über / over / oltre 210 bar
bis / until / fino a 1 m/sec	bis / until / fino a 2 m/sec	bis / until / fino a 5 m/sec	bis / until / fino a 4 m/sec	bis / until / fino a 5 m/sec	bis / until / fino a 5 m/sec	bis / until / fino a 6 m/sec	bis / until / fino a 8 m/sec

Tabelle 6 / Table 6 / Tabella 6

Regel- und Verstellorgane – Axialkolben-Verstellpumpen Control devices – Variable displacement axial piston pumps Elementi di regolazione e adattamento - Pompa da regolazione a pistoncini assiali

3. Vorbereitung zur Inbetriebnahme

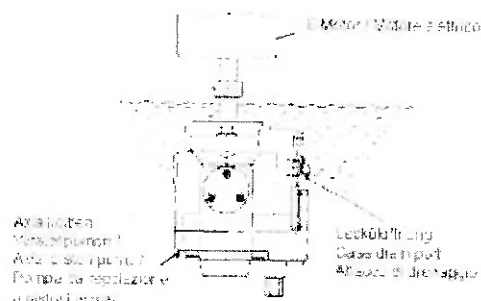
- Aufgrund der konstruktiven Pumpenausführung ist es notwendig, das Pumpengehäuse vor Inbetriebnahme mit Öl zu befüllen.
- Sobald die am Pumpengehäuse befestigte Ölwanne schraublos gelöst und nach Befüllung wieder verschlossen ist, kann die Pumpe gestartet werden.
- Nichtbeachtung dieser Maßnahme kann gleich bei der ersten Inbetriebnahme zu Pumpenausfällen durch Mangelverschmierung führen.
- Falls die Pumpe horizontal montiert wird, sind folgende Ölmenge zur Erstbefüllung erforderlich:

J-V15 – 0,5 Liter
 J-V23 – 0,6 Liter
 J-V38 – 0,9 Liter
 J-V50 – 2,0 Liter
 J-V70 – 2,0 Liter

Falls die Pumpe vertikal montiert wird (Bild 41), ist keine Erstbefüllung notwendig. Beim Entsaugen der Pumpe in den Ölbehälter fällt sich diese von selbst durch den Leckabschluß. Auf eine extra Leckdichtung kann verzichtet werden.

Die Pumpe ist als Sonderausführung, antilackfähig (Korrosionsschutz, Typenachdruck, Einzelanfertigung) lieferbar.

Bild 41
Fig. 41



3. Preparations before starting

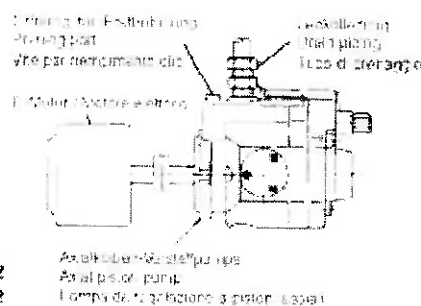
- The pump housing has to be filled with hydraulic oil before starting.
- Remove the plug from the case drain line on the pump housing, and fill the hydraulic oil. After filling, plug is on it was. Then the pump can be started.
- Neglecting the case drain change may cause pump failure due to insufficient lubrication.
- In case of mounting the pump horizontally, the following oil volumes are necessary for the first filling:

J-V15 – 0,5 liter
 J-V23 – 0,6 liter
 J-V38 – 0,9 liter
 J-V50 – 2,0 liter
 J-V70 – 2,0 liter

In case of vertical mounting of the pump (case mounting), no initial filling is needed, when the tank is filled with hydraulic oil, the pump housing is automatically filled up with oil. No extra drain piping is needed.

Under oil pump available as special version (corrosion protection, antilackable). Take care of working oil volume.

Bild 42
Fig. 42



3. Preparativi per la messa in funzione

- A causa della costruzione della pompa è necessario riempire di olio idraulico della pompa prima della messa in funzione.
- Rimuovere questo tappo la vite per riempimento ed è situato nel involucro della pompa e chiuderla di nuovo dopo il riempimento. Ora la pompa può essere messa in funzione.
- La non osservanza di questa necessità può causare l'usura della pompa già durante la prima messa in funzione per mancanza di lubrificazione.

Quando la pompa viene montata orizzontalmente, sono necessarie le seguenti quantità di olio per il riempimento iniziale:

J-V 15 – 0,5 litri
 J-V 23 – 0,6 litri
 J-V 38 – 0,9 litri
 J-V 50 – 2,0 litri
 J-V 70 – 2,0 litri

Quando la pompa viene montata verticalmente (montaggio serbatoio), il riempimento iniziale non è necessario. Entrando nel serbatoio la pompa si riempie automaticamente di olio tramite l'altezza di drenaggio. Non è necessario un apposito tubo di drenaggio.

Sotto olio pompa è disponibile in modello specializzato protezione di corrosione, antilacchi, per attenzione a colmare di olio.

4. Inbetriebnahme

- Nach Überprüfung aller Pumpenanschlüsse und erfolgter Pumpenbefüllung kann die Pumpe gestartet werden.
- Die Pumpe sollte nur kurz an und dann wieder ausgeschaltet werden. Richtige Drehrichtung der Pumpe überprüfen (siehe Pkt. 6).
- Anschließen sollte durch mehrmaliges An- und Ausschalten der Pumpe hergestellt werden, daß noch vorhandene Luft in den Rohrleitungen entfernt wurde.
- Pumpe nicht gleich zu Beginn gegen max. Arbeitsdruck fahren. Max. Betriebsdruck im System erst, nachdem über Entlüftungsventil einen drucklosen Pumpenlauf starten.
- Während Anlauf (Druck) im Behälter beobachten und sofort nachlassen.

4. Starting

- After checking all pump connections and first filling with hydraulic oil, the pump can be started.
- Turn the input switch just on and off and check right sense of rotation of pump (see point 6).
- Then turn the input switch on and off a few times to let the air out of the piping.
- Do not start with max. working pressure. Reduce max. operating pressure in the system or operate with an unloaded circuit when starting.
- Watch the oil level in the tank when starting. In case of need, refill immediately.

4. Messa in funzione

- Dopo il controllo di tutti gli attacchi della pompa e dopo il riempimento iniziale la pompa può essere messa in funzione.
- Si consiglia di accendere la pompa e spegnerla di nuovo subito dopo. Controllare il senso di rotazione della pompa è giusto (vedi punto 6).
- Ora si consiglia di accendere e spegnere la pompa più volte per eliminare aria rimasta nelle tubazioni.
- Non portare subito la pompa alla pressione di lavoro massima. Ridurre la pressione di esercizio massima nel sistema oppure effettuare un ciclo della pompa senza pressione, tramite una valvola di sgonfia.
- Durante l'avviamento controllare l'olio nel serbatoio. Se necessario aggiungere subito del olio.

Regel- und Verstellorgane – Axialkolben-Verstellpumpen

Control devices – Variable displacement axial piston pumps

Elementi di regolazione e adattamento - Pompa da regolazione a pistoncini assiali

5. Max. Ausgangsdruck

- Die zulässige Einschaltdauer ED_{re} sollte bei Nenndruck in Verbindung mit max. Förderstrom auf 10% und die Belastungsdauer auf weniger als 6 Sek. nach pro Spieldauer begrenzt werden.
- Die Pumpe wird nicht beschädigt, wenn sie kontinuierlich mit max. Nenndruck beaufschlagt wird, jedoch verringert sich ihre Lebensdauer.

5. Max. working pressure

- Operating time with max. working pressure and max. flow rate should be less than 10% of a cycle time and duration should be under 6 seconds.
- Continuous working at max. pressure does not damage the pump, however, life of the pump will be shortened.

5. Pressione d'uscita massima

- La durata d'inservizio relativa dovrebbe essere limitata, con press. che nominale e portata massima, al 10%. La durata di carica dovrebbe essere limitata a meno di 6 secondi per ogni durata d'esercizio.
- La pompa non viene danneggiata, quando viene sollecitata di continuo dalla pressione nominale e massima, però si riduce la sua durata.

6. Drehrichtung

- Die Drehrichtung der Pumpe ist durch einen Drehrichtungs Pfeil im Pumpengehäuse gekennzeichnet. Sie ist bei den Standardausführungen, auf den Wellenende gesehen, rechtsdrehend.
- Die Drehrichtung darf nicht geändert werden. Bei Änderung der Drehrichtung müssen das Eingehäus, der Austausch von Saug- und Druckanschluß sowie die Ventile an den Enden der Pumpe ausgetauscht werden.

6. Rotation direction

- Rotating direction is shown on the pump. The standard rotating direction is clockwise, viewed from the pump shaft end.
- Rotating direction cannot be changed. In case a pump for counterclockwise rotation is required, valve plate and end cap must be changed.

6. Senso di rotazione

- Il senso di rotazione della pompa è segnato sull'involucro della pompa tramite una freccia. Nelle versioni standard il senso di rotazione è a destra, guardando l'estremità dell'albero.
- Il senso di rotazione non deve essere cambiato. Per un cambio del senso di rotazione si devono sostituire l'estremità dell'involucro (cambio degli attacchi per aspirazione e pressione) e la piastra di valvola all'interno della pompa.

7. Eingangsdruck

- Zulässiger Eingangsdruck 0,83 bar absolut.
- Zu niedriger Eingangsdruck führt zu Kavitation, was eine Beschädigung der Bauteile, Vibrationen und Geräusche bewirkt.
- Zu niedriger Eingangsdruck verkürzt die Lebensdauer der Pumpe.
- Wenn möglich, Ölzufuhr versichern.

7. Inlet pressure

- Permissible inlet pressure = 0,83 bar absolute.
- Too low inlet pressure causes cavitation and thus damage of internal parts, vibration and noise.
- Too low inlet pressure shortens pump life.
- If possible, provide oil supply.

7. Pressione d'ingresso

- La pressione d'ingresso ammissibile è di 0,83 bar assoluta.
- Una pressione d'ingresso troppo bassa causa cavitazione con seguito danni alle parti interne, vibrazioni e rumori.
- Una pressione d'ingresso troppo bassa riduce la durata della pompa.
- Se possibile, realizzare l'alimentazione d'olio.

8. Filter

8.1 Saugfilter

- Bei Verwendung von Saugfiltern sollten die seitliche mm-Filtereinheit von 150 mm haben (Bauart 7).
- Verschmutzungsüberwachung für Saugfilter vorhanden, da diese bei Tankerlebnis nicht oder nur sehr aufwändig kontrollierbar sind.

8. Filter

8.1 Suction side

- Use a suction filter of 150 mm in the pump suction line (see point 7).
- Provide a contamination control for suction filter if tank mounted.

8. Filtri

8.1 Filtri sull'aspirazione

- Quando si usano filtri sull'aspirazione, l'unico grado di filtraggio deve essere di 150 mm (vedi punto 7).
- Realizzare un impianto per il controllo anti-sporozia dei filtri sull'aspirazione, perché visivamente questo controllo in caso di montaggio scorretto è impossibile e molto difficile.

8.2 Rücklauffilter

- Sicherstellen, daß ein Rücklauffilter von min. 25 mm in die Rücklaufleitung vor dem Tank eingebaut ist.
- Filter unmittelbar nach Inbetriebnahme prüfen.

8.2 Discharge side

- Be sure to use a filter of less than 25 mm in the return line to the tank on the discharge side.
- Check filter immediately after starting the pump.

8.2 Filtri sul ritorno

- Controllare che sia montato un filtro sul ritorno di min. 25 mm nel tubo di ritorno prima del serbatoio.
- Controllare il filtro subito dopo la messa in funzione.

9. Gehäusedruck

- Der Gehäusedruck darf den Wert von 0,35 bar nicht überschreiten.
- Der Gehäusedruck sollte so gering wie möglich gehalten werden. Zu hoher Gehäusedruck führt zur Zerstörung der Kollbenschuhe zur Zerstörung der Verteilventile und der Ventile, führt die Lebensdauer der Pumpe herab, führt zu Fehlfunktionen und letztendlich zum Ausfall der Pumpe.

9. Case pressure

- Internal pump case pressure should be less than 0,35 bar.
- Case pressure should be held as low as possible. Too high pressure may cause damage of piston shoes, oil seal, oil leakage, shortening of pump life, pump malfunction and finally pump failure.

9. Pressione nell'involucro

- La pressione nell'involucro non deve superare il valore di 0,35 bar.
- La pressione nell'involucro dovrebbe essere la più bassa possibile. Una pressione troppo alta nell'involucro distrugge le scarpe dei pistoncini e la guarnizione degli attriti e questo causa la perdita d'olio, riduce la durata della pompa, causa il malfunzionamento e infine l'avaria della pompa.

Regel- und Verstellorgane – Axialkolben-Verstellpumpen

Control devices – Variable displacement axial piston pumps

Elementi di regolazione e adattamento - Pompa da regolazione a pistoncini assiali

10. Druckflüssigkeit

- Zulässigen sind Druckflüssigkeiten auf Mineralbasis nach DIN 51524 und DIN 51525.
- Empfohlene Viskositätsklassen ISO VG 32 bis 68.
- Viskositätsbereich am Eingang:
 - Mindestviskosität: 15 mm²/s
 - Betriebviskosität: 15 bis 30 mm²/s
 - Anlaufviskosität: 400 mm²/s
- Reinheitsgrad der Druckflüssigkeit 18/14 nach CETOP RP 7 CH oder 9 nach NAS 1638.
- Zulässiger Druckflüssigkeitstemperaturbereich am Eingang: 0 °C bis +60 °C.

10. Hydraulic fluids

- Permissible hydraulic fluids on mineral oil basis according to DIN 51524 and DIN 51525.
- Recommended viscosity classes ISO VG 32-68.
- Viscosity range:
 - min. viscosity: 15 mm²/s
 - working viscosity: 15-30 mm²/s
 - starting viscosity: 400 mm²/s
- Cleanliness of oil: 18/14 acc. to CETOP RP 7 CH or 9 acc. to NAS 1638.
- Permissible temperature range of hydraulic fluid at inlet: 0 °C to +60 °C.

10. Fluido idraulico

- Ammessibili sono fluidi idraulici a base di olio minerale secondo DIN 51524 e DIN 51525.
- Classi di viscosità consigliate ISO VG 32-68.
- Campi di viscosità all'ingresso:
 - Viscosità minima: 15 mm²/s
 - Viscosità di esercizio: 15-30 mm²/s
 - Viscosità di avviamento: 400 mm²/s
- Purezza del fluido idraulico 18/14 secondo CETOP RP 7 CH oppure 9 secondo NAS 1638.
- Campo di temperatura ammesso del fluido idraulico all'ingresso: da 0 °C fino a +60 °C.

11. Sauberkeit des Betriebsmediums

Die Sauberkeit des Betriebsmediums ist von größter Wichtigkeit. Jeder Teil der Axialkolben-Verstellpumpe arbeitet mit großer Genauigkeit, und die Toleranzen zwischen den einzelnen Teilen sind sehr klein ausgelegt. Folglich ist absolute Sauberkeit anzustreben.

Aus dem Grund, für Sauberkeit vorzusehen, sind Verunreinigungen wie Sandkörner, Abrieb, Rost, Partikelstaub, Späne u.ä. Diese bewirken den Verschleiß der Hydraulikteile. Um die Sauberkeit des Betriebsmediums zu erhalten, ist ein Filter vorzusehen (Filtergröße 1 bis 25 µm). Die Größe der schädlichen Partikel liegt zwischen 10 und 30 µm. Folglich kann der Ansaugfilter mit einer Filtergröße von 100 µm keine Verunreinigungen von > 60 µm filtern und somit nicht die geforderte Sauberkeit garantieren. Es ist also ein Filter < 25 µm hinter der Pumpe vorzuziehen (Druckfiltrierung, Nachstromfiltrierung, Rücklauffiltrierung). In diesem Fall ist es nicht erlaubt, einen Filter von > 25 µm als Saugfilter vorzusehen wegen des unzureichend hohen Füllungsdrucks (siehe Punkt 7).

Um die Sauberkeit zu erhalten, ist folgendes zu beachten:

- Ansaugfilter muß in ausreichendem Abstand (min. 10 cm) vom Behälterboden abgetrennt sein.
- Ansaugfilter mit ausreichend großer Nenndurchfluß verwenden.
- Rücklauf- und Saugschlauch im Tank strikt voneinander trennen.
- BelüftungsfILTER vorsehen.
- Unverschlusste Öffnungen bei der Tankbelüftung vorsehen.

11. Cleanliness of oil

The first condition of working oil is cleanliness. Each part of the piston pump is very high in accuracy, and clearance among the parts designed very small. Between parts clearances are often.

What we call cleanliness of oil means harmful contaminants (Sludge, Iron powder, rust, grinding powder and others), which may cause wear of the hydraulic members. In order to maintain cleanliness of oil accurately, provide a filter (filtering accuracy less than 25 µm).

Particle size of harmful contaminants for piston pump ranges from 10 to 30 µm. Consequently, the suction filter, the filtering accuracy of which is 100 µm cannot filter contaminants smaller than 60 µm and cannot maintain the pre-designed cleanliness of oil. It is necessary to provide the line filter less than 25 µm. In this case, it is impossible to provide a filter of less than 25 µm on the suction side because of suction resistance. (Please see also point 7).

In order to maintain oil cleanliness, note the following items:

- Provide the suction port with a sufficient distance (over 10 cm) from the tank bottom.
- Select a strainer having sufficient capacity.
- Keep the return port apart from the suction port.
- Attach a filter to the air breather.
- Construct a tank in a way that no dust can enter.

11. Pulizia del mezzo di esercizio

La pulizia del mezzo di esercizio è di massima importanza.

Ogni parte della pompa da regolazione a pistoncini lavora ad alta precisione e le tolleranze fra le singole parti sono minime. Per questo è importante l'assoluta pulizia.

Alla pulizia nociva si spargono come fango, abrasioni, trucioli, residui di vernice, schegge e altro. Queste causano l'usura delle parti idrauliche. Per ottenere la pulizia del mezzo di esercizio, è necessario un filtro con un grado di filtraggio R 25 µm.

La grandezza delle particelle nocive è fra 10 e 30 µm. Il filtro sulla aspirazione con un grado di filtraggio di 100 µm non può filtrare particelle < 60 µm e quindi non può garantire la pulizia necessaria dell'olio. C'è quindi bisogno di un filtro R 25 µm dopo la pompa (filtri in pressione, filtri paralleli, filtri ad flusso). In questo caso non è permesso usare un filtro R 25 µm come filtro sulla aspirazione per la pressione d'ingresso troppo alta (vedi punto 7).

Per mantenere la pulizia dell'olio, sono da osservare i seguenti punti:

- L'orificio di aspirazione deve essere distante almeno 10 cm dal fondo del serbatoio.
- Usare filtri sull'aspirazione con una portata nominale sufficiente.
- Separare nettamente l'attacco di ritorno dal serbatoio da quello di aspirazione.
- Usare un filtro di ariatore.
- Disporre il serbatoio in modo di evitare aperture non ermetiche.

Regel- und Verstellorgane – Axialkolben-Verstellpumpen

Control devices – Variable displacement axial piston pumps

Elementi di regolazione e adattamento - Pompa da regolazione a pistoncini assiali

B. STÖRUNGEN UND GEGENMASSNAHMEN (INDUSTRIELLE ANWENDUNG)	B. TROUBLE AND COUNTERMEASURES (INDUSTRIAL APPLICATIONS)	B. DISTURBI E CONTROMISURE (APPLICAZIONE INDUSTRIALI)
---	--	---

1. Ursachen von Schäden

Benennung	Störung	Ursache der Störung
Welle	Bruch	- Pumpe wurde mit zu hohem Betriebsdruck betrieben - Mangelschmierung / Fresser
	Abnutzung	Verschleiß des Nadelagers
Zylinderblock (Kit) Ventilplatte	Verschleißung Abnutzung Verfärbung	- Verunreinigung der Druckflüssigkeit - Unzulässige Betriebstemperatur - Kavitation - Mangelschmierung - Keine Gehäusefettung mit Druckflüssigkeit - Ungeeignete Druckflüssigkeit
Kolbenschute	Abnutzung Zerabnutzung	- Verunreinigung der Druckflüssigkeit - Unzulässig hoher Gehäusedruck - Eingangsdruck zu niedrig - Kavitation / Mangelschmierung - Überhöhte Drehzahl - Ungeeignete Druckflüssigkeit
Lager	Zerstörung	- Unzulässig hoher Betriebsdruck - Radialbelastung der Welle
Wahrscheinung	Zerstörung	- Zu hoher Gehäusedruck - Radialbelastung der Welle
Rückhalteplatte	Deformierung	- Zu hoher Gehäusedruck - Zu hoher Ansaugdruck - Unzulässige Betriebstemperatur - Verunreinigung der Druckflüssigkeit

Tabelle 7

1. Causes of damage

Names of parts	Trouble	Causes of trouble
Shaft	broken	- Pump was used with too high working pressure - Insufficient lubrication / seizure
	wear	Wear of needle bearing
Cylinder block (Kit) Valve plate	seizure wear burning	- Impurities in oil - Excessive oil temperature - Cavitation - Insufficient lubrication - No case drain filling - Non-suitable hydraulic fluid
Piston shoe	wear damage	- Impurities in oil - Excessive case drain pressure - Inlet pressure too low - Non-suitable hydraulic fluid - Cavitation / insufficient lubrication - Too high speed
Bearing	damage	- Excessive working pressure - Radial force on shaft
Oil seal	damage	- Too high case drain pressure - Radial force on shaft
Retainer	strain	- Too high case drain pressure - Excessive suction pressure - Excessive working temperature - Impurities in oil

Table 7

Regel- und Verstellorgane – Axialkolben-Verstellpumpen

Control devices – Variable displacement axial piston pumps

Elementi di regolazione e adattamento - Pompa da regolazione a pistoncini assiali

1. Cause per guasti

Nome del pezzo	Disturbo	Causa del disturbo
Albero	Rottura	- La pompa ha funzionato con una pressione di esercizio troppo alta - Mancanza di lubrificazione / Grippaggio
	Usura	Usura del cuscinetto ad aghi
Gruppo del cilindro / Kit Plastre di valvole	Grippaggio Usura Cambiamento di colore	- Sporizia nel fluido idraulico - Temperatura di esercizio non ammissibile - Cavitazione - Mancanza di lubrificazione - Mancato pieno riempimento dell'involucro con fluido idraulico - Fluidi idraulici non adatti
Gruppo del pistone	Usura Distruzione	- Sporizia nel fluido idraulico - Pressione nell'involucro troppo alta - Pressione d'ingresso troppo bassa - Cavitazione / Mancanza di lubrificazione - Regime troppo alto - Fluido idraulico non adatto
Cuscinetto	Distruzione	- Pressione di esercizio troppo alta - Carico radiale sull'albero
Cavarnazione della porta	Distruzione	- Pressione nell'involucro troppo alta - Carico radiale sull'albero
Plastre di tenuta	Deformazione	- Pressione di esercizio troppo alta - Pressione di aspirazione troppo alta - Temperatura di esercizio non ammissibile - Sporizia nel fluido idraulico

Tabella 7

2. Pumpe fördert kein Öl

- Prüfung der Pumpenrichtung
- **Ansaugverhältnisse überprüfen**
 - Prüfen, ob Ölbehälter bis zur max. Füllstandsangabe befüllt ist
 - Prüfen, ob Ansaugstrich Druckfestigkeit erlangt
 - Prüfen, ob Ansaugfilter verstopft ist
 - Prüfen, ob Druckfestigkeit der vorgeschriebenen Viskosität hat
 - Prüfen, ob der Absperhahn offen ist
 - Prüfen, ob die vorgeschriebene Maschenweite des Ansaugfilters eingehalten wurde
 - Prüfen, ob Saugleitung nicht fest ist
 - Prüfen, ob der Ansaugstand von Pumpe zu Niveau Ölbehälter nicht mehr als 1 m beträgt
 - Prüfen, ob richtige Schlauchmontierung vorgenommen wurde
 - Prüfen, ob keine unnötigen Umlenkungen im Ansaugrohr vorgenommen werden
- **Überprüfen der Pumpe**
 - Antriebswelle auf Beschädigungen überprüfen
 - Kupplungsverband überprüfen
 - Verstellvolumenstellschraube überprüfen (siehe Seite 14)
 - Saug- und Druckschraube an richtigen Anschluß überprüfen

2. Pump does not discharge oil

- Check the pump rotating direction
- **Check the pump suction side**
 - Check whether the oil tank is filled with the pre-designed amount of oil
 - Check whether the suction filter is submerged in the oil
 - Check whether the suction strainer is clogged
 - Check whether the oil has the pre-designed viscosity
 - Check whether stop cock is open
 - Check whether the pre-designed net is used for the suction filter
 - Check suction line for leakage
 - Check whether suction pipe between pump and oil level in the tank does not exceed 1 m
 - Check right size of piping
 - Check whether there are no unnecessary curves in the suction pipe
- **Check the pump**
 - Check whether the shaft is damaged
 - Check coupling
 - Check the displacement adjusting screw (see page 14)
 - Check right connection of suction and pressure ports

2. La pompa non trasporta olio

- Controllare il senso di rotazione della pompa
- **Controllare le condizioni di aspirazione**
 - Controllare se il serbatoio è riempito fino all'indicazione del massimo grado di riempimento
 - Controllare se il tubo di aspirazione è immerso nel fluido idraulico
 - Controllare se il filtro sull'aspirazione è pulito
 - Controllare se il fluido idraulico ha la viscosità prescritta
 - Controllare se il rubinetto di sezionamento è aperto
 - Controllare se è stato rispettato il grado di filtraggio prescritto nel filtro sull'aspirazione
 - Controllare se il tubo di aspirazione è stato stretto
 - Controllare se la pompa è montata per il tipo di fluido idraulico di esercizio
 - Controllare se la dimensione della lubrificazione sarà giusta
 - Controllare se ci sono curve non necessarie lungo il tubo di aspirazione
- **Controllo della pompa**
 - Controllare se ci sono danni meccanici nell'albero di azionamento
 - Controllare il collegamento del giunto
 - Controllare la vite di taratura portata (vedi pagina 14)
 - Controllare gli attacchi di aspirazione e pressione

Regel- und Verstellorgane – Axialkolben-Verstellpumpen

Control devices – Variable displacement axial piston pumps

Elementi di regolazione e adattamento - Pompa da regolazione a pistoni assiali

3. Pumpengeräusche

- Bei Anschluß von Saug- und Druckanschlüssen durch Stahlrohrleitungen ist auf Spannungsfreiheit hinzu zu arbeiten. Bei Verpannen der Pumpe führt zu radialen Wellenbelastungen, Lagerbeschäden, Dichtungsschäden, Am Wellendichtung sowie zu Geräuschbelastungen.

Gegenmaßnahmen:

Elastische Zwischenstücke zwischen Pumpe und Saug- und Druckanschluß verwenden.

- Überprüfen, ob Pumpe ansaugt
 - Prüfen, ob in Druckförmigw. Luft eingeschlossen ist (in Druckauspiken eingeschlossene Luft führt zu Kavitation).
 - Niveau im Öltank und Lage des Ansaugrohrs überprüfen.
 - Ansaugrohr und Ansaßfl. bzw. Flanschenverbindungen auf Dichtheit untersuchen.
- Überprüfen, ob der Ansaugdruckstand zu hoch ist
 - Ansaugfilter auf Verschmutzung überprüfen.
 - Prüfen, ob Ansaugfilter zu klein ist.
 - Prüfen, ob Ölviskosität zu hoch oder zu niedrig ist.
 - Prüfen, ob Rohr in Saugleitung offen ist.
 - Prüfen, ob Ansaugleitung richtig dimensioniert ist.
 - Öltank auf Öl überprüfen.
- Leckdruck überprüfen
 - Hohes Leckdruck deutet auf verschlissene Kollenschuhe hin, welche anormale Geräusche verursachen.
- Rücklaufleitung überprüfen
 - Überprüfen, ob Rücklaufleitung weit genug von der Ansaugleitung entfernt ist.
 - Prüfen, ob Rücklaufleitung in das Betriebsmedium eintaucht. Ist dies nicht der Fall, führt dies zu Schaumbildung, Luftmischungen in der Druckflüssigkeit, Kavitation und Geräuschen.
- Pumpe überprüfen
 - Prüfen, ob Pumpenwelle und Motorwelle korrekt ausgerichtet sind.

3. Pump noise

- If suction inlet and discharge outlet are joined with steel pipes, check that no strain is put on the pump by the piping. Strain may cause radial shaft load, damage of bearings and seals as well as noise.

Countermeasures:

- A part of the discharge piping (pump connection) part should be replaced with a rubber hose.
- Check whether the pump draws in the air
 - Check whether oil in the tank is cloudy. If the pump draws air or cavitation occurs, oil becomes cloudy with air bubbles on the surface.
 - Check oil level and the location of the suction pipe.
 - Check density of suction pipe connections and flanges.
- Check whether suction resistance is excessive
 - Check whether suction strainer is clogged (check whether suction strainer is too small).
 - Check whether oil viscosity is appropriate (whether too high or too low).
 - Check whether cock in suction is open.
 - Check whether suction line has the right dimensions.
 - Check oil temperature.
- Check drain pressure
 - If drain pressure is very high, the piston shoe may be worn which causes abnormal noise.
- Check return oil piping
 - Check whether distance between return pipe and suction pipe is sufficient.
 - Check whether oil return pipe is submerged in the oil. If it is higher than the oil level, air is drawn in the oil (cavitation noise).
- Check the pump
 - Check whether the motor shaft is aligned with the pump shaft.

3. Rumori della pompa

- Quando gli attacchi di aspirazione e pressione sono eseguiti tramite tubi d'acciaio, è da fare attenzione a evitare tensioni di montaggio. Tensioni nella pompa causano forze laterali sull'albero, danni ai cuscinetti, danni alla guarnizione d'albero e rumori.

Contromisure:

- Usare tubi intermed. elastic. fra la pompa e gli attacchi di aspirazione o pressione.
- Controllare se la pompa aspira
 - Controllare se ci sono cumuli di aria nel fluido circolante. Questi causano cavitazione.
 - Controllare il livello olio nel serbatoio e la posizione del tubo di aspirazione.
 - Controllare se il tubo di aspirazione, gli attacchi e le flange sono a tenuta stagna.
- Controllare se la resistenza di aspirazione è troppo alta
 - Controllare se c'è sporcizia nel filtro sull'aspirazione.
 - Controllare se il filtro sull'aspirazione è troppo piccolo.
 - Controllare se la viscosità dell'olio è troppo alta o troppo bassa.
- Controllare se il tubo netto nel tubo di aspirazione è aperto.
- Controllare se la dimensione del tubo di aspirazione sono giusti.
- Controllare la temperatura dell'olio.
- Controllare la pressione di drenaggio
 - Una pressione di drenaggio alta indica scarpe dei pistoni usurate, che causano rumori anormali.
- Controllare il tubo di ritorno
 - Controllare se il tubo di ritorno è abbastanza distante dal tubo di aspirazione.
 - Controllare se il tubo di ritorno è immerso nel mezzo di esercizio. In caso contrario si hanno formazioni di schiuma, cumuli di aria nel fluido idraulico, cavitazione e rumori.
- Controllare la pompa
 - Controllare se l'allineo della pompa e del motore sono corretti in modo corretto.

Regel- und Verstellorgane – Axialkolben-Verstellpumpen

Control devices – Variable displacement axial piston pumps

Elementi di regolazione e adattamento - Pompa da regolazione a pistoncini assiali

4. Betriebsdruck wird nicht erreicht

- Überprüfung wie unter Punkt 2 beschrieben
- Überprüfung der Hydraulikanlage
 - Verpörmung gemäß Hydraulikschaltplan überprüfen
 - Anlage auf anomale Leckagen überprüfen
 - Schmutzstellung für drucklosen Umlauf überprüfen
 - Bei drucklosem Umlauf **kein** max. Betriebsdruck!
 - Während eines Achtschaltendes (z. B. Zyklus) kein Druck eingestellt werden
- Druckbegrenzungsventil überprüfen
 - Druckeinstellung des Druckbegrenzungsventils prüfen
 - Prüfen, ob Druckbegrenzungsventil störungsfähig arbeitet
- Druckeinstellung am Regler der Pumpe überprüfen
 - siehe hier zu Seite 13
- Leckblöhen zur Pumpengehäuse durch Entfetten der Leckleitung überprüfen. Bei anormalem Leckblöhen, durch verschlissene oder beschädigte Pumpeninnenteile, kein ausreichender Druckaufbau!

4. Pressure does not rise

- Check as described under point 2
- Check the hydraulic circuit
 - Check whether the hydraulic parts related as shown in the drawing
 - Check whether there are any abnormal leakages
 - Check the unloading circuit if the pump is unloaded, pressure does not rise
 - In case the cylinder is operating, pressure cannot be adjusted
- Check the pressure relief valve
 - Check whether pressure setting of the relief valve is correct
 - Check whether relief valve functions correctly
- Check pressure setting of pump controller
 - see page 13
- Check that no pump housing leakage via drain pipe. In case of abnormal drain due to worn or damaged pump parts, pressure does not rise.

4. Non si raggiunge la pressione di esercizio

- Eseguire i controlli descritti nel punto 2.
- Controllare l'impianto idraulico
 - Controllare la tubazione secondo il circuito idraulico
 - Controllare se ci sono perdite anomale nell'impianto
 - Controllare la posizione di caricamento per il ritorno senza pressione. In caso di ritorno senza pressione non si raggiunge la pressione di esercizio massima
 - Con un procedimento in corso (ad esempio: il cilindro esseri) non si può regolare la pressione
- Controllare la valvola di massima pressione
 - Controllare la taratura di pressione della valvola di massima pressione
 - Controllare se la valvola di massima pressione lavora senza disturbi
- Controllare la taratura di pressione nel regolatore della pompa
 - Per questo vedi pagina 13
- Controllare la portata di drenaggio sul motore della pompa fissando il tubo di drenaggio. In caso di portata di drenaggio anomala per parti interne della pompa (usura/danneggiata) la pressione non sale in modo sufficiente

5. Ölleckagen

- Überprüfen, ob alle Befestigungsschrauben fest angezogen sind.
- Dichtungen, Flachdichtungen und O-Ringe prüfen
- Dichtungen werden bei unsachgemäßer Pumpenmontage (Wälzlagerkräfte) oder zu hohem Gehäusedruck beschädigt.

5. Oil leakage

- Check whether any screws are loosened
- Check oil seals, packings and rings
- Oil seal damaged may be caused by improper alignment of shafts or abnormal high diam pressure

5. Perdite di olio

- Controllare se tutti le viti di fissaggio sono avvitate bene
- Controllare anelli di tenuta, guarnizioni piatte e guarnizioni OR
- Anelli di tenuta vengono danneggiati in caso di montaggio non corretto della pompa (forze d'albero laterali) o in caso di pressione di esercizio troppo alta

6. Pumpe dreht nicht

- Bruch der Antriebswerke
- Kupplung kaputt
- Verschleißungen (Rissen) von sich gegeneinander reibenden Innenteilen der Pumpe
- elektrischen Schaltkreis für E-Motor überprüfen

6. The pump does not revolve

- Shaft is broken
- Loose coupling
- Darning of the pump due to rotating pump parts
- Check electric circuit for e-motor

6. La pompa non gira

- Rottura dell'albero di azionamento
- Il giunto è rotto
- Grippaggio di parti interne della pompa che girano l'una contro l'altra
- Controllare il circuito per il motore elettrico

Regel- und Verstellorgane – Axialkolben-Verstellpumpen

Control devices – Variable displacement axial piston pumps

Elementi di regolazione e adattamento - Pompa da regolazione a pistoncini assiali

7. Anormaler Verschleiß der Pumpe

- Abnutzung von Zylinderblock oder Ventillplatte
- Druckflüssigkeit auf Verschmutzung prüfen
- Viskosität der Druckflüssigkeit überprüfen
- Leckdruck überprüfen
- Betriebstemperatur überprüfen
- Anordnung von Kolben schalten oder Druckplatte
- Prüfen, ob Pumpe mit Öl gefüllt ist
- Druckflüssigkeit auf Verschmutzung prüfen
- Viskosität der Druckflüssigkeit überprüfen
- Leckdruck überprüfen
- Betriebsdruck Pumpe überprüfen

7. Abnormal wear of pump

- Wear of the cylinder block or valve plate
- Check contamination of hydr. fluid
- Check viscosity of hydr. fluid
- Check drain pressure
- Check operating temperature
- Wear of piston shoe and thrust plate
- Check whether pump is filled with oil
- Check contamination of hydr. fluid
- Check oil level
- Check drain pressure
- Check pump speed

7. Usura anomala della pompa

- Usura del gruppo del cilindro oppure della piastra di valvola
- Controllare se c'è sporcizia nel fluido idraulico
- Controllare la viscosità del fluido idraulico
- Controllare la pressione di drenaggio
- Controllare il regime della pompa
- Usura delle scarpe dei pistoncini oppure della piastra di compressione
- Controllare se la pompa è riempita di olio
- Controllare se c'è sporcizia nel fluido idraulico
- Controllare la viscosità del fluido idraulico
- Controllare la pressione di drenaggio
- Controllare il regime di giri della pompa

8. Nullhubdruck ist instabil

- Leckstrom überprüfen
- Prüfen, ob Kolben im Regler arbeitet
- Drosselungsschrauben überprüfen
- Prüfen, ob Ventildruckregulierungsventil korrekt arbeitet
- Prüfen, ob Druckminderungs- und Regler korrekt ist (siehe Seite 13)
- Ventilkolben und Ventilländer auf Verschmutzung überprüfen
- Druckeinstelle der unterforderten Einstelldrucke überprüfen
- Hydrauliköl füllte auf unregelmäßige Leckagen im Überprüfen. Übermäßige Leckagen im System führen zu Fehlfunktionen

8. Compensated pressure is unstable

- Check drain volume
- Check whether the spool in the controller is working
- Check screws
- Check function of pilot pressure relief valve
- Check pressure setting of the controller (see page 13)
- Check whether spool or control cylinder are contaminated
- Check pre-designed adjustment range of spool
- Check whether there are abnormal oil leaks in the hydraulic circuit. Excessive leakage in the system causes malfunction

8. La pressione di azzeraimento non è stabile

- Controllare la portata di drenaggio
- Controllare se il pistoncino nel regolatore lavora
- Controllare le viti di fissaggio
- Controllare se la valvola pilota di massima pressione lavora in modo corretto
- Controllare se la taratura di pressione nel regolatore è corretta (vedi pagina 13)
- Controllare se c'è sporcizia nel pistoncino di regolazione oppure nel cilindro
- Controllare se la molla di taratura pressione ha la pressione di taratura necessaria
- Controllare se ci sono perdite anomali nell'impianto idraulico. Perdite eccessive nel sistema causano malfunzionamenti

SAUER BIBUS liefert ein komplettes Programm an Hydraulikkomponenten, von Hochdruckpumpen im offenen Kreislauf über Ventile bis hin zu kompletten hydrostatischen Antriebssystemen und Steuerungseinheiten für den stationären und mobilen Markt.

SAUER BIBUS bietet Ihnen eine umfassende Kundenberatung von der Projektstudie bis zur Serienfertigung. Wir beraten Sie und lassen Sie von unserer Erfahrung profitieren. Können wir Ihnen auch Ihre eigene Erfahrung beibringen?

SAUER BIBUS offers a complete program of hydraulic components from valves and open circuit variable displacement pumps right up to complete hydrostatic drive systems and controls for stationary and mobile market.

SAUER BIBUS offers present and future customers engineering services based on several experiences, from project studies to serial production. We shall be glad to advise you and enable you to profit from our store of experience gained from countless applications.

SAUER BIBUS fornisce un programma completo di componenti idraulici, dalla pompa di regolazione in circuito aperto alle valvole fino ai sistemi completi di azionamento idrostatico e comandi per il mercato stazionario e mobile.

SAUER BIBUS offre ai presenti e futuri clienti i servizi ingegneristici basati sull'esperienza dello studio del progetto fino alla produzione in serie. Vi consigliamo volentieri e Vi faremo approfittare della nostra esperienza basata su tanti casi di applicazione.

Anwendungsgebiete

Stationäre Anwendungen

- Werkzeugmaschinen
- Kunststoff- und Gummibearbeitungsmaschinen
- Holzbearbeitungsmaschinen
- Textilmaschinen
- Pressen aller Art
- Schweißmaschinen
- Transformatoren
- Wickelmaschinen
- Prüfmaschinen
- Latten- und Walzwerknechtschneidern
- Hubanrichtungen
- Kranfahrzeuge
- Schleppmaschinen
- Schneckenförderer
- Rührwerke
- Mischer
- Kneten
- Zentrifugen
- Spanplattenmaschinen
- Schwermaschinenbau
- Anwendungen in der Zuckerindustrie
- Agrarmaschinen

Applications

Stationary applications

- machine tools
- plastics and rubber processing machinery
- wood working machinery
- textile machinery
- presses of all kinds
- welding machines
- transformer lines
- winding machines
- testing plant
- lathes and rolling mill equipment
- lifting gear
- calendar plant
- stone shaping machinery
- worm conveyors
- agitators
- mixers
- kneaders
- centrifuges
- fibre board machinery
- heavy machine construction
- sugar industry
- power pack construction

Campi di applicazione

Applicazioni stazionarie

- Macchine utensili
- Macchine per la lavorazione della plastica e della gomma
- Macchine per la lavorazione del legno
- Macchine tessili
- Presso di tutti tipi
- Macchine saldanti
- Linee a traliccio
- Macchine avvolgitrici
- Macchine di prova
- Impianti per stampanti metallografici e laminatoi
- Dispositivi di sollevamento
- Calandra
- Macchine per la modellazione della pietra
- Conveglenti elicoidali (Coclee d'asporto)
- Agitatori
- Miscelatori
- Impastatrici
- Centrifughe
- Macchine per pannelli truciolari
- Macchine tessili
- Applicazioni nell'industria dello zucchero
- Costruzioni e ingegneria

SAUER BIBUS Service weltweit

Der weltweite Fertigungs- und Entwicklungsvertrieb SAUER SUNDSTRAND für Europa, Afrika und den Mittleren Osten: SUNDSTRAND SAUER in den USA für die amerikanische Hemisphäre und DAIKIN in Japan für den ostasiatischen Raum ermöglicht es SAUER BIBUS in fast allen Ländern der Welt Service zu bieten.

SAUER BIBUS Service worldwide

Thanks to the worldwide manufacturing and development in cooperation between SAUER SUNDSTRAND for Europe, Africa and the Near East, SUNDSTRAND SAUER in the US for the American hemisphere and DAIKIN in Japan for the Far East, SAUER BIBUS is able to offer service facilities in almost every country in the world.

Servizio SAUER BIBUS in tutto il mondo

L'unione mondiale per la produzione e lo sviluppo SAUER SUNDSTRAND per l'Europa, l'Africa e il Medio Oriente, SUNDSTRAND SAUER negli Stati Uniti per l'emisfero americana e DAIKIN in Giappone per l'Asia orientale permette alla SAUER BIBUS di offrire servizio in quasi tutti i paesi del mondo.

Druckmittel, manuelle und ferngesteuerte Antriebe sind erhältlich.

Medium, manual and remote controlled drives are available.

Quanto fluido e velocità di azione e controllo sono disponibili a comando remoto.

SAUER  BIBUS

Reichle, Pilsch, Gerd
im Riedle 12
D-89278 Nördlingen
Telefon: (0 91 47) 940-0
Telefax: (0 91 47) 940-10
Telex: SAUER BIBUS GERMANY D

SAUER  SUNDSTRAND

Via Brenz, 119/21
40013 Castel Maggiore (BO)
Tel: (051) 70 17 45 - 70 16 59
Telefax: (051) 70 13 86
Telex: 511267 TU LO I

HYDAC

INTERNATIONAL

Pressure Filters DF / MDF / LF

The DF, MDF and LF series of HYDAC pressure filters is designed for inline mounting in hydraulic systems and for process engineering applications for filtering contaminants out of fluids used in these systems.



1. DESCRIPTION

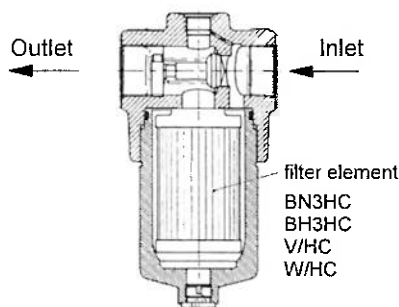
1.1. FILTER HOUSING

1.1.1 Basic design

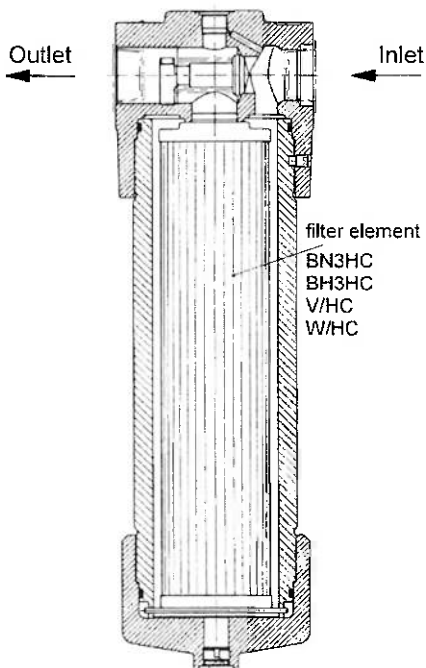
Filters of the DF, MDF and LF series consist of the filter head and a screw-in filter bowl. Size 660 of the DF filter is also available with a two-piece bowl (tube and cover plate) as an additional version. When changing the element, sizes 500 and 660 have the advantages of diamond knurling and a ring on the bowl. For size 990 and above the two-piece bowl version is used.

The standard models of the DF, MDF and LF are supplied without a bypass valve. Moreover, sizes 30 to 280 are supplied without a pressure release plug. Size 330 and above are supplied with a pressure release plug as standard. The connection for a clogging indicator is available as standard.

Model with one-piece bowl



Model with two-piece bowl



1.1.2 Materials

DF SERIES:
Filter Head: GGG 40
Filter Bowl: Cold impact formed steel

MDF SERIES:
Filter Head: GGG 40
Filter Bowl: Cold impact formed steel

LF SERIES:
Filter Head: Al
Filter Bowl: Size 30 - 330: Al
Size 660: Cold impact formed steel

1.1.3 Seals

NBR (Perbunan)

1.1.4 Special models

- Filters with protective finish
 - Filters with bypass valve
 - Filters with pressure release plug (size 280 and below)
 - Viton seals
- #### 1.1.5 Accessories
- Visual and/or electrical clogging indicator.
The clogging indicators must be tightened to the recommended torque ratings, (see brochure no.: E 7.050../..)
 - Mating flanges for filters with SAE flange connection.

1.2. NOTE

For larger flow rates and lower pressure ranges, see brochure: Inline Filters (RFL) no.: E 7.104../..

For stainless steel filters, see brochure: Industrial Processing Filters no.: E 7.700../..

Stainless steel filters also available for offshore applications. For information, contact our sales/technical department.

1.2.1 Filter elements

See Filter Element brochure no.: E 7.200../..

1.2.2 Cleaning of elements

Please note:

Only wire mesh (W) and metal fibre (V) elements can be cleaned.

Filter elements with Betamicon®-H or Betamicon®-N filter material **cannot** be cleaned.

1.2.3 Spare parts

See brochure: Spare Parts and Maintenance Instructions, no. E 7.501.E../..

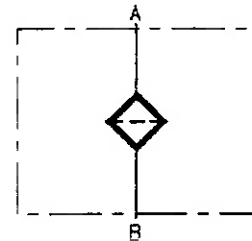
2. TECHNICAL SPECIFICATIONS

2.1 GENERAL

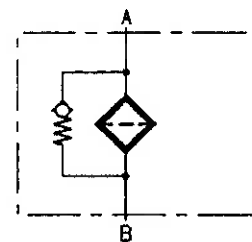
2.1.1 Designation and hydraulic symbols

High pressure filter	DF
Medium pressure filter	MDF
Inline filter	LF

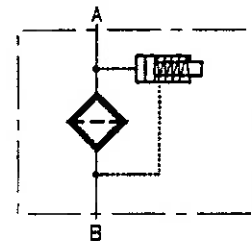
Filter without clogging indicator, without bypass valve (A)



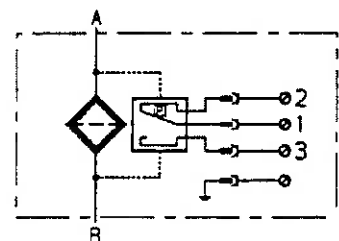
Filter without clogging indicator, with bypass valve (A.../B6)



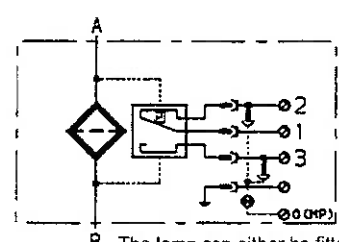
Filter with visual clogging indicator (B)



Filter with electrical clogging indicator (C)



Filter with visual and electrical clogging indicator (D)



The lamp can either be fitted to the normally open contact (3) or the normally closed contact (2)

2.1.2 Model Code

(also order example)

DF BH/HC 60 G 10 C 1 . 1 / -V

Filter Type

DF high pressure filter
MDF medium pressure filter
LF inline filter

Filter element material

BH/HC	Betamicon®-H3HC element	] absolute filtration
BN/HC	Betamicon®-N3HC element	
V/HC	metal fibre element	] nominal filtration
W/HC	wire mesh element	

Size

DF 30/60/110/140/160/240/280/330/500/660¹⁾/990/1320
MDF 30/60/110/160/240
LF 30/60/110/160/240/330/660

Type of connection

G threaded connection
F flange connection

Filtration rate in µm

3	] absolute filtration	
5		Betamicon®-H (BH3HC)
10		Betamicon®-N (BN3HC)
20		metal fibre (V)
25	wire mesh (W/HC)	] nominal filtration

Type of clogging indicator

A	= without clogging indicator	] see separate brochure on clogging indicators brochure no.: E 7.050../..
B	= with visual clogging indicator	
C	= with electrical clogging indicator	
D	= with combined visual and electrical indicator	

Type code

1 = standard connection for inlet and outlet (one-piece filter bowl)
2 = standard connection for inlet and outlet (two-piece filter bowl) sizes 660 to 1320

Modification number

1

Supplementary details

no details = standard

-V	= FPM (Viton) seals, filter suitable for phosphate ester (HFD-R)	] on type "D" indicators only
-W	= NBR (Perbunan) seals, filter suitable for oil-water emulsion (HFA), water polymer solution (HFC)	
-L24	= light with 24 V DC	
-L48	= light with 48 V DC	
-L110	= light with 110 V DC	
-L220	= light with 220 V DC	
-LED	= 2 light emitting diodes for up to 24 V DC	
-B6	= with bypass valve (cracking pressure 6 bar)	
-SO 184	= pressure release/oil drain plug (up to size 280)	

¹⁾ for DF series, this filter is available with type code 1 and 2

2.1.3 Type of construction

Inline filter

2.1.4 Mounting method

4 mounting holes in filter head

2.1.5 Approx. weights

	with element	without element
DF 30	1.9 kg	1.8 kg
DF 60	4.1 kg	3.9 kg
DF 110	6.0 kg	5.7 kg
DF 140	6.6 kg	6.2 kg
DF 160	9.6 kg	9.1 kg
DF 240	11.3 kg	10.6 kg
DF 280	15.9 kg	14.5 kg
DF 330	22.6 kg	21.4 kg
DF 500	26.9 kg	25.2 kg
DF 660 ²⁾	30.5 kg	28.3 kg
DF 660 ³⁾	36.2 kg	34.0 kg
DF 990	43.4 kg	40.0 kg
DF 1320	52.4 kg	48.0 kg
MDF 30	1.9 kg	1.8 kg
MDF 60	3.2 kg	3.0 kg
MDF 110	3.7 kg	3.2 kg
MDF 160	7.2 kg	6.7 kg
MDF 240	8.1 kg	7.4 kg
LF 30	0.8 kg	0.7 kg
LF 60	1.5 kg	1.3 kg
LF 110	1.8 kg	1.5 kg
LF 160	3.7 kg	3.2 kg
LF 240	4.3 kg	3.6 kg
LF 330	8.2 kg	7.0 kg
LF 660	17.8 kg	15.6 kg

2.1.6 Housing volumes

Filter type LF and DF

Size	Volume
30	0.13 l
60	0.20 l
110	0.33 l
140 ¹⁾	0.40 l
160	0.60 l
240	0.80 l
280 ¹⁾	1.45 l
330	1.50 l
500 ¹⁾	2.30 l
660	3.00 l
990 ¹⁾	4.20 l
1320 ¹⁾	5.60 l

Filter type MDF

Size	Volume
30	0.10 l
60	0.18 l
110	0.32 l
160	0.55 l
240	0.79 l

¹⁾ for DF series only

²⁾ size 660, type code 2

³⁾ size 660, type code 1

2.1.7 Pipe connection sizes

(threaded connection to ISO 228) and the relevant type codes

DF 30	G	G 1/2	1.1
DF 60	G	G 3/4	1.1
DF 110	G	G 3/4	1.1
DF 140	G	G 3/4	1.1
DF 160	G	G 1 1/4	1.1
DF 240	G	G 1 1/4	1.1
DF 280	G	G 1 1/4	1.1
DF 330	G	G 1 1/2	1.1
DF 330	F	SAE flange DN 50 / 6000 psi	1.1
DF 500	G	G 1 1/2	1.1
DF 500	F	SAE flange DN 50 / 6000 psi	1.1
DF 660	G	G 1 1/2	1.1
DF 990	G	G 1 1/2	2.1
DF 990	F	SAE flange DN 50 / 6000 psi	2.1
DF 1320	G	G 1 1/2	2.1
DF 1320	F	SAE flange DN 50 / 6000 psi	2.1
MDF 30	G	G 1/2	1.1
MDF 60	G	G 3/4	1.1
MDF 110	G	G 3/4	1.1
MDF 160	G	G 1 1/4	1.1
MDF 240	G	G 1 1/4	1.1
LF 30	G	G 1/2	1.1
LF 60	G	G 3/4	1.1
LF 110	G	G 3/4	1.1
LF 160	G	G 1 1/4	1.1
LF 240	G	G 1 1/4	1.1
LF 330	G	G 1 1/2	1.1
LF 660	G	G 1 1/2	1.1

2.1.8 Mounting position

Vertical

2.1.9 Flow direction

Inlet and outlet: side connection
At the same level, on opposite sides.

2.2. HYDRAULIC DATA

2.2.1 Operating pressure/temperature

The operating pressure is generally dependent on the operating temperature.
The following apply:

$\delta \text{ min} \dots \delta \text{ max} \dots = -10^\circ \text{C} \dots +100^\circ \text{C}$

DF 30 - 660³⁾: $p_{\text{max}} = 420 \text{ bar}$

DF 660²⁾ - 1320: $p_{\text{max}} = 315 \text{ bar}$

(420 bar available on request)

MDF all sizes: $p_{\text{max}} = 210 \text{ bar}$

LF all sizes: $p_{\text{max}} = 100 \text{ bar}$

$\delta \text{ min} \dots \delta \text{ max} \dots = -30^\circ \text{C} \dots -10^\circ \text{C}$
only possible with Perbunan (NBR) seals.

DF 30 - 660³⁾: $p_{\text{max}} = 210 \text{ bar}$

DF 660²⁾ - 1320: $p_{\text{max}} = 157.5 \text{ bar}$

LF sizes 30 - 330: $p_{\text{max}} = 100 \text{ bar}$

LF size 660: $p_{\text{max}} = 75 \text{ bar}$

Proof of fatigue strength for complete filters to HYDAC test standard. Min. 1 mill. stress cycles, from 0 bar to permissible operating pressure ($= p_{\text{max}}$).

For other temperature ranges, please contact our sales/technical department.

2.2.2 Permissible Δp across element

Betamicon[®]-H (BH3HC): 210 bar

Betamicon[®]-N (BN3HC): 25 bar

Metal fibre (V): 210 bar

Wire mesh (W): 30 bar

2.2.3 Compatibility with hydraulic media

Mineral oils:

test criteria to ISO 2943

Lubricating oils:

test criteria to ISO 2943

Suitable for use with non flammable fluids, synthetic oils and rapidly biodegradable oils. For use with water please check with our sales/technical department.

2.2.4 Flow fatigue resistance to ISO 3724

High fatigue resistance due to solid filter material supports on both sides and high inherent stability of filter materials.

2.2.5 Pressure setting of clogging indicator

$\Delta p_a = 5 \text{ bar} - 10\%$

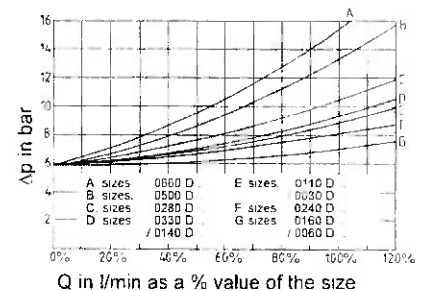
2.2.6 Cracking pressure of bypass valve

$\Delta p_o = 6 \text{ bar} + 10\%$

2.2.7 Bypass valve graphs

The bypass valve graphs apply to mineral oil with a density of 0.86 kg/dm^3 .

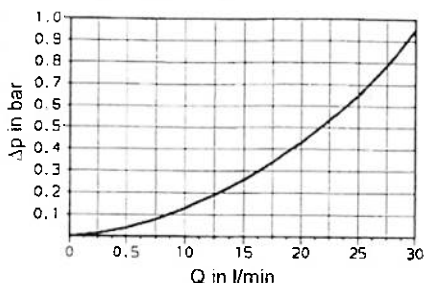
The differential pressure of the valve changes proportionally to the density.



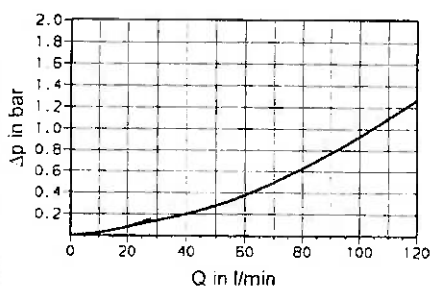
2.3. HOUSING GRAPHS

The housing graphs apply to mineral oil with a density of 0.86 kg/dm^3 and a kinematic viscosity of $30 \text{ mm}^2/\text{s}$.
For turbulent flows the differential pressure changes proportionally to the density.
For laminar flows the pressure changes proportionally to the density and the viscosity.

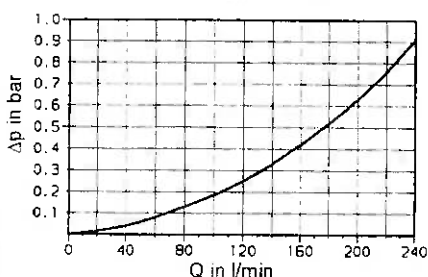
DF/MDF/LF 30



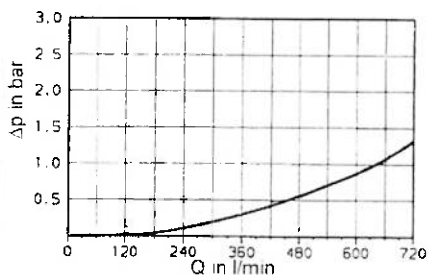
DF/MDF/LF 60/110/140*



DF/MDF/LF 160/240/280*



DF/LF 330/500*/660/990*/1320*



* only for DF model

3. FILTER CALCULATION

3.1. TOTAL DIFFERENTIAL PRESSURE ACROSS THE COMPLETE FILTER

The total differential pressure of the clean filter is the sum of housing and element differential pressure at operating viscosity.

$$\Delta p_{\text{total}} =$$

$$\Delta p_{\text{housing at } Q} + f \times \Delta p_{\text{element at } Q}$$

Δp_{total} = total differential pressure across complete filter

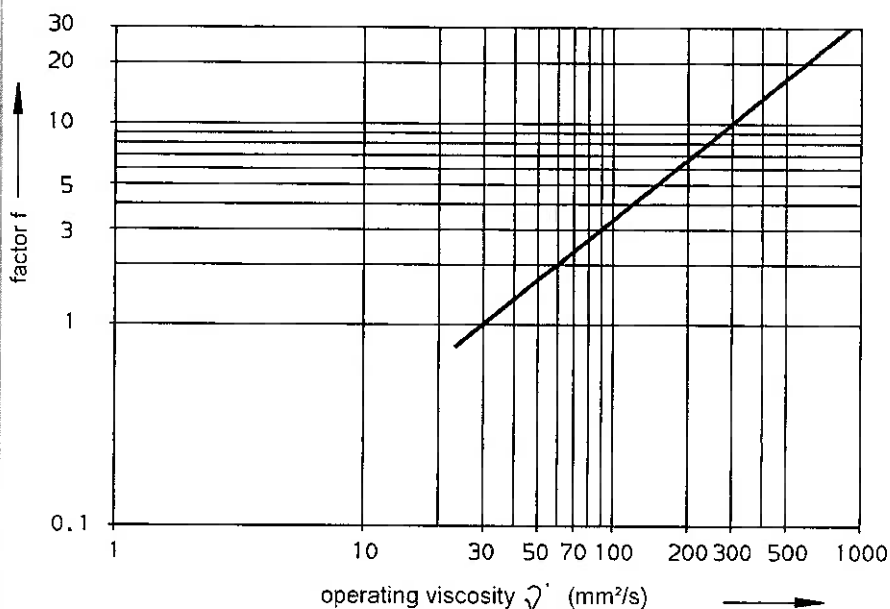
$\Delta p_{\text{housing at } Q}$ = housing differential (obtainable from housing graphs see point 2.3.)

$\Delta p_{\text{element at } Q}$ = element differential pressure at $30 \text{ mm}^2/\text{s}$ at max. flow in l/min:

(obtainable from element graphs see brochure no. E 7.200/... Filter Elements)

f = viscosity conversion factor - see point 3.1.1.

3.1.1 Viscosity conversion factor f



3.1.2 Calculation guidelines

Due to the high contamination retention capacity of the Betamicon® elements, we recommend that the calculation of the filters (with clean element and at operating viscosity) be based on the following initial pressure drop:

$$\Delta p_{\text{total}} = 0.2 \times \text{pressure setting of clogging indicator.}$$

For pressure setting of clogging indicator see point 2.2.5.

Other calculations are possible, depending on the system.

An approximate calculation of the filter size can be made by means of the pre-selection chart - see point 3.2.

3.2. FILTER PRE-SELECTION CHART

The pre-selection chart applies to a viscosity of 30 mm²/s at the usual hydraulic loads and favourable application conditions and applies to the following filters:

Filter type: DF, MDF, LF

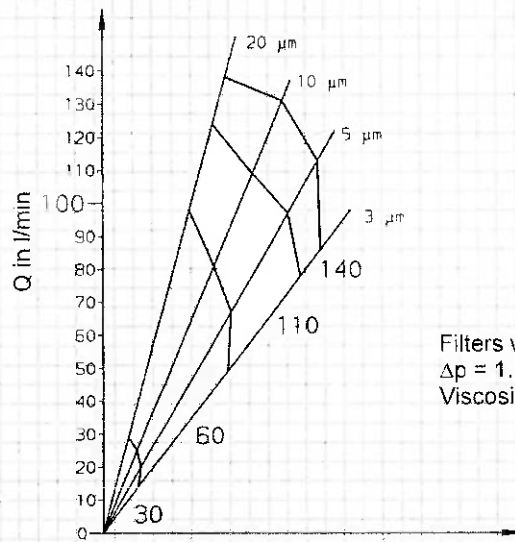
Element type: ...D...BN3HC and ...D...BH3HC

The following example explains the procedure using the pre-selection chart:

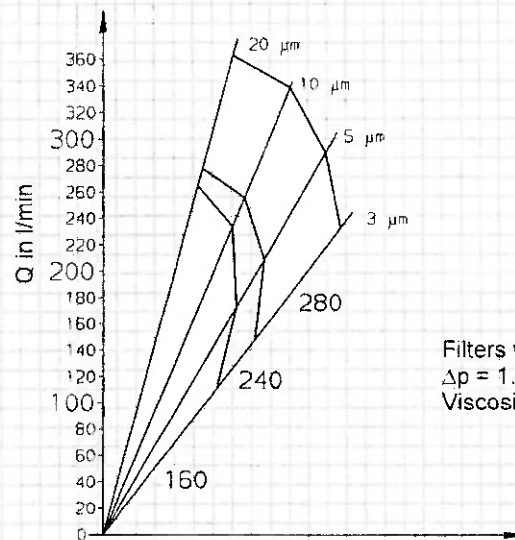
Example:

- System related details:
Flow rate of variable displacement pump:
 $Q_p = 120 - 350$ l/min
Max. operating pressure:
 $p_B = 280$ bar
Required filtration rating:
5 μ m absolute
Filter material:
BH3HC
 - Method:
Determination of filter type
Max. operating pressure
 $p_B = 280$ bar
thus $p_B \leq p_{max}$
⇒ filter type: DF (see point 2.2.1)
 - Determination of calculation flow rate Q_A
 $Q_A = \text{max. flow rate through the filter}$
 $Q_A = Q_p \text{ max.} = 350$ l/min
 - Determination of filter size
For a calculation flow rate of $Q_A = 200$ l/min and a filtration rating of 5 μ m absolute, the filter size according to the pre-selection chart is 500
- Filter type:
DF BH/HC 500 .. 5 ..

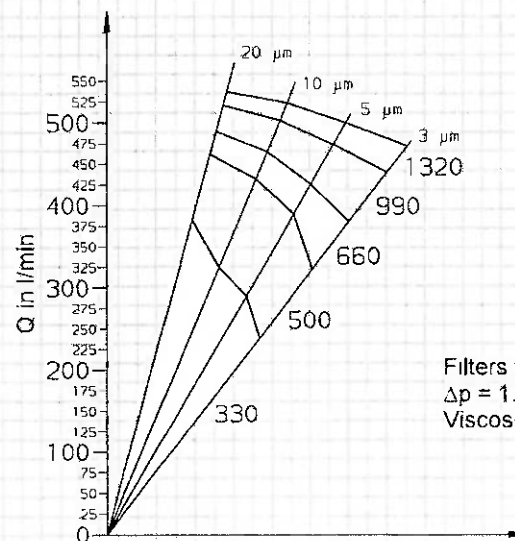
Size 30 - 140



Size 160 - 280

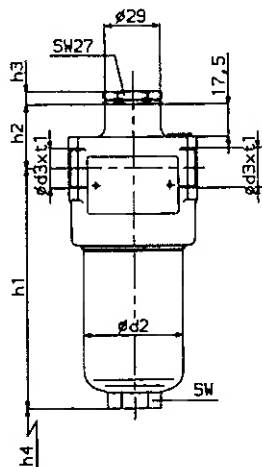


Size 330 - 1320

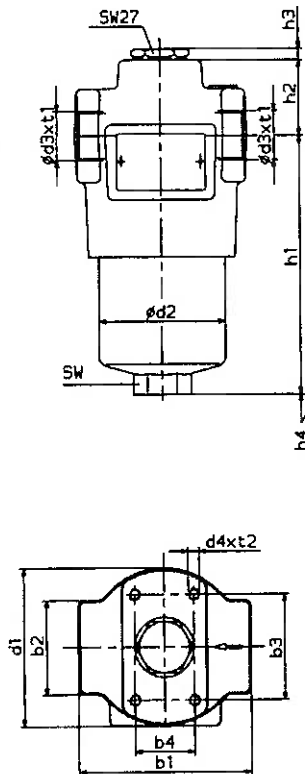


4. DIMENSIONS

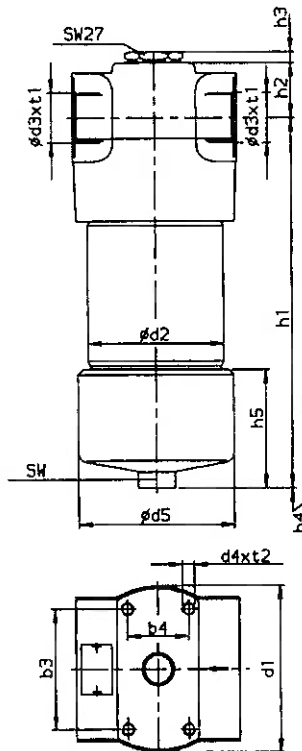
DF/MDF/LF 30 G



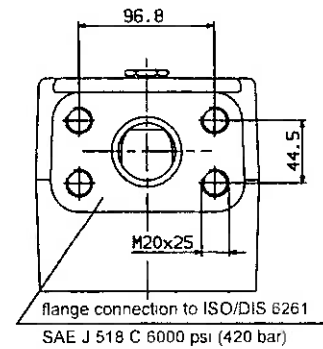
DF/LF 60 - 660 G
MDF 60 - 240 G



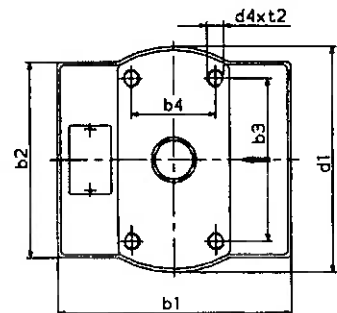
DF/LF 660 - 1320 G



DF/LF 330 - 1320 F



DF 330 - 1320 G/F



Threaded connection to ISO 228

Dimensions in mm

Typ	b_1	b_2	b_3	b_4	ϕd_1	ϕd_2	d_3	d_4	ϕd_5	h_1	h_2	h_3	h_4	h_5	SW	t_1^*	t_2^*
LF 30 G	69	33	45	30	67	52	G 1/2	M 5	-	125.5	35	7	75	-	24	15	6
LF 60 G	92	50	56	32	84	68	G 3/4	M 6	-	137.5	40	6	75	-	27	17	9
LF 110 G	128	65	85	35	116	95	G 1 1/4	M 10	-	205.0	47	6	95	-	32	21	14
LF 160 G	162	85	115	60	159	130	G 1 1/2	M 12	-	250.5	50	6	105	-	36	23	17
LF 240 G						127				417.5							
DF/MDF 30 G	68/66	33/54	45/43	30/21	67/60	52/45	G 1/2	M 5	-	127.5/130	34/36	7	75	-	24	15	6
DF/MDF 60 G	93/92	50/66	56	32	84/78	68/59	G 3/4	M 6	-	137.5/133			85/75	-	27	17	9
DF/MDF 110 G										205 /201	40	6		-			
DF 140 G										248.5				-			
DF/MDF 160 G	128/124	65/80	85	35	117/112	95/84	G 1 1/4	M 10	-	193.5/178			105/85	-	32	21	14
DF/MDF 240 G										253.5/237	47	6		-			
DF 280 G										435.5				-			
DF 330 G	167						G 1 1/2		-	255.5				-			
DF 330 F	160						SAE DN 50		-	255.5				-			
DF 500 G	167	138	115	60	159	130	G 1 1/2	M 12	-	348.5	52	6	115	-	36	23	17
DF 500 F	160						SAE DN 50		-	348.5				-			
DF 660 G	167						G 1 1/2		-	426.0				-			
DF 660 F	160						SAE DN 50		-					-			
DF 660 G ¹⁾	167						G 1 1/2			420			350				
DF 660 F ¹⁾	160						SAE DN 50			420			350				
DF 990 G	167	138	115	60	159	132	G 1 1/2	M 12	152	576	52	6	500	112	36	23	17
DF 990 F	160						SAE DN 50			576			500				
DF 1320 G	167						G 1 1/2			742			670				
DF 1320 F	160						SAE DN 50			742			670				

* = thread depth

¹⁾ = size 660 with type code 2

5. NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

General information about system pressure, identification in the type code, indicator type:

	Indication for operating pressure	Indicator type	Possible Flange
Up to 210 bar	"L"	VM	3000 PSI
Up to 280 bar	"O"	VD	6000PSI

Examples:

	Operating pressure	Indicator type	Port
MDF BN/HC 60 O C 10 D...	280	VD	Threaded
MDF BN/HC 60 L C 10 D...	210	VM	Threaded
MDF BN/HC 60 O I 10 D...	280	VD	Flanged 6000 PSI
MDF BN/HC 60 L I 10 D...	210	VM	Flanged 3000 PSI

TYPENSCHLÜSSEL (gleichzeitig Bestellbeispiel)
KOMPLETTFILTER

MDF BN/HC 60 O C 10 D 1.X /-L24

Filtertyp

Filtermaterial

BN/HC Betamicon® (BN3HC)

BH/HC Betamicon® (BH3HC)

W, W/HC Edelstahldrahtgewebe

V Edelstahlvlies

Baugröße, Filter bzw. Element

MDF: 30/ 60/ 110/ 160/ 240/ 330/ 660

Betriebsüberdruck

Gewindeanschluß: O = 280 bar

Flanschanschluß: L = 210 bar (3000PSI Flansch, VM - Anzeige)

O = 280 bar (6000PSI Flansch, VD - Anzeige)

Anschlußart/Anschlußgröße

Art	Anschluß	Filterbaugröße						
		30	60	110	160	240	330	660
B	G ½	•						
C	G ¾	•	•	•				
D	G 1		•	•				
E	G 1 ¼				•	•		
F	G 1 ½				•	•	•	•
H	SAE DN 13	•						
I	SAE DN 20		•	•				
J	SAE DN 32				•	•		
K	SAE DN 40						•	•

Filterfeinheit in µm

BN3HC, BH3HC, V : 3, 5, 10, 20

W, W/HC : 25, 50, 100, 200

Ausführung der Verschmutzungsanzeige

Y nur mit Kunststoffkappe

A nur mit Verschlußschraube

B optisch

weitere Verschmutzungsanzeigen

C elektrisch

siehe Prospekt-Nr. 7.050../.

D optisch und elektrisch

Typenkennzahl

1

Änderungszahl

X es wird immer aktuellster Stand der jeweiligen Type geliefert

Ergänzende Angaben

B. Bypassöffnungsdruck, B3 = 3 bar, B6 = 6 bar (ohne Angabe = ohne Bypass)

L... Lampe mit entsprechender Spannung (24V, 48V, 110V, 220V)

nur bei Verschmutzungsanzeige

LED 2 Leuchtdioden bis 24 Volt Spannung

Type D

SO 184 Druckentlastungsschraube / Ölablaßschraube (bis BG 240)

V FPM-Dichtungen, Filter geeignet für biologisch schnell abbaubare Öle und Phosphorsäureester (HFD-R)

W geeignet für Öl-Wasser-Emulsionen HFA, HFC (nur notwendig bei Einsatz einer Verschmutzungsanzeige, bzw. V, W und W/HC-Elementen)

ERSATZELEMENT

0330 D 010 BN3HC /-V

Baugröße

0030, 0060, 0110, 0160, 0240, 0330, 0660

Ausführung

D

Filterfeinheit in µm

BN3HC, BH3HC, V : 3, 5, 10, 20

W*, W/HC* : 25, 50, 100, 200

Filtermaterial

BN3HC, BH3HC, V, W, W/HC

Ergänzende Angaben

V = FPM-Dichtungen, Element geeignet für biologisch schnell abbaubare Öle und Phosphorsäureester (HFD-R)

W = geeignet für Öl-Wasser-Emulsionen HFA/HFC
(Angabe nur bei V-, W- und W/HC-Elementen erforderlich)

*W = Standard

W/HC = vergrößerte Filterfläche

MODEL CODE (also order example)
COMPLETE FILTER

MDF BN/HC 60 O C 10 D 1.X /-L24

Filter type

Filter material

BN/HC Betamicon® (BN3HC)
BH/HC Betamicon® (BH3HC)
W, W/HC Stainless steel wire mesh
V Stainless steel fibre

Size, filter, element

MDF: 30/ 60/ 110/ 160/ 240/ 330/ 660

Operating pressure

Threaded Port: O = 280 bar
Flanged Port: L = 210 bar (3000PSI Flange, VM Indicator)
O = 280 bar (6000PSI Flange, VD Indicator)

Type and size of port

Type	Port	Filter size							
		30	60	110	160	240	330	660	
B	G ½	•							
C	G ¾	•	•	•					
D	G 1		•	•					
E	G 1 ¼				•	•			
F	G 1 ½				•	•	•	•	
H	SAE DN 13	•							
I	SAE DN 20		•	•					
J	SAE DN 32				•	•			
K	SAE DN 40						•	•	

Filtration rating in µm

BN3HC, BH3HC, V : 3, 5, 10, 20
W, W/HC : 25, 50, 100, 200

Type of clogging indicator

Y with plastic blanking plug
A with steel blanking plug
B with visual indicator
C with electrical indicator
D with combined visual/electrical indicator

for other clogging indicators
see brochure No. 7.050../..

Type code

1

Modification number

X the latest version is always supplied

Supplementary details

B. cracking pressure of the bypass valve, B3 = 3 bar, B6 = 6 bar (not mentioned = without bypass)
L... light with corresponding voltage (24V, 48V, 110V, 220V) only for
LED 2 light-emitting diodes up to 24 volt D-type indicator
SO 184 pressure release/oil drain plug (up to size 240)
V FPM seals, filter suitable for rapidly biodegradable oils and phosphate ester (HFD-R)
W NBR seals, filter suitable for oil-water emulsions (HFA, HFC) (necessary when using an indicator, or V, W, W/HC elements)

REPLACEMENT ELEMENT

0330 D 010 BN3HC /-V

Size

0030, 0060, 0110, 0160, 0240, 0330, 0660

Type

D

Filtration rating in µm

BN3HC, BH3HC, V : 3, 5, 10, 20
W*, W/HC* : 25, 50, 100, 200

Filter material

BN3HC, BH3HC, V, W, W/HC

Supplementary details

V = FPM seals, filter suitable for rapidly biodegradable oils and phosphate ester (HFD-R)
W = NBR seals, filter suitable for oil-water emulsions (HFA, HFC) (only for V, W and W/HC elements)

*W = standard

W/HC = high capacity

HYDAC

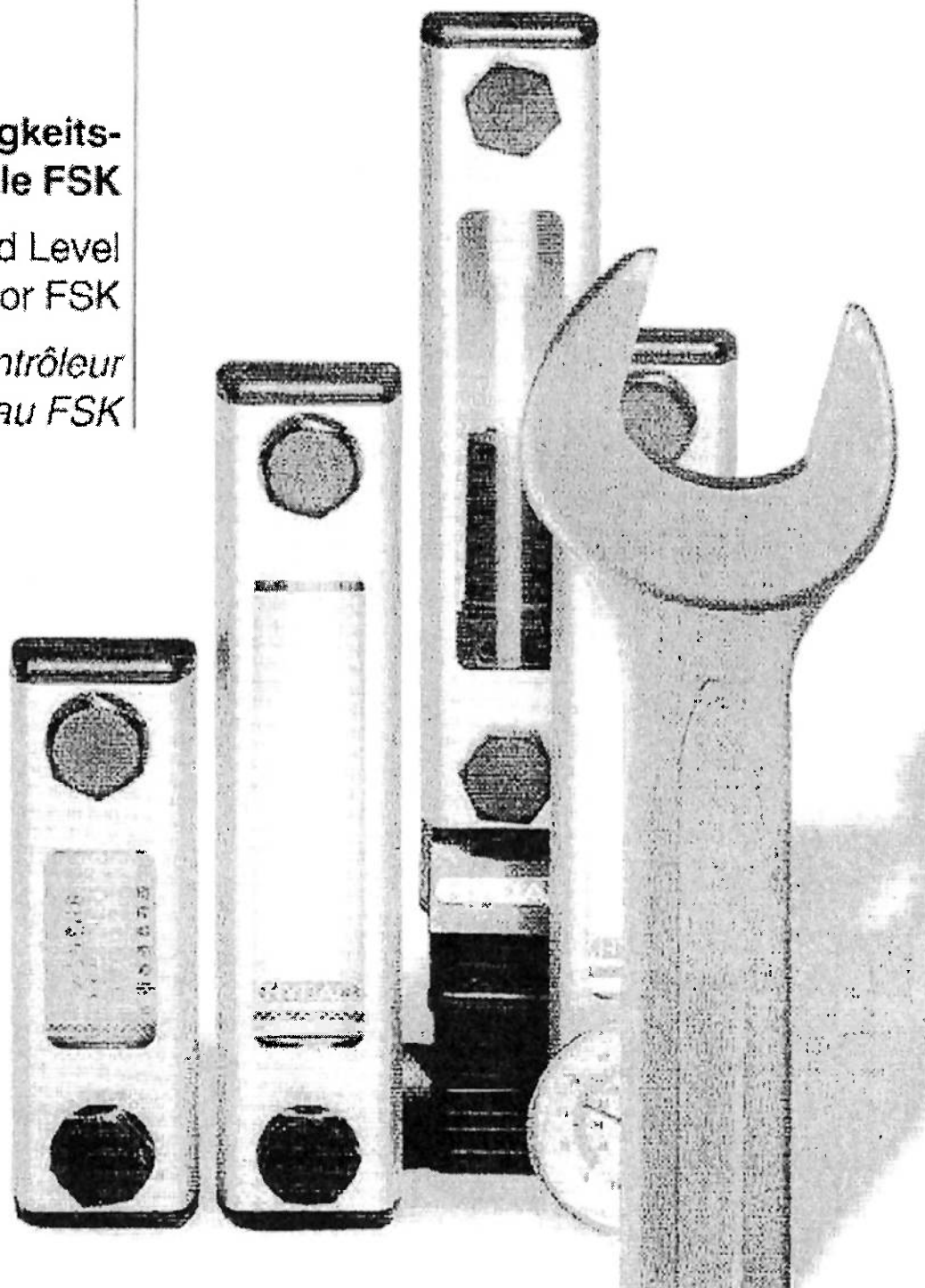
INTERNATIONAL

**Bedienungsanleitung
Operating Manual
Manuel d'utilisation**

**Flüssigkeits-
Standkontrolle FSK**

Fluid Level
Sensor FSK

*Contrôleur
de niveau FSK*



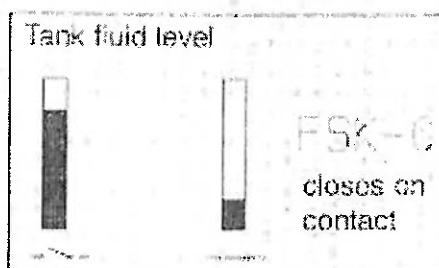
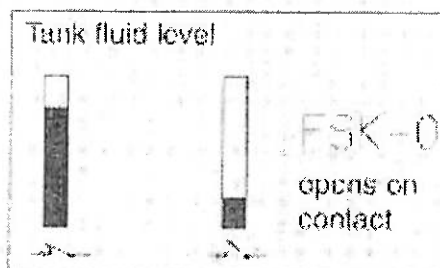
1. General

The following instructions must be followed in full to ensure correct use of this fluid level sensor.

2. Function

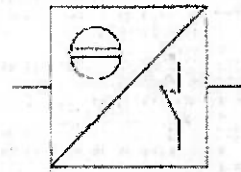
HYDAC fluid level sensors monitor the fluid level in a hydraulic tank. If the level falls below a minimum this is transmitted immediately via an electrical switching signal. The switching signal (max. switching current 0.2 A) can be used as a warning message to regulate the fluid level or directly to a PLC control. On the FSK type O, the contact opens when the fluid reaches the minimum level, on the FSK type C, the contact closes when the fluid reaches the minimum level, and on FSK type W (dual switching circuit), both switching functions can be used for control or indication.

Visual indication of the fluid level is also guaranteed on all models.

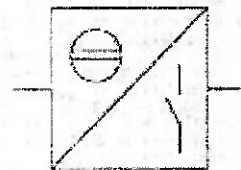


3. Technical specifications

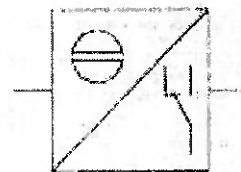
3.1 DESIGNATION & SYMBOL



O - N/C contact
(opens when fluid at switching level)



C - N/O contact
(closes when fluid at switching level)



W - N/O or N/C contact
(dual switching unit)



3.2 TYPE OF CONSTRUCTION

The units are designed to be mounted directly on to the fluid tank.

3.3 TYPE OF MOUNTING

Threaded holes on the tank side M12 or M10,
alternatively clearance holes $\varnothing$ 13 or $\varnothing$ 11.

3.4 MOUNTING POSITION

vertically on the tank wall
(connection plug at the bottom of the tank)

3.5 WEIGHTS

FSK 127 - 0.21 kg
FSK 176 - 0.23 kg
FSK 254 - 0.26 kg
FSK 381 - 0.30 kg

3.6 AMBIENT TEMPERATURE

min. -20°C

max. $+80^{\circ}\text{C}$

3.7 MATERIALS

End caps and tube:

High quality synthetic material

Housing: Aluminium

Seals: Viton (FKM)

Bolts and nuts: Steel (zinc-plated)

3.8 HYDRAULIC SPECIFICATIONS

3.8.1 Nominal pressure

PN 0.5 bar

3.8.2 Operating fluids

Mineral oil to DIN 51524, part 1 and 2

Water-oil emulsions and synthetic fluids, such as hydraulic fluids based on phosphate-ester.

Other fluids on request.

3.8.3 Temperature range of operating fluid

min. -20°C

max. $+80^{\circ}\text{C}$



Warning

3.8.4 Viscosity range

max. 2000 mm²/s

3.9 ELECTRICAL DETAILS

3.9.1 Contact load

max. 8 W

3.9.2 Switching voltage

50 V AC/DC

3.9.3 Switching current

max. 0.2 A

3.9.4 Protection class

IP 65



Warning



Warning



Danger

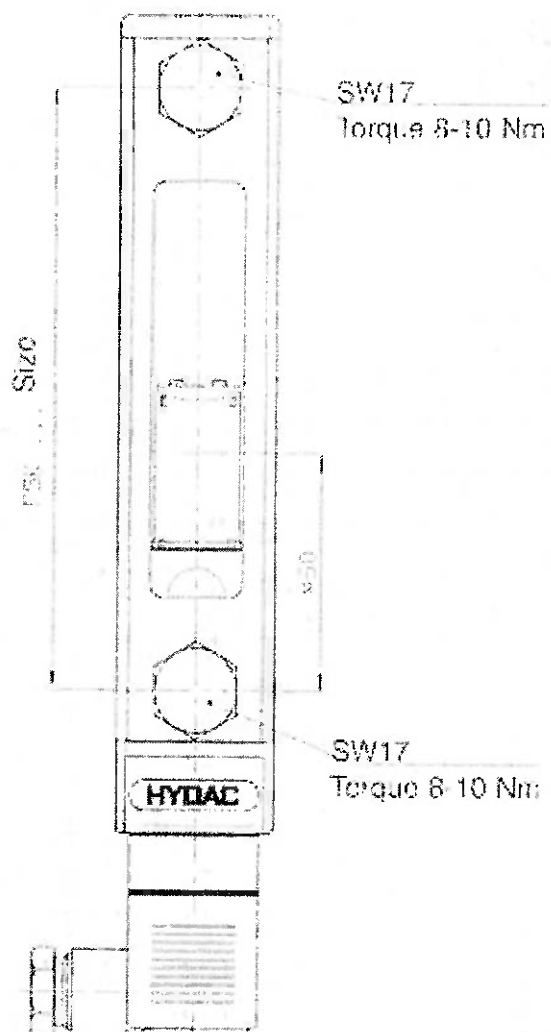
4. Operating conditions

4.1 GENERAL

- For correct operation, the application range and the ambient temperature must not be exceeded.
- If the connections are incorrect, the function of the FSK is not guaranteed.
- The electrical connection values must be observed.
- The given torque rating for the banjo bolt of 8 - 10 Nm must be observed.
- Use only appropriate tools to fit the sensor.
- Not suitable for use with glycol or fluids containing glycol. Special models with a glass tube (SO 14) are available on request.
- The type code is marked on the back of the sensor: O, C, W for the different switching functions
- Designing the protective network
When using reed switches to switch inductive or capacitive loads, including long cables or lamps, a protective network should be used to ensure the life of the switching contacts.
- The tube of the FSK must not come into direct contact with cleaning fluids or solvents which may be used to clean the tank. Damage to the tube can result in breakdown of the fluid level sensor.



4.2 DIMENSIONS



4.3 MODEL CODE

FSK - 127 - 2. X/O/- 12

Size: _____
127, 176, 254, 381

Material of seal: 2 = Viton (FKM) _____

Switching contact: _____
O = opens at the switching level
C = closes at the switching level
W = opens or closes at the switching level

Banjo bolt thread: M12 or M10 _____





5. Circuit diagrams

Note: Before installation, switch is actuated by magnetic field (i.e. tank empty). All circuits below are shown before installation (i.e. when tank is empty).

5.1 FSK - STANDARD (MPM plug)

Type O -
Opens when
fluid at
switching level



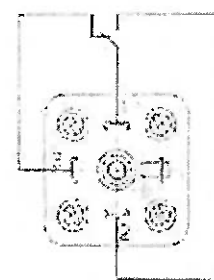
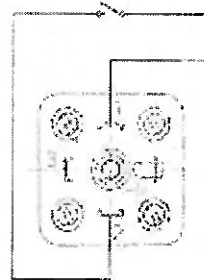
Type C - Closes
when fluid at
switching level



Type W - Dual switching unit
(Special control - SO 70)

5.2 FSK - Z4 (Hirschmann plug)

Type O -
Opens when
fluid at
switching
level

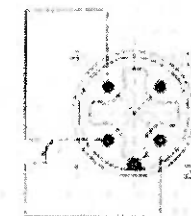
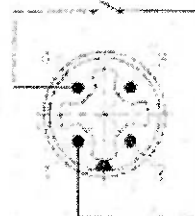


Type W - Dual
switching unit

Note: Closing function is possible using the dual switching unit

5.3 FSK - SEW (Sensor technology plug)

Type O -
Opens when
fluid at
switching level



Type W - Dual
switching unit

Note: Closing function is possible using the dual switching unit

6. Note

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.





HYDAC
Accessories GmbH

Hirschbachstraße 2
D-66280 Sulzbach/Saar

Phone:
++49 (0)6897-509-901

Fax:
++49 (0)6897-509-909

Internet: www.hydac.com

HYDAC INTERNATIONAL



FLUTEC Tankpack

Betriebs- und
Wartungsanleitung

FLUTEC Tank pack

Operating and Maintenance
Instructions

FLUTEC Tankpack

Mise en service et entretien

TYPEN

Die Tankpacks werden in den
Ausführungen:

- Pumpenträger mit
eingebautem Öl-Luft-Kühler,
Tank, Filter und Fuß
Typ: TPF-1; TPF-2; TPF-3
- Pumpenträger mit
eingebautem Öl-Luft-Kühler,
Tank und Filter (ohne Fuß)
Typ: TP-3; TP-4 und TP-5
geliefert.

TYPES

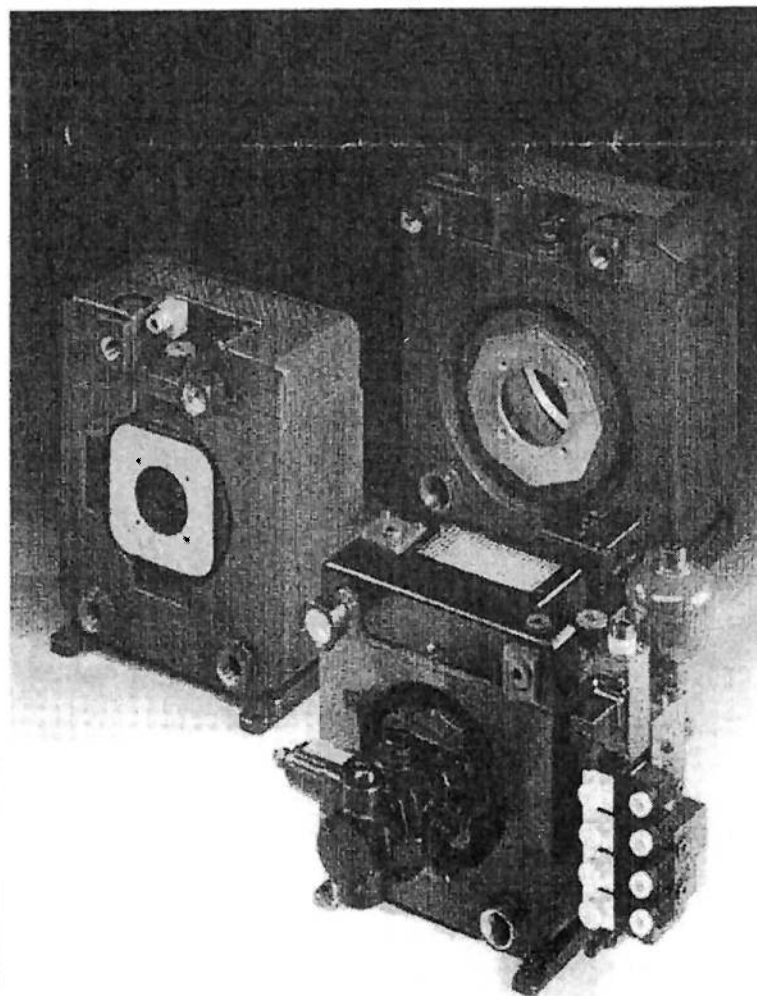
The tank packs are supplied in the
following versions.

- Bell housing with built-in oil/air
cooler, tank, filter and foot
bracket.
Type: TPF-1; TPF-2; TPF-3
- Bell housing with built-in oil/air
cooler, tank and filter
(no foot bracket)
Type: TP-3; TP-4 and TP-5

TYPES

Les tankpacks sont disponibles
dans les exécutions suivantes:

- Support de pompe avec
refroidisseur air-huile intégré,
réservoir, filtre et pied
Types: TPF-1; TPF-2; TPF-3
- Support de pompe avec
refroidisseur air-huile intégré,
réservoir et filtre (sans pied)
Types: TP-3; TP-4 et TP-5



EINBAU UND INSTALLATION:

Die Einbaulage des Tankpacks ist vorzugsweise waagrecht. Bei anderen Einbaulagen muß der Tank eine besondere Abdichtung erhalten. Das Aggregat muß so aufgestellt werden, daß die Kühlluft ungehindert zu- und abströmen kann.

DRUCKBELASTUNGEN:

Der max. zulässige Betriebsüberdruck von 8 bar für den Wärmetauscher darf nicht überschritten werden.

Druckspritzen sind zu vermeiden.

Der max. Betriebsdruck im Behälter darf 1 bar nicht überschreiten.

BETRIEBS- TEMPERATUR:

max. zulässige
Betriebstemperatur + 80 °C
kurzzeitig + 100 °C.

ELEKTRISCHER ANSCHLUSS:

Der elektrische Anschluß muß nach den einschlägigen VDE-Vorschriften erfolgen. Motordrehzahl 1500 1/min. Die Drehrichtung des Ventilatorrades muß rechts sein.
(Blick auf die Pumpenwelle)

INBETRIEBNAHME:

Drehrichtung des Ventilators überprüfen. Auf richtigen Anschluß und freien Durchfluß der Ölleitung achten. Sauganschluß auf der gegenüberliegenden Seite des Filters.

INSTALLATION:

The tank pack should preferably be installed in a horizontal position. For other installation positions the tank must have a special seal. The unit must be positioned so that the cooling air can flow freely in and out.

PRESSURE LOADS:

The maximum permissible operating pressure of 8 bar for the heat exchanger should not be exceeded. Pressure peaks must be avoided.

The maximum operating pressure in the tank should not exceed 1 bar.

OPERATING TEMPERATURE:

max. permissible operating
temperature + 80 °C
short-term + 100 °C.

ELECTRICAL CONNECTION:

The electrical connection must be carried out in accordance with the relevant regulations of the particular country.

Rpm 1500 1/min. The direction of rotation of the fan wheel must be clockwise
(when looking at the pump shaft).

COMMISSIONING:

Check the direction of rotation of the fan. Make sure that the connection is correct and that the oil can flow freely. The suction connection should be on the opposite side of the filter.

MONTAGE ET INSTALLATION:

Les tankpacks sont montés de préférence à l'horizontale. Pour un montage différent, il faudra prévoir des joints d'étanchéité spéciaux. L'appareil devra être installé de façon à ne pas entraver la circulation de l'air de refroidissement.

CONTRAINTES EN PRESSION:

Ne pas dépasser la pression de service max. admissible à l'échangeur 8 bar. Éviter les pointes de pression. La pression de service max. dans le réservoir ne devra pas excéder 1 bar.

TEMPERATURE DE SERVICE:

Température de service
max. admissible + 80 °C
Pendant un
court instant: + 100 °C

RACCORDEMENT ELECTRIQUE:

Le raccordement électrique devra se faire selon les normes en vigueur. Vitesse de rotation: 1500 1/min. Sens de rotation de la roue du ventilateur: vers la droite (vue sur l'axe de la pompe)

MISE EN SERVICE:

Vérifier le sens de rotation du ventilateur. Veiller au raccordement correct et à la libre circulation du fluide. Raccord d'aspiration sur le côté opposé du filtre.

WARTUNG:

Die "Tankpacks" sind weitgehend wartungsfrei. Bei stark verschmutzter Umgebungsluft kann eine Reinigung des Wärmetauschers erforderlich werden. Der Wärmetauscher kann zum Reinigen aus der Anlage herausgeklappt werden. Durchblasen mit Pressluft entgegen der normalen Durchblasrichtung. Eventuell den Wärmetauscher innen ausbürsten. Keine harten Gegenstände zum Reinigen verwenden. Der Verschmutzungsgrad der Filterpatrone muß überwacht werden. Bei starker Verschmutzung der Filterpatrone steigt der Druck im System an und ein Teil des Öles wird über die Überdrucksicherung in den Tank geleitet. Das heißt, eine optimale Kühlung der gesamten Ölmenge ist nicht mehr gewährleistet.

FILTERELEMENT-WECHSEL:

Die vier Schrauben des Filtergehäusedeckels lösen. Deckel um 45° drehen und abheben. Das verschmutzte Filterelement aus dem Filtergehäuse herausziehen. Anschließend das neue bzw. gereinigte Element ins Gehäuse einsetzen. Danach den Deckel wieder aufsetzen und die vier Schrauben gleichmäßig anziehen.

ACHTUNG:

Nur Elemente mit Drahtgewebe (W) und Metallvlies (V) sind reinigbar. Betamicon® N (BN-HC, BN) bzw. Papiervlieselemente (P) dagegen sind nicht reinigbar.

Reinigungsanweisungen werden auf Anfrage zugeschickt.

MAINTENANCE:

The "Tank packs" are maintenance-free on the whole. If the ambient air is badly contaminated it may be necessary to clean the heat exchanger. The heat exchanger can be removed from the system for cleaning. Blow through with compressed air in the opposite direction to normal. Clean the interior of the heat exchanger with a brush if necessary. Do not use any hard objects for cleaning. The degree of contamination of the filter cartridge must be monitored. If the filter cartridge is badly contaminated the return system pressure increases and part of the oil is fed through the pressure overload device into the tank. This leads to an optimum cooling of the total oil quantity no longer being guaranteed.

CHANGING THE FILTER ELEMENT:

Loosen the four screws at the filter housing lid, rotate the lid by 45° and lift off. Remove the dirty filter element from the filter housing. Finally, fit the new or cleaned element in the housing. Replace the lid and tighten the four screws uniformly.

NOTE:

Only elements with wire mesh (W) and metal fibre (V) can be cleaned. Betamicon® -2-N (BN-HC, BN) or paper elements (P) cannot be cleaned.

Cleaning instructions will be supplied on request.

ENTRETIEN:

Les tankpacks ne demandent pratiquement aucun entretien. Un nettoyage de l'échangeur thermique s'impose, lorsque l'air ambiant est fortement pollué. Pour ce faire, l'échangeur thermique peut être rabattu hors de l'installation. Faire passer un courant d'air comprimé dans le sens contraire à celui du passage habituel. Brosser éventuellement l'intérieur de l'échangeur. Ne pas utiliser d'objets durs pour le nettoyage. Surveiller le taux de pollution des éléments filtrants.

Lorsque l'élément filtrant est fortement pollué, la pression augmente dans le système et une partie du fluide retourne dans le réservoir. De ce fait, il ne sera plus possible d'assurer le refroidissement optimal de tout le volume d'huile.

REPLACEMENT DE L'ÉLÉMENT FILTRANT:

Dévisser les 4 vis du couvercle du filtre, tourner le couvercle de 45° et l'enlever. Retirer l'élément filtrant pollué du corps de filtre. Remplacer l'élément filtrant nettoyé ou le nouvel élément filtrant dans le corps. Reposer le couvercle et visser les 4 vis de façon homogène.

ATTENTION:

Seuls les éléments en tissu et mailles métalliques peuvent être nettoyés. Les éléments en Bétamicon® N (BN-HC, BN) ou en papier (P), par contre, ne peuvent être nettoyés.

Des instructions pour le nettoyage des éléments filtrants peuvent être fournies sur demande.

DEUTSCHLAND

FLUTEC

Flutec Technische Geräte GmbH
Postfach 1251
D-66273 Sulzbach/Saar
Johannes-Weg 3 St.
D-66280 Sulzbach/Saar
Tel. 06897/504-0
Telefax 06897/504-577
Telex 4429331

HYDAC

Technologie GmbH
Postfach 1251
D-66273 Sulzbach/Saar
Industrieweg 31
D-66280 Sulzbach/Saar
Tel. 06897/504-0
Telefax 06897/504-577
Telex 4429331

HYDAC-Büro Berlin
Ing.-Büro Hamburger GmbH
Luisenstr. 22 a
D-12209 Berlin
Tel. 030/7728550
Telefax 030/7728550

HYDAC-Büro Hamburg
Postfach 102
D-30177 Hannover
Tel. 0511/695021
Telefax 0511/6950210

HYDAC-Büro West
Reiniger Str. 6
D-45141 Essen
Tel. 0201/32059-0
Telefax 0201/320441

HYDAC-Büro Ost
Postfach 1348
D-07503 Gera
Wiesestraße 189
D-07551 Gera
Tel. 0365/7397-329
Telefax 0365/7397-660

HYDAC-Büro Mitte
Gartenstraße 9
D-64293 Darmstadt
Tel. 06181/6146-0
Telefax 06181/6146-29

HYDAC-Büro Saarbrücken
Otto Zimmermann GmbH
Unterlunkheimer Str. 4
D-66117 Saarbrücken
Tel. 0631/56307-0
Telefax 0631/56307-43

HYDAC-Büro Süd
Mühlbachstr. 15
D-71711 Steinheim/Murr
Tel. 07144/2609-0
Telefax 07144/2609-33

HYDAC-Büro München
Parzbergstr. 18
D-82239 Alling
Tel. 08141/3694-0
Telefax 08141/3694-7

HYDAC-Büro Nürnberg
Postfach 61
D-91225 Leinburg
Gieselerweg 4
D-91227 Leinburg
Tel. 09126/9229-6137
Telefax 09126/9229-6139

EUROPÄISCHES AUSLAND

FINLAND

HYDAC OY
Matti-Myyriäntie 67
FIN-01720 Vantaa
Tel. 00352/3-601502
Telefax 00352/3-601502

FRANKREICH

HYDAC S.A.R.L.
Zone Industrielle 3, Rue
Rue de Schumann
F-57350 Stiring-Wendel
Tel. 0384129400
Telefax 0384129400

BUREAU DE PARIS

28, rue de la Bourde
1, Rue Marie Paul
F-91300 Massy
Tel. 016913026
Telefax 016913026

BUREAU DE LYON

28, rue de la Bourde, H.M. A.
F-69260 Charbonnières-les-Bains
Tel. 0478673302
Telefax 0478673302

GRIECHENLAND

AUTOMATION SYSTEM S.A.
Sofia Plateia 12
GR-11855 Athens
Tel. 1/341500
Telefax 1/341500
Telex 270892 chalygr

GRÖßBRITANNIEN

Furze Limited
Woodstock Road
Charlbury, Oxfordshire
OX7 0ES
Tel. 01493/811231
Fax 01493/811231
E-Mail: furze@bt.com

ITALIEN

Ruol S.p.A.
Via Cassina 6
I-20060 Cassina de Pecchi (Mi)
Tel. 2/9524022
Telefax 2/95344367

LUXEMBURG

FRIEDERICH-HYDROFANT S.A.R.L.
Reine d'Esch
C.P. 35
L-3801 Schifflange
Tel. 847242
Telefax 847242
Telex 1030000

NIEDERLANDE

HYDAC B.V.
Postfach 447
NL-5700 AK Helmond
Ranteweg 47
NL-5708 HR Helmond
Tel. 0492/425835
Telefax 0492/425874

ÖSTERREICH

(Bulgarien, Slowenien, Kroatien,
Restjugoslawien, Rumänien,
Ungarn)
HYDAC Hydraulische Geräte GmbH
Industriestraße 3
A-4066 Pasching
Tel. 07228/61811-0
Telefax 07228/61811-35
Telefax 07228/370244

POLEN

HYDAC Sp. z o.o.
ul. Reymonta
PL-43-190 Mikołów
Tel. 32/156255
Telefax 32/1562709
Telex 012981 hydac pl

PORTUGAL

Hydac e Equip. Lda
Rua Eng. Furtado, 105
P-4100 Porto
Tel. 2/6152034
Telefax 2/6152070
Telex 27277

MDV CONTROL LDA
Praça Pedro Vences 177-227
P-4100 Porto
Tel. 2/6154176
Telefax 2/6154475
Telex 291000 mdvpo

SCHWEDEN

HYDAC Fluidkraft AB
Karlavagnen 41, Märkham
Box 2037
S-16102 Bromma
Tel. 8/985220
Telefax 8/987422

SCHWEIZ

RUAL S.A. Hydraulik
v.d. Cantonstr. 47
CH-6964 Davesco-Lugano
Tel. 01/9356030
Telefax 01/9423880

RUAL S.A. - T.B. Bern

Zürcherstr. 21
CH-3006 Bern
Tel. 07/3014214
Telefax 07/3014647
RUAL S.A. - T.B. St. Gallen
Langeasse 91
CH-9008 St. Gallen
Tel. 71/2428577
Telefax 71/2428790

SLOWAKEI

HYDAC, s.p.o
Schmidtova 14
03601 Martin
Tel. 842/35930
Telefax 842/35931

SPANIEN

Dur S.A.
Paseo de Arriola 15
E-20009 San Sebastian
Tel. 43/217000
Telefax 43/217207
Telex 30540

TSCHECHISCHE REPUBLIK

REXROTH BRNO spol. s r.o.
P.O. Box 51
Hydrodávská 5
627 00 BRNO
Tel. 5/4528638
Telefax 5/4528638

AUSSER- EUROPÄISCHES AUSLAND

ÄGYPTEN

Hydac Egypt Hydraulic Eng.
60-66-68 Sado Building, Kabbat
P.O. Box 6660 Giza 11815
Cairo, Ägypten
Tel. 2/4220192, 4530222
4530223
Telefax 2/4530858

AUSTRALIEN

HYDAC Pty. Ltd.
331 La Pute Street
AUS-Melbourne, 3020
Tristram Hill
P.O. Box 1277 L
AUS-G.P.O. Melbourne, 3001
Tel. 3/9670660, 96708245
Telefax 3/96708245

BRASILIEN

HYDAC Ltda
Rua 12 de Outubro no. 421
CEP 03941-210 - Jd. Caminho
DIADEMA-SP, Brazil
Tel-Fax 011/40772219

CHILE

MAURICIO ROCHSCHILDT S.A.
Avenida Brasil
Jardín Guzmán 3525
Renca-Santiago/Chile
Tel. 2/6414481, 6411185
Telefax 2/6413120
Telex 242360

CHINA

HYDAC Technology (Shanghai) Ltd.
271 South Road
Shanghai Minhang
Economic & Technological
Development Zone
Shanghai 200245
Tel. 21/6483350
Telefax 21/64930257

INDIEN

HYDAC HYCOM INDIA PVT. LTD.
115 Mahatma Industrial Estate
Opp. Raw Industrial Estate
Off. Marikan, Gurgaon Road
Andheri (E)
IND-Bombay 400093
Tel. 22/836329
Telefax 22/8364229

IRAN

Rah Hydraulic Systems Co. Ltd.
110, Mirdamad Ave.
Bazar Bozorg, Mirdamad
P.O. Box 19395-3636
IR-Teheran
Tel. 21/3863512
Telefax 21/8680029
Telex 218336, Attn: 26067

JAPAN

Soken Kogyo Co. Ltd.
4-15-3 Matsui
Edogawa-ku
Tokyo/Japan
Tel. 03/3653-0379
Telefax 03/3653-7927

KANADA

HYDAC Corporation
14 Fedim Road
CDN-Welland, Ontario
L3B 3P2
Tel. 905/7749322
Telefax 905/7744954

MEXIKO

Hidro H. G. S. de C.V.
Carretera Vallejo km 925
Col. Nueva Industrial Vallejo
CP 07750
Mexico, D.F.
Mexico
Tel. 5/5675400
Telefax 5/5675574

SINGAPUR

Hydac Technology Pte Ltd
32 Pilling Building Road # 04-05
Elfre Industrial Building 1
Singapore 349313
Tel. 741/7458
Telefax 741/7454

SÜD-AFRIKA

(Namibia, Zimbabwe)
Hytec of Southern Africa (Pty) Ltd
P.O. Box 8
ZA-Maraiburg, 1700 (Transvaal)
South Africa
Tel. 1/6731210, 6732113
Telefax 1/6730272

THAILAND

Pneumax Co. Ltd.
2447/15 Moo 14, Pathumwan Rd.
Near Ekamai Junction
Bangkok, Huayfong
T-10310 Bangkok
Tel. 2/3181979, 3180086
Telefax 2/3181979
Ann. 04/01 Co. Ltd.
600/441 Moo 14, Pathumwan Rd.
LAMLOOKKA PATUMTHANEE 12130
Tel. 2/3367123, 3367153,
3367154, 3367155
3367156, 3367157, 3367158
Telefax 2/3367131

USA

HYCON Corporation
2263 Old Line Road
USA-Bethlehem, PA 18017
Postanschrift
P.O. Box 22650
Lehigh Valley, PA 18002-2069
Tel. (610) 264-0700
Telefax (610) 264-0540
HYDAC Corporation
2263 Old Line Road
USA-Bethlehem, PA 18017
Postanschrift
P.O. Box 22650
Lehigh Valley, PA 18002-2069
Tel. (610) 264-9503
Telefax (610) 264-9519



Kapitel 10
Chapter 10

Inhaltsverzeichnis / Contents

1.	Hinweise zur Druckluft Instructions to compressed air	OP- 0336 OP- 0336e	Seite 1 bis 6 Page 1 to 6
2.	Pneumatik- CP- Ventilinseln Pneumatic- CP- Valve terminal	OP- 0335 OP- 0335e	Seite 1 bis 5 Page 1 to 5
3.	Pneumatikplan und Stückliste Pneumatic plan and part list		K-3-062536 / 29931
4.	Druck Sensor SDE1-... Pressure/vacuum sensor SDE1..	OP- 0439 OP- 0439e	Seite 1 bis 26 Page 1 to 26
5.	FESTO • Magnetventile CPE 14... FESTO • Solenoid valves CPE 14...	OP- 0441 OP- 0441e	Seite 1 bis 5 Page 1 to 5



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Instructions
to
Compressed Air

Contents ²

	Page
1. compressed air	2
2. air filter	3
3. pressure regulator	4
4. air lubricator	5
5. 5/2 way valve, indirectly actuated	6



**Please read and observe safety instructions prior to
maintenance and servicing works !**



Instructions to compressed air

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

1. Compressed air

The service life of pneumatic elements depends on the condition of compressed air. It is therefore absolutely necessary to prepare the air in a way that service life of these elements is not unnecessarily shortened. The use of clean and waterless air ensures a long lifetime of the equipment. A filter with water separator installed in the line purifies the air filters from solid particles and segregates condensed water. The condensed water is collected in a filter bowl. From time to time this bowl is automatically drained by means of the automatic condensate drain.

The pneumatic drives and control elements are provided with a basic lubrication during the assembly which - under standard operational conditions - is for lifetime. These drives and elements can normally be used without lubricator. However, a filter element which segregates impurities up to 5 μ is indispensable.

In order to avoid early wear it is recommended to provide the oil-mist lubricator with an extra lubrication.

2. Air filter

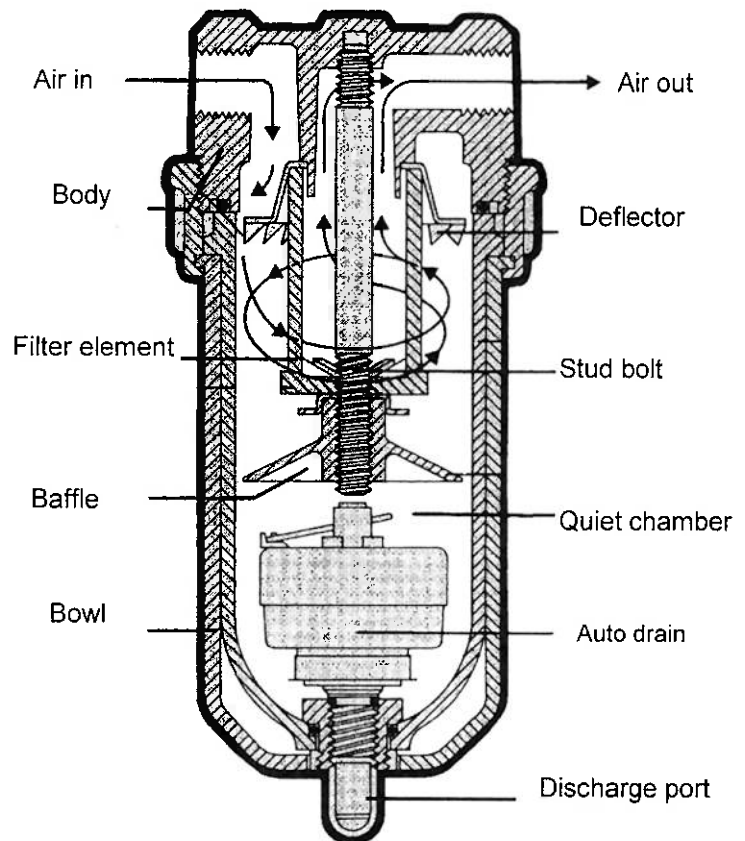
Air filter construction

A filter consists of a body - normally made of zinc-die cast or aluminium - a deflector, filter element, baffle and a bowl to collect solid and liquid contaminants. This bowl is cleaned by a manual or automatic drain valve.

Air filter operation

When pressurized air enters a typical filter body, the curved inlet and deflector direct the incoming air in a downward whirling pattern. Centrifugal force hurls the larger solid and liquid particles outward where they collect on the inner surface of the filter bowl.

The particles spiral down past a baffle into a quiet chamber. The baffle prevents turbulent air from re-entraining liquid contaminants and carrying them downstream. Then the dry, cleaner air passes up the center of the filter element and out of the discharge port where contaminants exceeding the pore size of the filter element are filtered out.



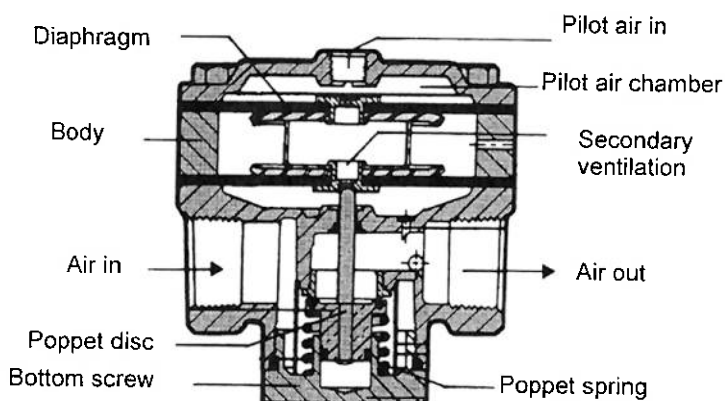
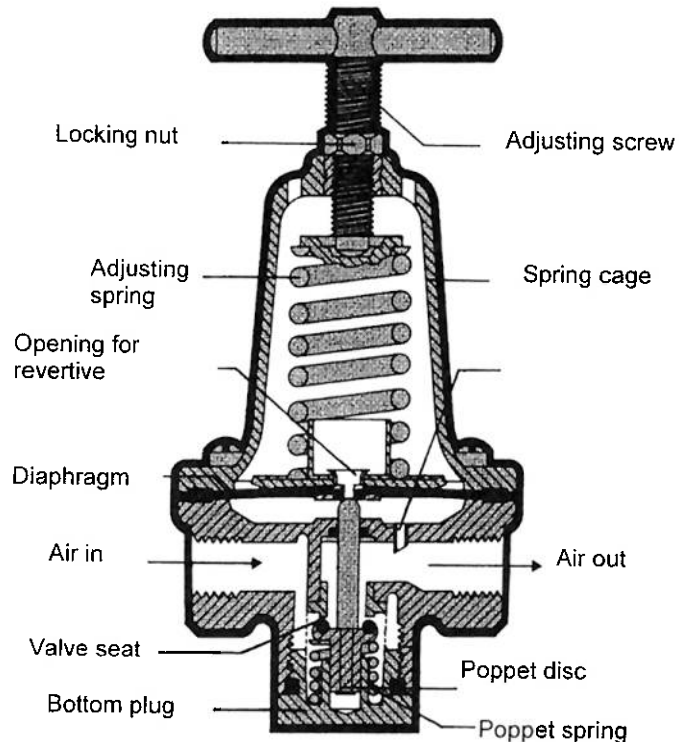
Replacement of filter elements

- lock shutoff valve in front of the filter
- open drain valve
- screw off bowl from body
- unscrew baffle
- exchange filter element (EK 2602 B)
- fix deflector
- screw bowl to body
- lock drain valve
- open shutoff valve

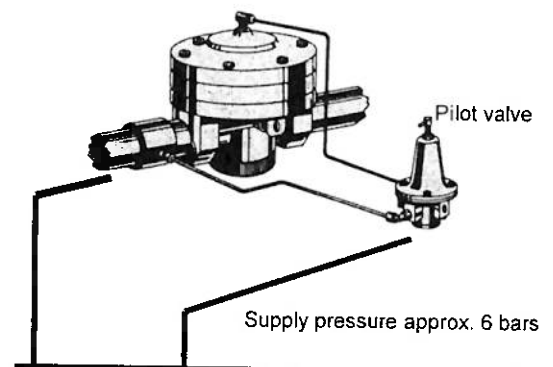
3. Regulator

Regulator operation

In front of the inlet port of the regulator uncontrolled pressurized air with supply pressure (inlet pressure) flows to the valve seat of the poppet disc, is then set to the required pressure while it is passing the valve and gets finally to the outlet port as downstream pressure (secondary pressure). The required downstream pressure is connected to the top of the diaphragm by actuating the adjusting screw thus effecting the adjusting spring. The bottom of the diaphragm is pressurized with secondary pressure. Depending on the force balance of spring and secondary pressure, the diaphragm is moving either to the top or to the bottom. In this, the poppet disc is actuated and releases the valve seat, thus opening the orifice. If secondary pressure exhausts, the spring force effecting to the diaphragm is exceeding the opposing downstream pressure. By this, the poppet disc is pressed downwards towards the poppet spring. The orifice opens and the secondary pressure increases.



Actuating a remote-controlled regulator





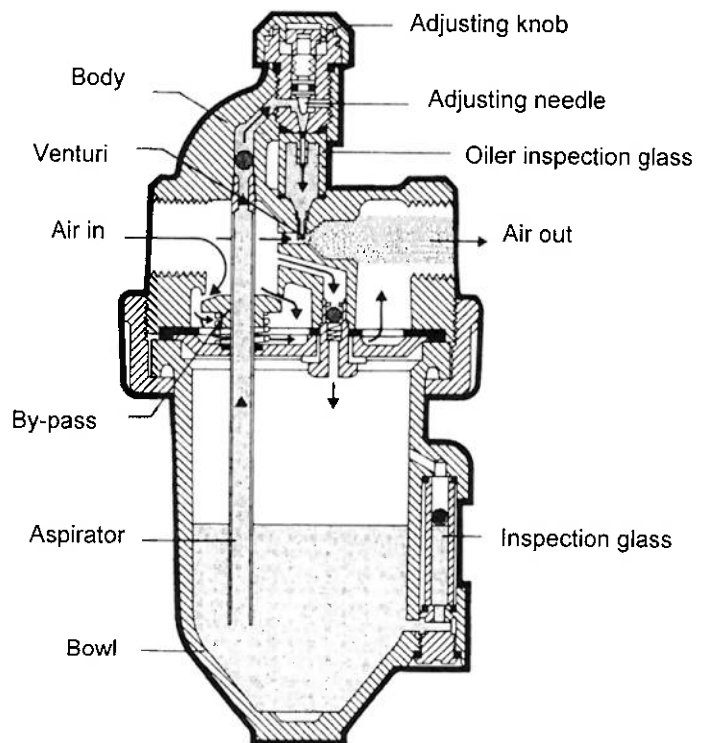
Instructions to compressed air

HEINRICH GEORG GMBH
MASCHINENFABRIK

4. Air lubricator

Lubricator construction

A lubricator consists of the body, the oil regulating device, aspirator, bypass and bowl. The housing is made of zinc-die cast or aluminium. The bowl is available in zinc-die cast, steel or polyurethane. Note that the system must be exhausted before the bowl is removed. In some designs the oil cannot be filled under pressure, whereas with other designs the bypass automatically serves as pressure relief.



Lubricator operation

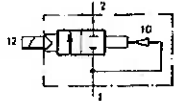
In a typical lubricator the air enters the lubricator housing and is channeled in either of two directions depending on the flow rate. At low flow rates, all the air passes through the venturi to the discharge port. Under higher flow conditions air bypasses the venturi in parallel. Oil droplets are created only by the air passing the venturi, thus producing a vacuum in the oil-drip device. These oil droplets are mixed with the air flow rate passing through the bypass. This bypass enables lubrication at low flow rate and prevents extensive lubrication at high flow rate, keeping the pressure drop at low level.

5. 5/2- way valve, indirectly actuated

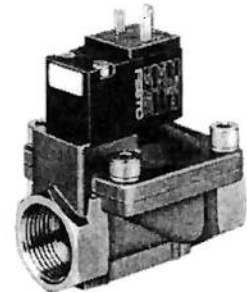
Magnetventil

Messing-Ausführung

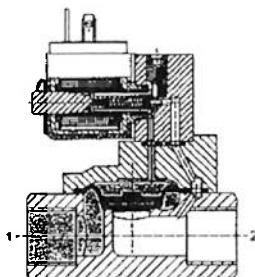
Typ MN1H-...-MS



The task of the directional control valve is to close, open or reverse compressed air paths. The 2/2-way function has two connections and two switching positions. Connection (1) is the compressed air inlet and connection (2) the compressed air outlet. Electrical indirectly actuated single solenoid valve. The valve maintains its switching position only for as long as the switching signal is applied. Once this signal is switched off, the valve is reset via a pneumatic spring. Coil from N1 series. The normal position is closed. Indirectly actuated.



The valve can be switched through via a manual override.
For DC or AC
The valve can be mounted in-line.



Schaltzeiten (nach VDI 3290)

Typ	Druckluft ms		Wasser ms	
	Ein	Aus	Ein	Aus
MN1H-2-1/4-MS	30	100	50	220
MN1H-2-3/8-MS	30	100	50	220
MN1H-2-1/2-MS	30	100	50	220
MN1H-2-3/4-B-MS	120	180	75	350
MN1H-2-1-B-MS	120	180	75	350
MN1H-2-1 1/2-MS	230-440	300-1000	230-550	1000-1400

Feature	Data/description
Medium	Compressed air, filtered, lubricated or unlubricat
Operating principle	Disc seat
Shape of function component	Diaphragm disk
Type of mounting	Screw
Connection	G 1/2 Female thread
Nominal size	13 mm
Standard nominal flow rate	3100 l/min
Operating pressure	0,5 – 10 bar
Response time OFF/OVER (dom.)	30 ms
Response time OFF/OVER	100 ms
Ambient temperature	-10 – 60°C
Medium temperature	-10 – 60°C
Degree of protection as per IEC 529 IP..	65



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Magnetspule (N1-Spule)
mit Anschlußbild für
Festo Standard-Steckdosen
nach DIN 43650 Bauform A

Gleichspannung
Typ MSN1G-...

Wechselspannung
Typ MSN1W-...

Diese Magnetspulen können auf folgende
Magnetventile montiert werden:
Typ JMN1H-...
MN1H-...

Die Magnetspulen entsprechen der VDE-
Vorschrift 0580 mit der Isolierstoffklasse F.
Sie können ohne Eingriff in den Pneumatik-
Kreislauf ausgetauscht werden.

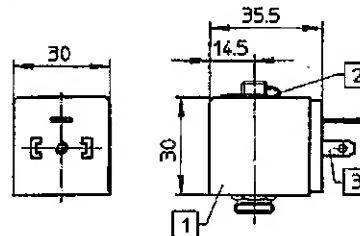
Befestigungsclips gehören zum Liefer-
umfang.

Zubehör:
Standard-Steckdose
Bestellbezeichnung 34583 MSSD-C

Steckdosen mit Kabel
Typ KMC siehe Blatt 2.595

Leuchtende Dichtung
Bestellbezeichnung 19145 MC-LD-12-24

Zwischenstecker
siehe Blatt 2.597, 2.598



1 Steckerfahnen

Feature	Data/description
Solenoid system (dimensioning)	N1G
Ambient temperature	-10°C - 50°C
Standard plug pattern	DIN 43650-1
Plug design	A
CT criterion	Free of copper and teflon
Voltage type	DC
Nominal voltage	24 V
Power consumption (DC)	2,5 W
Degree of protection as per IEC 529 IP..	65

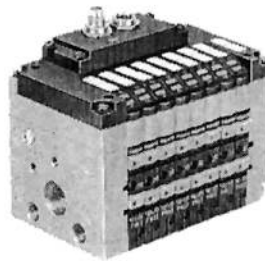


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Pneumatic- CP-Valve terminal

Type

FESTO¹



Contents ²

	Page
1.0 System overview	2
1.1 Description of components	2
2.0 Maintenance and conversion	3
2.1 Fitting/removing CP terminal components	3
2.1.1 Removing components from valve locations	3
2.1.2 Fitting components into the valve locations	4

¹ Festo AG & Co., D-73726 Esslingen

² Source: Manual 165 200 GB

CP-Valve terminal Type FESTO

1.0 System Overview

1.1 Description of components

The CP terminal consists of the following components:

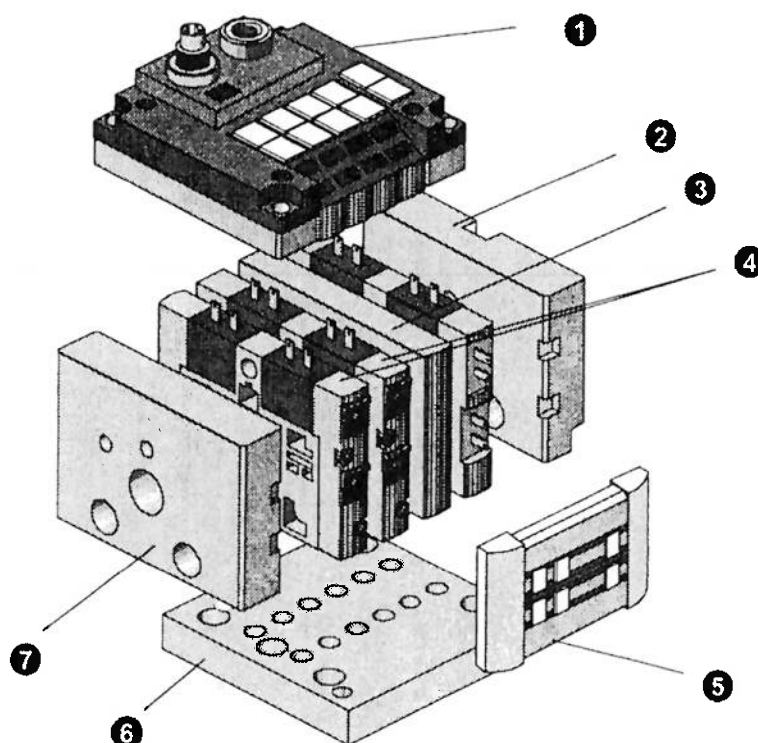


Fig. 1: Components of the valve terminal

1. Connector plate for multipin, AS-i or CP
2. Right-hand end plate (with/without supply connections or for pneum. m.c. plate)
3. Relay board (only CPV10/14-valve terminals with CP)
4. Blanking or isolating plate (with locked air ducts 1 and 11 and outlet duct (3/5) or locked air ducts 1 and 11 only)
5. Valve plates fitted with monostable or pulse valves
6. Pneumatic multiple connector plate (optional)
7. Left-hand end plate (with/without supply connections or for pneum. m.c. plate)



CP-Valve terminal Type FESTO

HEINRICH GEORG GMBH
MASCHINENFABRIK

2.0 Maintenance and conversion

2.1 Fitting/removing CP terminal components



WARNING

Before starting the fitting, switch off the following:

- the compressed air supply
- the power supply to the valve solenoid coils

You thereby avoid:

- Uncontrolled movements of loose tubing.
- Sudden and undesired movements of the connected actuators.
- Undefined switching states of the electronic components.

2.1.1 Removing components from valve locations

The components on the CP terminal can easily be removed to facilitate maintenance and conversion work.

Proceed as follows:

1. Loosening the electrical connections

- In the case of AS-i or CP connections, loosen the plug and pull it off. Then loosen the four fastening screws on the connector plate. Pull the connector plate away from the connecting lugs on the valve plates.
- In the case of individually connected valve solenoid coils, loosen the locking screws on the connector plugs of the valve plates in order to remove them. Pull the plugs carefully away from the connector lugs. Mark the sockets. In the case of CP terminals with pneumatic multiple connector plate, we recommend that the connector plugs be removed from each valve plate.

2. Loosening the pneumatic connections

- In the case of individually wired CP terminals, loosen the work tubing of the valve on the valve plate which is to be removed.

3. Loosen the CP terminal from the fastening surface.

- In the case of CP terminals with pneumatic multiple connector plate, loosen the fastening screws of the connector plate in the left and right-hand end plates one turn in diagonally opposite sequence. Then remove the screws completely. Now remove the CP terminal from the pneumatic multiple connector plate.
- In the case of CP terminals with foot fastening, loosen the fastening screws in the right-hand end plate and remove them.
- If the CP terminal is-fitted onto a wall or onto a hat rail, loosen the right-hand wall fastening or hat rail clamping unit.

4. Remove the components.

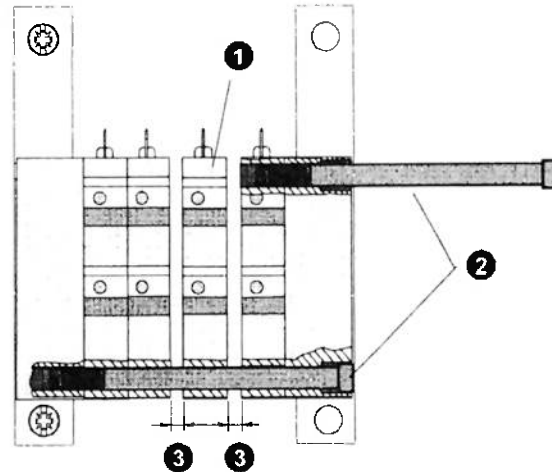
- Loosen both lower tie rods one turn.
- Then loosen the upper tie rod and pull it over the components which are to be replaced.
- Unscrew the two lower tie rods until the heads of the screws are flush with the outer surface of the end plate (do not remove the tie rod).
- Pull the valve terminal apart so that the distance between the component to be replaced and the next component is in each case 2 mm.

CP-Valve terminal Type FESTO

HEINRICH GEORG GMBH
MASCHINENFABRIK

Fig. 2: Removing the valves

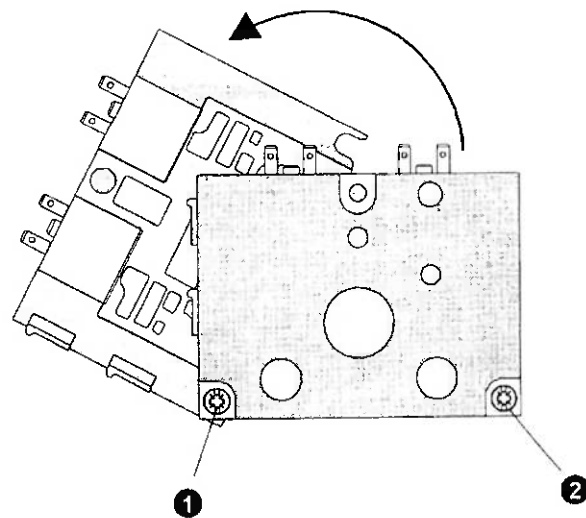
- ① Component to be replaced
- ② Tie rod
- ③ Abstand ca. 2 mm



- Turn the component forwards around the front tie rod.

Fig. 3: Position of the tie bolt

Front tie bolt
hinterer Zuganker



Pull the component so that it snaps out of the front tie bolt.

2.1.2 Fitting components into the valve locations

Proceed as follows:

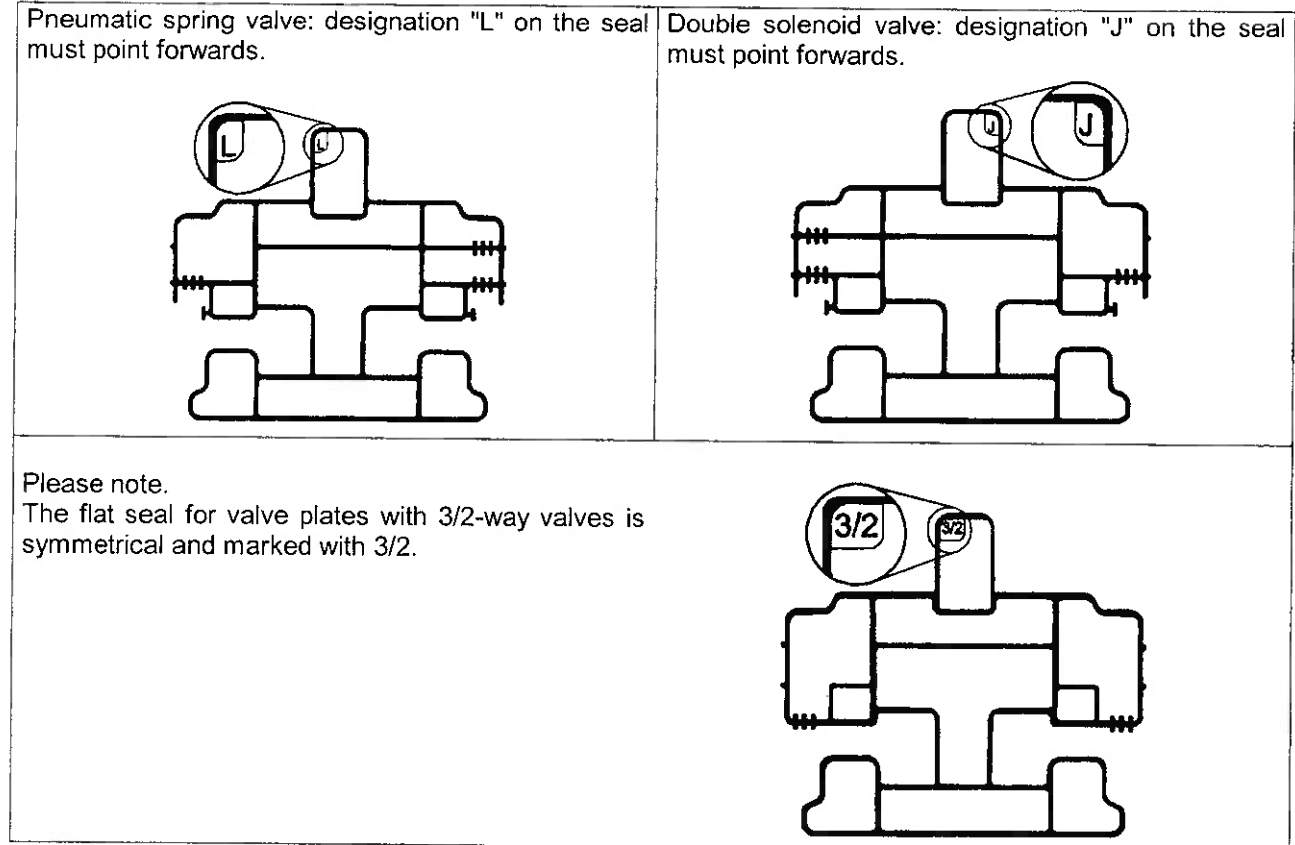
1. Fitting components

- Check that the seals are fitted correctly between the terminal components. They must lie accurately in the appropriate seal grooves.
- Check that the seals are seated correctly when valve plates with pneumatic springs or double solenoid valves are fitted. The seating is not symmetrical (see diagram).

CP-Valve terminal Type FESTO

HEINRICH GEORG GMBH
MASCHINENFABRIK

Fig. 4: Position of seals with pneumatic spring valves or double solenoid valves



- Place the components on the front tie rod. Press the components down so that they snap into the tie rod.
- Swing the components carefully backwards. Make sure there is sufficient space for the flat seals.
- Push the upper tie rod as far as possible into the CP terminal and screw it in a few turns.
- Align the components of the CP terminal on a flat surface so that they are not offset against each other.
- Tighten first the upper tie rod and then the lower tie rod with 0.3 Nm. Then tighten both tie rods with 2 Nm.

2. Fitting the CP terminal

CP terminals with pneumatic multiple connector plate

- Place the 3 and 4-seal strips in the recesses in the left or right-hand end plate. Press the 2-seal strips carefully into the threads of the work connections.
- Place the CP terminal on the pneumatic multiple connector plate and tighten the fastening screws in the left and right-hand end plates with 0.3 Nm. Then tighten the screws in diagonally opposite sequence with 2 Nm.

Kommission Nr.
work order no.

4295

Firma
messr.

IMEFY

Maschine / Anlage
machine / line

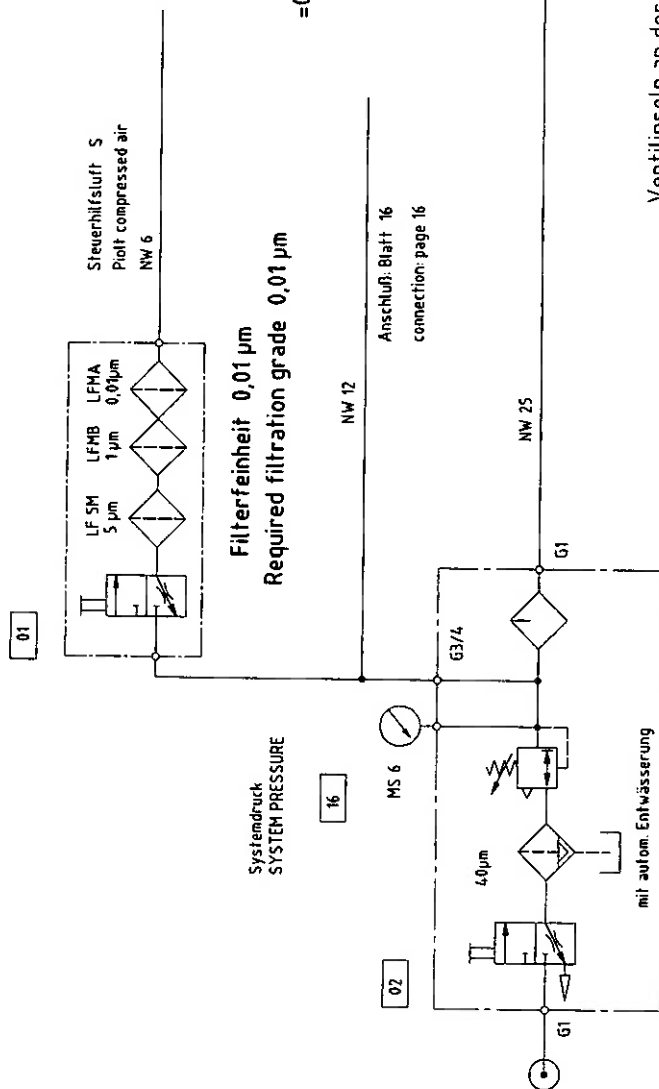
TBA / ME / E 400x2000-PB/T

Ventilspannung
valve voltage

24 V=

Druckstellwerte bei Montage oder im Werk
des Kunden ermitteln und eintragen
determine and book pressure adjustement valves
for assembly or in the works of the costomer

... bar



Ventilinseln an der Bedienseite angebracht

Ventilinseln in der Nähe der schnellschaltenden Zylindern angebracht

Schlauchleitungen von der V.-insel zu den Zylindern so kurz wie möglich verlegt

Ventilinseln mit Bezeichnungsschildern im Klartext versehen

Anschluß: Blatt 02
connection: page 02

Benennung Pneumatikschema
PNEUMATIC SCHEMATIC DIAGRAM

Kom.

4295

Stückliste
part list

29931

Stand

19.02.07

Name

H. Röcher

Datum

15.02.07

Gez

Gepr

HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL



Zeichnungsnummer
drawing-no.

K-3-062536-01

Formel Blatt
sheet size

01

Blatt Nr.
sheet no.

18

Blatt Nr.
sheet no.

01

Blatt Nr.
sheet no.

18

Blatt Nr.
sheet no.

01

Blatt Nr.
sheet no.

18

Blatt Nr.
sheet no.

01

Blatt Nr.
sheet no.

18

Blatt Nr.
sheet no.

01

Blatt Nr.
sheet no.

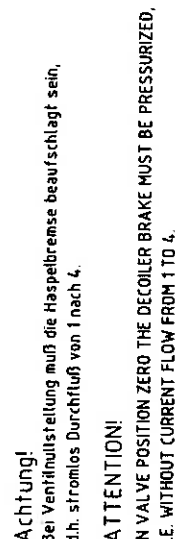
18

Blatt Nr.
sheet no.

01

Benennung	designation
Pneumatikschema	PNEUMATIC SCHEMATIC DIAGRAM

formal Blatt	07	von	18	Blatt Nr	Index
K-3-062536-02					
Zeichnungsnummer drawing-no					

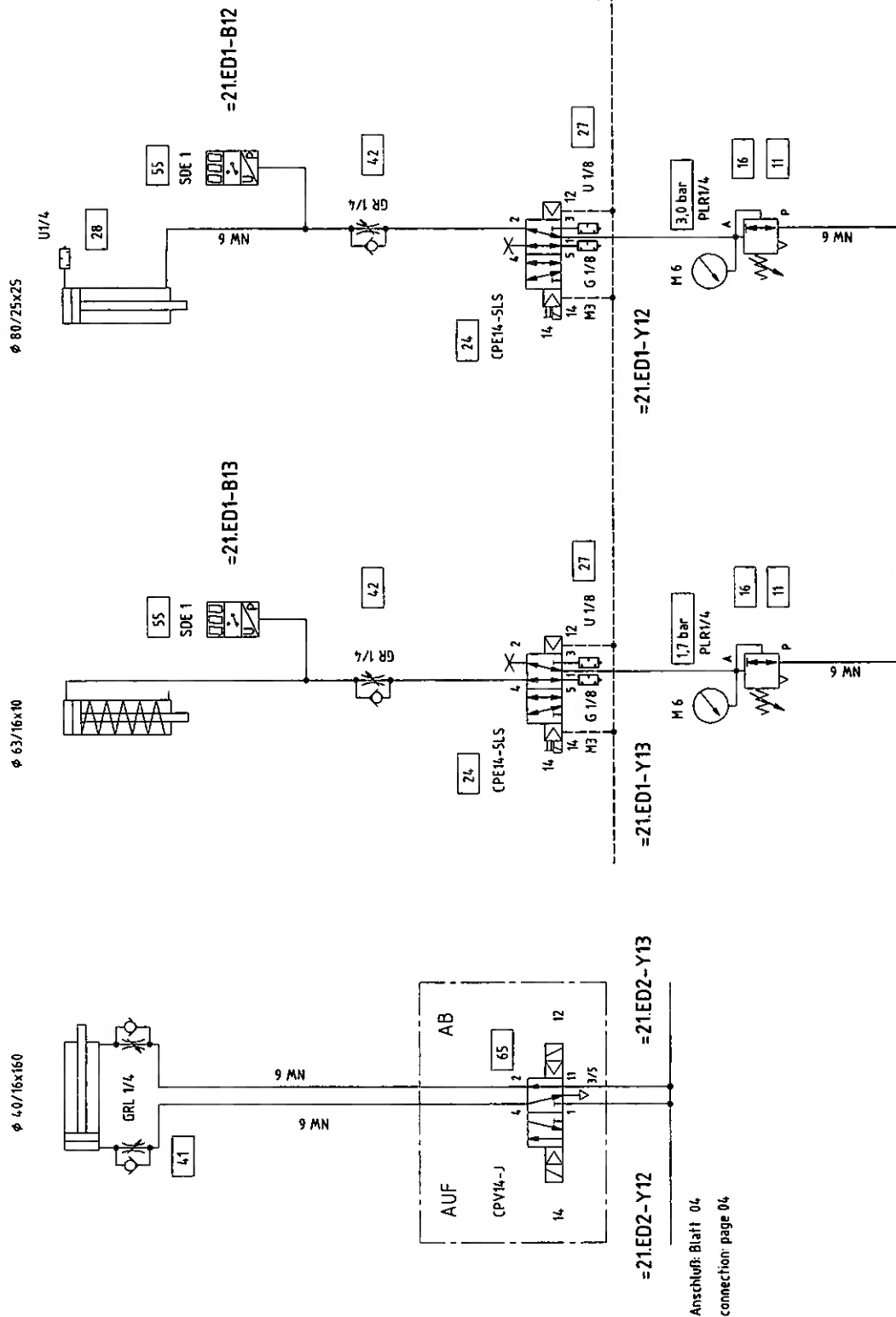


Das Unternehmen stellt in seinen Einrichtungen
mit 200 bis 300 Mitarbeitern und eine für diese
Technische Fertigung und Montage der
Lagerung der Bauteile vor.

Schlaufenhebel
LOOP LEVER
2.14/15
ø 40/16x160

Meßrolle
MEASURING ROLL
ø 63/16x10

Antriebsrolle
DRIVE ROLL
ø 80/25x25



Anschluß: Blatt 04
connection: page 04

Anschluß: Blatt 02
connection: page 02

Anschluß: Blatt 04
connection: page 04



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Benennung designation

Pneumatikschema
PNEUMATIC SCHEMATIC DIAGRAM

Zeichnungsnummer drawing-no.

K-3-062536-03

Blatt / Nr. sheet no.	18
von of	03

Entsprechend dem Herstellerempfehlung
für die Ausführung von Rohrleitungen
sind die Maße in mm anzugeben.

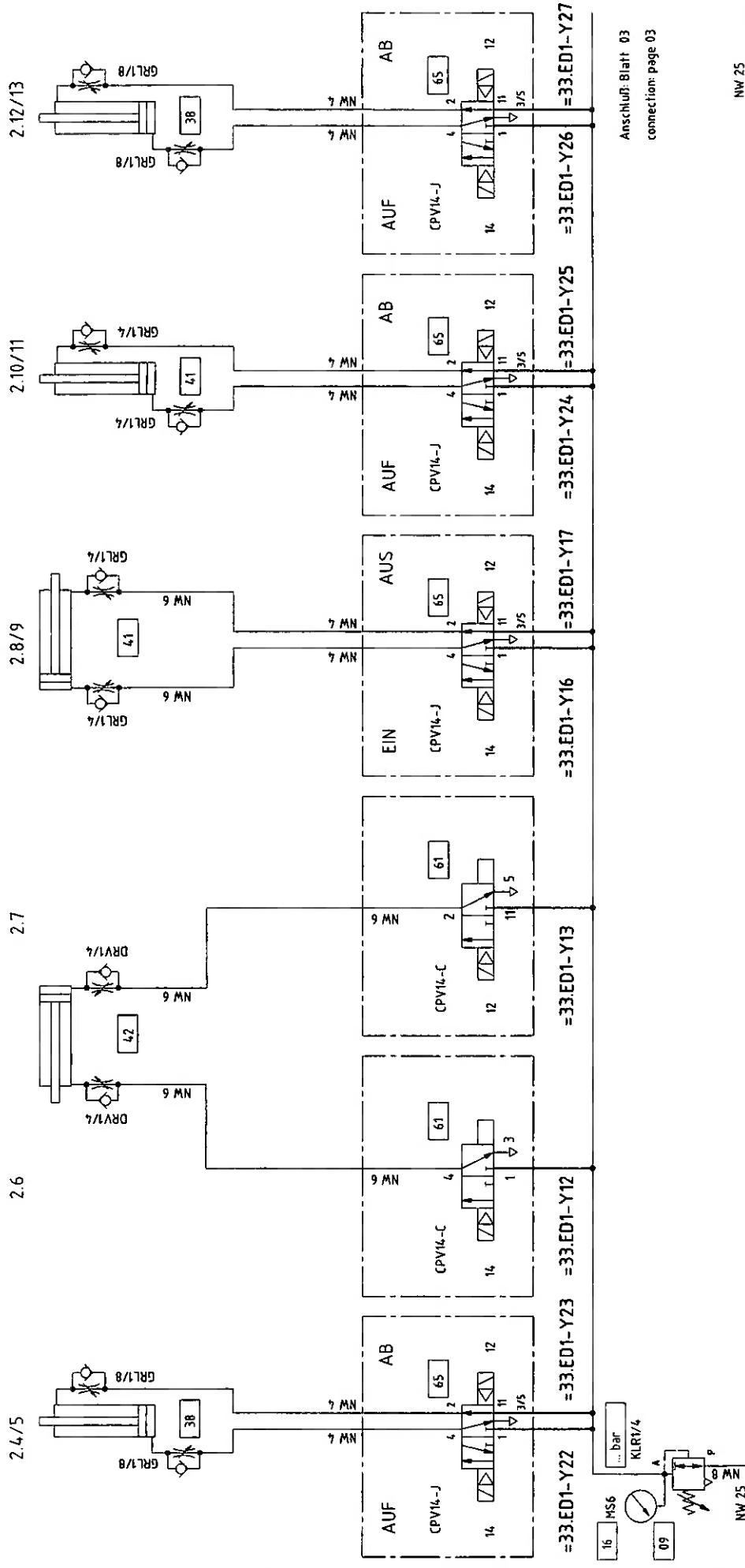
Hochhaltebleche Schere 1
HOLD UP PLATES SHEAR 1
vor Schere 1
IN FRONT OF THE SHEAR 1
Ø 25/10x80

Schere schwenken
SHEAR schwing

Schere arretieren
SHEAR fixing

Hochhaltebleche Schere 1
HOLD UP PLATES SHEAR 1
nach Schere 1
BEHIND THE SHEAR 1
Ø 32/12x80

Hochhalteblech
HOLD UP PLATE
nach Schere 2
BEHIND THE SHEAR 2
Ø 20/8x100



Anschluß: Blatt 03
connection: page 03

Anschluß: Blatt 05
connection: page 05



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Datum	Name	Stand	Stückliste part list	Kom.
15.02.07	H. Röcher	15.02.07	29931	4295

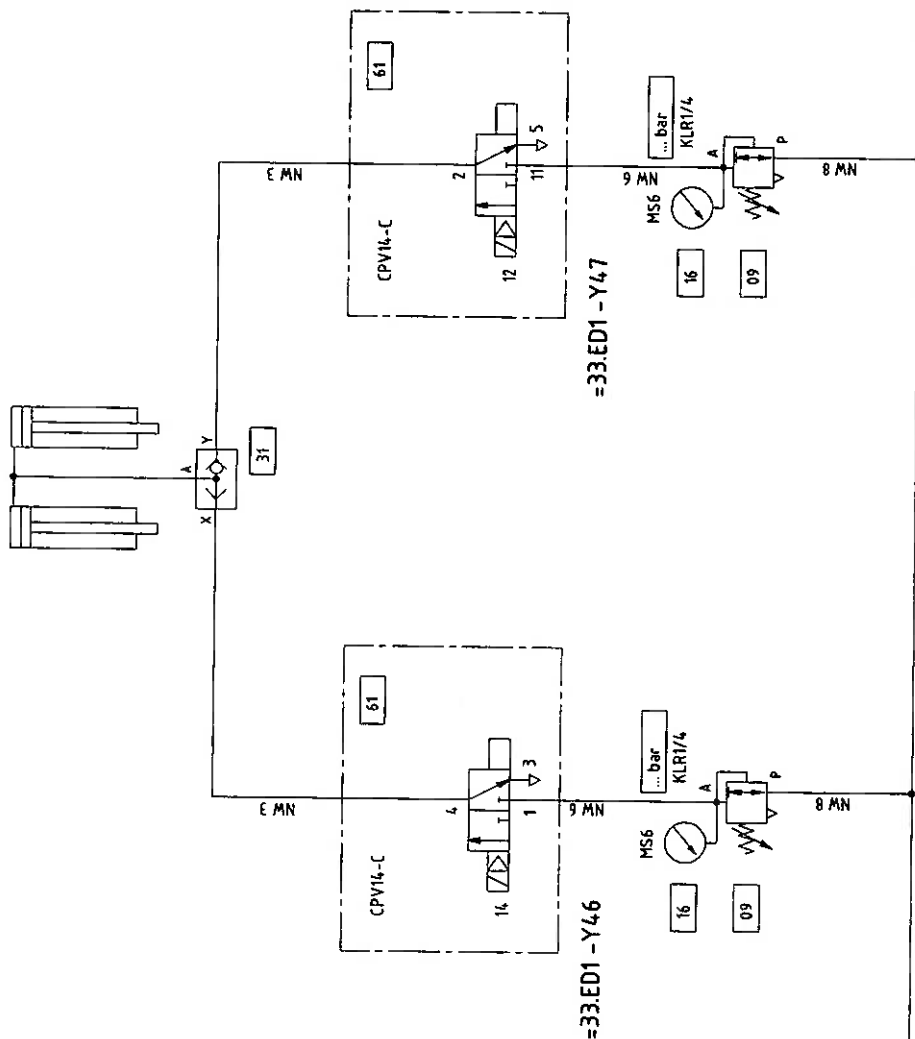
Benennung designation
Pneumatikschema
PNEUMATIC SCHEMATIC DIAGRAM

Zeichnungsnummer drawing-no.	
K-3-062536-04	
Blatt Nr. sheet no.	18
von of	04

Druckrollen
vor den Scheren
PRESSURE ROLLS
IN FRONT OF THE SHEARS
Ø 20/10x4

ND
2.0

HD
2.1



NW 25

NW 25

Anschluß: Blatt 05
connection: page 05

Anschluß: Blatt 07
connection: page 07



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Datum	Name	Stand	Stückliste part list	Kom.
Gez 15.02.07	H. Röcher	15.02.07	29931	4295
Gepr 15.02.07	Rö			

Benennung designation

Pneumatikschema

PNEUMATIC SCHEMATIC DIAGRAM

Zeichnungsnummer drawing-no

K-3-062536-06

Format sheet size 06 per 18 Blatt Nr. sheet no.

Blatt Nr. sheet no.

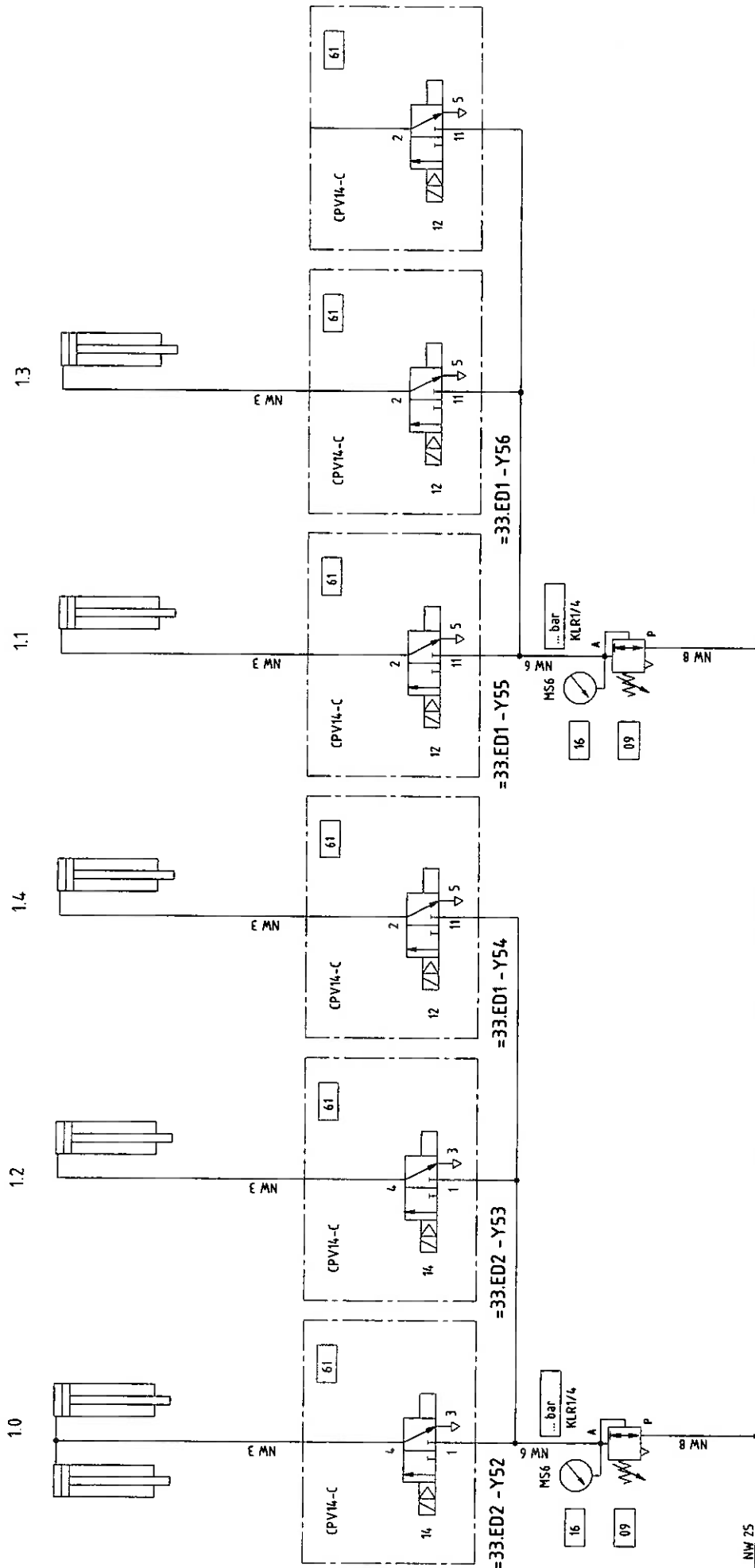
Druckrollen
zwischen den Scheren
PRESSURE ROLLS
BEHIND THE SHEARS
Ø 20/10x4

Druckrolle 1
nach den Scheren
PRESSURE ROLL 1
BEHIND THE SHEARS
Ø 20/10x4

Druckrolle 2
nach den Scheren
PRESSURE ROLL 2
BEHIND THE SHEARS
Ø 20/10x4

Druckrolle 3
nach den Scheren
PRESSURE ROLL 3
BEHIND THE SHEARS
Ø 20/10x4

Druckrolle 4
nach den Scheren
PRESSURE ROLL 4
BEHIND THE SHEARS
Ø 20/10x4



Anschluß: Blatt 06
connection: page 06

Anschluß: Blatt 08
connection: page 08



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-51723 KREUZTAL

Datum	Name	Stand	Stückliste part list	Kom.
Gez 15.02.07	H. Röcher	15.02.07	29931	4295
Gepr 15.02.07	Ro			

Benennung designation
Pneumatikschema
PNEUMATIC SCHEMATIC DIAGRAM

Zeichnungsnummer drawing-no	
K-3-062536-07	
Form sheet	07
von of	18
Blatt Nr. sheet no.	

Entsprechend den Schutzanforderungen
für die Sicherheit von Mensch und
Umwelt ist das System so zu betrie-
ben, daß die Gefahr von Verletzungen
vermieden wird.



Anschluß: Blatt 09
connection: page 09

HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Gez	Datum	Name
Gez	15.02.07	H. Rocher
Gez	19.02.07	D.

land	Stückliste part list
19.02.07	29931

om.	4295
-----	------

Benennung designation

Pneumatikschema

Zeichnungsnummer drawing-no

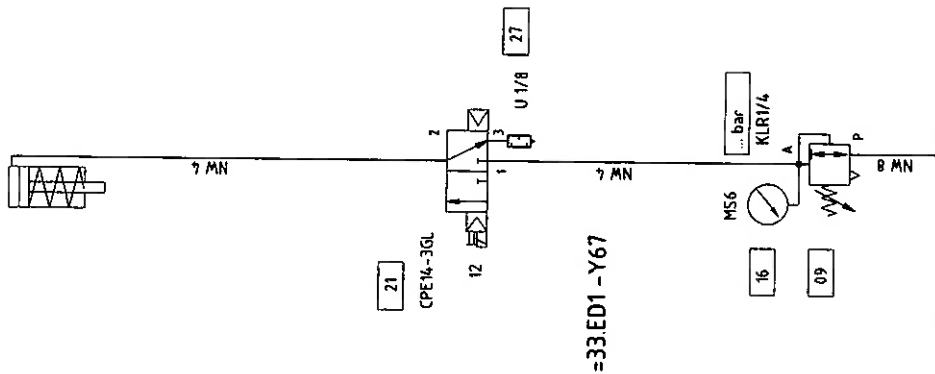
K-3-062536-08

format	blast	vol	blast no	pages
size	sheet	08	18	

Das Experiment zum Urknall wird mit
einem Orbital-Teleskop im Weltraum
durchgeführt. Die Daten werden
über das Internet veröffentlicht.

Druckrollen Auslauftransportband
PRESSURE ROLL RUNOUT CONVEYOR BELT

Ø 20/8x20

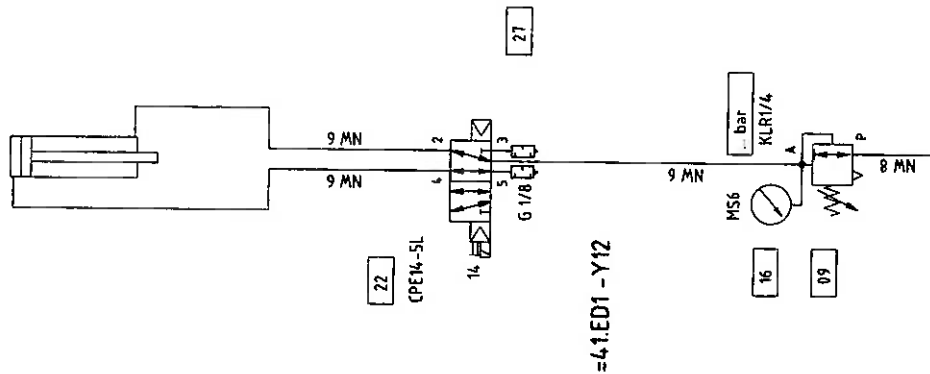


p = 6 bar

NW 25

Trennkeil
SEPARATING WEDGE

Ø 50/20x25



Anschluß: Blatt 08
connection: page 08

Anschluß: Blatt 10
connection: page 10



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Datum	Name	Stand	Stückliste part list	Kom.
Gez 15.02.07	H. Röcher	15.02.07	29931	4295
Gepr 15.02.07	Ro			

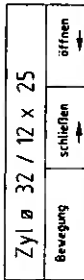
Benennung designation
Pneumatikschema
PNEUMATIC SCHEMATIC DIAGRAM

Zeichnungsnummer drawing-no.	Blatt Nr. sheet no.	Blatt 18	Blatt 19
K-3-062536-09	09	18	19

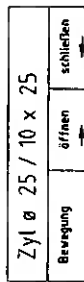
Stapelvorrichtung 1 unten

STACKING UNIT 1 bottom

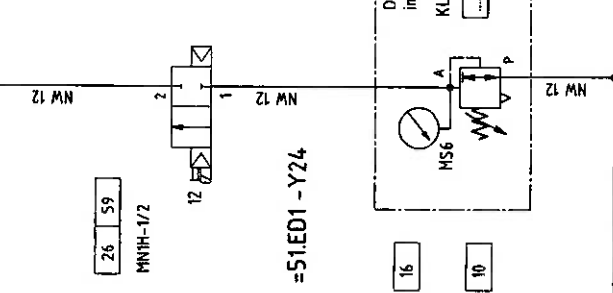
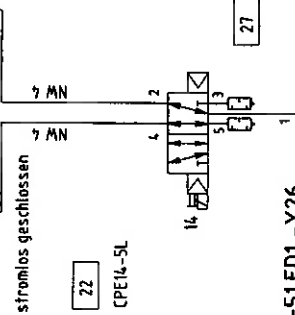
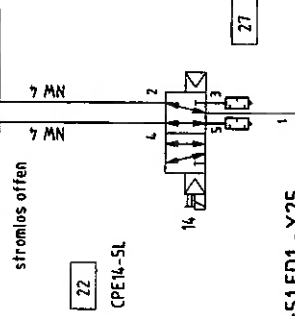
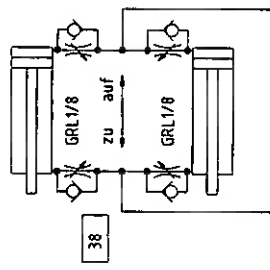
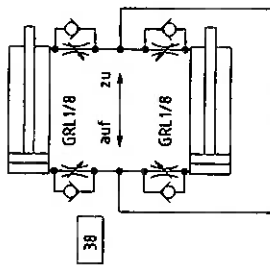
Hubleiste / Seitenleiste
LIFTING BAR / PUSHER



Hochhalteleiste
HOLD UP BAR



Luftdüsen
AIR NOZZLES



Anschluß: Blatt 09
connection: page 09

Anschluß: Blatt 11
connection: page 11



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Datum	Name	Stand	Stückliste part list	Kom.
Gez 15.02.07	H. Röcher	15.02.07	29931	4295
Gepr 15.02.07	Ro			

Benennung designation
Pneumatikschema
PNEUMATIC SCHEMATIC DIAGRAM

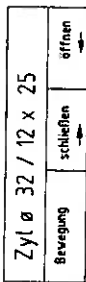
Zeichnungsnummer drawing-no.			
K-3-062536-10			
Format size	Blatt sheet	von of	von of
	10	27	18

Entsprechend den Sicherheitsvorschriften
nach DIN EN 12151 sind alle für die
Funktionsprüfung und Wartung des
Lagers des Trägers zu

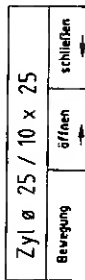
Stapelvorrichtung 2 oben

STACKING UNIT 2 top

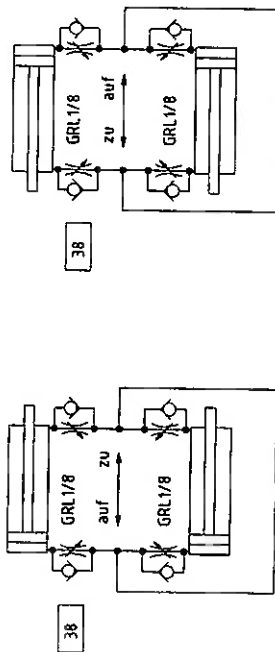
Hubleiste / Seitenleiste
LIFTING BAR / PUSHER



Hochhalteleiste
HOLD UP BAR



Luftdüsen
AIR NOZZLES



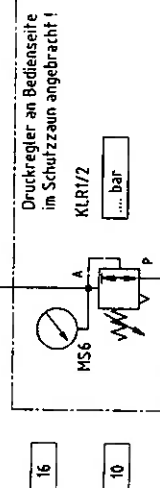
=51ED2 -Y25
NW 6

Anschluß: Blatt 10
connection: page 10

=51ED2 -Y26
NW 6

Anschluß: Blatt 10
connection: page 10

=51ED2 -Y24
NW 12



p=6 bar

NW 25

NW 25

Anschluß: Blatt 12
connection: page 12

Anschluß: Blatt 14
connection: page 14



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Benennung designation

Pneumatikschema
PNEUMATIC SCHEMATIC DIAGRAM

Kom.

Stückliste part list

Stand

Name

Datum

Gez.

Gepr.

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Rö

4295

29931

17.10.07

15.02.07

H. Röcher

Stapelvorrichtung 2 oben STACKING UNIT 2 top

Abstreifer / Niederhalter 1

STRIPPER / DOWN HOLDER 1

Zyl Ø 16 / 6 x 100	ab	auf
Bewegung	↓	↑

Abstreifer / Niederhalter 2

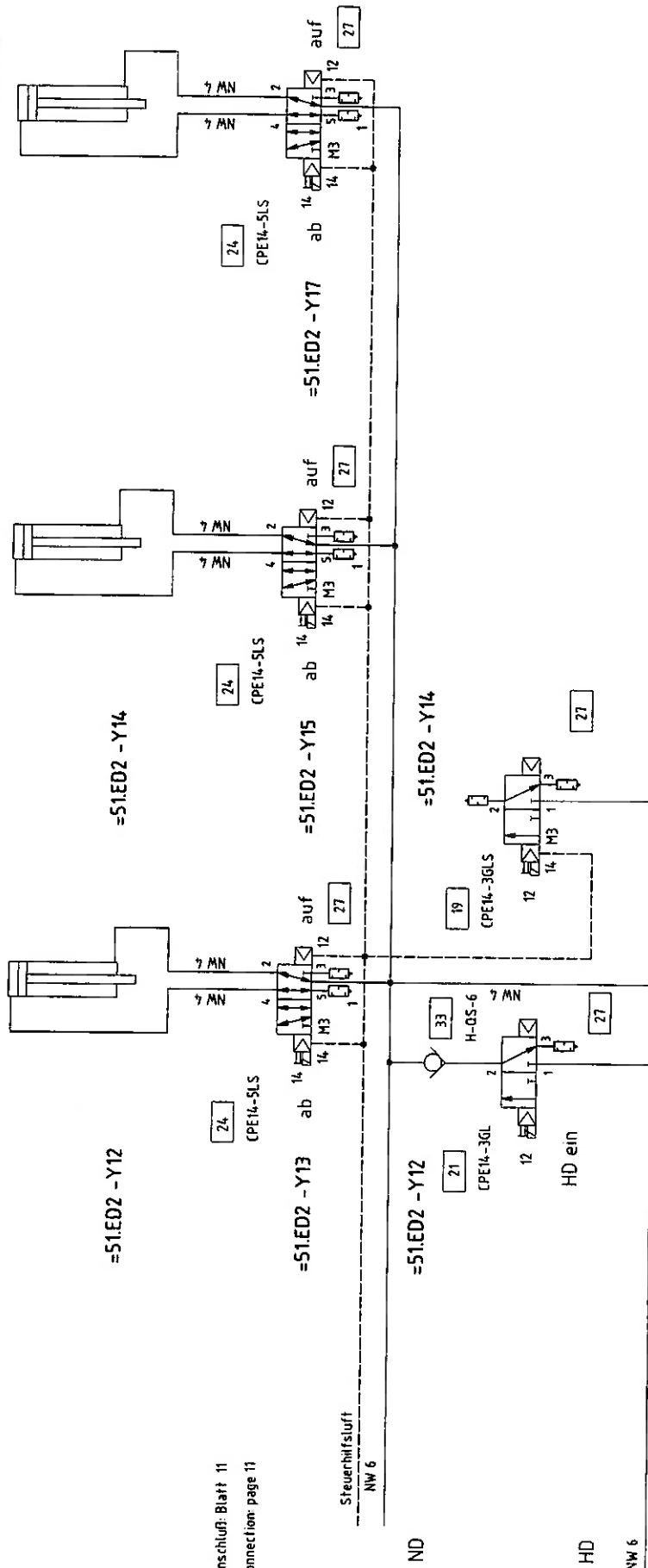
STRIPPER / DOWN HOLDER 2

Zyl Ø 16 / 6 x 100	ab	auf
Bewegung	↓	↑

Abstreifer / Niederhalter 3

STRIPPER / DOWN HOLDER 3

Zyl Ø 16 / 6 x 100	ab	auf
Bewegung	↓	↑



Anschluß: Blatt 11
connection: page 11

NW 6

NW 25

Anschluß: Blatt 13
connection: page 13

NW 25

Anschluß: Blatt 13
connection: page 13



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Datum	Name	Stand	Stückliste part int	Kom
15.02.07	H. Röcher	08.06.07	29931	4295
Gez.				
Gepr.				

Benennung designation
Pneumatikschema
PNEUMATIC SCHEMATIC DIAGRAM

Zeichnungsnummer drawing-no

K-3-062536-14

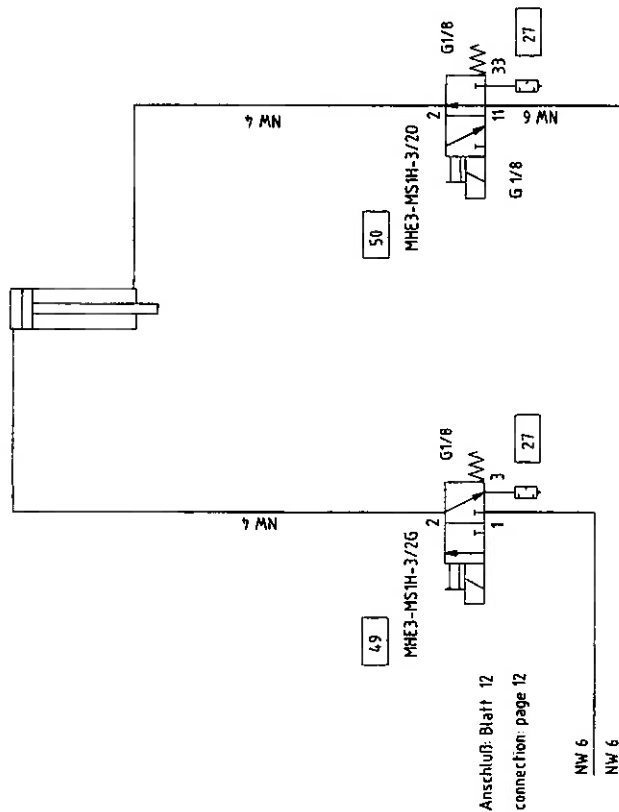
Anschluß: Blatt 15
connection: page 15

Blatt Nr sheet no	Blatt Nr sheet no	Blatt Nr sheet no
14	15	16

Stapelvorrichtung 2 oben
STACKING UNIT 2 top

Fädelbolzen
Threading pin

Zyl Ø 16 / 6 x 100
Bewegung
↑ ab
auf ↑



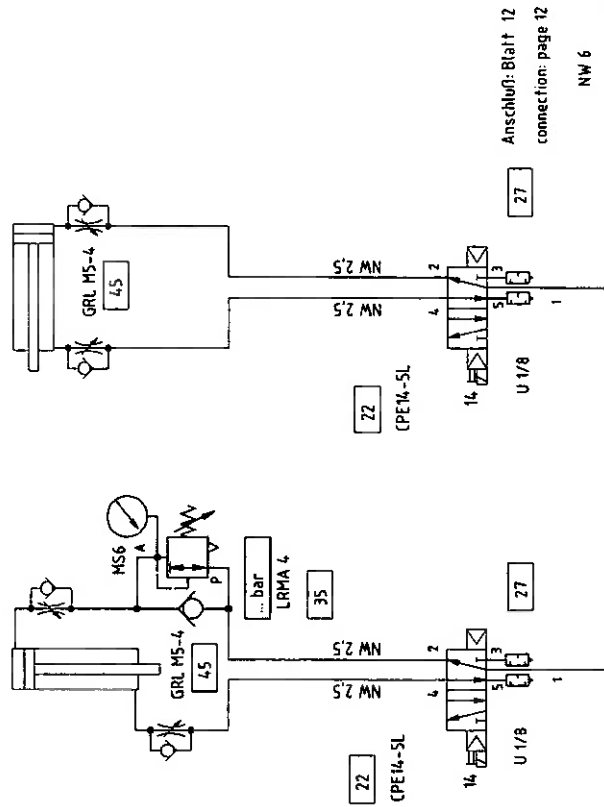
=xx.EDx - Yxx

=xx.EDx - Yxx

Blechhaltevorrichtung
SHEET HOLDING DEVICE

Zyl Ø 20 / 8 x 40
Bewegung
↑ ab
auf ↑

Zyl Ø 25 / 10 x 25
Bewegung
en
aus



=51.ED2 - Y22

=51.ED2 - Y23

NW 25

Anschluß: Blatt 14
connection: page 14

Anschluß: Blatt 16
connection: page 16



HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Datum	Name	Stand	Stückliste part list	Kom.
Gez 15.02.07	H. Röcher	15.02.07	29931	4295
Gepr 15.02.07	Rö			

Benennung designation
Pneumatikschema
PNEUMATIC SCHEMATIC DIAGRAM

Ziehungsnummer drawing-no.	Blatt no.	von	von	von	von
K-3-062536-15	15	15	15	15	15

Insel 1 auf dem Scherenagregat mitfahrend

- 12.0 = Druckrollen zw. d. Scheren
- 12.1 = Druckrolle 3 n.d. Scheren
- 12.2 = Druckrolle 1 n.d. Scheren
- 12.3 = Druckrolle 4 n.d. Scheren
- 12.4 = Druckrolle 2 n.d. Scheren
- 12.5 = Trennplatte
- 12.6/7 = Transportrolle 1
- 13.0/1 = Transportrolle 2
- 13.2/3 = Transportrolle 3
- 13.4/5 = Transportrolle 4
- 13.6/7

Insel 2 auf dem Scherenagregat mitfahrend

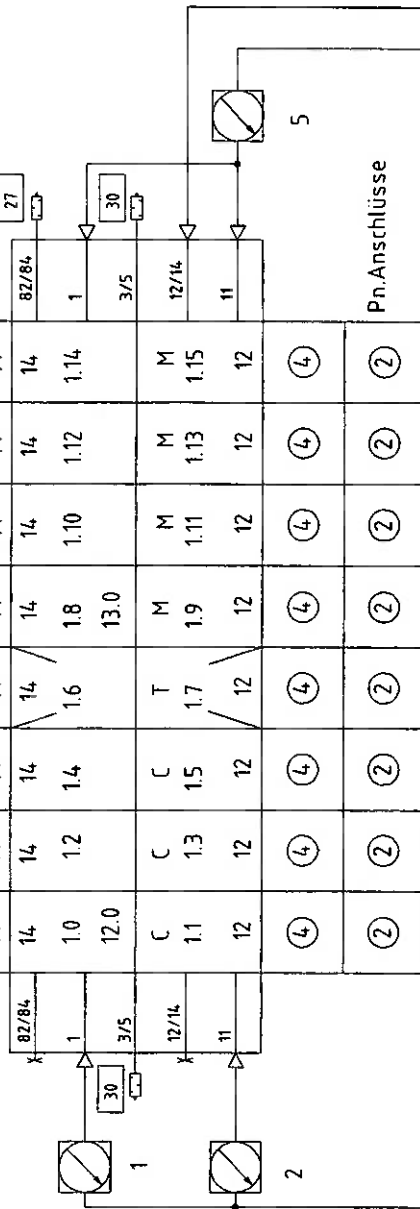
- 16.0 = Druckrollen v. d. Scheren Niederdruck
- 16.1 = Druckrollen v. d. Scheren Hochdruck
- 16.2/3 = Trennplatte
- 16.4/5 = Hochhalteblech vor Schere 1
- 16.6 = Schere schwenken
- 16.7 = Schere schwenken
- 17.0/1 = Schere anretzen
- 17.2/3 = Hochhalteblech nach Schere 1
- 17.4/5 = Hochhalteblech nach Schere 2
- 17.6/7 = Schlaufenhebel

- 1 = Druckrollen n.d.Scheren zw+1-2
- 2 = Druckrollen n.d.Scheren 3-5
- 3 = Druckrolle v.d.Schere HD
- 4 = Druckrolle v.d.Schere ND
- 5 = Transportrollen
- 6 = Insel 2

Insel 1

=02.NE7 -A22

67



Schilder für Druckregler u. Manometer

Systemdruck	Presion del Sistema
Haspel	Devanadera
Insel 1 Scherenaggregat	Isla 1 desplazable junto al grupo de cizallas
Insel 2 Scherenaggregat	Isla 2 desplazable junto al grupo de cizallas
Antriebsrolle	Rodillo de accionamiento
Messrolle	Rodillo de medición
Hubführungen v.d.Scheren	Guia elevacion delante de cizalla 1
Hubführungen n.d.Scheren	Guia elevacion detras de cizalla 2
Druckrollen vor der Schere	Rodillos de presion delante de cizalla
Druckrollen v.d. Schere ND	Rodillos de presion delante a cizalla alta presion
Druckrollen v.d. Schere HD	Rodillos de presion delante a cizalla baja presion
Druckrolle 1 - 2 n.d. Schere	Rodillos de presion 1-2 detras de cizallas
Druckrolle 3 - 4 n.d. Schere	Rodillos de presion 3-4 detras de cizallas
Transportrollen	Rodillo de transporte
Trennkeil	Chavata de separacion
Druckrollen Austauschband	Rodillos de presion cinta de salida
Seitenleiste / Hubleiste	Regletas guia
Hochhalteleiste	Regleta seperadora superior
Abstreifer auf	Bascador arriba
Abstreifer ab	Bascador abajo
Fädelbolzen HD	X
Fädelbolzen ND	X
Blechhaltevorrichtung	Dispositivo retencion
Luftdüsen	Toberas de Aire



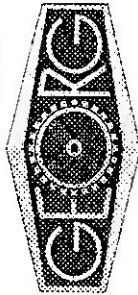
HEINRICH GEORG GMBH
MASCHINENFABRIK
D-57223 KREUZTAL

Gez.	Datum	Name	Stand	Stückliste part list	Kom.
Gepr.	15.02.07	H. Röcher	15.02.07	29931	4295
	15.02.07	Rö			

Benennung designation
Pneumatikschema
PNEUMATIC SCHEMATIC DIAGRAM

Zeichnungsnummer drawing-no	
K-3-062536-18	
Formel Blatt size sheet	von of
18	18
Blatt Nr. sheet no	von of
18	18

Heinrich Georg GmbH Maschinenfabrik



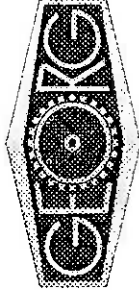
57223 Kreuztal
Germany

1	2	3	4	5	6	7	8	9
Teil Part	Stück pc.	Benennung Designation	Artikel-Nr. Part No.	Bestellbezeichnung Order Designation	Hersteller Manufacturer	Maga.	Bemerkung Remark	Ersatz. Sp. part
1	1	Druckluftfilter filter of compressed air	050004292	G 1/2 V00258, LF-1/2-D-5M-MIDI-A komplett	FESTO		Feinsfilterkombination	1.B 0
2	1	Wartungseinheit maintenance unit	05003493	G 1 FRC-1-D-MAXI, Art.Nr. V00284	FESTO			3.B 0
3.1	0	Filterelement filter element	05004294	LFP-D-MIDI-5M	FESTO		Filterfeinheit 5 µm	1.A 0
3.2	0	Filterelement filter element	05004278	LFMBP-D-MIDI	FESTO		Filterfeinheit 0,01 µm	1.A 0
3.3	0	Filterelement filter element	05004293	LFMAP-D-MIDI	FESTO			1.A 0
4	0	Filterelement filter element	05002593	LFP-D-MAXI-40M	FESTO			1.A 0
5	0	Kugelhahn ND ball stop valve	05000045	G 1/4 mit Entlüftung		x		
6	1	Kugelhahn ND ball stop valve	05000047	G 1/2		x		
7	0	Kugelhahn ND ball stop valve	05000051	G 1 mit Entlüftung		x		
8	0	Wasserabscheider	05003486	ZK-02	FESTO		Teile Nr. 170 682	3.A 0
9	17	Konstant-Druckminderer Pressure controller	05000304	737.302 G 1/4, 0,5 - 6 bar	RIEGLER	x	ohne Manometer	3.A 0
10	1	Konstant-Druckminderer Pressure controller	05000305	737.502 G 1/2, 0,2 - 6 bar	RIEGLER	x	ohne Manometer	3.A 0
11	2	Präzisions-Regler precision controller	05000070	G 1/4 11-818-993	AIR-COM	x		3.A 0
12	0	Nebelöler oiler	05000307	762 K, G 1	RIEGLER	x		3.A 0
13	0	Kugelhahn ND ball stop valve	05004123	Ø 8, HE 3-1/4-QS 8	FESTO	x	3/2-Wege-Kugelhahn	3.A 0
Änderung Modification			Datum Date	Name	Benennung: Pneumatik zur Anlage		Stückliste Nr. Partlist No.	Index
					gez.	07.02.2006	Röcher	0
					gepr.	08.06.2007	Rö	entstanden aus
					Zchn.	K-3-062536		Blatt 1 von 1

Heinrich Georg GmbH Maschinenfabrik

1	2	3	4	5	6	7	8	9
Teil Part	Stück pc.	Benennung Designation	Artikel-Nr. Part No.	Bestellbezeichnung Order Designation	Hersteller Manufacturer		Bemerkung Remark	Ersatz. Sp. part
14	0	Druckregler pressure control valve	05000017	G 1/2, vorgest. R119-04	AIR-COM	X		3.A 0
15	0	Druckregler pressure control valve	05000018	G 1, vorgest. R119-08	AIR-COM	X		3.A 0
16	22	Manometer pressure gauge	05000146	Ø 63, 0.00 bis 6.00 bar G1/4 hinten mit montiertem Dreilochfließ	WIKA	X		2.A 0
17	0	Wegeventil way directional control valve	05000103	handbet., H-3-1/4-B	FESTO	X		
18	0	Wegeventil way directional control valve	05000104	5/2-handbet., G 1/4 H-5-1/4-B	FESTO	X		3.A 0
19	2	Wegeventil way directional control valve	05003594	3/2-el.magn., G 1/8 CPE14-M1BH-3GLS-1/8	FESTO			3.A 0
20	2	Wegeventil way directional control valve	05000105	handbet., THO-3-1/4-B	FESTO	X		3.A 0
21	4	Wegeventil way directional control valve	05004007	3/2-el.magn., G 1/8 CPE14-M1BH-3GL-1/8	FESTO	X		3.A 0
22	12	Wegeventil way directional control valve	05002550	5/2-el.magn., G 1/8 CPE14-M1BH-5L-1/8	FESTO	X		2.A 0
23	1	Wegeventil way directional control valve	05003008	5/2-el.magn., G 1/8 CPE14-M1BH-5J-1/8	FESTO	X		3.A 0
24	8	Wegeventil way directional control valve	05002495	5/2-el.magn., G 1/8 CPE14-M1BH-5LS-1/8	FESTO	X		2.A 0
25	4	Wegeventil way directional control valve	05002329	5/2-el.magn., G 1/8 CPE14-M1BH-5JS-1/8	FESTO	X		2.A 0
25.1	5	Handbetätigung	05002330	AHB-MZB	FESTO	X		
25.2	36	Actor-Kabel, 3-pol Actor cable	05002672	KMYZ-9-24-10-LED-PUR-B	FESTO	X		1.A 0
26	2	Wegeventil way directional control valve	05000114	el.magn., MN1H-2-1/2-MS	FESTO	X		2.C 0
Änderung Modification			Datum Date	Name	Benennung: Pneumatik zur Anlage		Stückliste Nr. Partlist No.	Index 0
					gez.	07.02.2006	Röcher	29931
					gepr.	08.06.2007	Rö	entstanden aus
					Zchn.	K-3-062536		Blatt 2 von 1

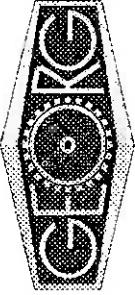
Heinrich Georg GmbH Maschinenfabrik



57223 Kreuztal
Germany

1 Teil Part	2 Stück pc.	3 Benennung Designation	4 Artikel-Nr. Part No.	5 Bestellbezeichnung Order Designation	6 Hersteller Manufacturer	7 Maga.	8 Bemerkung Remark	9 Ersatzl. Sp. part
27	60	Schalldämpfer sound damper	05000075	AN 110-01-1/8	SMC	x		
28	4	Schalldämpfer sound damper	05000076	AN 200-02-1/4	SMC	x		
29	2	Schalldämpfer sound damper	05000077	AN 300-03-3/8	SMC	x		
30	4	Schalldämpfer sound damper	05000078	AN 400-04-1/2	SMC	x		
31	1	Wechselventil shuttle valve	05000102	G 1/4 OS-1/4-B	FESTO	x		
32	0	Rückschlagventil non return valve	05001497	NG 4 H-QS-6	FESTO	x		
33	4	Rückschlagventil non return valve	05000467	G 1/4, 8 H-QS-8	FESTO	x		
34	0	Rückschlagventil non return valve	05000296	entsperb. G 1/4 ASP 430F-02-08S	SMC	x	Drosselrückschlagventil	
35	2	Druckregler pressure control valve	05000013	Ø 4, direkt gest. LRMA-QS-4	FESTO	x		3.A 0
36	0	Drosselventil flow control valve	05002657	M5 GRLA-M5-QS-4-D	FESTO	x	Teile-Nr. 193138	3.A 0
37	0	Drosselventil flow control valve	05000293	G 1/8 DRV 1/8	BAUMGARTNER	x		
38	32	Drosselventil flow control valve	05000284	G 1/8 R 1/8	BAUMGARTNER	x		
40	0	Drosselventil flow control valve	05000286	G 1/4 R 1/4	BAUMGARTNER	x		
41	10	Drosselventil flow control valve	05000287	G 1/4 R 1/4-S8 A	BAUMGARTNER	x		
42	4	Drosselventil flow control valve	05000292	G 1/4 DRV 1/4	BAUMGARTNER	x		2. 0
Änderung Modification			Datum Date	Name	Benennung: Pneumatik zur Anlage		Name Partlist No.	Index
					gez.	07.02.2006	Röcher	0
					gepr.	08.06.2007	Rö	entstanden aus
					Zchn.	K-3-062536		Blatt 3 von 1

Heinrich Georg GmbH Maschinenfabrik



57223 Kreuztal
Germany

1	2	3	4	5	6	7	8	9
Teil Part	Stück pc.	Benennung Designation	Artikel-Nr. Part No.	Bestellbezeichnung Order Designation	Hersteller Manufacturer	Maga	Bemerkung Remark	Ersatz. Sp. part
43	0	Drosselventil flow control valve	05000288	G 3/8 R 3/8	BAUMGARTNER	x		
44	0	Drosselventil flow control valve	05000290	G 1/2 DRV 1/2	BAUMGARTNER	x		
45	8	Drosselventil flow control valve	05002657	M5 GRLA-M5-QS-4-D	FESTO	x	Teile-Nr. 193138	3.A 0
46	2	Schnellentlüftungsventil fast venting valve	05000082	SEU 1/4	FESTO	x		
47	0	Schnellentlüftungsventil fast venting valve	05000083	SEU 3/8	FESTO	x		
48	0	Schnellentlüftungsventil fast venting valve	05000084	SEU 1/2	FESTO	x		
49	2	Wegeventil way directional control valve	05003271	3/2-el.magn., G 1/8 MHE3-MS1H-3/2 G-1/8	FESTO			3.A 0
50	2	Wegeventil way directional control valve	05003272	3/2-el.magn., G 1/8 MHE3-MS1H-3/2 O-1/8	FESTO		Schnellschaltventil	3.A 0
50.1	4	Actor-Kabel, 3-pol	05003273	KMYZ-3-24-10-LED-PUR-B	FESTO		zu Pos. 24 / 25	
51	0	Wegeventil way directional control valve	05002232	5/2-el.magn., ISO 2 JMFH-5/2-D-2-C	FESTO			2.C 0
52	0	Anschlußplatte mounting plate	05000726	ISO 2 NAS-3/8-2A-ISO	FESTO			
53	0	Wegeventil way directional control valve	05000106	pneum. bet., VLO-3-1/2-B	FESTO	x		3.A 0
54	0	Wegeventil way directional control valve	05000838	5/2-pneum. bet., DN4 JH-5-1/8	FESTO			3.A 0
55	3	Druckschalter pressure switch	05001901	G 1/8 SDE1 D10 G2 H18 C PU M8	FESTO	x		2.A 0
56	1	Anschlußplatte mounting plate	05002551	G 1/8 CPE 14-PRSG-3	FESTO	x		
Änderung Modification			Datum Date	Name	Benennung: Pneumatik zur Anlage		Datum Date	Index
					KOM. 4295		07.02.2006	0
					Designation: pneumatic		08.06.2007	
							Röcher	entstanden aus
							Rö	Blatt 4 von 1
							Zchn. K-3-062536	
							29931	

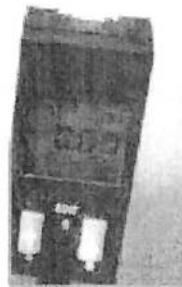


HEINRICH GEORG GMBH
MASCHINENFABRIK

Pressure/vacuum sensor SDE1-...

Type

FESTO¹



Contents²

Technical documentation Pressure/vacuum sensor SDE1-...

Page
2- 26

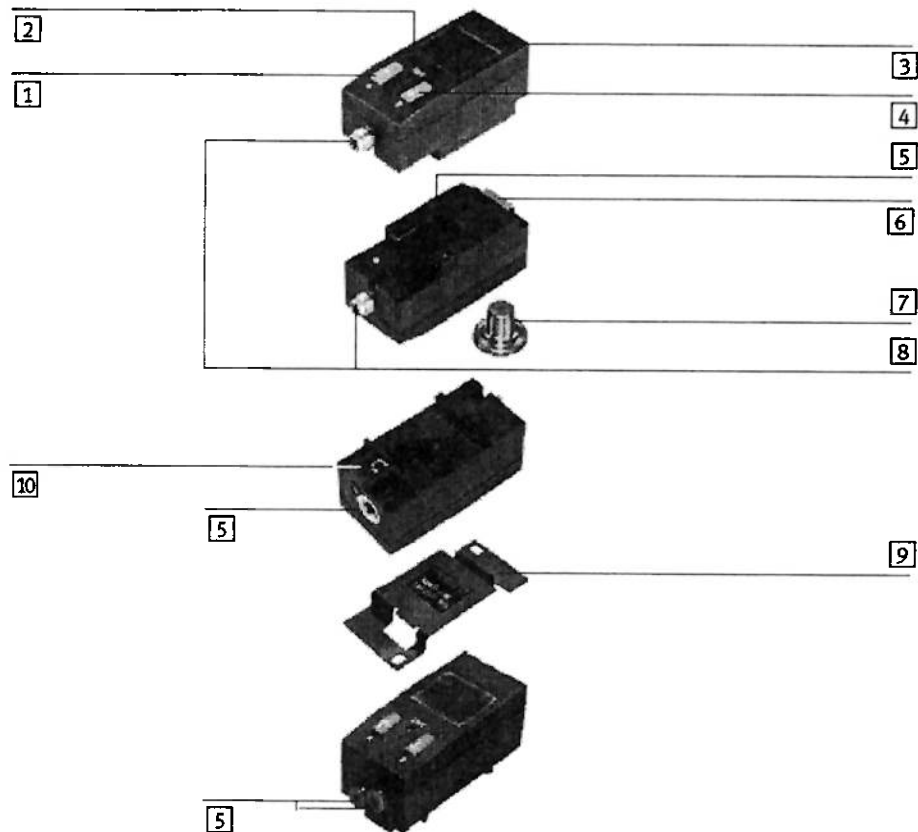
Pressure/vacuum sensor type SDE1-...

1 Contents

1	Contents	27
2	Operating parts and connections	28
3	Product overview	30
	Functions on the SDE1-...	30
	Brief description	32
	Variants of the SDE1-...	34
4	Method of operation and use	35
5	Conditions of use	35
6	Fitting	36
	Mechanical components	36
	Pneumatic components	37
	Electric components	38
7	Commissioning	40
	Preparation for commissioning	40
	Carrying out commissioning	45
8	Operation	46
9	Care and maintenance	46
10	Dismantling	47
11	Accessories	47
12	Eliminating faults	48
13	Technical specifications	49

SDE1-....

2 Operating parts and connections



SDE1-....

- 1** UP key (A-key)
- 2** EDIT button
- 3** Display
- 4** DOWN key (B-key)
- 5** Compressed air or vacuum connection
 - hole
 - thread
 - screw connectors for differential pressure measurement
- 6** Bolt for flange fastening
- 7** Flange adapter (serves at the same time for fastening)
- 8** Plug for electrical connection
 - 3-pin
 - 4-pin
- 9** Fastening plate for fitting onto a wall
- 10** Fastening slide for fitting onto a hat rail

Fig. 1

Applies to:

SDE1-...

SDE1-...

SDE1-...

SDE1-...

SDE1-...-R..-...

SDE1-...-H/W18-...

SDE1-...-H/WQ4-...

SDE1-...-R..-...

SDE1-...-R..-...

SDE1-...-P1/N1-...-M8

SDE1-...-P2/N2/PU/NU-...-M8

SDE1-...-W..-...

SDE1-...-H/W..-...

SDE1-....

3 Product overview

Functions on the SDE1-...

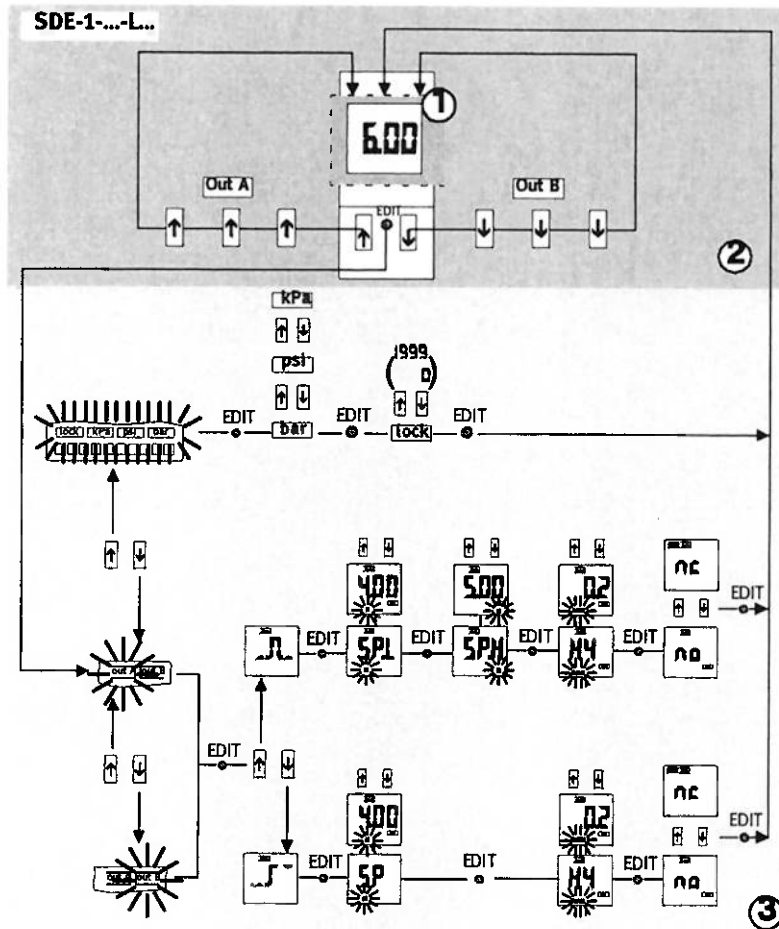


Fig. 2

SDE1-....

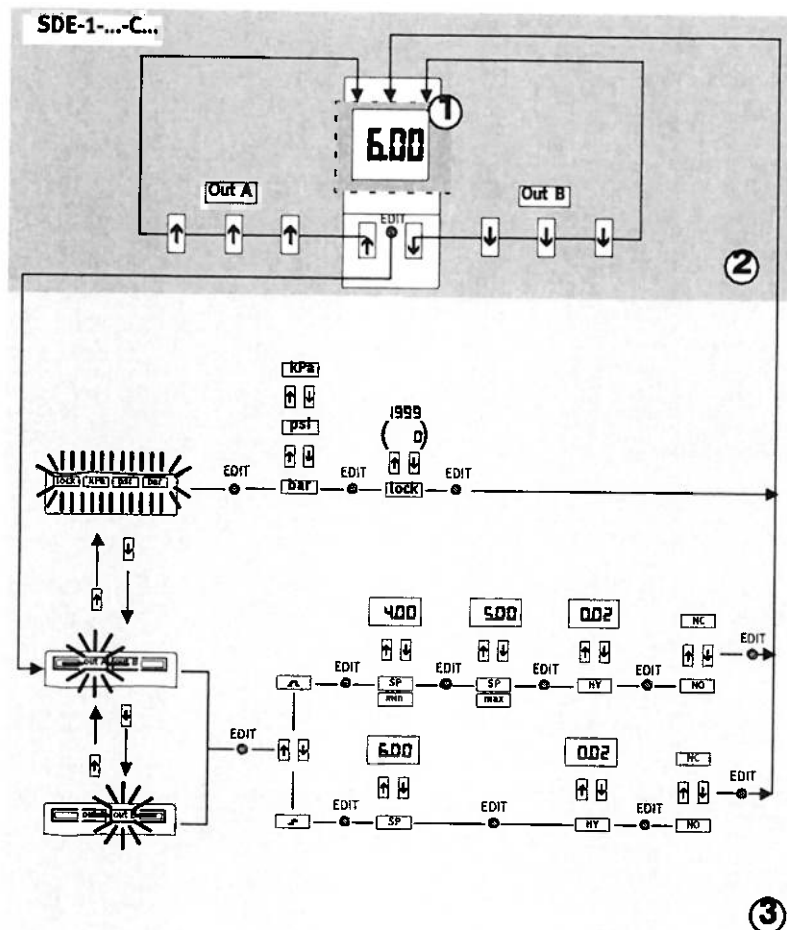


Fig. 3

Key to Fig. 2 and Fig. 3:

- ① RUN mode: shows the current pressure value
- ② SHOW mode: shows the current settings
- ③ EDIT mode: modifies the current settings

SDE1-....

Definition

Pressure p = Relative pressure (also includes vacuum with SDE1-...-V.-...).
With differential pressure type (SDE1-...-HQ4-.../...-WQ4-...) the display for pressure is: $p = p_1 - p_2$ (measured pressure – reference pressure).

Brief description

For switching pressure setting Out A (factory setting: threshold comparator, NO):

1. Hold EDIT pressed down 5 s (SDE1-... is then in RUN mode)
2. Press EDIT 3 times (SP-field flashes)
3. Set desired switching pressure with UP/DOWN key on the SDE1-...
4. Hold EDIT pressed down 5 s (SDE1-... is then in RUN mode)

For simple teach function Out A (factory setting: threshold comparator, NO):

1. Hold EDIT pressed down 5 s (SDE1-... is then in RUN mode)
2. Apply desired switching pressure
3. First press the A-key **1**, then also the EDIT button **2** (Out A flash)
4. Repeat point 3 (the taught switching pressure is then also the pressure applied).

SDE1-....

Symbols on the display

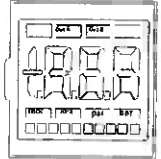
Display	Symbol on ...C-..	Symbol on ...L-..	Meaning
	 	 	Switching output A/switching output B
			Switching output set/not set
			Threshold value comparator
(SDE1-....C-...)			Window comparator
	SP	SP	Switching pressure
	SP min	SP_L	Lower switching pressure
	SP max	SP_H	Upper switching pressure
	HY	HY	Hysteresis
	NO	no	Normally-open contact
	NC	nc	Normally-closed contact
	min	P_L 0	Minimum value of measured pressure
(SDE1-....L-...)	max	P_H ,	Maximum value of measured pressure
	lock	lock	Safety code active (locked against unauthorized programming)
			Bar display - setting for switching output Out A - display of current measured pressure - setting for switching output Out B

Fig. 4

Signal curve with applied pressure (..-D..) or vacuum (..-V..)

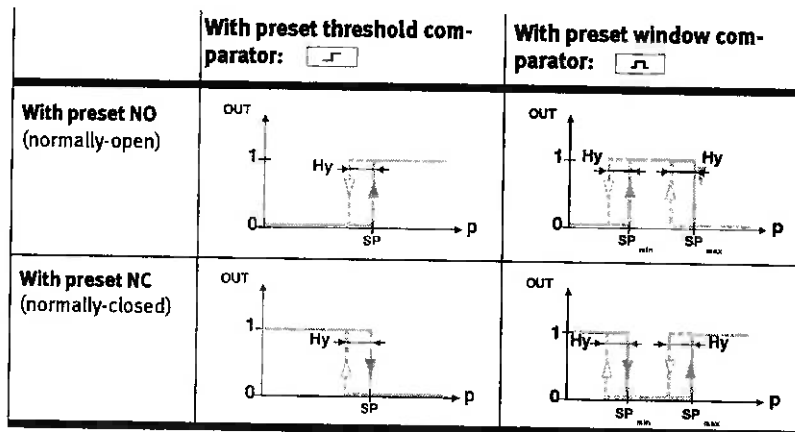


Fig. 5

Variants of the SDE1-...

Feature	Type designation (order code)		
Pressure/vacuum sensor	SDE1-...		
Pressure range	-D10-... (0...10 bar)	-V1-... (0...-1 bar)	
Accuracy	-G2-... (2 %)		
Mechanical connection	-R..-... (flange)	H..-... (hat rail)	-W..-... (wall)
Pneumatic connection	..18-... (1/8")	..14-... (1/4")	..Q4-... (QS4)
Display	-C-... (LCD)		-L-... (luminous-LCD)
Electronic outputs	-P.. (PNP)		-N.. (NPN)
	..1-... one switch ..2-... two switches ..U-... one switch and analogue output		
Electrical connection	-M8-...		

Fig. 6

4 Method of operation and use

The prevailing pressure p in the compressed air system is applied to the pressure chamber of the SDE1-... . This is shown directly on the display by means of a piezoresistive element with a downstream switched electronic evaluating unit. The SDE1-... can be programmed electrically as a normally-open or normally-closed contact. It has been designed for monitoring changes in pressure in the compressed air system and for converting pneumatic pressure values into electric signals which can be used for control or regulating functions.

5 Conditions of use



Please note

Malfunctioning can arise as a result of incorrect handling.

- Observe the following instructions to ensure the correct and safe use of the product.
- Compare the maximum values specified e.g. for pressures, forces, temperatures, with your actual application.
- Ensure that there is a correctly prepared supply of compressed air.
- Take into account the prevailing ambient conditions.
- Please observe the regulations applicable to your site. Comply also with national and local safety laws and regulations.
- Remove all transport packaging such as protective wax, foils, caps and cartons.
The individual materials can be deposited in containers for recycling purposes.
- Use the product in its original condition without undertaking any modifications.

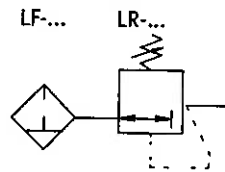


Fig. 7

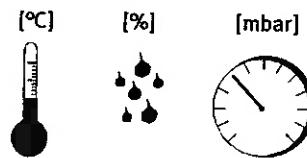


Fig. 8

SDE1-....

6 Fitting

Mechanical components

- Fasten the SDE1-... at the position intended for this purpose.

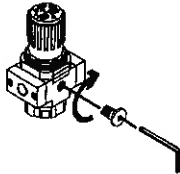
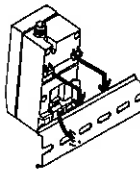
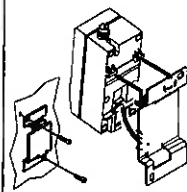
	SDE1-			
	R18-...	R14-...	H...	W...
Fastening method	Thread 1/8"	Thread 1/4"	Hat rail	Fitting on a wall
Width across flats	5 mm (hexagon socket)		—	
Maximum tightening torque	7 Nm	12 Nm	—	—
Remarks	With the aid of a flange adapter can be fitted to Festo service units. Additional sealing of the teflon-coated connecting thread is not necessary.			Fit fastening plate (e.g. 2 x M3)
			Hang the SDE1-... in the hat rail / fastening plate and press until the fastening clip 10 snaps into place.	
				

Fig. 9

SDE1-....

Pneumatic components

- Please note the following connecting variants:

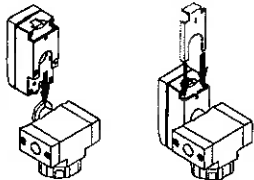
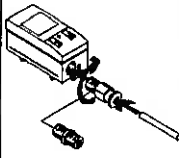
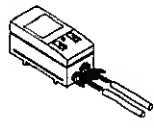
	SDE1-		
	R-...	H18/W18	HQ4/WQ4
Pneumatic connection	Flange adapter	G 1/8 thread	Screw connectors for differential pressure
Fitting	Place SDE1-... on the flange adapter and lock with bolt	Screw in screw connector with seal (tightening torque: max. 7 Nm). Alternately with double nipple E-1/8-1/8	Insert tubing (outside dia. 4 mm) into screw connectors (pay attention to correct connections of p1 and p2)
			

Fig. 10

Electric components



Warning

- Use only power units which guarantee reliable electrical isolation of the operating voltages with at least 4 kV isolation resistance as per IEC 742/EN 60742/VDE 0551 (Protected Extra-Low Voltage, PELV).

Switch power packs are permitted, providing they guarantee reliable isolation as per EN 60950/VDE 0805.



Warning

Long signal cables reduce the immunity to interference.

- Make sure that the maximum permitted length of the signal cables does not exceed 30 m.

- Connect the circuitry of the SDE1-... as follows:

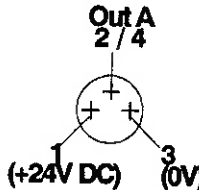
Connection designation SDE1-....P1/N1-... (3-pin plug)	Pin	Cable colours *)	
+24 V DC power supply	1	Brown	
Output A (Out A)	2/4	Black	
0 V	3	Blue	
*) With socket used with cables as per 'Accessories'			

Fig. 11

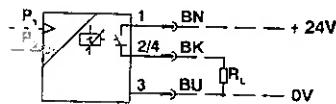


Fig. 12

SDE1-...P1-...

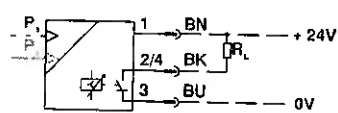


Fig. 13

SDE1-...N1-...

SDE1-....

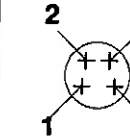
Connection designation SDE1-...-P2/N2/PU/NU-... (4-pin plug)	Pin	Cable colours *)	
+24 V DC power supply	1	Brown	Out BOut A  (+24V DC)(0V)
Output B (Out B) (analogue output 0...10 V with SDE1-...-PU-... or SDE1-...-NU-...)	2	White	
0 V	3	Blue	
Output A (Out A)	4	Black	
*) With socket used with cables as per 'Accessories'			

Fig. 14

The tightening torque is max. 0.3 Nm.

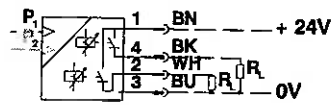


Fig. 15 SDE1-...P2-...

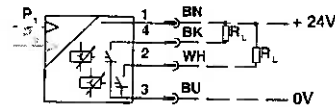


Fig. 16 SDE1-...-N2-...

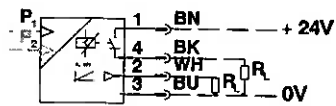


Fig. 17 SDE1-...PU-...

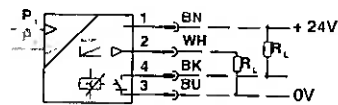


Fig. 18 SDE1-...-NU-...

7 Commissioning

Preparation for commissioning

Definition

RUN mode = basic status.

You can access this mode from other modes by pressing the EDIT button for 5 seconds.

- Switch on the power supply.
The SDE1-... is now in the RUN mode.
- Check the functions of the SDE1-... as follows:

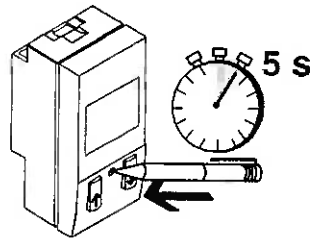


Fig. 19

RUN mode (displays current pressure)

- Pressurize the SDE1-... with different pressure values.
The number and bar display changes according to the current pressure values (measured pressure).

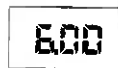


Fig. 20



Fig. 21

SHOW mode (displays set values)

- Press the A-key (UP key) [1].
The following settings for switching output Out A will be shown one after the other:
 - switching pressure [SP/SPmin (SP.L), SPmax (SP.H)]
 - hysteresis [HY]
 - switching function [ or ]
 - switching characteristic [NO/NC]

With SDE1-...-P2-.../...N2-...:

- Repeat the scanning by pressing the B-key (DOWN key) [3].
The settings for switching output Out B will be shown.
- Press keys A and B at the same time.
The lowest pressure in the compressed air system at that moment will be displayed (min/P.Lo). If both keys are then pressed again simultaneously, the maximum pressure will be shown (max/P.Hi). By pressing again, you can return to the RUN mode.
The memory for the minimum and maximum system pressure values will be reset if the A and B keys are held simultaneously pressed down for longer than 2 seconds (min max/LoHi). Resetting will also take place if the power supply is switched off.

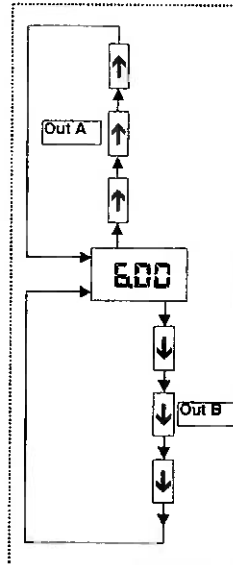


Fig. 22

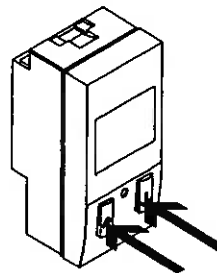


Fig. 23

EDIT mode (modifies the current settings)

In order to set the switching pressure of the threshold window or comparator in the RUN mode:

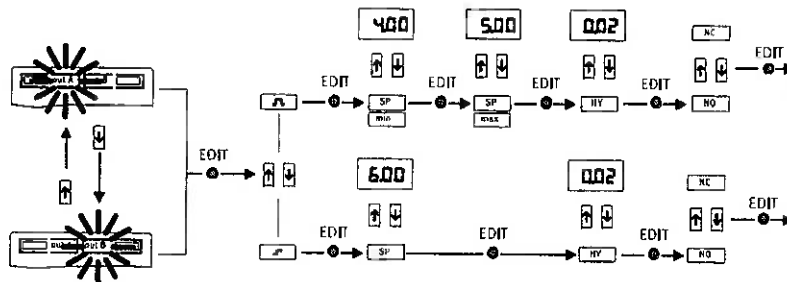


Fig. 24

- Proceed as follows:

a) Selecting the switching output

Switching output Out A	Switching output Out B (with SDE1-...-P2-.../N2-...)
1. Only with active safety lock: – Press the EDIT button. – Press the UP/DOWN key until the selected safety code is set.	
2. Press the EDIT button (switching output Out A flashes).	
—	3. Press the Down key (switching output Out B flashes).
4. Press the EDIT button.	
5. Press the UP/DOWN key until the desired switching function (threshold value/window comparator) is set.	

b) Setting the switching function

Switching function: threshold value comparator		Switching function: window comparator	
6. Press the EDIT button.			
7. Press the UP/DOWN key until the desired switching pressure [SP] is set.		7. Press the UP/DOWN key until the desired lower switching pressure [SP min / SP.L] is set.	
—		8. Press the EDIT button.	
—		9. Press the UP/DOWN key until the desired upper switching pressure [SP max / SP.H] is set.	
10. Press the EDIT button.			
11. Press the UP/DOWN key until the desired hysteresis [HY] is set.			
12. Press the EDIT button.			
13. Press the UP/DOWN key until the desired switching characteristic [NO/NC] is set.			
14. Press the EDIT button (RUN mode)			

Fig. 25

In order to select the unit display and to set the safety code (locking against unauthorized programming) in the RUN mode,

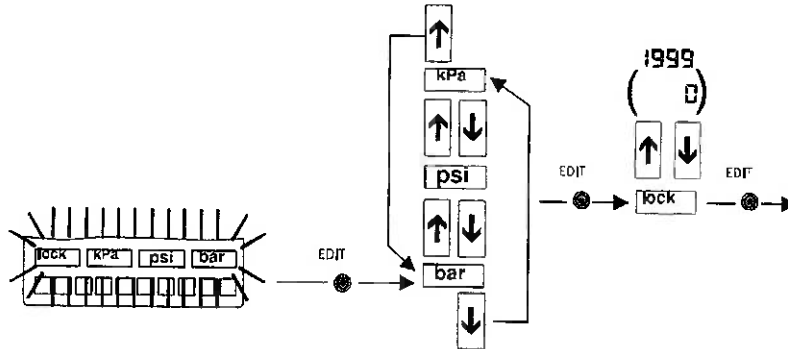


Fig. 26

- proceed as follows:

Unit display	Safety code
1. Only with active safety lock: – Press the EDIT button. – Press the UP/DOWN key until the selected safety code is set.	
2. Press the EDIT button (switching output Out A flashes)	
3. Press the UP/DOWN key until the unit bar flashes.	
4. Press the EDIT button.	
5. Press the UP/DOWN key until the desired unit is set: – bar, – psi, – kPa	—
6. Press the EDIT button.	
—	7. Press the UP/DOWN key until the desired safety code is set (0 = no protection). Tip: Keep the safety code hidden in a safe place.
8. Press the EDIT button (RUN mode)	

Fig. 27

SDE1-....

Carrying out commissioning

- Pressurize the SDE1-... with the switching pressure.
- Carry out a test run and by varying the pressure, ascertain whether the SDE1-... switches as desired.

TEACH mode

In order to teach the switching variables,

- select the desired switching function (setting see EDIT mode).

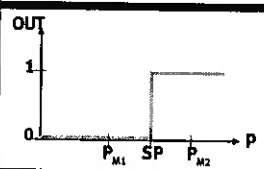
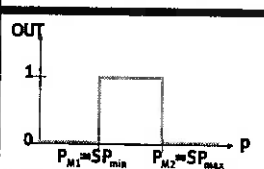
With presetting: threshold value comparator	With presetting: window comparator
	
1. Apply measuring pressure P_{M1}	
2. First press the key for the desired switching output (Out A or Out B), then press the EDIT key at the same time.	
3. Only with active safety lock: – Press the UP/DOWN key until the desired safety code is set. – Press the EDIT button.	
The switching output symbol and the relevant bar display flash (only with SDE1-...-C-...).	
4. Apply measuring pressure P_{M2} .	
5. First press the key selected under 2., then press the EDIT button at the same time (SDE-1-... in RUN mode).	
The (taught) switching pressure is derived from the medium value of both measuring pressures $SP = \frac{1}{2} (P_{M1} + P_{M2})$ (special case: $SP = P_{M1} = P_{M2}$)	The taught switching window results from the measuring pressures $SP_{min} = P_{M1}$ $SP_{max} = P_{M2}$

Fig. 28

8 Operation



Warning

Excessive internal heat will damage the SDE1-...

- Avoid high pulse frequency with high pressure amplitudes.

Otherwise the maximum permitted temperatures of the materials used will be exceeded.

If the safety code cannot be found, the SDE1-... can be reset to the factory settings as follows:



Please note

The reset to the factory settings leads to the loss of all personal settings which have been undertaken during commissioning.

- Make a note of these settings before reset.

1. Switch off the power supply.
2. Press all three setting elements (UP/DOWN key and EDIT button) at the same time and switch on the power supply again.

9 Care and maintenance

Cleaning:

- Before cleaning switch off the power supply.
- If necessary, clean the SDE1-....

The following cleaning agents are permitted:

- soap suds (max. + 60 °C)
- petroleum ether
- all non-abrasive cleaning agents.

SDE1-....

10 Dismantling

Before dismantling,

- switch off the following power supplies:
 - the operating voltage
 - the compressed air supply
 - the vacuum.
- Disconnect the SDE1-....
- Dismantle the SDE1-... as shown in Fig. 30.

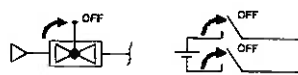


Fig. 29

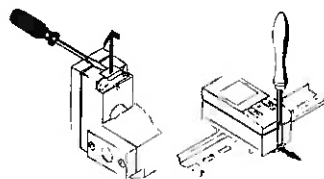


Fig. 30

11 Accessories

Designation	Type
Connecting cable - 3-pin	SIM-M8-3..D-...
- 4-pin	SIM-M8-4..D-...

Fig. 31

SDE1-....

12 Eliminating faults

Fault	Possible cause	Remedy
No display	No power supply or no permitted power supply	Switch on power supply/ adhere to permitted power supply range
	Connections swapped (incorrect polarity)	Wire the SDE1-... as per circuit diagram
	SDE1-... defective	Return SDE1-... to Festo
Incomplete display	Display defective	Return SDE1-... to Festo
Incorrect pressure displayed	Pressure failure	Eliminate pressure failure
	Pneumatic connections swapped (only with ...Q4-..)	Connect tubing as described in section 'Fitting pneumatic components'
	SDE1-... operated with non-permitted medium	Replace SDE1-... and operate only with compressed air
Pressure display flashes	Overpressure (in permitted range)	Observe permitted pressure range
	Overpressure above permitted maximum value (device damaged)	Replace SDE1-...
Outputs do not switch according to the settings	Short circuit or overload at the relevant output	Eliminate short circuit/ overload
	SDE1-... defective	Return SDE1-... to Festo
Settings cannot be edited ("lock" in display)	Access protection active	Enter safety code (if forgotten, continue as described in 'Operation')

Fig. 32

SDE1-....

13 Technical specifications

Type	SDE1-D10-...	SDE1-V1-...
Design	Piezoresistive pressure sensor	Piezoresistive vacuum sensor
Mounting position	As desired, preferably vertical (danger of condensate accumulation)	
Medium	Filtered compressed air (40 µm), lubricated or non-lubricated (no aggressive gases)	Vacuum
Pressure/vacuum range	0...10 bar	0...-1 bar
Overload pressure (briefly)	max. 20 bar	max. 5 bar
Setting range	Switching pressure: 0.20...9.98 bar Hysteresis: 0.00...9.00 bar	Switching vacuum -0.020...-0.998 bar Hysteresis: 0.000...0.900 bar
Accuracy of switching pressures at T = + 20 ... + 25 °C at T = 0 ... + 50 °C	max. ± 2 % FS [max. ± 3 % FS for analogue output] max. ± 3 % FS [max. ± 4 % FS for analogue output]	
Repeatability	max. ± 0.3 % FS	
Perm. temperature range – ambient – storage	0 °C ... max. + 50 °C - 20 °C ... max. + 80 °C	
Permitted operating voltage	15... max. 30 V DC (permitted residual ripple max. 10 %)	
Idling current	max. 35 mA	
Alert delay	max. 450 ms	

SDE1-....

Type	SDE1-D10-...	SDE1-V1-...
Switching outputs – Permitted switching current – Voltage drop – Switchable capacity – Switching times (on/off)	Positive switching (PNP) with SDE1-...-P.-... negative switching (NPN) with SDE1-...-N.-... max. 150 mA max. 2.5 V max. 100 nF 5 ms (typical) / 10 ms (max.)	
Analogue output – Permitted load current	0...10 V with SDE1-...-PU.-...or SDE1-...-NU.-... max. 5 mA	
Protective functions	Against incorrect polarity, short circuit/overload (pulsed), induced voltage	
Protective type	IP65 (as per EN 60529)	
Protective class	III	
Minimum operating quality during interference	Maximum drift at analogue output < 5 % FS	
Max. permitted signal cable length	30 m	
Materials: – housing – keys – display – seals – lock/fastening plate – plug/flange adapter/com-pressed air connections	PA, POM (reinforced) VMQ PC NBR St (chromed) Ms (nickel-plated, chromed)	

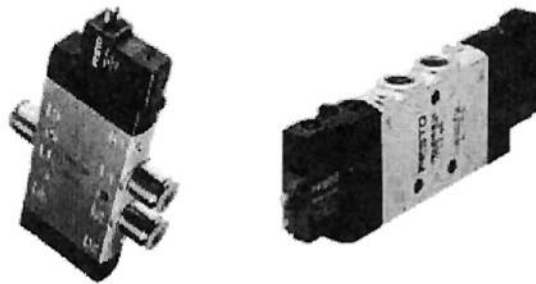
Fig. 33



Solenoid valves CPE ...

Type

FESTO ¹



Contents ²

	Page
Function and application	2 - 5

¹ FESTO, D-73726 Esslingen

² Source:

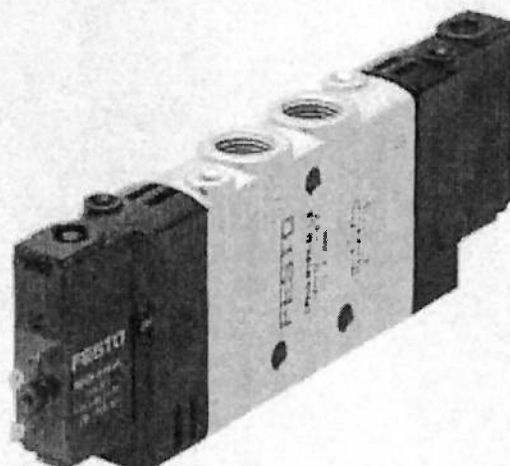
Solenoid valves CPE, Compact Performance

Features

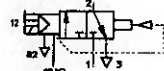
FESTO

Directional control valves for standard applications
Compact Performance

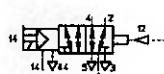
2.1



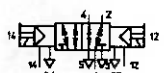
Function¹⁾



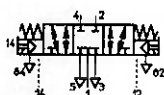
- 1) 3/2-way, e.g. with external pilot air, normally closed



- 1) 5/2-way, single solenoid, e.g. with external pilot air



- 1) 5/2-way, double solenoid, e.g. with external pilot air



- 1) 5/3-way, e.g. with external pilot air, normally closed

-  Width
10 ... 24 mm

-  Flow rate
180 ... 3,200 l/min

-  Voltage
24 V DC
110 V AC
230 V AC

Performance optimised sizes

The solenoid valves CPE, Compact Performance are distinguished by their minimal width and low power consumption at high flow rates.

Can be mounted on site:

- on cylinders,
- on moving system components.
- Choice of installation either individual, top-hat rail or wall mounted.

Micro CPE10, Mini CPE14 and Midi CPE18:

Simple structure comprising compact valve manifolds through modular manifold blocks.

Possible combinations → 2 / 2.1-58

Shorter tubing lengths with minimal air volumes:

- fast switching times
- quick reaction times

Optimised installations:

- shorter machine cycles
- larger quantities
- low power consumption

Convenient manual override

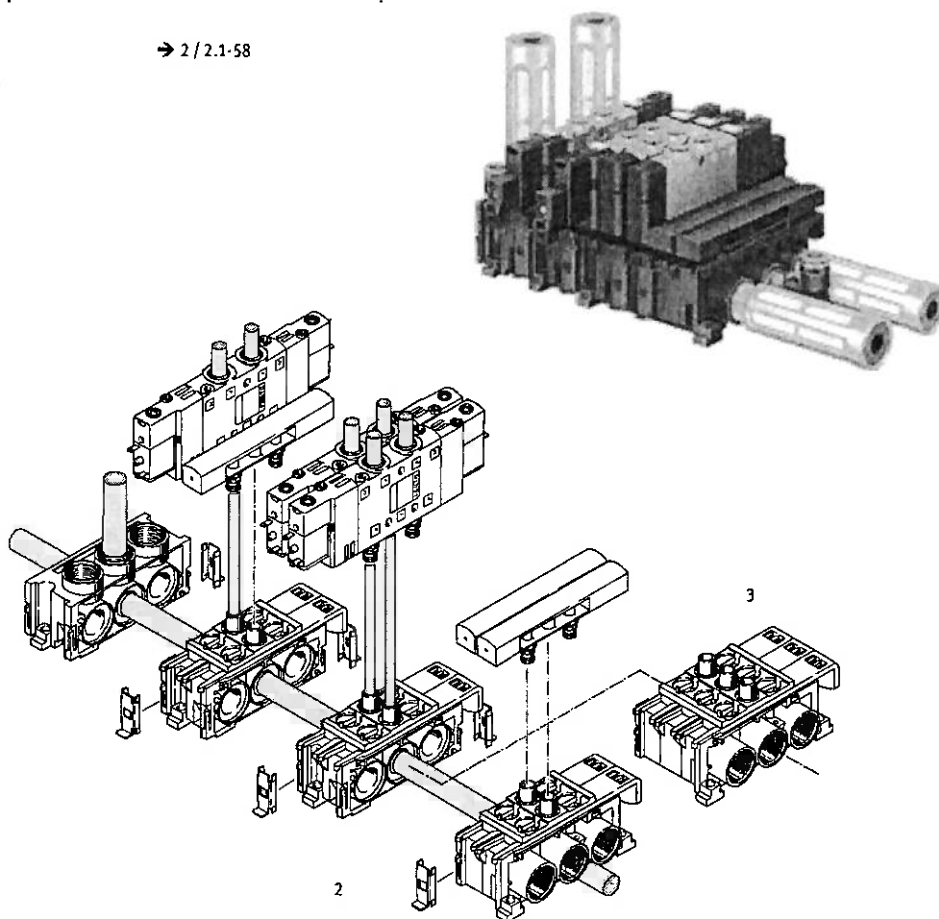
A current reduction function has been integrated in the KMYZ-9 plug socket for sizes Micro CPE10 and Mini CPE14.

Solenoid valves CPE, Compact Performance

FESTO

Manifold assembly for Micro CPE10, Mini CPE14 and Midi CPE18

→ 2 / 2.1-58



Directional control valves for standard applications
Compact Performance

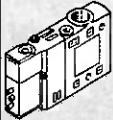
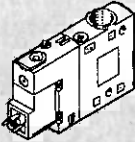
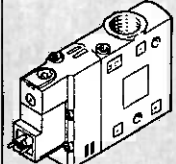
2.1

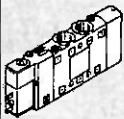
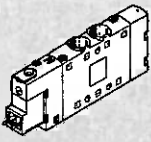
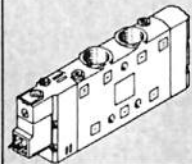
Solenoid valves CPE, Compact Performance

FESTO

Directional control valves for standard applications
Compact Performance

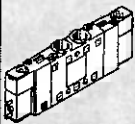
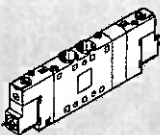
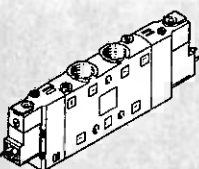
2.1

3/2-way valves				
				
	10	14	18	24
Nominal flow rate [l/min]				
5	1 0			
	400			
1/8		00		
1/4			1 300	
3/8				2 500
-4	1 0			
-6	300	510		
-8		810	850	
-10			1 000	1 250
-12				1 650
Operating voltage				
24	■	■	■	■
110			■	■
230			■	■
→	2 / 2.1-12	2 / 2.1-13	2 / 2.1-14	2 / 2.1-15

5/2-way valves				
				
	10	14	18	24
Nominal flow rate [l/min]				
5	180			
	350			
1/8		800		
1/4			1 500	
3/8				3 200
-4	180			
-6	320	400		
-8		680	850	
-10			1 000	1 250
-12				1 650
Operating voltage				
24	■	■	■	■
110			■	■
230			■	■
→	2 / 2.1-22	2 / 2.1-23	2 / 2.1-24	2 / 2.1-25

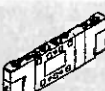
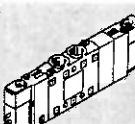
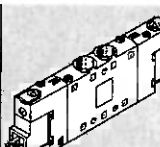
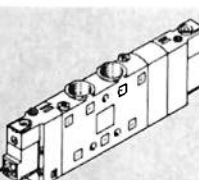
Solenoid valves CPE, Compact Performance

FESTO

5/2-way valves, Double solenoid valves					
		10	14	18	24
Nominal flow rate [l/min]		10	14	18	24
	5	180			
		350			
	1/8		800		
	1/4			1 500	
	3/8				3 200
	-4	180			
	-6	320	400		
	-8		680	850	
	-10			1 000	1 250
	-12				1 650
Operating voltage					
24		■	■	■	■
110				■	■
230				■	■
→		2 / 2.1-32	2 / 2.1-33	2 / 2.1-34	2 / 2.1-35

Directional control valves for standard applications
Compact Performance

2.1

5/3-way valves					
		10	14	18	24
Nominal flow rate [l/min]		10	14	18	24
	5	180			
		250 ... 350			
	1/8		00 ... 50		
	1/4			1 200 ... 1 450	
	3/8				2 600 ... 3 000
	-4	180			
	-6	250 ... 300	3 0 ... 410		
	-8		5 0 ... 20	80 ... 850	
	-10			1 000 ... 1 050	1 250
	-12				1 600 ... 1 650
Operating voltage					
24		■	■	■	■
110				■	■
230				■	■
→		2 / 2.1-41	2 / 2.1-42	2 / 2.1-43	2 / 2.1-44

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01			Customer: IMEFY S.L. , Los Yébenes (Toledo)			part list: 32137				
Commission: 4295			45470 Los Yébenes (Toledo), Spanien			Name: Ingrid Huber				
operating side: Rechts			machine type: TBA/ME/EL 400x2000-PBT			Date: 08.11.2007				
Pos	Stck	Bezeichnung	Stcklp	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis	Totalpreis
Item	pcs	Description	plstno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price	total price
		Abwickelhaspel-TBA decoiler-tba		25313	K-0-005746	HSP/2-400/2000/MOS				
		Ständer mit Lagerung stand with bearing		24179	K-0-005746	hydr. Schwenkung				
1	1	Ritzel pinion	11	1002675	K-4-040131	Ø118.0/0.0x105.0, m=6.0, z=17		1		
2	1	Planetengetriebe planet gear	20	04000001		P 5-25	BRINKMANN	3		
3	1	Hydraulikmotor hydraulic motor	21	05000129		EPRM80C Gerollermotor	IMD	3		
4	1	Druckbegrenzungsventil pressure relief valve	22	05000783		KPDR 210 R1/2	IMD	2		
5	2	Anschlagpuffer stop buffer	24	03002677		Form 25481	CONTINENTAL	2		
		Spreizkopf-TBA expanding mandrel-tba		25015	K-0-005747	mit C-Haken				
6	2	Drehdurchführung rotating joint	27	05000127	K-3-026736	2-fach, G1/4, Gewindeanschl. 803.0	TRIES	2		
7	2	O-Ring o-ring	28	05000128		70.00x5.00		1		
8	2	O-Ring o-ring	29	05000147		35.00x4.00		1		
9	2	O-Ring o-ring	30	05000148		60.00x5.00		1		
10	4	Nutring lip seal	31	03002483		NA300 80x65x12	FREUDENBER	2		
11	2	Nutring lip seal	32	03002488		NI300 40x55x10	FREUDENBER	2		
		Haspelantrieb-TBA decoiler drive-tba		24197	K-0-005746	mit Bremse				
pro:	1: high failure probability 2: middle failure probability 3: small failure probability			plstno: part list number			Quotation No.: 9378.01 Commission: 4295 Page 1 of 34			

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01		Customer: IMEFY S.L., Los Yébenes (Toledo)		part list: 32137						
Commission: 4295		45470 Los Yébenes (Toledo), Spanien		Name: Ingrid Huber						
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007						
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plisno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis Price EUR	Totalpreis total price
12	2	Ritzel pinion	8	1002710	K-3-058262	Ø110.0/0.0x105.0, m=5.0, z=20		1		
13	2	Bremszange brake pincers	28	03002789		DH 30 P Einbau Rechts 4457300106	RINGSPANN	2		
14	4	Reibklotz Braking pad for brake tong (2 pcs. = 1 set)	28.1	03003472		Art.2472005016	RINGSPANN	1		
15	2	Zylinderrollenlager cylinder roller bearing	29	03003799		NU 226 ECP	SKF	3		
16	2	Rillenkugellager deep groove ball bearing	30	03003950		6224		3		
		Haspelarretierung decoller locking device		24198	K-0-005746					
17	1	Pneumatikzylinder pneumatic cylinder	11	05000130		RM/930-50	NORGREN	2		
18	1	Dichtsatz seal pack	11.1	05000257		QM/930H/00 Ø0.0/0.0	NORGREN	1		
		Bandführung strip guide		27824	K-0-018466					
		Bandführung sheet guide		27784	K-0-018466	Schlaufengrubentiefe 2000 mm				
19	1	Gleitbuchse slide bushing	38	03002378		zylindrisch BK1-2020	MASCHINENLA	3		
20	1	Zuschnitt, Rechteckform Layout, design rectangular	40	01001940		1000.0x1000.0x100.00		3		
21	1	Pneumatikzylinder pneumatic cylinder	41	05000482		DNC-40-160-PPV-A	FESTO	2		
22	1	Dichtsatz seal pack	41.1	05000699		DNC-40-...-PPV-A, Teile-Nr. 369196	FESTO	1		
		Bandführung sheet guide		27819	K-0-018466					
pro:			plisno: part list number			Quotation No.: 9378.01				
1: high failure probability						Commission: 4295				
2: middle failure probability						Page 2 of 34				
3: small failure probability										

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01 Commission: 4295			Customer: IMEFY S.L. , Los Yébenes (Toledo) 45470 Los Yébenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT			part list: 32137 Name: Ingrid Huber Date: 08.11.2007				
operating side: Rechts										
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plistno	Arthr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausfl pro	Preis EUR Price EUR	Totalpreis total price
23	1	Führungsrohr Guide tube	3	1018695	K-4-071196	Ø15.0x710.0		2		
24	1	Zahnriemen gear belt	11	03002444		25T10/1880.0		3		
25	2	Führungswagen guide roller car	15	03007033		1622-814-20	BOSCH-REXR	2		
26	4	Rillenkugellager deep groove ball bearing	17	03000163		6204-2RS		3		
		Vorschubaggregat-TBA feed unit-tba		28163	K-0-021224	TBA-V-550/240				
		Vorschubaggregat-TBA feed unit-tba		23880	K-0-021224	Bmax=550				
27	1	Treibrolle pinch roll	6	23788	K-3-061563	Ø159.1x395.0/200.0		1		
28	1	Druckrolle pressure roll	7	21828	K-3-043279	Ø127.0x264.0/200.0		1		
29	1	Planetengetriebe planet gear	31	04000255		SP 140 S-MF1-4-010/SIEMENS 1FT ALPHA		3		
30	1	Pneumatikzylinder pneumatic cylinder	35	05002656		DNCB-80-25-PPV-A	FESTO	2		
31	1	Dichtsatz seal pack	35.1	05002940		DNCB-80-...-PPV-A Ø0.0/0.0	FESTO	1		
32	1	Gelenkkopf joint head	38	05000516		SGS-M20x1,5, Art.-Nr. 9264	FESTO	3		
33	2	Druckfeder compression spring	45	03001289		D-305-A	GUTEKUNST	2		
34	1	Pendelkugellager self-aligning ball bearing	54	03000131		2212-2RS		3		
35	1	Pendelkugellager self-aligning ball bearing	58	03000128		2208-2RS		3		
pro:			1: high failure probability 2: middle failure probability 3: small failure probability							
			plistno: part list number							
			Quotation No.: 9378.01 Commission: 4295 Page 3 of 34							

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik



spare part list

57223 Kreuztal, Germany

Quotation No.: 9378.01 Commission: 4295		Customer: IMEFY S.L. , Los Yébenes (Toledo) 45470 Los Yébenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT			part list: 32137 Name: Ingrid Huber Date: 08.11.2007					
operating side: Rechts										
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plistno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR Price EUR	Totalpreis total price
36	2	Rillenkugellager deep groove ball bearing	63	03000178		6305-2Z		3		
37	1	Meßrolle-TBA measuring roll-tba		24223	K-2-018557	für TBA-Vorschub, DH 200				
38	1	Meßrolle measuring roll	1	1000063	K-3-043239	Ø127.324x93.0/25.0		2		
39	4	Druckrolle pressure roll	6	1000068	K-3-043240	Ø127.0x75.0/25.0		1		
40	1	Rillenkugellager deep groove ball bearing	40	03001283		6205-2Z		3		
41	2	Pneumatikzylinder pneumatic cylinder	42	05000131		M/50163/10	NORGREN	1		
42	1	Druckfeder compression spring	43	03000033	K-4-024938	D-158	GUTEKUNST	2		
		Wellenkupplung shaft coupling	45	03003324		W7C25-6-6 (Bohrung 6 auf 6mm)	HELICAL	3		
		Stanzaggregat punching unit		28172						
		V-Stanze v-notch		28192	K-0-021675					
43	4	Kugelführungsbuchse Ball guide bushing	39	10000011		ST 7402.50x095x108	STEINEL	2		
44	1	Gelenklager spherical plain bearing	41	03009799		GE 35-FO-2RS C2	ELGES	3		
45	2	Zylinderrollenlager cylinder roller bearing	45	03009800		SL 183007	INA	3		
46	1	Pendelrollenlager self-aligning roller bearing	48	03009801		22211 E	SKF	3		
		Quersupport cross support		28178	K-1-020853	zur V-Stanze				
pro:		1: high failure probability 2: middle failure probability 3: small failure probability								
		plstno: part list number								
		Quotation No.: 9378.01 Commission: 4295								

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01 Commission: 4295			Customer: IMEFY S.L., Los Yébenes (Toledo) 45470 Los Yébenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT			part list: 32137 Name: Ingrid Huber Date: 08.11.2007				
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plstno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR Price EUR	Totalpreis total price
47	1	Kugelgewindetrieb ball screw	6	02001812	K-3-056553	KGT 40x10 R L=355/Lges.=390 Aus	BOSCH-REXR	2		
48	1	Wellenkupplung shaft coupling	17	10000014		WLA 020-022/022	SCHAEFER	2		
49	4	Führungswagen guide roller car	20	10000013		1622-414-20	BOSCH-REXR	2		
		Lochstanze hole punching unit		28193	K-0-021676					
50	4	Führungsschiene roller rail guides	33	03009857		M 4020 Lochtyp 10, L=200	INA	3		
51	4	Führungsschiene roller rail guides	34	03009858		V 4020 Lochtyp 10, L=160	INA	3		
52	4	Winkelflächkäfig Angle flat cage	35	03009856		HW 15x146,5 F	INA	3		
53	4	Abstreifer stripper	36	03009859		LWEAV 4020	INA	3		
54	4	Endstück end piece	37	03009860		LWEV 4020	INA	3		
55	4	Schräggugellager angular ball bearing	45	03000193		7206 BE		3		
56	2	Pendelrollenlager self-aligning roller bearing	47	03002959		21304 CC		3		
57	2	Nilos-Ring nilos ring	47.1	03002543		21304 AV	ZILLER	3		
58	2	Gelenklager spherical plain bearing	48	03010380		GE 25-FO-2RS C2	ELGES	3		
59	2	Sprengring snap ring	50	03009586		SB 47	SEEGER	3		
		Längssupport slitting support		28197	K-0-021677	zu den Lochstanzen				
pro:	1: high failure probability 2: middle failure probability 3: small failure probability		plstno: part list number			Quotation No.: 9378.01 Commission: 4295 Page 5 of 34				

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01 Commission: 4295			Customer: IMEFY S.L. , Los Yébenes (Toledo) 45470 Los Yébenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT			part list: 32137 Name: Ingrid Huber Date: 08.11.2007				
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plstno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR Price EUR	Totalpreis total price
60	8	Führungswagen guide roller car	21	10000013		1622-414-20	BOSCH-REXR	2		
61	2	Planetengetriebe planet gear	24	04000354		PLS 90-3/Siemens1FT6044	NEUGART	3		
62	2	Wellenkupplung shaft coupling	26	10000014		WLA 020-022/022	SCHAEFER	2		
63	2	Rillenkugellager deep groove ball bearing	30	03000149		6005-2RS		3		
		Lochstanze hole punching unit		28531	K-0-021911					
64	2	Führungsschiene roller rail guides	33	03009857		M 4020 Lochtyp 10, L=200	INA	3		
65	2	Führungsschiene roller rail guides	34	03009858		V 4020 Lochtyp 10, L=160	INA	3		
66	2	Winkelflächkäfig Angle flat cage	35	03009856		HW 15x146,5 F	INA	3		
67	2	Abstreifer stripper	36	03009859		LWEAV 4020	INA	3		
68	2	Endstück end piece	37	03009860		LWEV 4020	INA	3		
69	2	Schräggugellager angular ball bearing	45	03000193		7206 BE		3		
70	1	Pendelrollenlager self-aligning roller bearing	47	03002959		21304 CC		3		
71	1	Nilos-Ring nilos ring	47.1	03002543		21304 AV	ZILLER	3		
72	1	Gelenklager spherical plain bearing	48	03010380		GE 25-FO-2RS C2	ELGES	3		
73	1	Sprengring snap ring	50	03009586		SB 47	SEEGER	3		
pro: 1: high failure probability 2: middle failure probability 3: small failure probability			plstno: part list number			Quotation No.: 9378.01 Commission: 4295			Page 6 of 34	

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01			Customer: IMEFY S.L., Los Yébenes (Toledo)			part list: 32137				
Commission: 4295			45470 Los Yébenes (Toledo), Spanien			Name: Ingrid Huber				
operating side: Rechts			machine type: TBA/ME/EL 400x2000-PBT			Date: 08.11.2007				
Pos	Stck	Bezeichnung	Stcklp	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis EUR	Totalpreis
Item	pcs	Description	plstno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price EUR	total price
		Quersupport		28534	K-0-021910	zur Lochstanze				
		cross support								
74	1	Kugelgewindetrieb	6	02001152	K-3-056553	KGT 40x10 R L=440/Lges.=475 Flar	BOSCH-REXR	3		
75	1	Planetengetriebe	20	04000354		PLS 90-3/Siemens1FT6044	NEUGART	3		
76	1	Wellenkupplung	22	10000014		WLA 020-022/022	SCHAEFER	2		
77	4	Führungswagen	25	10000013		1622-414-20	BOSCH-REXR	2		
78	2	Führungsschiene	26	03004489		1605-404-31, L=941, 50.5/8x105/50.	BOSCH-REXR	2		
		Führung		28301	K-0-021794	im Stanzaggregat				
		guidance								
79	1	Rollenleiste	1	25134	K-2-025297			2		
		Roller bar								
80	6	Rillenkugellager	1.10	03000137		608-2Z		1		
		deep groove ball bearing								
81	1	Rollenleiste	2	25135	K-2-025297			2		
		Roller bar								
82	6	Rillenkugellager	2.10	03000137		608-2Z		1		
		deep groove ball bearing								
83	1	Rollenleiste	3	27863	K-2-027094			2		
		Roller bar								
84	12	Rillenkugellager	3.10	03000137		608-2Z		1		
		deep groove ball bearing								
85	1	Rollenleiste	4	28357	K-0-021788			2		
		Roller bar								
86	2	Druckfeder	4.11	03000033	K-4-024938	D-158	GUTEKUNST	2		
		compression spring								
pro:	1: high failure probability		plstno: part list number							
	2: middle failure probability									
	3: small failure probability									
						Quotation No.: 9378.01	Commission: 4295		Page 7 of 34	

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreuztal, Germany



Quotation No.: 9378.01 Commission: 4295			Customer: IMEFY S.L. , Los Yébenes (Toledo) 45470 Los Yébenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT			part list: Name: Ingrid Huber Date: 08.11.2007					
operating side: Rechts											
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plstno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis Price	EUR EUR	Totalpreis total price
87	27	Rillenkugellager deep groove ball bearing	4.21	03000137		608-2Z		1			
88	1	Rollenleiste Roller bar	7	28323	K-2-027325			2			
89	7	Rillenkugellager deep groove ball bearing	7.6	03000137		608-2Z		1			
90	1	Rollenleiste Roller bar	8	25956	K-3-065951			2			
91	3	Rillenkugellager deep groove ball bearing	8.6	03000137		608-2Z		1			
92	1	Rollenleiste Roller bar	9	25958	K-2-026354			2			
93	5	Rillenkugellager deep groove ball bearing	9.6	03000137		608-2Z		1			
94	1	Stirnradgetriebemotor spur wheel back-gearred motor	120	03010253		R17 DT 71 D4/BMG/MM05, P=0.55kW	SEW	3			
95	2	Pneumatikzylinder pneumatic cylinder	128	05000518		SLT-20-10-P-A	FESTO	1			
96	9	Führungswagen guide roller car	130	10000024		1622-214-20	BOSCH-REXROTH	2			
97	1	Einfach-Rollenkette single roller chain	140	03003050		1/2x1/4x8,51 300-221-000	WMH	3			
98	10	Schräggugellager angular ball bearing	150	03000195		7303 B		3			
99	10	Nilos-Ring nilos ring	151	03002561		7303 AVH	ZILLER	3			
100	5	Rillenkugellager deep groove ball bearing	154	03000162		6203-2RS		3			
101	3	Pendelkugellager self-aligning ball bearing	157	03000123		2205-2RS		3			
pro:			1: high failure probability 2: middle failure probability 3: small failure probability			plstno: part list number			Quotation No.: 9378.01 Commission: 4295 Page 8 of 34		

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01 Commission: 4295			Customer: IMEFY S.L. , Los Yebenes (Toledo) 45470 Los Yebenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT			part list: Name: Ingrid Huber Date: 08.11.2007				
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plstno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR Price EUR	Totalpreis total price
102	1	Pendelkugellager self-aligning ball bearing	160	03000125		2206-K2RS+H306 C		3		
103	2	Rillenkugellager deep groove ball bearing	167	03000145		6003-2RS		3		
104	2	Gleitbuchse slide bushing	200	03002414		mit Bund BKF1-20215	MASCHINENLA	3		
		Abstützung Rollenleiste support roller gib		28209	K-2-027296	Durchlaufhöhe 405 mm, bmax=440				
105	1	Kurvenrolle curve roller	10	03000083		KR 26 PP		3		
106	1	Pendelkugellager self-aligning ball bearing	11	03000125		2206-K2RS+H306 C		3		
		Scherenaggregat shear unit		28173						
		Schere shear		28333	K-0-021776	Schere 1				
107	4	Kugelführungsbuchse Ball guide bushing	35	10000017		ST 7402.50x077x088	STEINEL	2		
108	2	Zylinderrollenlager cylinder roller bearing	45	03009800		SL 183007	INA	3		
109	1	Pendelrollenlager self-aligning roller bearing	48	03009801		22211 E	SKF	3		
110	1	Gelenklager spherical plain bearing	52	03009799		GE 35-FO-2RS C2	ELGES	3		
		Schere shear		28334	K-0-021777	Schere 2				
111	4	Kugelführungsbuchse Ball guide bushing	35	10000017		ST 7402.50x077x088	STEINEL	2		
112	2	Zylinderrollenlager cylinder roller bearing	45	03009800		SL 183007	INA	3		
pro:	1: high failure probability 2: middle failure probability 3: small failure probability		plstno: part list number			Quotation No.: 9378.01 Commission: 4295				

Heinrich Georg GmbH Maschinenfabrik

57223 Kreuztal, Germany



Quotation No.: 9378.01			Customer: IMEFY S.L., Los Yébenes (Toledo)			part list: 32137		
Commission: 4295			45470 Los Yébenes (Toledo), Spanien			Ingrid Huber		
operating side: Rechts			machine type: TBA/ME/EL 400x2000-PBT			Date: 08.11.2007		
Pos	Stck	Bezeichnung	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Totalpreis
Item	pcs	Description	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price EUR
113	1	Pendelrollenlager self-aligning roller bearing	48	03009801	22211 E	SKF	3	
114	1	Gelenklager spherical plain bearing	52	03009799	GE 35-FO-2RS C2	ELGES	3	
		Quersupport cross support		28012	zum Scherenaggregat			
115	4	Führungswagen guide roller car	31	10000013	1622-414-20	BOSCH-REXR	2	
116	1	Stirnradgetriebemotor spur wheel back-gearred motor	35	03010253	R17 DT 71 D4/BMG/MM05, P=0.55KSEW		3	
117	2	Schrägguggellager angular ball bearing	40	03000192	7205 B		3	
118	2	Nilos-Ring nilos ring	41	03002558	7205 AVH	ZILLER	3	
119	2	Rillenkugellager deep groove ball bearing	50	03000145	6003-2RS		3	
120	1	Einfach-Rollenkette single roller chain	52	03003050	1/2x1/4x8,51 300-221-000	WMH	3	
		Scherenschwenkung shear swing		28028				
121	1	Buchse bushing	2	1000225	Ø120.0/100.0x56.5		3	
122	2	Axialnadelager axial needle bearing	30	03001322	AXK 120/155		3	
123	4	Axialscheibe axial disc	31	03000020	AS 120/155		3	
124	1	Pneumatikzylinder pneumatic cylinder	35	05001064	DNC-63-160-PPV-A	FESTO	2	
125	1	Dichtsatz seal pack	35.1	05002223	DNC-63-...-PPV-A, Teile-Nr. 369198	FESTO	1	
pro:			1: high failure probability 2: middle failure probability 3: small failure probability			Quotation No.: 9378.01 Commission: 4295 Page 10 of 34		

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01		Customer: IMEFY S.L. , Los Yebenes (Toledo)		part list: 32137						
Commission: 4295		45470 Los Yebenes (Toledo), Spanien		Name: Ingrid Huber						
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007						
Pos	Stck	Bezeichnung	Stcklp	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis EUR	Totalpreis
Item	pcs	Description	plstno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price EUR	total price
126	1	Schwenkflansch Swivelling flange	36	05001065		SNC-63	FESTO	3		
127	1	Pneumatikzylinder pneumatic cylinder	42	05003034		ADVC-63-25-A-P-A	FESTO	2		
128	2	Anschlagpuffer stop buifer	48	03002677		Form 25481	CONTINENTAL	2		
		Transportaggregat-TBA transport unit		24625	K-0-020129					
129	4	Stirnrad cylinder gear	6	1000276	K-4-055811	Ø0.0/0.0x0.0, m=2.0, z=20		2		
130	4	Laufrolle transport roll	11	1000264	K-4-055524	Ø90.00x28.0/22.0		1		
131	4	Druckrolle pressure roll	12	1000261	K-4-055525	Ø60.0x22.0/22.0		1		
132	2	Stirnrad cylinder gear	15	1000275	K-4-055536	z=30/m=2.0		2		
133	4	Druckfeder compression spring	25	03001816		D-182	GUTEKUNST	3		
134	4	Pneumatikzylinder pneumatic cylinder	28	05000810		AEVC-20-5-I-P	FESTO	1		
135	8	Rillenkugellager deep groove ball bearing	31	03000164		6205-2RS		3		
136	8	Rillenkugellager deep groove ball bearing	32	03000146		6003-2Z		3		
137	4	Rillenkugellager deep groove ball bearing	33	03000145		6003-2RS		3		
138	2	Pendelrollenlager self-aligning roller bearing	35	03000133		22206 E		3		
139	8	Gleitbuchse slide bushing	38	03002363		zylindrisch BK1-1212	MASCHINENLA	3		
pro:		1: high failure probability 2: middle failure probability 3: small failure probability		plstno: part list number		Quotation No.: 9378.01		Commission: 4295		Page 11 of 34

Heinrich Georg GmbH Maschinenfabrik

57223 Kreuztal, Germany



Quotation No.: 9378.01 Commission: 4295		Customer: IMEFY S.L., Los Yébenes (Toledo) 45470 Los Yébenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT		part list: Name: Ingrid Huber Date: 08.11.2007						
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plstno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR Price EUR	Totalpreis total price
		Transportaggregat-TBA transport unit		27841	K-0-021458	nach Schere 2, 4 Rollen, a=120				
140	4	Schiebehülse slide sleeve	6	1002533	K-4-055617	Ø58.0x50.0		2		
141	4	Laufrolle transport roll	18	1000264	K-4-055524	Ø90.00x28.0/22.0		2		
142	4	Druckrolle pressure roll	30	1000261	K-4-055525	Ø60.0x22.0/22.0		1		
143	8	Rillenkugellager deep groove ball bearing	64	03001303		6206-2RS		3		
144	8	Rillenkugellager deep groove ball bearing	71	03000147		6004-2RS		3		
145	4	Pneumatikzylinder pneumatic cylinder	78	05002977		ADVU-25-27-A-P-A	FESTO	2		
146	8	Rillenkugellager deep groove ball bearing	82	03000146		6003-2Z		3		
147	4	Pneumatikzylinder pneumatic cylinder	84	05000810		AEVC-20-5-I-P	FESTO	1		
148	4	Druckfeder compression spring	85	03001816		D-182	GUTEKUNST	2		
149	8	Gleitbuchse slide bushing	87	03002363		zylindrisch BK1-1212	MASCHINENLA	2		
150	6	Rillenkugellager deep groove ball bearing	98	03000145		6003-2RS		3		
		Transportrollenantrieb drive for transport rolls		28042	K-0-022136	zum Scherenaggregat				
151	1	Zahnriemenscheibe crown gear	1	02000309	K-4-063213	T=10 z=29		2		
152	3	Zahnriemenscheibe crown gear	2	02000156	K-4-055541	T=10 z=25		2		
pro:		1: high failure probability 2: middle failure probability 3: small failure probability		plstno: part list number		Quotation No.: 9378.01 Commission: 4295 Page 12 of 34				

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik



spare part list

57223 Kreutztal, Germany

Quotation No.: 9378.01			Customer: IMEFY S.L. , Los Yebenes (Toledo)			part list: 32137				
Commission: 4295			45470 Los Yebenes (Toledo), Spanien			Name: Ingrid Huber				
operating side: Rechts			machine type: TBA/ME/EL 400x2000-PBT			Date: 08.11.2007				
Pos	Stck	Bezeichnung	Stcklp	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis	Totalpreis
Item	pcs	Description	plstno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price	total price
153	1	Stirnradgetriebemotor spur wheel back-geared motor	15	03005407		R17 DT 80 N4/MM11, P=1.10KW, n:	SEW	3		
154	1	Spannsatz clamping set	16	03000210		ML 5000/B20x47	MASCHINENLA	3		
155	3	Spannsatz clamping set	19	03000211		ML 5000/B22x47	MASCHINENLA	2		
156	1	Zahnriemen gear belt	22	03002456		30T10/1960.0		1		
157	4	Rillenkugellager deep groove ball bearing	25	03000145		6003-2RS		3		
		Führungsleiste guide gib		28338	K-0-022136	zu den Transportaggregaten				
158	1	Rollenleiste Roller bar	1	25239	K-3-065475			2		
159	10	Rillenkugellager deep groove ball bearing	1.7	03000137		608-2Z		1		
160	1	Rollenleiste Roller bar	4	25245	K-3-065482			2		
161	5	Rillenkugellager deep groove ball bearing	4.7	03000137		608-2Z		1		
162	1	Rollenleiste Roller bar	6	28045	K-2-027215			2		
163	8	Rillenkugellager deep groove ball bearing	6.10	03000137		608-2Z		1		
		Führung guidance		28449	K-0-021854	im Scherenaggregat				
164	1	Rollenleiste Roller bar	15	28479	K-3-068346			2		
165	2	Rillenkugellager deep groove ball bearing	15.10	03000137		608-2Z		1		
pro:	1: high failure probability		plstno: part list number			Quotation No.: 9378.01				
	2: middle failure probability					Commission: 4295				
	3: small failure probability					Page 13 of 34				

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01 Commission: 4295			Customer: IMEFY S.L. , Los Yebenes (Toledo) 45470 Los Yebenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT			part list: Name: Ingrid Huber Date: 08.11.2007				
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plstno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR Price EUR	Totalpreis total price
166	1	Rollenleiste Roller bar	23	23349	K-3-060827			2		
167	3	Rillenkugellager deep groove ball bearing	23.10	03000137		608-2Z		1		
168	2	Führungswagen guide roller car	52	10000024		1622-214-20	BOSCH-REXR	2		
169	2	Pneumatikzylinder pneumatic cylinder	55	05000518		SLT-20-10-P-A	FESTO	1		
170	4	Schräggugellager angular ball bearing	60	03000195		7303 B		3		
171	4	Nilos-Ring nilos ring	61	03002561		7303 AVH	ZILLER	3		
172	2	Rillenkugellager deep groove ball bearing	68	03000162		6203-2RS		3		
173	2	Schräggugellager angular ball bearing	75	03000192		7205 B		3		
174	2	Nilos-Ring nilos ring	76	03002558		7205 AVH	ZILLER	3		
175	2	Rillenkugellager deep groove ball bearing	85	03000145		6003-2RS		3		
176	1,61	Einfach-Rollenkette single roller chain	90	03003050		1/2x1/4x8,51 300-221-000	WMH	3		
		Hochhalteblech high holding sheet		24299	K-1-017867	vor Schere 1				
177	2	Gleitbuchse slide bushing	27	03002362		zylindrisch BK1-1210	MASCHINENLA	3		
178	1	Pneumatikzylinder pneumatic cylinder	31	05001041		DSNU-25-80-PPV-A	FESTO	1		
		Hochhalteblech high holding sheet		28695	K-0-022043	nach Schere 1				
pro:	1: high failure probability 2: middle failure probability 3: small failure probability									
plstno: part list number										Quotation No.: 9378.01 Commission: 4295

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01		Customer: IMEFY S.L. , Los Yébenes (Toledo)		part list: 32137					
Commission: 4295		45470 Los Yébenes (Toledo), Spanien		Name: Ingrid Huber					
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007					
Pos	Stck	Bezeichnung	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis	Totalpreis
Item	pcs	Description	partno	drawing	Finalized dimension/order designation	manufacturer	pro	EUR	total price
179	1	Pneumatikzylinder pneumatic cylinder	15 05003343		DFM-25-250-B-P-A-GF	FESTO	2		
		Hochhalteblech high holding sheet	28073	K-1-020820	nach Schere 2				
180	2	Anlaufscheibe stop disc	03000003		BK1-16-WC	MASCHINENLA	2		
		Auslauftransportband-TBA run-out conveyor belt	28663	K-0-021974					
		Auslauftransportband-TBA run-out conveyor belt	28645	K-0-021974	TBA 400/500, a=910				
181	1	Stirnradgetriebemotor spur wheel back-gearred motor	03005407		R17 DT 80 N4/MM11, P=1.10KW, n=	SEW	3		
182	1	Zahnriemen gear belt	03007201		20T10/980.0		1		
183	1	Transportband endlos conveyor belt, endless	03009813		80.0x3.1, L=2070.0, Transilon E8/2	SIEGLING	1		
184	4	Pendelrollenlager self-aligning roller bearing	03002959		21304 CC		3		
185	4	Nilos-Ring nilos ring	03002543		21304 AV	ZILLER	3		
		Druckrollenanordnung pressure roller arrangement	24786	K-2-026101					
186	1	Rolle roller	1001292	K-4-045309	Ø60.0x22.0/22.0		1		
187	2	Zugfeder tension spring	03000267		Ø10.0/1.40x26.9 Z-115-MI	GUTEKUNST	2		
188	2	Pneumatikzylinder pneumatic cylinder	05000810		AEVC-20-5-I-P	FESTO	1		
189	2	Rillenkugellager deep groove ball bearing	03000144		6002-2Z		3		
pro:	1: high failure probability 2: middle failure probability 3: small failure probability		pistno: part list number		Quotation No.: 9378.01		Commission: 4295		9378.01
						Page		15 of 34	

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01 Commission: 4295		Customer: IMEFY S.L. , Los Yébenes (Toledo) 45470 Los Yébenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT				part list: 32137 Name: Ingrid Huber Date: 08.11.2007					
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plisno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis Price	EUR EUR	Totalpreis total price
		Stapelvorrichtung staple equipment		32138		PBT					
		Umlenkvorrichtung diverting unit		28463	K-0-021865						
190	2	Spindelhubelement Screw jack	110	03010593		MSZ-25-S-RN-KGT-3205-1	ZIMM	3			
191	2	Kugelgewindetrieb ball screw	111	02002110		KGT-F-3205 R Lges.=890 Flansch-Einzelmutter n. D		3			
192	1	Kupplung coupling	116	03004542		KUZ28, incl. Stern	ZIMM	3			
193	1	Drehstrommotor three-phase a.c. motor	117	04000060		Asynchron-Normmotor 100 Lx8, B14	VEM	3			
194	1	Kupplung coupling	118	03004543		KUZ28-GS, incl. Stern	ZIMM	3			
195	1	Kupplung coupling	119	03004545		KUZ28, incl. Stern	ZIMM	3			
196	1	Stirnradgetriebemotor spur wheel back-geared motor	121	03003397		R17 DT 80 N4/MM11/BW1, P=0.11kW	SEW	3			
197	2	Flanschlager flange-type bearing	124	03004436		RCJTZ 20	INA	3			
198	6	Pendelkugellager self-aligning ball bearing	125	03000122		2204-2RS		3			
199	4	Zylindrisches Lager cylindrical bearing	128	03004541		Ø20/30x35	BORNEBUSCH	3			
200	2	Rillenkugellager deep groove ball bearing	130	03003150		6204-2Z		3			
201	1	Pneumatikzylinder pneumatic cylinder	135	05000871		RA/8050/M-25	NORGREN	1			
202	2	Transportband endlos conveyor belt, endless	138	03006322		80.0x1.7, L=5840.0, S-140H	HABASIT	1			
pro:		1: high failure probability 2: middle failure probability 3: small failure probability		plisno: part list number		Quotation No.: 9378.01 Commission: 4295 Page 16 of 34					

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01 Commission: 4295		Customer: IMEFY S.L., Los Yébenes (Toledo) 45470 Los Yébenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT				part list: 32137 Name: Ingrid Huber Date: 08.11.2007					
operating side: Rechts		Bezeichnung Description		Stcklp plistno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR Price EUR	Totalpreis total price
203	4	Kugelhüchse spherical liner		140	03004427		0670-230-40	BOSCH-REXR	3		
		Positionierband positioning belt			28631	K-0-021954	PBT für Fädelbolzen				
204	2	Planetengetriebe planet gear		32	04000239		PLS 115-4, 1FT6064/OP2/M2	NEUGART	3		
205	2	Wellenkupplung shaft coupling		34	03008160		3/932.333/25/32	MAYR	3		
206	4	Transportband endlos conveyor belt, endless		36	03005307		80.0x1.7, L=4340.0, S-140H THERM	HABASIT	1		
207	6	Pneumatikzylinder pneumatic cylinder		38	05002107		DZF-25-60-A-P-A	FESTO	1		
208	10	Linear-Set linear-set		39	03009002		1066-220-00	BOSCH-REXR	2		
209	6	Pendelrollenlager self-aligning roller bearing		51	03000133		22206 E		3		
		Fädelbolzenanordnung stacking pin arrangement			31705	K-2-028978	pneumatisch				
210	2	Dämpfungspuffer damping buffer		9	1030247		Ø16.0/5.0x6.0		2		
211	2	Pneumatikzylinder pneumatic cylinder		15	05004286		MQML B16 - - 100 D	SMC	3		
212	8	Gleitlager friction bearing		18	03013311		WJ200UM-01-10	IGUS	3		
		Führung guidance			27876	K-0-021468	zur Stapelebene				
		Führungsleiste guide gib			27885	K-2-027111					
213	20	Leiste bar		3	1018020	K-4-071091	140.0x15.0x5.0		2		
pro:		1: high failure probability 2: middle failure probability 3: small failure probability				plistno: part list number		Quotation No.: 9378.01 Commission: 4295 Page 17 of 34			

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01 Commission: 4295			Customer: IMEFY S.L. , Los Yébenes (Toledo) 45470 Los Yébenes (Toledo), Spanien		part list: 32137 Name: Ingrid Huber Date: 08.11.2007						
operating side: Rechts			machine type: TBA/ME/EL 400x2000-PBT								
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plstno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis Price	EUR EUR	Totalpreis total price
		Führungsleiste guide gib		27889	K-2-027115						
214	16	Leiste bar	3	1018020	K-4-071091	140.0x15.0x5.0		2			
215	8	Führungswagen guide roller car	51	03009828		1623-314-20	BOSCH-REXR	3			
216	1	Stirnradgetriebemotor spur wheel back-gearred motor	57	03008253		R17 DT 71 D4/BMG/MM03, P=0.37kW	SEW	3			
217	4	Rillenkugellager deep groove ball bearing	58	03000146		6003-2Z		3			
218	2	Rillenkugellager deep groove ball bearing	59	03000162		6203-2RS		3			
219	4	Schräggugellager angular ball bearing	60	03000195		7303 B		3			
220	4	Nilos-Ring nilos ring	61	03002561		7303 AVH	ZILLER	3			
221	8	Gelenkkopf hinged clevis	64	03000056		GAR 10 UK		3			
222	12	Gelenkkopf hinged clevis	65	03000055		GAL 10 UK		3			
223	12	Gleitbuchse slide bushing	66	03005255		mit Bund BKF1-12120	MASCHINENLA	2			
224	12	Gleitbuchse slide bushing	67	03002360		zylindrisch BK1-1012	MASCHINENLA	2			
		Führungsverstellung guidance adjustment		27897	K-0-021486	zur Führung zur Stapelebene					
225	4	Gelenk link	12	1017509	K-4-062236	70.0x0.0x0.0		3			
226	1,6	Einfach-Rollenkette single roller chain	32	03003050		1/2x1/4x8,51 300-221-000	WMH	3			
pro:	1: high failure probability 2: middle failure probability 3: small failure probability		plstno: part list number			Quotation No.: 9378.01 Commission: 4295 Page 18 of 34					

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01		Customer: IMEFY S.L. , Los Yebenes (Toledo)		part list: 32137						
Commission: 4295		45470 Los Yebenes (Toledo), Spanien		Name: Ingrid Huber						
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007						
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plistno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR Price EUR	Totalpreis total price
227	12	Schräggugellager angular ball bearing	35	03000191		7203 B		3		
228	2	Rillenkugellager deep groove ball bearing	37	03000141		6001-2RS		3		
		Aufhängung								
		Suspension			K-1-020758					
229	4	Führungswagen guide roller car	9	03009827		1622-894-20	BOSCH-REXR	3		
		Blechaltevorrichtung								
		sheet holding device			K-1-017530					
230	2	Pneumatikzylinder pneumatic cylinder	9	05000367		ADVUL-25-25-P-A	FESTO	1		
231	2	Pneumatikzylinder pneumatic cylinder	10	05000368		DFM-20-25-P-A-GF	FESTO	1		
		Hochhalteleiste								
		high holding gib			K-1-016902					
232	4	Pneumatikzylinder pneumatic cylinder	14	05002229		DZH-25-25-PPV-A	FESTO	1		
233	4	Gelenkkopf Joint head	15	05000780		SGS-M10x1,25, Art.-Nr. 9261	FESTO	3		
		Fädelbolzen								
		chained pin								
234	2	Dämpfungspuffer damping buffer	3	1005383		kurze Ausführung				
		Hydraulik zur Anlage								
		hydraulic								
325	1	Axialkolbenpumpe axial piston pump	1-03	05003180		J-V15-A2RX-95		3		
236	1	Filterelement filter element	1.06	05003441		0060 D 010 BN3HC	HYDAC	2		
pro:		1: high failure probability		2: middle failure probability		3: small failure probability		Quotation No.: 9378.01		
		plstno: part list number						Commission: 4295		

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik



spare part list

57223 Kreutztal, Germany

Quotation No.: 9378.01 Commission: 4295			Customer: IMEFY S.L., Los Yébenes (Toledo) 45470 Los Yébenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT			part list: Name: Ingrid Huber Date: 08.11.2007				
Pos Item	Stck pcs	Bezeichnung Description	Stcklip plisno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR	Totalpreis total price
237	1	Schlauchleitung hydraulic hose	1.09	05001727		1SN-DN10x500 DKOL/DKOL90° (12L)		2		
238	1	Schlauchleitung hydraulic hose	1.10	05003620		1SN-DN16x0450 DKOL45/DKOL90(18L)		2		
239	1	Wegeventil way directional control valve	2.02	05000654		4/3-handbet., NG 6 0810 091 380	BOSCH	3		
240	1	Druckminderventil pressure reducing valve	2.03	05000664		0811 150 234	BOSCH	3		
241	1	Manometer pressure gauge	2.04	05000656		0.00 bis 160.00 bar G1/4 unten MGFOERTER	OERTER	2		
242	1	Manometer pressure gauge	2.09	05000140		Ø 63, 0.00 bis 160.00 bar G1/4 hinten 9380546	WIKA	3		
243	1	Wegeventil way directional control valve	2.11	05000677		4/3-el.magn., NG 6 0810 091 212	BOSCH	2		
244	1	Rückschlagventil non return valve	2.15	05000674		entsperrb. NG 6 0811 024 105	BOSCH	3		
245	2	Druckminderventil pressure reducing valve	2.22	05003632		0811 150 234	BOSCH	3		
246	1	Wegeventil way directional control valve	2.23	05000665		4/3-el.magn., NG 6 0810 091 203	BOSCH	3		
247	1	Drosselventil flow control valve	2.24	05000666		NG 6 0811 324 103	BOSCH	3		
248	4	O-Ring o-ring	2.70	05000156		9.25x1.78	FREUDENBER	3		
249	1	Schlauchleitungen zur Anlage	2.75	05004450				2		
		Pneumatik zur Anlage pneumatic		29931	K-3-062536	KOM. 4295				
250	1	Filterelement filter element	3.1	05004294		LFP-D-MIDI-5M	FESTO	1		
pro:			1: high failure probability 2: middle failure probability 3: small failure probability			plisno: part list number			Quotation No.: 9378.01 Commission: 4295 Page 20 of 34	

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01		Customer: IMEFY S.L. , Los Yébenes (Toledo)		part list: 32137							
Commission: 4295		45470 Los Yébenes (Toledo), Spanien		Name: Ingrid Huber							
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007							
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plstno	Artnr partno	Zeichnung drawing	Fertigmas/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis Price	EUR EUR	Totalpreis total price
251	1	Filterelement filter element	3.2	05004278		LFMBP-D-MIDI	FESTO	1			
252	1	Filterelement filter element	3.3	05004293		LFMAP-D-MIDI	FESTO	1			
253	1	Filterelement filter element	4	05002593		LFP-D-MAXI-40M	FESTO	1			
254	3	Konstant-Druckminderer Pressure controller	9	05000304		737.302 G 1/4, 0,5 - 6 bar	RIEGLER	3			
255	1	Konstant-Druckminderer Pressure controller	10	05000305		737.502 G 1/2, 0,2 - 6 bar	RIEGLER	3			
256	2	Präzisions-Regler precision controller	11	05000070		G 1/4 11-818-993	AIR-COM	3			
257	5	Manometer pressure gauge	16	05000146		Ø 63, 0.00 bis 6.00 bar G1/4 hinten r 9091491	WIKA	2			
258	2	Wegeventil way directional control valve	20	05000105		handbet., THO-3-1/4-B	FESTO	3			
259	2	Wegeventil way directional control valve	21	05004007		3/2-el.magn., G 1/8 CPE14-M1BH-3	FESTO	3			
260	3	Wegeventil way directional control valve	22	05002550		5/2-el.magn., G 1/8 CPE14-M1BH-5	FESTO	2			
261	1	Wegeventil way directional control valve	23	05003008		5/2-el.magn., G 1/8 CPE14-M1BH-5	FESTO	3			
262	8	Wegeventil way directional control valve	24	05002495		5/2-el.magn., G 1/8 CPE14-M1BH-5	FESTO	2			
263	4	Wegeventil way directional control valve	25	05002329		5/2-el.magn., G 1/8 CPE14-M1BH-5	FESTO	2			
264	36	Actor-Kabel, 3-pol Actor cable	25.2	05002672		KMYZ-9-24-10-LED-PUR-B	FESTO	1			
265	2	Wegeventil way directional control valve	26	05000114		el.magn., MN1H-2-1/2-MS	FESTO	2			
pro:		1: high failure probability 2: middle failure probability 3: small failure probability		plstno: part list number		Quotation No.: 9378.01		Commission: 4295		Page 21 of 34	

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01 Commission: 4295			Customer: IMEFY S.L., Los Yébenes (Toledo) 45470 Los Yébenes (Toledo), Spanien machine type: TBA/ME/EL 400x2000-PBT			part list: 32137 Name: Ingrid Huber Date: 08.11.2007				
operating side: Rechts										
Pos Item	Stck pcs	Bezeichnung Description	Stcklp plisno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR Price EUR	Totalpreis total price
266	2	Druckregler pressure control valve	35	05000013		Ø 4, direkt gest. LRMA-QS-4	FESTO	3		
267	4	Drosselventil flow control valve	42	05000292		G 1/4 DRV 1/4	BAUMGARTNE	2		
268	8	Drosselventil flow control valve	45	05002657		M5 GRLA-M5-QS-4-D	FESTO	3		
269	2	Wegeventil way directional control valve	49	05003271		3/2-el.magn., G 1/8 MHE3-MS1H-3/2	FESTO	3		
270	2	Wegeventil way directional control valve	50	05003272		3/2-el.magn., G 1/8 MHE3-MS1H-3/2	FESTO	3		
271	3	Druckschalter pressure switch	55	05001901		G 1/8 SDE1 D10 G2 H18 C PU M8	FESTO	2		
272	2	Magnet magnet	59	03000092		MSN 1G24-OD, Art.-Nr. 123060	FESTO	2		
273	1	Magnetventilplatte solenoid valve plate	61	05000456		CPV14-M1H-2x3-GLS-1/8 (C), 161 360	FESTO	1		
274	1	Magnetventilplatte solenoid valve plate	64	05000451		CPV14-M1H-5LS-1/8 (M), 161 360	FESTO	1		
275	1	Magnetventilplatte solenoid valve plate	65	05000452		CPV14-M1H-5JS-1/8 (J), 161 361	FESTO	1		
		Elektrik zur Anlage electric		32226						
276	10	Glühbirne, 24V/ 25 mA Bulb		08000225		T2 3/4 - 1, 24V/ 25 mA	ALBA	1		
277	1	TFT-Panel		08008831		5AP920.1505-K24	B&R	2		
278	1	SDL-Kabel, 20m SDL-cable		08008836		5CASDL.0200-00	B&R	2		
279	1	SDL-Panel Link		08008384		5DLSDL.1000-00	B&R	2		
pro:	1: high failure probability 2: middle failure probability 3: small failure probability		plisno: part list number			Quotation No.: 9378.01 Commission: 4295				

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik



spare part list

57223 Kreutztal, Germany

Quotation No.: 9378.01		Customer: IMEFY S.L., Los Yebenes (Toledo)		part list: 32137							
Commission: 4295		45470 Los Yebenes (Toledo), Spanien		Name: Ingrid Huber							
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007							
Pos	Stck	Bezeichnung	Stckip	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis	Totalpreis	
Item	pcs	Description	plstno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	EUR	total price	
280	1	Industrie-PC, APC620		08009223		APC620GEORG02	B&R	2			
281	1	Endschalter mit Rollenstößel Limit switch with roller pluger		08007584		6.087.367.005	BERNSTEIN	1			
282	1	Betätiger Operating device		08005111		016849	EUCHNER	1			
283	1	Zustimmtaster Push button		08000553		052449	EUCHNER	1			
284	1	Sicherheitsendschalter Kopf links Safety limit switch		08009429		083230	EUCHNER	1			
285	1	Sicherheitsendschalter Kopf rechts Safety limit switch		08009430		083231	EUCHNER	1			
286	1	Sicherheitsschalter Safety switch		08008344		089631	EUCHNER	1			
287	1	Actor-Kabel, 2x0,75mm² Actor-cable, 3-pol.		05002331		KMYZ-9-24-5-LED-PUR-B	FESTO	2			
288	1	Kleinhupe HP Horn		08000709		365 9407	FUNKE&HUST	2			
289	1	Spannungsversorgung 24VDC/ 5VDC Power supply		08009161		FBSP-CW2-2405	GEORG	2			
290	1	Zählerkarte FLIFC Counter card		08000675		FLIFC	GEORG	2			
291	1	Installationsschalter, 1pol. Installation switch		08000579		552116	HAGER	2			
292	1	3 Stufen Zustimmtaster 3-step push button		08000821		JSHD4ME	JOKAB-SAFET	2			
293	1	Steuertransformator 2000VA, 400/230V Control-power transformer		08000835		Prim: 400V +/-5%, Sek: 230V-2000V	JUNG	3			
294	1	Bedienmodul für VC-Frequenzumrichter Operator module for VC-Frequency converter		08001099		417192	LENZE	2			
pro:		1: high failure probability 2: middle failure probability 3: small failure probability		plstno: part list number		Quotation No.: 9378.01		Commission: 4295		Page 23 of 34	

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik



spare part list

57223 Kreutztal, Germany

Quotation No.: 9378.01			Customer: IMEFY S.L. , Los Yebenes (Toledo)			part list: 32137			
Commission: 4295			45470 Los Yebenes (Toledo), Spanien			Name: Ingrid Huber			
operating side: Rechts			machine type: TBA/ME/EL 400x2000-PBT			Date: 08.11.2007			
Pos	Stck	Bezeichnung	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis EUR	Totalpreis
Item	pcs	Description	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price EUR	total price
295	1	VC-Frequenzumrichter 0,75kW, 2,4A	08008810		E82EV751K4C200	LENZE	2		
296	1	VC-Frequency converter							
297	1	I/O Funktionsmodul für Frequenzumrichter	08007571		E82ZAFSC100	LENZE	2		
		Function module for Frequency converter							
297	1	Funkentstörfilter	08004819		E82ZZ75134B210	LENZE	2		
		radio interference suppression filter							
298	1	Profibus Modul für Frequenzumrichter	08004820		EMF2133IB	LENZE	2		
		Profibus module for Frequency converter							
299	1	Bremswiderstand	08004821		ERBM470R100W	LENZE	3		
		Brake resistor							
300	1	Encoder G58	08001165		3919070	LITTON	1		
		encoder							
301	1	Ultraschallsensor	08007273		104093	PEPPERL+FUCHS	1		
		Ultrasonic sensor							
302	1	Blitzleuchte 24 VDC Gelb	08001358		21030803000	PFANNENBERG	2		
		Warning lamp							
303	1	Sensor-Kabel 5m, 0 Grad, Buchse, M8, 3-polig	08004948		1669628	PHOENIX	1		
		Sensor cable							
304	1	Sensor-Kabel 5m, 0 Grad, Buchse, M8, 4-polig	08005400		1681868	PHOENIX	1		
		Sensor cable							
305	1	Sensor-Kabel 10m, 0 Grad, Buchse, M8, 4-polig	08004950		1683484	PHOENIX	1		
		Sensor cable							
306	1	Actor-Kabel 5m, Ventilsteckertyp A	08009518		1683785	PHOENIX	1		
		Actor cable							
307	1	Actor-Kabel 10m, Ventilsteckertyp A	08009516		1683798	PHOENIX	1		
		Actor cable							
308	1	Sensor-Kabel 10m, 0 Grad, Buchse, M8, 3-polig	08005396		1694101	PHOENIX	1		
		sensor cable							
309	1	VARIOFACE-COMPACT-LINE MODUL	08001402		2962722	PHOENIX	3		
		Varioface compact line module							
pro:			plisto: part list number			Quotation No.: 9378.01			9378.01
1: high failure probability						Commission: 4295			4295
2: middle failure probability						Page			24 of 34
3: small failure probability									

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01		Customer: IMEFY S.L., Los Yébenes (Toledo)		part list: 32137							
Commission: 4295		45470 Los Yébenes (Toledo), Spanien		Name: Ingrid Huber							
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007							
Pos Item	Stck pcs	Bezeichnung Description	Stcklip plisno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR Price EUR	Totalpreis total price	
310	1	VARIOFACE-COMPACT-LINE MODUL Varioface compact line module		08001399		2962735	PHOENIX	3			
311	1	VARIOFACE-COMPACT-LINE MODUL Varioface compact line module		08001400		2962748	PHOENIX	3			
312	1	Türpositionsschalter Door position switch		08005756		PS 4127.000	RITTAL	2			
313	1	Schaltschrankleuchte 230V / 30W Lamp for switchgear cabinet		08001651		PS 4138.300	RITTAL	3			
314	1	Temperaturregler Thermostat		08001707		SK 3110.000	RITTAL	2			
315	1	Geberkabel 20m sensor cable		08007778		0117820	SANGEL	1			
316	1	Motorleitung mit Bremsader 4x1,5+2x1,5mm², 20m motor line with brake core		08007811		011620020	SANGEL	1			
317	1	Motorleitung ohne Bremsader 4x2,5 mm², 20m motor line without brake core		08007804		011676020	SANGEL	1			
318	1	Motorleitung ohne Bremsader 4x1,5 mm², 15m motor line without brake core		08007788		DESINA PUR 5CA01-15M	SANGEL	1			
319	1	Motorleitung ohne Bremsader 4x1,5 mm², 25m motor line without brake core		08007790		DESINA PUR 5CA01-25M	SANGEL	1			
320	1	Sicherheitssensor Safety sensor		08001919		BNS 333-01yV	SCHMERSAL	1			
321	1	Sicherheitsbetätiger Safety element		08001920		BPS 300	SCHMERSAL	1			
322	1	Haftmagnet 24VDC/8,5W/100%ED Magnet		08001928		EG1060A52/110	SCHRAMME	3			
323	1	Reflektionslichtschranke 5500mm PNP Reflexion light barrier		08001936		571-50004	SENSOPART	1			
324	1	Profibusanschaltung Profibus interface module		08001953		8236836	SEW	1			
pro:		1: high failure probability 2: middle failure probability 3: small failure probability		plisno: part list number		Quotation No.: 9378.01		Commission: 4295		Page 25 of 34	

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreuztal, Germany



Quotation No.: 9378.01			Customer: IMEFY S.L., Los Yébenes (Toledo)			part list: 32137				
Commission: 4295			45470 Los Yébenes (Toledo), Spanien			Name: Ingrid Huber				
operating side: Rechts			machine type: TBA/ME/EL 400x2000-PBT			Date: 08.11.2007				
Pos	Stck	Bezeichnung	Stckip	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis	Totalpreis
Item	pcs	Description	plisno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price	total price
325	1	Reflektor Reflector		08002039		1000132	SICK	1		
326	1	Umlenkspiegel PSK1, für Lichtsender 0-30m diverting reflector for light transmitter		08007889		1005229	SICK	1		
327	1	Laser-Ausrichthilfe Laser alignment helping		08001961		1015741	SICK	1		
328	1	Einweglichtschranke bis 8,5m One-way light barrier		08007831		WS/WE 160-F 440, 6022758	SICK	1		
329	1	Lichtschranke für Unfallschutz, Sender light barrier - transmitter		08007893		1 015 726	SICK	1		
330	1	Lichtschranke für Unfallschutz, Empfänger light barrier - receiver		08007892		1 015 727	SICK	1		
331	1	DS-Servomotor 8/12Nm 3000U/min three-phase servo motor		08009582		1FK7064-7AF71-1GH3-Z=N25	SIEMENS	3		
332	1	Drehstrommotor three-phase a.c. motor		08002085		1FT6044-1AF71-3EG1 1FT6044-1A	SIEMENS	3		
333	1	DS-Servomotor 8,0Nm 2000U/min three-phase servomotor		08006665		1FT6064-6AC71-3TG0	SIEMENS	3		
334	1	Drehstrommotor three-phase a.c. motor		08002095		1FT6086-8AC71-3TG0 1FT6086-8A	SIEMENS	3		
335	3	NH-Sicherung Grösse 00, 40A NH-Fuse		08002260		3NA3 817	SIEMENS	1		
336	3	SITOR-Sicherung Grösse 00, 160A SITOR Fuse size 00		08002308		3NE8 024	SIEMENS	1		
337	1	Reversierschützkomination 3kW, DC 24V Revers contactor combination		08002326		3RA1315-8XB30-1BB4	SIEMENS	2		
338	1	Mechanische Verriegelung für Wendekombination Mechanical locking for reversing combination		08002331		3RA1924-2B	SIEMENS	2		
339	1	Hilfsschutz 2NO+2NC, AC 230V/ 50/60Hz contactor relay		08002342		3RH1122-1AP00	SIEMENS	2		
pro:	1: high failure probability 2: middle failure probability 3: small failure probability		plisno: part list number			Quotation No.: 9378.01 Commission: 4295 Page 26 of 34				

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik



spare part list

57223 Kreutztal, Germany

Quotation No.: 9378.01		Customer: IMEFY S.L., Los Yebenes (Toledo)			part list: 32137					
Commission: 4295		45470 Los Yebenes (Toledo), Spanien			Name: Ingrid Huber					
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT			Date: 08.11.2007					
Pos	Stck	Bezeichnung	Stcklp	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis EUR	Totalpreis
Item	pcs	Description	plstno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price EUR	total price
340	1	Hilfsschutz 2NO+2NC, DC 24V Contactor relay		08002343		3RH1122-1BB40	SIEMENS	2		
341	1	Hilfsschutz 4NO, DC 24V Contactor relay		08002350		3RH1140-1BB40	SIEMENS	2		
342	1	Hilfsschalterblock 4NO für 3RH1 Auxiliary switch block		08002353		3RH1911-1FA40	SIEMENS	2		
343	1	Hilfsschalterblock 1NO+2NC für 3RT1 Auxiliary switch block		08002355		3RH1911-1HA12	SIEMENS	2		
344	1	Hilfsschalterblock 2NO+2NC für 3RT1 Auxiliary switch block		08002356		3RH1911-1HA22	SIEMENS	2		
345	1	Leistungsschutz 3kW, AC 230V/ 50/60Hz Power contactor		08002377		3RT1015-1AP01	SIEMENS	2		
346	1	Leistungsschutz 3kW, DC 24V Power contactor		08002378		3RT1015-1BB41	SIEMENS	2		
347	1	Leistungsschutz 5,5kW, DC 24V Power contactor		08002392		3RT1024-1BB44	SIEMENS	2		
348	1	Leistungsschutz 7,5kW, DC 24V Power contactor		08002398		3RT1025-1BB44	SIEMENS	2		
349	1	Leistungsschutz 37kW, AC 24VDC Power contactor		08004603		3RT1045-1BB44	SIEMENS	2		
350	1	Hilfsschalterblock 1NO+1NC, DC 24V Auxiliary switch block		08002436		3RT1916-2FJ21	SIEMENS	2		
351	1	Hilfsschalterblock 1NO+1NC, AC/DC 24V Auxiliary switch block		08008905		3RT1916-2FJ31	SIEMENS	2		
352	1	Motorschutzschalter 0,18-0,25A Motor circuit breaker		08002476		3RV1011-0CA10	SIEMENS	2		
353	1	Motorschutzschalter 1,1-1,6A Motor circuit breaker		08002492		3RV1011-1AA10	SIEMENS	2		
354	1	Motorschutzschalter 1,4-2,0A Motor circuit breaker		08002494		3RV1011-1BA10	SIEMENS	2		
pro:		1: high failure probability 2: middle failure probability 3: small failure probability			plstno: part list number		Quotation No.: 9378.01		Commission: 4295	
							Page		27 of 34	

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik



spare part list

57223 Kreutztal, Germany

Quotation No.: 9378.01		Customer: IMEFY S.L. , Los Yebenes (Toledo)		part list: 32137						
Commission: 4295		45470 Los Yebenes (Toledo), Spanien		Name: Ingrid Huber						
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007						
Pos	Stck	Bezeichnung	Stcklp	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis	Totalpreis
Item	pcs	Description	plstno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price	total price
355	1	Motorschutzschalter 2,2-3,2A Motor circuit breaker		08002498		3RV1011-1DA10	SIEMENS	2		
356	1	Motorschutzschalter 2,8-4,0A Motor circuit breaker		08002500		3RV1011-1EA10	SIEMENS	2		
357	1	Motorschutzschalter 3,5-5,0A Motor circuit breaker		08002502		3RV1011-1FA10	SIEMENS	2		
358	1	Motorschutzschalter 9,0-12A Motor circuit breaker		08002510		3RV1011-1KA10	SIEMENS	2		
359	1	Leistungsschalter für Trafoschutz 4,5-6,3A Power circuit breaker		08002544		3RV1421-1GA10	SIEMENS	3		
360	1	Leistungsschalter für Trafoschutz 7-10A Power circuit breaker		08002546		3RV1421-1JA10	SIEMENS	3		
361	1	Hilfsschalter 1NO+1NC Schraubanschluß Auxiliary switch		08002549		3RV1901-1E	SIEMENS	2		
362	1	Drucktaster, gelb, incl. Halter Push button, yellow, incl. holder		08002633		3SB3000-0AA31	SIEMENS	1		
363	1	Drucktaster, weiß, incl. Halter Push button, white, incl. holder		08002634		3SB3000-0AA61	SIEMENS	1		
364	1	NOT-AUS-Pilzdrucktaster d=40mm Mushroom-head emergency stop push button		08002637		3SB3000-1HA20	SIEMENS	1		
365	1	Knebel 50° 3 Schaltstellungen, schwarz Knob		08002639		3SB3000-2GA11	SIEMENS	1		
366	1	Knebel 50° 2 Schaltstellungen, schwarz Knob		08002640		3SB3000-2KA11	SIEMENS	1		
367	1	Schloßtaсте 50° 2 Schaltstellungen, schwarz Key-operated push button		08002641		3SB3000-4AD11	SIEMENS	1		
368	1	Schloßtaсте 50° 2 Schaltstellungen, schwarz Key-operated push button		08002642		3SB3000-4BD01	SIEMENS	1		
369	1	Schloßtaсте 50° rechts verrastend 0-1 Locking-type push button		08002646		3SB3000-4LD11	SIEMENS	1		
pro:		1: high failure probability 2: middle failure probability 3: small failure probability		plstno: part list number				Quotation No.: 9378.01		Commission: 4295

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik

spare part list

57223 Kreutztal, Germany



Quotation No.: 9378.01		Customer: IMEFY S.L. , Los Yebenes (Toledo)		part list: 32137							
Commission: 4295		45470 Los Yebenes (Toledo), Spanien		Name: Ingrid Huber							
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007							
Pos	Stck	Bezeichnung	Stcklip	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis	Totalpreis	
Item	pcs	Description	plstno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	EUR	total price	
370	1	Leuchtdrucktaster, grün Illuminated push button, green		08002651		3SB3001-0AAA41	SIEMENS	1			
371	1	Leuchtdrucktaster, blau Illuminated pushbutton, blue		08002652		3SB3001-0AAA51	SIEMENS	1			
372	1	Leuchtdrucktaster, weiß Illuminated push button, white		08002653		3SB3001-0AAA61	SIEMENS	1			
373	1	Leuchtdrucktaster, klar Illuminated pushbutton, clear		08002654		3SB3001-0AA71	SIEMENS	1			
374	1	Leuchtdrucktaste, gelb Illuminated pushbutton, yellow		08002656		3SB3001-0BA31	SIEMENS	1			
375	1	Leuchtmelder, klar Indicator light		08002661		3SB3001-6AA70	SIEMENS	1			
376	1	Leuchtdrucktaster, blau 1S / 24V, komplett Illuminated push button		08002714		3SB3220-0AA51	SIEMENS	1			
377	1	Schaltelement 1NO Schraubanschluß Switching element		08002724		3SB3400-0B	SIEMENS	1			
378	1	Schaltelement 1NC Schraubanschluß Switching element		08002725		3SB3400-0C	SIEMENS	1			
379	1	Lampenfassung BA 9s DC/AC 24V Lamp holder		08002728		3SB3400-1A	SIEMENS	1			
380	1	Schaltelement für Bodenbefestigung 1S Switching element		08002731		3SB3420-0B	SIEMENS	1			
381	1	Schaltelement für Bodenbefestigung 1Ö Switching element		08002732		3SB3420-0C	SIEMENS	1			
382	1	NOT-AUS-Pilzdrucktaster 40mm, Gehäuse IP65 Emergency stop mushroom-head pushbutton		08007820		3SB3801-0DF3	SIEMENS	1			
383	5	LED-Lampe gelb, 24V/ 20 mA LED-Lamp yellow		08002741		3SB3901-1BA	SIEMENS	1			
384	5	LED-Lampe grün, 24V/ 20 mA LED-Lamp green		08005149		3SB3901-1DA	SIEMENS	1			
pro:		1: high failure probability 2: middle failure probability 3: small failure probability		plstno: part list number		Quotation No.: 9378.01		Commission: 4295		Page 29 of 34	

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik



spare part list

57223 Kreutzal, Germany

Quotation No.: 9378.01		Customer: IMEFY S.L. , Los Yebenes (Toledo)		part list: 32137							
Commission: 4295		45470 Los Yebenes (Toledo), Spanien		Name: Ingrid Huber							
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007							
Pos	Stck	Bezeichnung	Stcklp	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis EUR	Totalpreis	
Item	pcs	Description	plstno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price EUR	total price	
385	5	LED-Lampe blau, 24V/ 20 mA LED-Lamp blue		08002742		3SB3901-1PA	SIEMENS	1			
386	5	LED-Lampe weiss, 24V/ 20 mA LED-Lamp white		08002743		3SB3901-1QA	SIEMENS	1			
387	1	Sicherheitskombination 3NO+1NC Safety combination		08008206		3TK2825-1BB40	SIEMENS	2			
388	1	Sicherheitskombination 2NO+2NO+1NC Safety combination		08008201		3TK2828-1BB40	SIEMENS	2			
389	1	Sicherheitskombination 4NO+1NC Safety combination		08008202		3TK2830-1CB30	SIEMENS	2			
390	1	Ausgangskoppelglied 1W Output coupling device		08002840		3TX7002-1BB00	SIEMENS	2			
391	1	3PH Netzdrössel 160A, 400/480V, 50/60Hz Line reactor		08008192		4EU2752-1UB00-0AA0	SIEMENS	2			
392	1	Sicherungsautomat 4A C Automatic circuit-breaker		08002986		5SX2 104-7	SIEMENS	2			
393	1	Sicherungsautomat 6A C Automatic circuit-breaker		08002987		5SX2 106-7	SIEMENS	2			
394	1	Sicherungsautomat 10A C Automatic circuit-breaker		08002989		5SX2 110-7	SIEMENS	2			
395	1	Hilfsschalter 1NO+1NC auxiliary switch		08003018		5SX9 100	SIEMENS	2			
396	1	Pushbutton Panel PP7		08003031		6AV3688-3AA03-0AX0	SIEMENS	2			
397	1	Pushbutton Panel PP17 I		08003032		6AV3688-3CD13-0AX0	SIEMENS	2			
398	1	Geregelte Laststromversorgung DC 20A Regulated Load power supply		08006419		6EP1436-3BA00	SIEMENS	2			
399	1	Geregelte Laststromversorgung DC 40A Regulated Load power supply		08006794		6EP1437-3BA00	SIEMENS	2			
pro:		1: high failure probability 2: middle failure probability 3: small failure probability		plstno: part list number		Quotation No.: 9378.01		Commission: 4295		Page 30 of 34	

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik



spare part list

57223 Kreutztal, Germany

Quotation No.: 9378.01		Customer: IMEFY S.L. , Los Yebenes (Toledo)		part list: 32137							
Commission: 4295		45470 Los Yebenes (Toledo), Spanien		Name: Ingrid Huber							
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007							
Pos	Stck	Bezeichnung	Stcklp	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis	Totalpreis	
Item	pcs	Description	plisno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price	total price	
400	1	DC-USV-MODUL 24V/ 40A		08008393		6EP1931-2FC41	SIEMENS	2			
401	1	Akku-Modul 24V/ 20A, 7Ah		08007978		6EP1935-6ME21	SIEMENS	2			
402	1	Meldemodul für Laststromversorgung Signalling module for Load power supply		08006795		6EP1961-3BA10	SIEMENS	2			
403	1	RS485 Repeater 12 MBAUD		08003349		6ES7 972-0AA01-0XA0	SIEMENS	2			
404	1	Busanschlußstecker bis 12 MBAUD Bus connector		08003355		6ES7 972-0BA41-0XA0	SIEMENS	2			
405	1	Busanschlußstecker bis 12 MBAUD Bus connector		08003358		6ES7 972-0BB12-0XA0	SIEMENS	2			
406	1	Elektronikmodul für ET200S, DC 24V/4DI electronic module		08008827		6ES7131-4BD01-0AA0	SIEMENS	2			
407	1	Elektronikmodul für ET200S, DC 24V/4DO/2A electronic module		08009017		6ES7132-4BD31-0AA0	SIEMENS	2			
408	1	Powermodul für ET200S		08008828		6ES7138-4CA01-0AA0	SIEMENS	2			
409	1	Interfacemodul IM151 für ET200S		08008829		6ES7151-1AA04-0AB0	SIEMENS	2			
410	1	Terminalmodul für ET200S Terminal module		08003214		6ES7193-4CA50-0AA0	SIEMENS	1			
411	1	Terminalmodul für ET200S Terminal module		08003216		6ES7193-4CD30-0AA0	SIEMENS	1			
412	1	Baugruppenträger SIMATIC S7-400 Card rack		08003256		6ES7400-1TA01-0AA0	SIEMENS	2			
413	1	Stromversorgungsbaugruppe PS405, 10A power supply unit		08008321		6ES7405-0KA02-0AA0	SIEMENS	2			
414	1	Zentralbaugruppe CPU414-3 central unit		08009592		6ES7414-3XM05-0AB0	SIEMENS	2			
pro:		1: high failure probability 2: middle failure probability 3: small failure probability		plisno: part list number		Quotation No.: 9378.01		Commission: 4295		Page 31 of 34	

Ersatzteilliste

Heinrich Georg GmbH Maschinenfabrik



spare part list

57223 Kreutztal, Germany

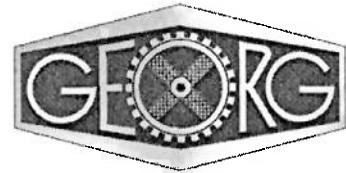
Quotation No.: 9378.01			Customer: IMEFY S.L. , Los Yébenes (Toledo)		part list: 32137					
Commission: 4295			45470 Los Yébenes (Toledo), Spanien		Name: Ingrid Huber					
operating side: Rechts			machine type: TBA/ME/EL 400x2000-PBT		Date: 08.11.2007					
Pos	Stck	Bezeichnung	Stcklp	Artnr	Zeichnung	Fertigmass/Bestellbezeichnung	Hersteller	Ausf	Preis	Totalpreis
Item	pcs	Description	plstno	partno	drawing	Finalized dimension/order designation	manufacturer	pro	Price	total price
415	1	Digitaleingabebaugruppe SM 421		08004614		6ES7421-1BL01-0AA0	SIEMENS	1		
		Digital input module								
416	1	Digitalausgabebaugruppe SM 422		08003272		6ES7422-1BH11-0AA0	SIEMENS	1		
		Digital output module								
417	1	Digitalausgabebaugruppe SM 422		08003273		6ES7422-1BL00-0AA0	SIEMENS	1		
		Digital output module								
418	1	Memory Card 256 kByte Flash E-PROM		08003334		6ES7952-0KH00-0AA0	SIEMENS	2		
		Memory card								
419	1	Profibus-DP-Schnittstellenmodul IF964-DP		08008255		6ES7964-2AA04-0AB0	SIEMENS	2		
		Profibus-DP-Interface module								
420	2	Pufferbatterie		08003345		6ES7971-0BA00	SIEMENS	1		
		Back-up								
421	1	Busanschlußstecker bis 12 MBAUD		08005403		6ES7972-0BA12-0XA0	SIEMENS	2		
		Bus connector plug								
422	1	TS-Adapter II		08009038		6ES7972-0CB35-0XA0	SIEMENS	3		
423	1	Kommunikationsprozessor CP 443-1 IT		08007833		6GK7443-1EX40-0XE0	SIEMENS	2		
		Communication processor								
424	1	Wechselrichtergerät, 1,5 kW, MC		08003501		6SE7014-0TP50-ZG91+C43+K80	SIEMENS	2		
		Inverter								
425	1	Wechselrichtergerät, 2,2 kW, MC		08006677		6SE7016-0TP50-ZG91+C33+K80	SIEMENS	2		
		Inverter								
426	1	Wechselrichtergerät, 4 kW, MC		08007436		6SE7021-0TP70-ZG91+C43+K80	SIEMENS	2		
		Inverter								
427	1	Wechselrichtergerät, 5,5 kW, MC		08003521		6SE7021-3TP50-ZG91+C12+C33+K80	SIEMENS	2		
		Inverter								
428	1	Wechselrichtergerät, 7,5 kW, VC		08004615		6SE7021-8TP60-ZG91+K80	SIEMENS	2		
		Inverter								
429	1	Bremswiderstand 20kW, 20 Ohm		08003541		6SE7023-2ES87-2DC0	SIEMENS	2		
		Braking resistor								
pro:	1: high failure probability		plstno: part list number		Quotation No.: 9378.01		Commission: 4295		Page 32 of 34	
	2: middle failure probability									
	3: small failure probability									

Ersatzteilliste**Heinrich Georg GmbH Maschinenfabrik****spare part list****57223 Kreuztal, Germany**

Quotation No.: 9378.01		Customer: IMEFY S.L. , Los Yebenes (Toledo)				part list: 32137				
Commission: 4295		45470 Los Yebenes (Toledo), Spanien				Name: Ingrid Huber				
operating side: Rechts		machine type: TBA/ME/EL 400x2000-PBT				Date: 08.11.2007				
Pos Item	Stck pcs	Bezeichnung Description	Stckpl plstno	Artnr partno	Zeichnung drawing	Fertigmass/Bestellbezeichnung Finalized dimension/order designation	Hersteller manufacturer	Ausf pro	Preis EUR Price EUR	Totalpreis total price
430	1	Einspeiseeinheit 3AC 380/480V MC Incoming unit		08003569		6SE7031-2EP85-0AA0	SIEMENS	2		
431	1	Elektronikbaugruppe EB32 Electronic module		08007277		9AC9105-0AA03	SIEMENS	2		
432	1	Absolutwertgeber 4096/4096 V000 Profibus DP Absolute encoder		08007759		5802-00045	T+R	1		
433	1	Absolutwertgeber 4096/4096 V000 Profibus DP Absolute encoder		08008322		CH58M*4096/4096 V000 PROFIBUS	T+R	1		
434	1	Initiator 60mm 10...65VDC, 1S Initiator		08003920		15640	TURCK	1		
435	1	Magnetfeldsensor 10...30VDC, 1NO Magnetic field initiator		08003909		46210	TURCK	1		
436	1	Lichtleiter light guide		08008003		3035214	TURCK	1		
437	1	Lichtleiterverstärker Light guide amplifier		08003915		3035349	TURCK	1		
438	1	Magnetfeldsensor 10...30VDC, 1NO Magnetic field initiator		08003912		4623502	TURCK	1		
439	1	Sensor, induktiv 2mm 10...30VDC, 1NO Initiator		08004834		4670260	TURCK	1		
440	1	Sensor, induktiv 5mm 10...30VDC, 1NO initiator		08004954		4670402	TURCK	1		
441	1	Sensor, induktiv 5mm 10...30VDC, 1NO Initiator		08004835		4670460	TURCK	1		
442	1	Sensor, induktiv 5mm 10...30VDC, 1NC Initiator		08003907		4670461	TURCK	1		
443	1	Sensor, induktiv 10mm 10...30VDC, 1NO Initiator		08004951		4670660	TURCK	1		
444	1	Magnetfeldsensor - BIM-NST-AP6X-V1131 - Magnetic field sensor		08003914		4685800	TURCK	1		
pro:		1: high failure probability 2: middle failure probability 3: small failure probability				plstno: part list number		Quotation No.: 9378.01		Commission: 4295
								Page 33 of 34		

Technische Dokumentation

Technical Documentation



HEINRICH GEORG GMBH
MASCHINENFABRIK

Kapitel 12

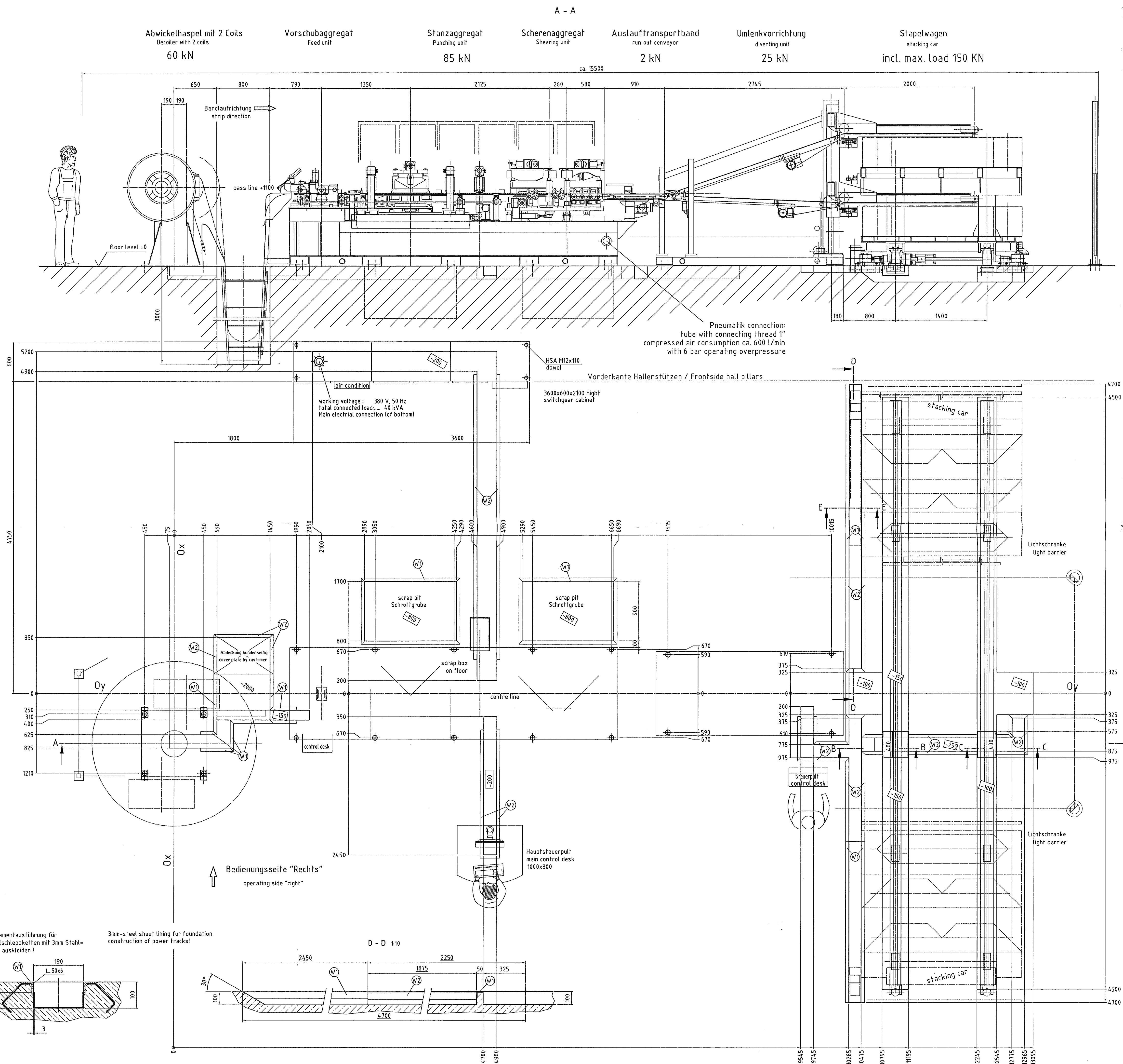
Chapter 12

Inhaltsverzeichnis

Contents

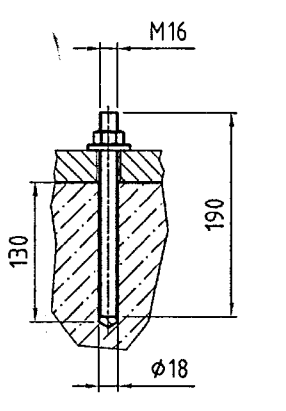
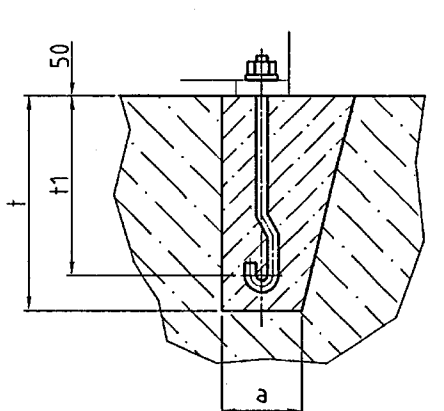
1. **Fundamentplan**
Foundation drawing

K- 0- 024137



Steinschraube DIN 529 1:10
stone bolt according to DIN 529

Verbundanker 1:5
adhesive anchor

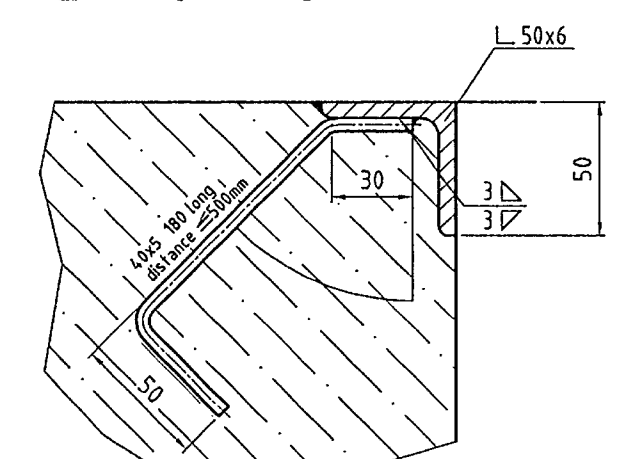


SYMBOL

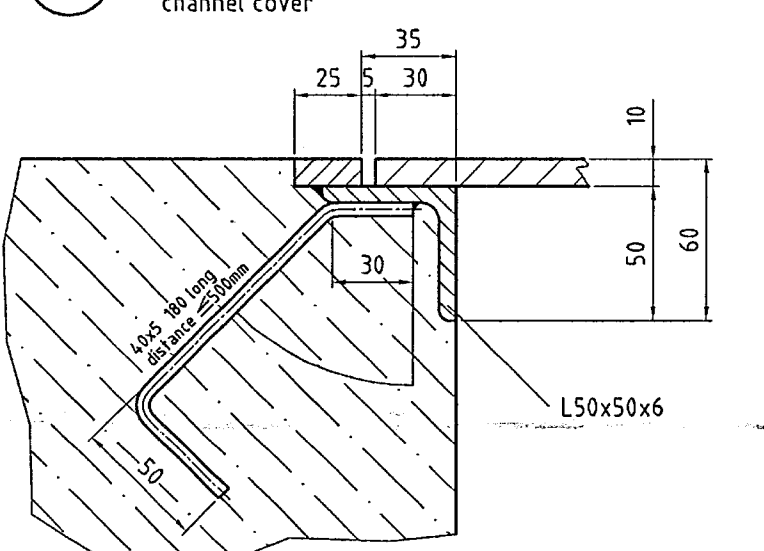
SYMBOL

t1	t	a	SYMBOL
200	270	100	M16

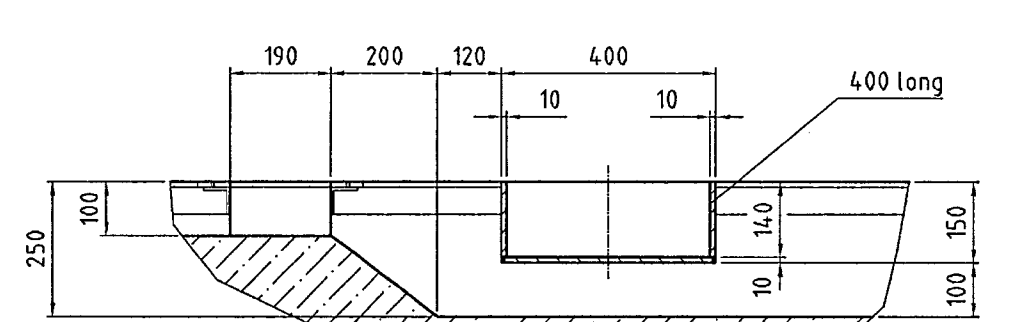
W1 Grubeneinfassung 1:2
edge bordering



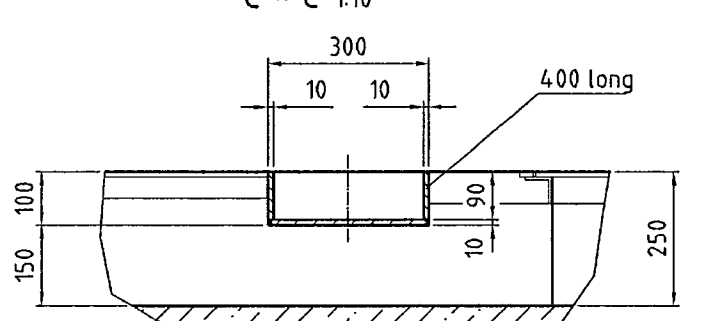
W2 Kanalabdeckung 1:2
channel cover



B - B 1:10



C - C 1:10



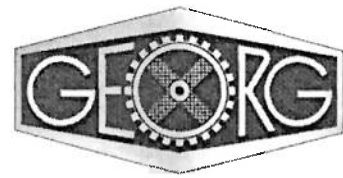
Die Fundamente sind auf gewachsenen Grund zu führen.
Die Maße beziehen sich auf Fluroberkante.
Die ausgerichteten Maschinen sind zu untergießen.
 Zement-Guß (nach dem Ausrichten der Maschine gegossen).
Die Tiefe der Fundamente richtet sich nach der Bodenbeschaffenheit.
Verankerungsteile siehe Stückliste Nr. (Lieferung: GEORG)
Kanalabdeckungen, Randleisten, Geländer, Schrottbehälter und Steigseilen
gehören nicht zum Lieferumfang der Firma GEORG.

Foundation are to be provided upto solid ground.
Dimensions refer to floor level.
Aligned machines are to be grouted.
 Concrete-cast (after machines have been aligned)
Foundation depths depend on soil conditions.
Anchoring parts see part list No. (supplier: GEORG)
Cable covers and edge bordering are not part of the
GEORG scope of supply.

Kunde / customer: IMEFY / Spain
Kom: 4295-2-05

Stand / dated: 2006-12-15

	HEINRICH GEORG GMBH MASCHINENFABRIK D - 51223 KREUZTAL	Ediz. 35.02.2006 C. Hübner	Reviz. 1:20 Art.-Nr. K-0-024137	Modifiziert: drawing no.
		Benennung Fundamentplan		



Kapitel 13

Chapter 13

Inhaltsverzeichnis

Contents

1. **Aufstellung der OP- Dokumentation**
List of OP- Documentation
2. **OP- Dokumentationen**
OP- Documentation

Seite 1- 2
Page

Technische Dokumentation

Technical Documentation



Verzeichnis der OP- Dokumentation

List of OP- Documents

HEINRICH GEORG GMBH
MASCHINENFABRIK

Kom.-Nr.: 4296 - 2 - 06

OP	Nr.	Bezeichnung
OP	- 0013	SEW • Getriebe (OP-0013-G) Drehstrommotore (OP-0013-M) SEW • gear units (OP-0013-G) AC motors (OP-0013-M)
OP	- 0043	ALPHA • Spielarme Planetengetriebe Typ SP, SP ^{High-Speed} und SPK ALPHA • low-backlash planetary gear reducers type SP, SP ^{High-Speed} and SPK
OP	- 0054	STAR • Kugelgewindetrieb STAR • Ball Screw Assemblies
OP	- 0060	DEMAG • Radblock DEMAG • Wheel Block
OP	- 0076	BRINKMANN • Planetengetriebe BRINKMANN • Planetary Gear
OP	- 0086	Zahnriemen Timing Belts
OP	- 0089	Drehverbindung Slewing Ring
OP	- 0104	KTR • Rutschnaben KTR • Slip Hubs
OP	- 0142	Rollenketten Roller Chains
OP	- 0156	SIEGLING • Transilon Transportbänder SIEGLING • Transilon conveyor belts
OP	- 0168	IMD • HYDRAULIK Hydraulikmotor IMD • HYDRAULIK Hydraulic motor
OP	- 0175	STAR • Kugelbüchsenführungen STAR • Linear Bushings and Shafts
OP	- 0183	STAR • Profilschienenführungen STAR • Monorail guidance systems
OP	- 0188	RINGSPANN • Bremszange DH 30 PA RINGSPANN • Callipers DH 30 PA
OP	- 0191	NEUGART • Planetengetriebe NEUGART • Planetary Gears

Technische Dokumentation

Technical Documentation



Verzeichnis der OP- Dokumentation

List of OP- Documents

HEINRICH GEORG GMBH
MASCHINENFABRIK

OP	-	Nr.	Bezeichnung
OP	-	0216	ZIMM • Spindelhubgetriebe ZIMM • Worm gear screw jacks
OP	-	0304	STEINEL • Präzisions- Wälzlagerführungen STEINEL • precision roller bearings
OP	-	0305	ZIMM • Elastische Kupplungen ZIMM • Flexible couplings
OP	-	0306	KABELSCHLEPP • Energieführungsketten (Stahl) KABELSCHLEPP • cable drag chains (steel)
OP	-	0308	MAYR • Präzisionskupplungen (smartflex) MAYR • precision couplings (smartflex)
OP	-	0326	HABASIT • Hochleistungsflachriemen HABASIT • high efficiency belts
OP	-	0328	DEMAG • Flachgetriebemotor - Getriebe: AU- AD- AG- AF- AM; Motor: ZNA- ZBA- ZBF DEMAG • Compact gear motor - gear: AU- AD- AG- AF- AM; motor: ZNA- ZBA- ZBF
OP	-	0330	HELICAL • Kupplungen HELICAL • Couplings
OP	-	0353	FESTO • Schlitteneinheit Typ SLT-..., SLF-... FESTO • Pneumatic sliding unit SLT-..., SLF-...
OP	-	0412	NILOS (ZILLER) Nilos-Ringe (Metallische Dichtungen für Wälzlager) NILOS (ZILLER) Nilos-Rings (Metallic seals for bearings)
OP	-	0436	IGUS • Energieführungsketten (Stahl) IGUS • Cable drag chains (steel)

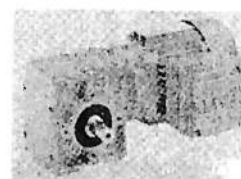
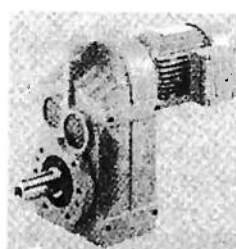


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

**Gear Units
Series R..7, F..7, K..7, S..7, Spiroplan® W**

Type

SEW¹⁾



Contents ²

	Page
1. Important Notes	2
2. Safety Notes	2
3. Installation	4
4. Assembly / Disassembly	6
4.1 Required tools / Material	6
4.2 Gear units with solid shaft	6
4.3 Shaft-mounted gear units	7
4.4 AM Motor-Adapter	14
4.5 AQ Motoradapter	16
4.6 AD Input Shaft Assembly	17
5. Startup	19
5.1 Startup of helical-worm and Spiroplan® W-Gear units	19
6. Inspection / Maintenance	20
6.1 Inspection and maintenance periods	20
6.2 Lubricant replacement schedule	21
6.3 Inspection and maintenance	21
7. Troubleshooting	22
8. Mounting Positions	22
9. Lubricants	25

¹ SEW-EURODRIVE GmbH & Co, Postfach 3023, D-76642 Bruchsal

² Source: Operating Instructions 1050 3013 / EN, Edition 04/2000

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

1. Important Notes

Safety and Warning notes

Please note the safety and warning notes in this publication!



Electrical hazard

Could result in: death or severe injuries.



Imminent danger

Could result in: death or severe injuries.



Dangerous situation

Could result in: slight or minor injuries.



Dangerous situation.

Could result in: damage of drive and operating environment.



Operating hints and useful information.



Close adherence to the Operating Instructions is the prerequisite for fault-free operation and fulfillment of any rights to claim under guarantee. Please start reading the Operating Instructions prior to operating the drive!

Keep Operating Instructions in vicinity of unit since it contains important information on service procedures.

Disposal (please observe the most current regulations):



- Dispose of housing parts, gears, shafts and anti-friction bearings of gear units as steel scrap. The same applies to gray cast iron parts unless there is separate collection service.
- Some worm gears are made of non-ferrous metals and must be disposed of accordingly.
- Collect waste oil and dispose according to local guidelines.



- **Adjust lubricant fill amounts when changing mounting position (see section 9).**
- **Please see notes in section 3.3!**

2. Safety Notes

Preliminary remarks

The following safety notes are principally concerned with the use of gear units. If using **geared motors**, please also refer to the safety notes for motors in the corresponding operating instructions.

Please also take account of the supplementary safety notes in the individual chapters of these operating instructions.

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

General information

During and after operation, geared motors and gear units have live and moving parts and their surfaces may be hot.

All work related to transport, putting into storage, setting up/mounting, connection, startup, maintenance and repair may only be carried out by qualified specialists in accordance with

- the corresponding detailed operating instructions booklet(s) and wiring diagrams
- the warning and safety signs on the gear unit/geared motor
- the specific regulations and requirements for the system and
- national/regional regulations governing safety and the prevention of accidents

Severe injuries and damage to property may result from

- incorrect use
- incorrect installation or operation
- removal of required protective covers or the housing when this is not permitted

Designated use

These geared motors/gear units are intended for industrial systems. They correspond to the applicable standards and regulations. The technical data and the information about permitted conditions are to be found on the nameplate and in the documentation. It is essential for all specified information to be observed!

Transport / putting into storage

Inspect the delivery for any damage in transit as soon as you receive the delivery. Inform the transport company immediately. It may be necessary to preclude startup.

Tighten screwed in transport lugs firmly. They are only designed for the weight of the geared motor/gear unit; do not attach any additional loads.

Use suitable, sufficiently rated handling equipment if necessary. Remove any transport fixtures prior to startup.

Installation/mounting

Refer to the instructions in sections 3 and 4!

Startup/operation

Check whether the direction of rotation is correct in **decoupled** status (also listen out for unusual grinding noises as the shaft rotates).

Secure the shaft keys for test mode without output elements. Do not render monitoring and protection equipment inoperative even for test mode.

Switch off the geared motor if in doubt whenever changes occur in relation to normal operation (e.g. increased temperature, noise, vibration). Determine the cause; contact SEW if necessary.

Inspection/maintenance

Refer to the instructions in Sec. 6!

Technical Documentation

Gear Units Series R..., F..., K..., S..., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

3. Installation

3.1 Before you begin

The drive may only be installed if

- the entries on the name plate of the drive match the mains power supply,
- the drive is undamaged (no damage caused by transport or storage) and
- it is certain that the following requirements have been fulfilled:
 - with standard gear units: ambient temperature between 0 °C and +40 °C, no oil, acid, gas, vapors, radiation, etc.,
 - with special versions: drive configured in accordance with the ambient conditions
 - with helical worm/Spiroplan® W gear units:
no large external mass moments of inertia which could exert a retrodriving load on the gear unit
(where h' (retrodriving) = $2 - 1/h < 0.5$ self-locking)

3.2 Preliminary work

The output shafts and flange surfaces must be thoroughly cleaned of anti-corrosion agents, contamination or such like (use a commercially available solvent). Do not let the solvent come into contact with the sealing lips of the oil seals - danger of damage to the material!

Please note: The service life of the lubricant in the bearings is reduced if the unit is stored for more than one year.

Gear units of the "extended storage" type have

- an oil fill suitable for the mounting position so the unit is ready to run (mineral oil). Nevertheless, check the oil level prior to startup (see "Inspection / Maintenance" on page 20).
- a higher oil level with synthetic oil. Correct the oil level prior to startup (see "Inspection / Maintenance" on page 20).

3.3 Installing the gear unit

The gear unit or geared motor must be mounted/installed in the specified mounting position on a level¹⁾, vibration-absorbing and torsionally rigid support structure (Spiroplan® gear units are not dependent on mounting position). Do not tighten housing legs and mounting flanges against each other!



Oil check screws, drain screws and breather valves have to be freely accessible!

At this point of assembly, please check that the oil filling is as prescribed for the mounting position (see "lubricant fill levels on page 49 or data on nameplate). In case of mounting position change, adjust lubricant filling quantities accordingly. Please consult our service department, if the mounting position for K gear units is changed to M5 or M6 or within these mounting positions. Please consult our service department, if the mounting position of S units in sizes S47...S97 is to be changed to mounting position M2.

Use plastic inserts (2 - 3 mm thick) if there is a risk of electrochemical corrosion between the gear unit and the driven machine (connection between different metals such as cast iron and high-grade steel)! Also fit the bolts with plastic washers! Ground the housing additionally - use the grounding bolts on the motor.

1) Maximum permitted flatness error for flange mounting (approximate values with reference to DIN ISO 1101): with • flange 120...600 mm max. error 0.2...0.5 mm

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Installation in damp areas or in the open

Gear units are supplied in corrosion-resistant versions for use in damp areas or in the open air. Any damage to the paintwork (e.g. on the breather valve) must be repaired.

Gear unit venting

All gear units are delivered by SEW ready for the mounting position with the breather valve and transport fixture fitted.

Exception:

Gear units for pivoting or inclined mounting positions and gear head units are delivered with a screw plug on the vent hole provided. Prior to startup, the customer must replace the highest screw plug by the supplied breather valve on each individual gear unit!

- With geared motors for long-term storage, pivoting or inclined mounting positions, the supplied breather valve is located in the **motor terminal box**.
- **With gear head units** that have to be vented on the input side, the breather valve is supplied in a plastic bag.
- **No** breather valve will be supplied **for gear units in enclosed design**.

Activating the breather valve

Usually the breather valve is activated in the plant. Should this not be the case, the transport fixture must be removed from the breather valve prior to the startup of the gear unit!

1. Breather valve with transport fixture
2. Remove transport fixture
3. Activate breather valve



Painting the gear unit

Cover breather valve and oil seals with protective tape prior to painting or partly repainting the drive. Remove adhesive strips when the paint job is finished.

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



HEINRICH GEORG GMBH
MASCHINENFABRIK

4. Assembly / Disassembly

4.1 Required tools / Material

- Set of spanners
- Torque wrench (for shrink discs, AQ adapters without keyway, input shaft assembly with centering shoulder)
- Mounting device
- Shims and distance rings if necessary
- Fixing devices for input and output elements
- Lubricant (e.g. NOCO® -fluid)
- Agent for securing screws, e.g. Loctite 243 (for input shaft assembly with centering shoulder)

Mounting tolerances

Shaft end	Flanges
Diametric tolerance in accordance with DIN 748 • ISO k6 for solid shafts with $d, d_1 \leq 50$ mm • ISO m6 for solid shafts with $d, d_1 > 50$ mm • ISO H7 for hollow shafts • Center hole according to DIN 332, shape DR..	Centering shoulder tolerance according to DIN 42948 • ISO j6 with $b_1 \leq 230$ mm • ISO h6 with $b_1 > 230$ mm

4.2 Gear units with solid shaft

Installation of input and output elements

Fig. 1 is an example of a mounting device for mounting couplings or hubs onto gear unit or motor shaft ends. It may be possible to dispense with the thrust bearing on the mounting device.

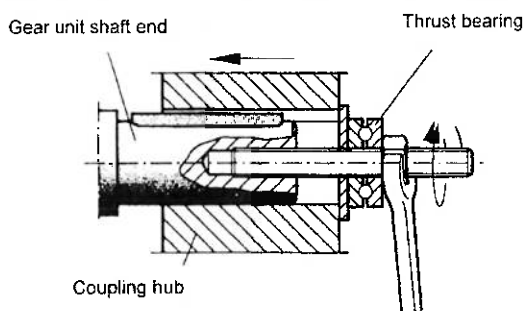


Fig. 1: Example of a mounting device

Fig. 2 displays the correct mounting arrangement of a gear wheel or sprocket to prevent excessively high overhung loads.

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



HEINRICH GEORG GMBH
MASCHINENFABRIK

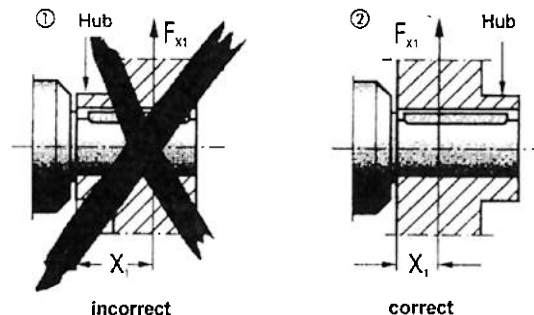


Fig. 2: Correct mounting arrangement of a gear wheel or sprocket



- Only use a mounting device (see Fig. 1) for installing input and output elements. Use the center bore and the thread on the shaft end for positioning purposes.
- **Never drive belt pulleys, couplings, pinions, etc. onto the shaft end by hitting them with a hammer (damage to bearings, housing and the shaft!).**
- **In the case of belt pulleys, make sure the belt is tensioned correctly (in accordance with the manufacturer's instructions).**
- Power transmission elements should be balanced after fitting and must not give rise to any impermissible radial or axial forces (see Fig. 2 / permitted values see the "Geared Motors" catalog).



Note:

Assembly is easier if you first apply lubricant to the output element or heat it up briefly (to 80 - 100 °C).

Installation of couplings:

Harmonize the following factors according to the manufacturer's recommendation when installing couplings:

- a) maximum and minimum clearance
- b) axial misalignment
- c) angular misalignment

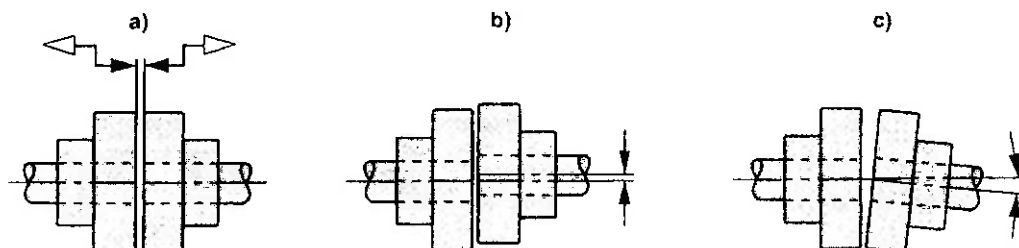


Fig. 3



Output elements such as belt pulleys, couplings, etc. must be equipped with protection against contact!

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



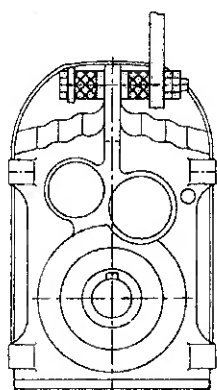
**HEINRICH GEORG GMBH
MASCHINENFABRIK**

4.3 Shaft-mounted gear units

Mounting torque arms

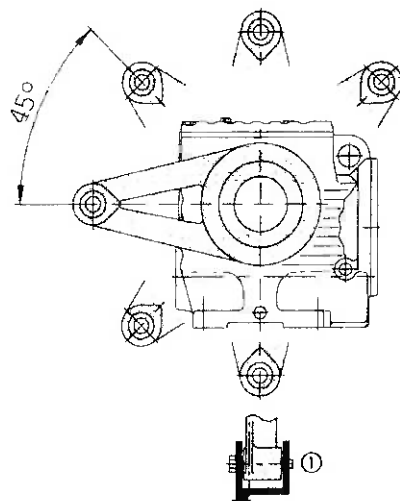
Do not strain torque arms during installation!

with parallel shaft helical gear units:



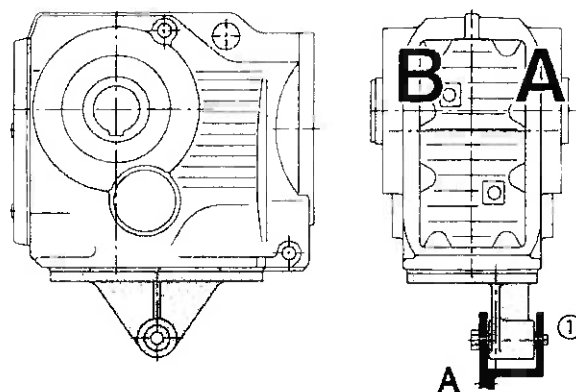
with helical-worm gear units

- bush with bearings on both ends ♦ *



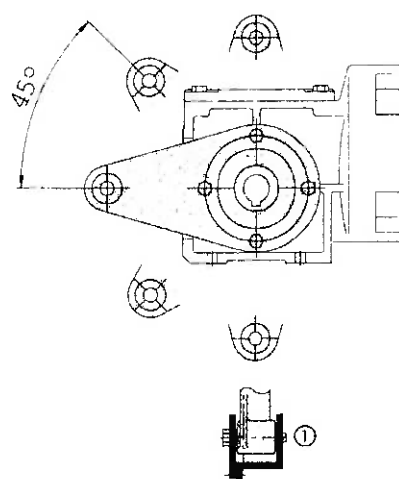
with helical-bevel gear units:

- bush with bearings on both ends ♦ *
- install connection end B as a mirror image of A



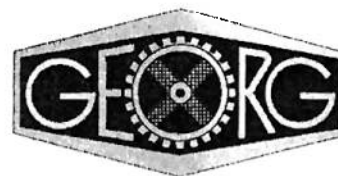
with SPIROPLAN® W gear units

- bush with bearings on both ends ♦ *



Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



HEINRICH GEORG GMBH
MASCHINENFABRIK

"Hollow shaft with keyway or splined hollow shaft" version

Installation notes

1. Apply NOCO® fluid

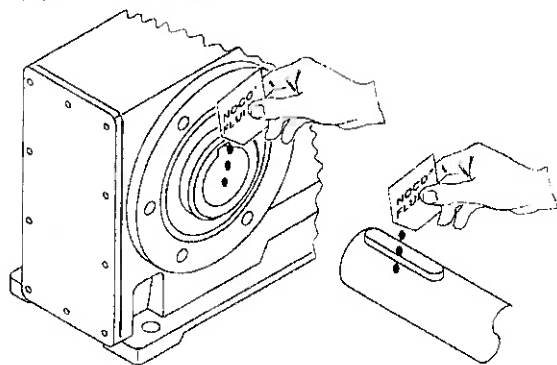


Fig. 4

2. Distribute NOCO® fluid evenly

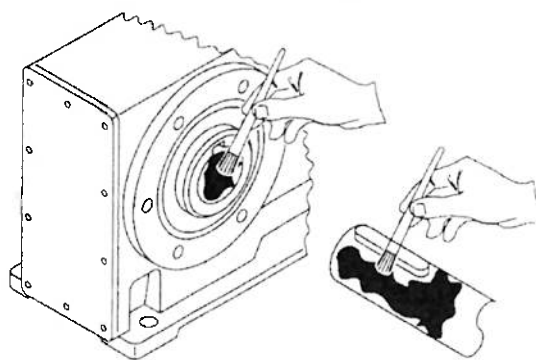
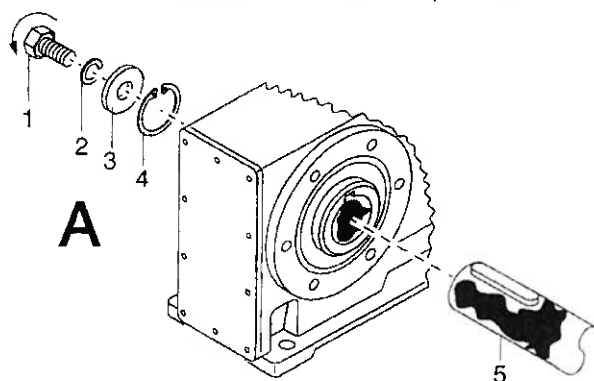


Fig. 5

3. Install shaft and secure axially
(installation will be easier by using a mounting device)

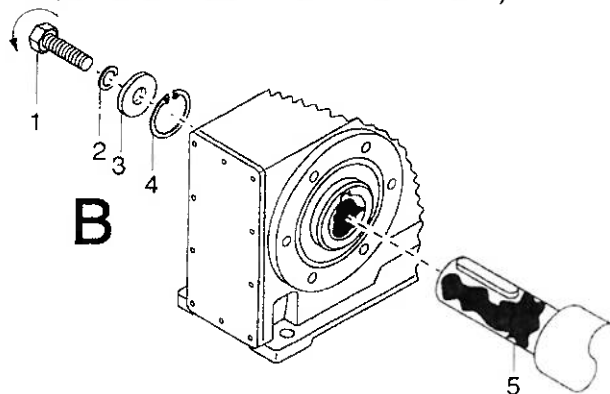
3A: Installation with standard components



- 1 short retaining screw (standard components)
- 2 lock washer
- 3 washer
- 4 circlip
- 5 customer shaft

Fig. 6: Installation with standard components

3B: Installation with SEW mounting/removal kit
(customer shaft with contact shoulder)

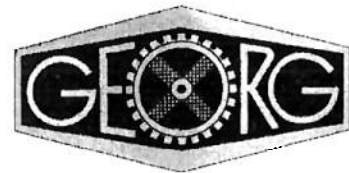


- 1 retaining screw
- 2 lock washer
- 3 washer
- 4 circlip
- 5 customer shaft **with** contact shoulder

Fig. 7: Installation with SEW mounting/removal kit (customer shaft with contact shoulder)

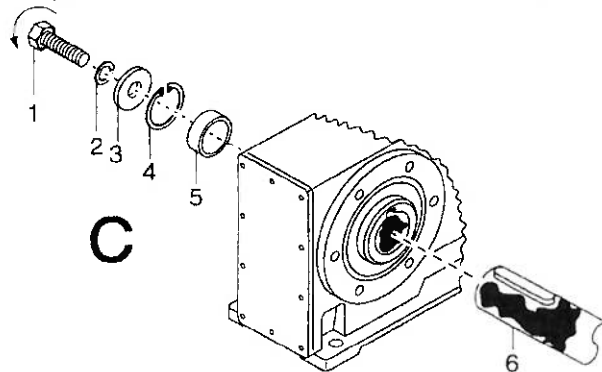
Technical Documentation

Gear Units Series R..., F..., K..., S..., Spiroplan® W



HEINRICH GEORG GMBH
MASCHINENFABRIK

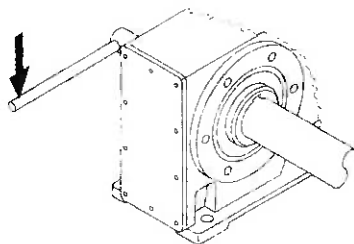
3C: Installation with SEW mounting/removal kit (customer shaft **without** contact shoulder)



- 1 retaining screw
- 2 lock washer
- 3 washer
- 4 circlip
- 5 spacer tube
- 6 customer shaft **without** contact shoulder

Fig. 8: Installation with SEW mounting/removal kit (customer shaft without contact shoulder)

4. Tighten retaining screw with corresponding torque (see Table 1).



Screw	Torque [Nm]
M6	8
M10/12	20
M16	40
M20	80
M24	200

Table 1: Torque values

Fig. 9: Tighten retaining screw



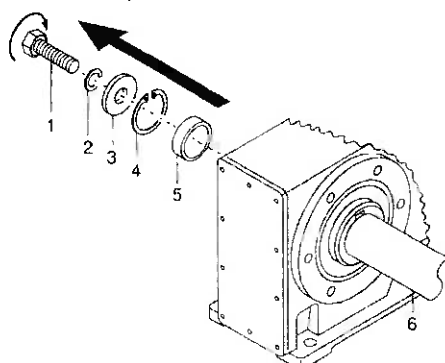
Note:

We recommend you also loosen the customer shaft between the two contact surfaces to prevent mated-surface rust!

Removal notes

The description applies only to gear units that were installed with the SEW mounting/ removal kit (see page 13, items 3B or 3C)

1. Loosen retaining screw 1.
2. Remove parts 2 to 4 and the spacer tube 5, if installed.



- 1 retaining screw
- 2 lock washer
- 3 washer
- 4 circlip
- 5 spacer tube
- 6 customer shaft

Fig. 10

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

3. Insert the removal washer 8 and the locking nut 7 from the SEW mounting/removal kit between customer shaft 6 and circlip 4.
4. Reinsert the circlip 4.
5. Replace retaining screw 1. You can now remove the gear unit from the shaft by tightening the screw.

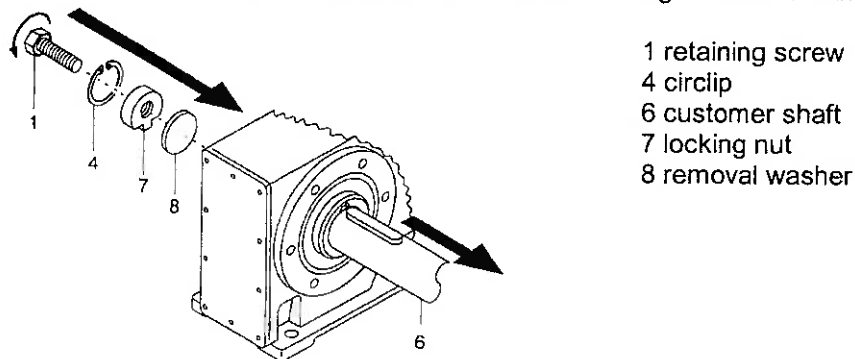


Fig. 11

SEW installation/removal kit

The SEW installation/removal kit can be ordered with the part number indicated in table 2 or be made on site according to Fig. 12.

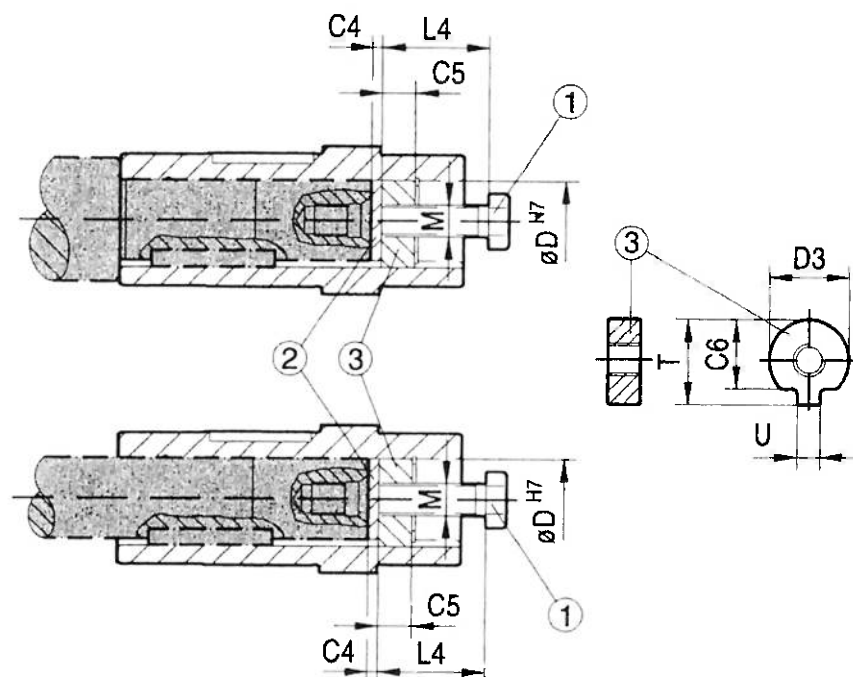


Fig. 12: SEW installation / removal kit

- 1 retaining screw
- 2 removal washer
- 3 locking nut for removal

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Type	D ^{H7} [mm]	M ¹⁾	C4 [mm]	C5 [mm]	C6 [mm]	U ^{0.5} [mm]	T ^{0.5} [mm]	D3 ^{0.5} [mm]	L4 [mm]	Part number installation/ removal kit
WA..20	18	M6	5	6	13.5	5.5	20.5	17.7	25	643 682 X
WA..20, WA..30, SA..37	20	M6	5	6	15.5	5.5	22.5	19.7	25	643 683 8
SA..47	25	M10	5	10	20	7.5	28	24.7	35	643 684 6
FA..37, KA..37, SA..47, SA..57	30	M10	5	10	25	7.5	33	29.7	35	643 685 4
FA..47, KA..47, SA..57	35	M12	5	12	29	9.5	38	34.7	45	643 686 2
FA..57, KA..57, FA..67, KA..67, SA..67	40	M16	5	12	34	11.5	41.9	39.7	50	643 687 0
SA..67	45	M16	5	12	38.5	13.5	48.5	44.7	50	643 688 9
FA..77, KA..77, SA..77	50	M16	5	12	43.5	13.5	53.5	49.7	50	643 689 7
FA..87, KA..87, SA..77, SA..87	60	M20	5	16	56	17.5	64	59.7	60	643 690 0
FA..97, KA..97, SA..87, SA..97	70	M20	5	16	65.5	19.5	74.5	69.7	60	643 691 9
FA..107, KA..107, SA..97	90	M24	5	20	80	24.5	95	89.7	70	643 692 7
FA..127, KA..127	100	M24	5	20	89	27.5	106	99.7	70	643 693 5
FA..157, KA..157	120	M24	5	20	107	31	127	119.7	70	643 694 3

1) retaining screw

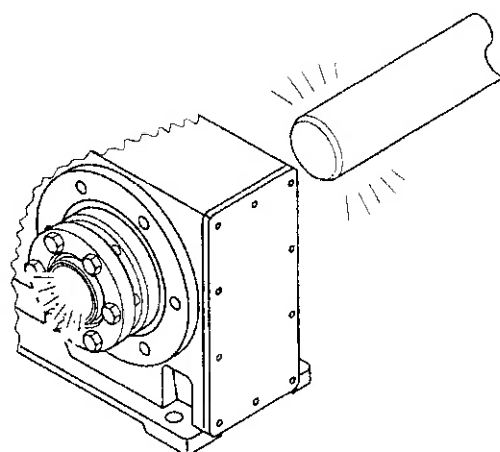
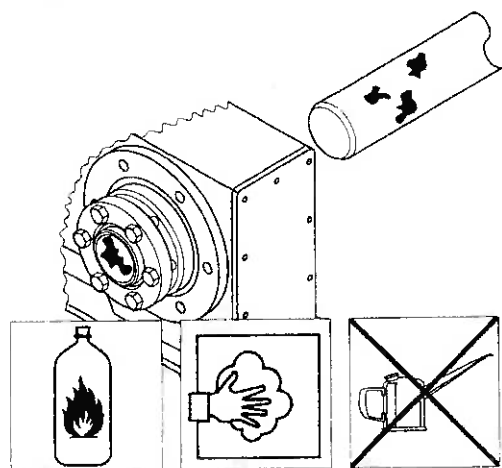
Table 2

"Hollow shaft with shrink disc" type

Installation notes

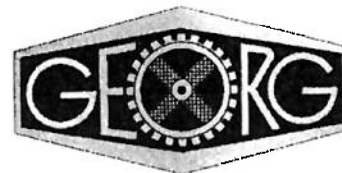
- Do not tighten locking screws unless shaft is installed - the hollow shaft could be deformed!
- The outside surface of the hollow shaft should be covered with grease in the area of the shrink disc seat in order to provide protection against corrosion!

- Thoroughly remove grease from hollow shaft bore
- Degreased hollow shaft/input shaft.



Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W

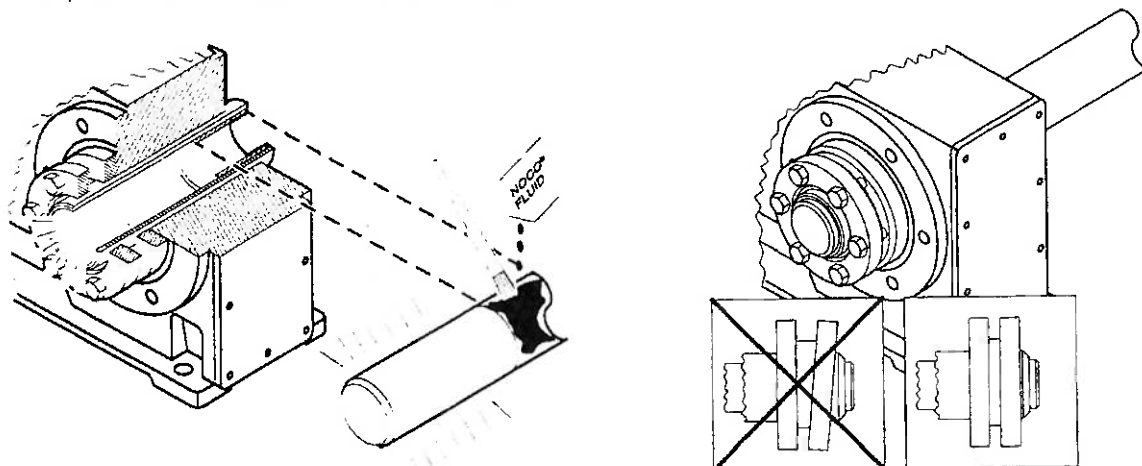


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

3. starting with gear unit size 107

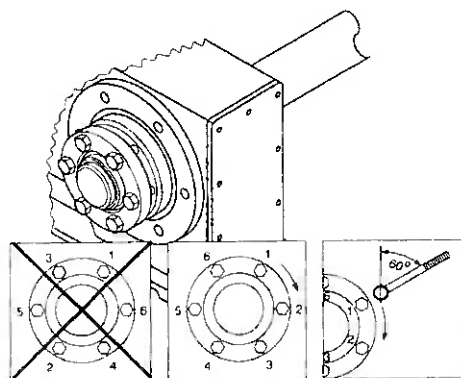
Apply NOCO® fluid only in the bushing area onto the input shaft¹⁾, smaller sizes remain untreated.

4. Install shaft, making sure that the locking collars of the shrink disc are equally spaced.



1) The clamping area of the shrink disc must always be kept free from grease! Therefore, never apply NOCO® fluid directly onto the bushing, since the paste can enter the clamping area of the shrink disc when installing the input shaft.

5. Tighten the locking screws by working round several times from one bolt to the next (not in diametrically opposite sequence). See table on right for tightening torques.



Gear unit type			Screw	Nm	• max. ¹⁾
		SH37	M5	5	60°
KH37...77	FH37..77	SH47..77	M6	12	
KH87/97	FH87/97	SH87	M8	30	
KH107	FH107		M10	59	
KH127/157	FH127		M12	100	
KH167/187			M16	250	

1) maximum tightening angle per cycle

Fig. 13

Notes on removal of shrink disc

- Unscrew the locking screws evenly one after the other.
To avoid tilting and jamming of the locking collars, each locking screw may only be unscrewed by about one quarter turn in the initial cycle. Do not fully unscrew the locking screws!
- Remove the shaft or pull the hub off the shaft (it is necessary to remove any rust which may have formed between the hub and the end of the shaft).
- Pull the shrink disc off the hub.

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



HEINRICH GEORG GMBH
MASCHINENFABRIK



Caution! There is a risk of injuries if the shrink disc is not removed correctly!

Cleaning and lubricating the shrink disc

There is no need to take apart and re-grease disassembled shrink discs before they are screwed back on. The shrink disc only needs to be cleaned and re-greased if it is contaminated. Use one of the following solid lubricants for the tapered surfaces.

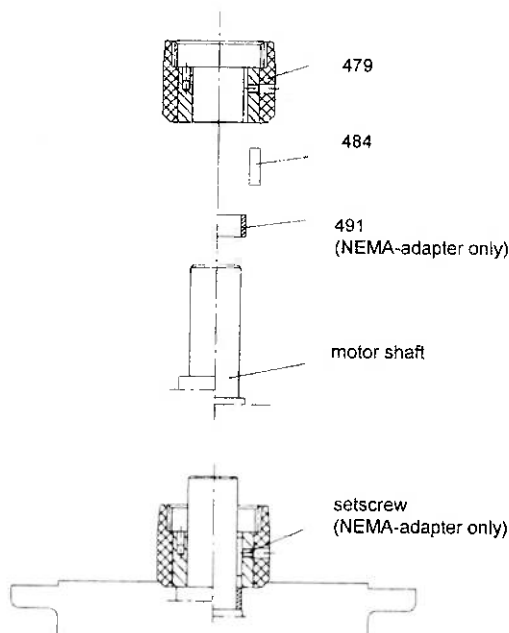
Lubricant (Mo S2)	Available as
Molykote 321 (Gleitlack)	spray
Molykote Spray (Pulver-Spray)	spray
Molykote G Rapid	spray oder paste
Aemasol MO 19P	spray oder paste
Aemasol	spray
DIO-sétral 57 N (Gleitlack)	

Table 3

Grease the locking screws with a multipurpose grease such as Molykote BR 2 or similar.

4.4 AM Motor-Adapter

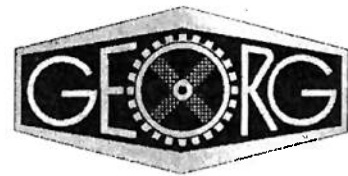
Mounting the coupling (IEC-adapter AM63-225/ NEMA-adapter AM56 - 365)¹⁾



¹⁾ The coupling in this size is not slip-proof. For hoists and elevators, please consult our technical department.

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

1. Clean motor shaft and flange surfaces of the motor and adapter.
2. **IEC adapter:** For sizes AM90/100/112/132../225, remove the key from the motor shaft and replace with the delivered key (484).
NEMA adapter: Remove key from motor shaft (**except for size AM254/256**), slip spacer (491) onto motor shaft and insert the delivered key (484).
3. Warm the steel portion of the coupling half (479) to approx. 80 °C, slip coupling half onto the motor shaft and, where necessary, set coupling via steel portion.
IEC adapter:
Drive in as far as shoulder of motor shaft.
NEMA adapter: Drive in as far as spacer.



Caution: The plastic cover of the coupling must under no circumstances be warmed to over 80 °C during assembly or be used for pressing onto the motor shaft.

4. **NEMA adapter:** Secure key and coupling half on motor shaft with setscrew.
5. Apply light coat of lubricant inside gearing of the coupling half (where not already lubricated in factory).
6. Mount motor onto adapter; the gearing of the coupling half and the geared adapter shaft must enmesh.

Removal of coupling (IEC-Adapter AM63 - 225 / NEMA-Adapter AM56 - 365)

For removal of the IEC size 132 and NEMA size 213/215 couplings, there are two removal threads (see table 4) which can be used to remove the coupling from the motor shaft.



If the coupling half is to be used again, the plastic cover must not under any circumstances be used for removal.

IEC adapter	NEMA adapter	Removal thread	Thread depth [mm]
AM132S/M/ML	AM213/215	M6	10
AM160/AM180	AM254 – AM286	M8	12
AM200/AM225	AM324 – AM365	M10	15

Table 4: Removal thread

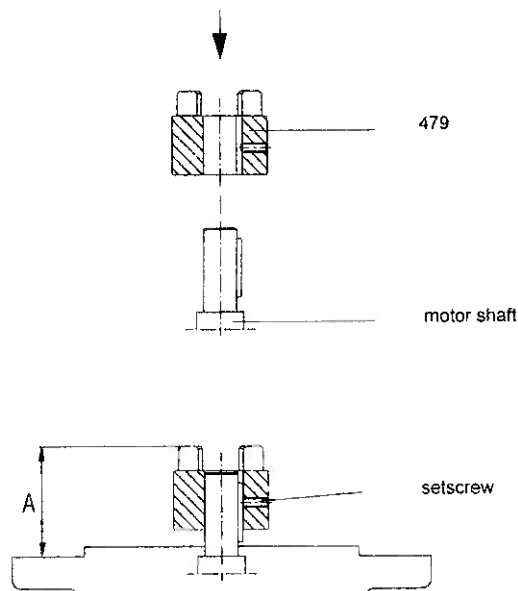
Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



HEINRICH GEORG GMBH
MASCHINENFABRIK

Installation of AM coupling adapter (IEC adapter AM250/AM280)



1. Clean motor shaft and flange surfaces of the motor and adapter.
2. Remove key from motor shaft and replace with delivered key (**size AM280 only**).
3. Warm coupling half (**479**) (80 °C...100 °C) and slip onto motor shaft. (**A = 139 mm**).
4. Secure coupling half with setscrew and check position (**distance "A"**).
5. Mount motor onto adapter; the jaws of both coupling halves must enmesh.

4.5 AQ Motor Adapter

Installing the coupling

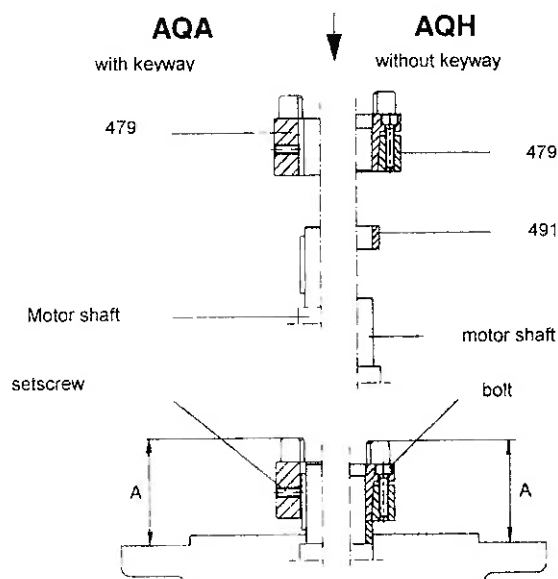


Fig. 6

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



HEINRICH GEORG GMBH
MASCHINENFABRIK

1. Clean motor shaft and flange surfaces of motor and adapter.
2. **Design AQH:** Slide spacer (491) onto motor shaft.
3. **Design AQH:** Loosen screws of coupling half (479) and conical connection.
4. Warm coupling half (80 °C - 100 °C) and slide onto motor shaft.
Design AQH: Push as far as spacer (491).
Design AQA: Push up to distance "A" (see Table 5)
5. **Design AQH:** Tighten screws in coupling half evenly by working round several times in sequence until all screws have TT torque given in table.
Design AQA: Secure coupling half with setscrew.
6. Check position of the coupling (distance "A" see Table 5).
Mount motor onto adapter; the jaws of both coupling halves must enmesh. The insertion force required to join the coupling halves is suspended after final assembly thereby causing danger of axial load on the adjacent bearing.

Setting dimensions, tightening torques

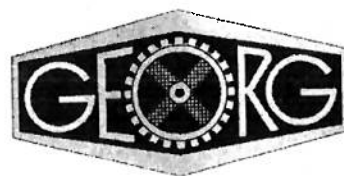
Type	Coupling size	Distance "A" [mm]	Bolts DIN 912 ¹⁾	Tightening torque TT ¹⁾ [Nm]
AQA /AQH 80 /1/2/3	19/24	44,5	M4	3
AQA /AQH 100 /1/2		39		
AQA /AQH 100 /3/4		53		
AQA /AQH 115 /1/2		62		
AQA /AQH 115 /3	24/28	62	M5	6
AQA /AQH 140 /1/2	28/38	62	M5	6
AQA /AQH 140 /3		74,5		
AQA /AQH 190 /1/2	38/45	76,5	M6	10
AQA /AQH 190 /3		100		

1) only version without keyway (AQH)

Table 5: Setting dimensions, tightening torques

Technical Documentation

Gear Units Series R..., F..., K..., S..., Spiroplan® W



HEINRICH GEORG GMBH
MASCHINENFABRIK

4.6 AD Input Shaft Assembly

See section "Installation of input and output elements" on page 9.

Version with motor mounting platform AD../P

Installation of motor and adjustment of motor mounting platform:

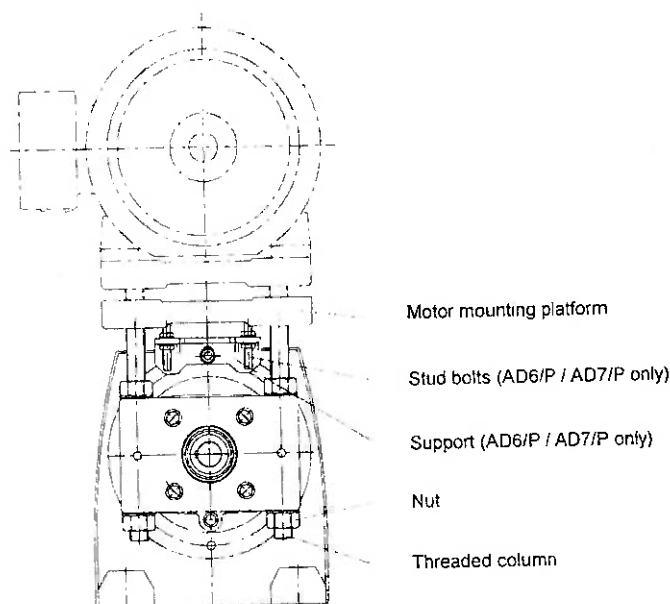


Fig. 7

1. Adjust motor mounting platform to required mounting position by evenly tightening the adjusting nuts. For the lowest possible adjustment position of helical gear units, remove eyebolts/transport lugs if there are any; touch up any damage to protective coating.
2. Align motor on motor mounting plate (shaft extensions must be aligned) and secure it.
3. Mount drive elements onto input shaft extension and install motor shaft, align these to each other; correct motor position where necessary.
4. Install traction mechanisms (V-belts, chains, ...) and tighten by evenly adjusting the motor mounting plate. The motor mounting plate and columns must not be tightened against each other.
5. Secure threaded columns with the nuts not used for adjustment purposes.

AD6/P and AD7/P only:

Loosen nuts and stud bolts before readjustment so that the stud bolts can be moved freely in the support axially. Tighten nuts after the final position has been accomplished. Do not adjust the motor mounting platform by using the support.

AD../ZR design with centering shoulder

Installing components on the input shaft assembly with centering shoulder

1. The bolts must be available in the correct length to fasten the installed components.
The length of the new bolts results from:

$$l = t + a$$

- t** screw depth
(see table)
- a** thickness of installed component
- s** fastening thread
(see table)

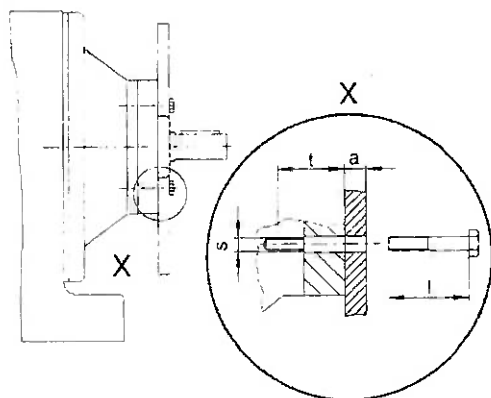


Fig. 2

The calculated screw length must be rounded down to the next smallest standard length.

3. Remove retaining screws from the centering shoulder.
4. Clean contact surfaces and centering shoulder.
5. Clean the threads of the new screws and apply an adhesive agent (e.g. Loctite 243) to the first turns on the screw.
6. Set component onto centering shoulder and fasten retaining screws with the indicated tightening torque TT (see table).

Type	Depth of screw t	Fastening thread s	Tightening torque TT [Nm]
AD2/ZR	25,5	M8	25
AD3/ZR	31,5	M10	48
AD4/ZR	36	M12	86
AD5/ZR	44	M12	86
AD6/ZR	48,5	M16	210
AD7/ZR	49	M20	410
AD8/ZR	42	M12	86

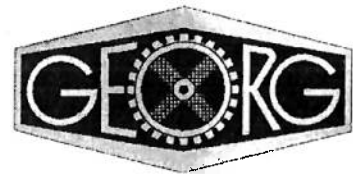
Table 6

AD../RS version with backstop

Before installation or startup, the direction of rotation of the drive must be checked. In case of the wrong direction of rotation, please consult our technical department. The backstop is maintenance-free.

Technical Documentation

Gear Units Series R..., F..., K..., S..., Spiroplan® W



HEINRICH GEORG GMBH
MASCHINENFABRIK

5. Startup

5.1 Startup of helical-worm and Spiroplan® W gear units



Please note: The direction of rotation of the output shaft in the S..7 helical-worm gear unit series has been changed from CW to CCW; this is different to the S..2 series. To change direction of rotation: Switch two motor feeder cables.

Running-in period

Spiroplan® and helical-worm gear units require a running-in period of at least 24 hours before reaching their maximum efficiency. A separate running-in period for each direction of rotation is required if the gear unit is operated in both directions of rotation. Table 7 shows the average performance reduction (approximate values) during the running-in period.

	Helical-worm		Spiroplan®	
	power reduction	i-range	power reduction	i-range
1 start	12%	50...280	15%	40...75
2 starts	6%	20...75	10%	20...30
3 starts	3%	20...90	8%	15
4 starts	-	-	8%	10
5 starts	3%	6...25	5%	8
6 starts	2%	7...25	-	-

Table 7: Performance reduction in helical-worm and Spiroplan® gear units

6. Inspection / Maintenance

6.1 Inspection and maintenance periods

Time period	What to do?	• Section
every 3000 machine hours at least every six months	check oil	See section 6.3
depending on operating instructions (• Fig. 7) at least every three years	change mineral oil	
	replace bearing (anti.-fr.) grease	
depending on operating conditions (• Fig. 7) at least every five years	change synthetic oil	
	replace bearing (anti-fr.) grease	
R/RF 17/27 and Spiroplan® gear units are lubricated for life and require no maintenance		

Table 8: Inspection and maintenance periods



6.2 Lubricant replacement schedule

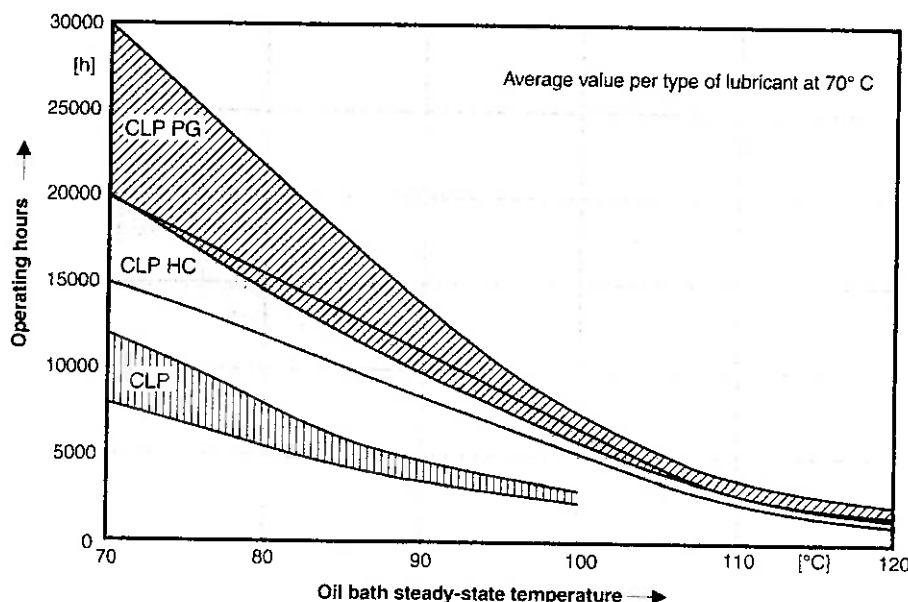


Fig. 7: Oil change intervals for standard gear units under normal environmental conditions. Change the oil more frequently when using special versions subject to more severe/aggressive environmental conditions!

6.3 Inspection and maintenance

Do not mix synthetic lubricants with each other nor with mineral lubricants! Oil is the standard lubricant. **The position of the oil level plug, oil drain plug and the breather valve is dependent on the mounting position. The respective position can be determined in the mounting position diagrams (see section 8).**

Checking the oil level



1. **De-energize the drive and secure against unintentional switch-on!**
Wait until the gear unit has cooled down - Danger of burns!
2. For modified mounting positions, refer to Section 3.3!
3. For gear units with oil level plug: - remove oil level plug, check fill level and correct if necessary
- install oil level plug

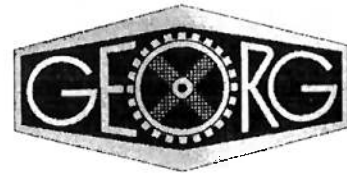
Checking the oil



1. **De-energize the drive and secure against unintentional switch-on!**
Wait until the gear unit has cooled down - Danger of burns!
2. Remove some oil from the oil drain plug.
3. Check the oil consistency
 - viscosity
 - if the oil is visibly contaminated, it is recommended to change it sooner than recommended by the maintenance intervals under point 6.1.
4. For gear units with an oil level plug:
 - remove oil level plug, check fill level and correct if necessary
 - install oil level plug

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Changing the oil



Only change the oil when the gear unit is at operating temperature.

1. **De-energize the drive and secure against unintentional switch-on!**

Wait until the gear unit has cooled down - Danger of burns!

Note: Gear unit must still be warm, otherwise the high viscosity of excessively cold oil will make it harder to drain the oil correctly.

2. Place a container underneath the oil drain plug
3. Remove oil level plug, breather plug/valve and oil drain plug
4. Drain oil completely
5. Install oil drain plug
6. Fill new oil of the same type through the breather hole, otherwise consult our service department
 - amount in accordance with the mounting position (see section 8) or data on nameplate
 - check at the oil level plug
7. Install oil level plug
8. Install breather plug/valve

7. Troubleshooting...

Problem	Possible cause	Solution
Unusual, regular running noise	a) Meshing/grinding noise: Bearing damage b) Knocking noise Irregularity in the gearing	1. Check the oil (• section 6.3) 2. Contact customer service
Unusual, irregular running noise	Foreign bodies in the oil	1. Check the oil (• section 6.3) 2. Stop the drive, contact customer service
Oil leaking ¹⁾ • from the motor flange • from the motor oil seal • from the gear unit flange • from the output end oil seal	a) Seal defective b) Gear unit not vented	a) Call customer service b) Vent the gear unit (• section 8)
• Oil leaking from the breather valve	a) Too much oil b) Breather valve not fitted properly c) Frequent cold starts (oil foams) and/or high oil level	a) Correct the oil level (• section 6.3) b) Fit the breather valve correctly (• section 8)
Output shaft is not rotating although the motor is running or the input shaft is rotating	Shaft hub connection in the gearbox interrupted	Send in the gear unit/geared motor for repair

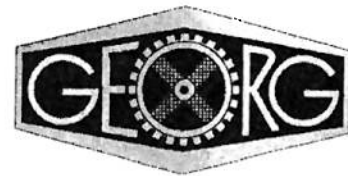
- 1) It is normal for small amounts of oil/grease to leak out of the oil seal during the **running-in phase (24 hour running time)**.

Please have the following information to hand if you require the assistance of our customer service:

- Nameplate data (complete)
- Type and extent of the fault
- Time and circumstances of the fault
- Possible cause

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W

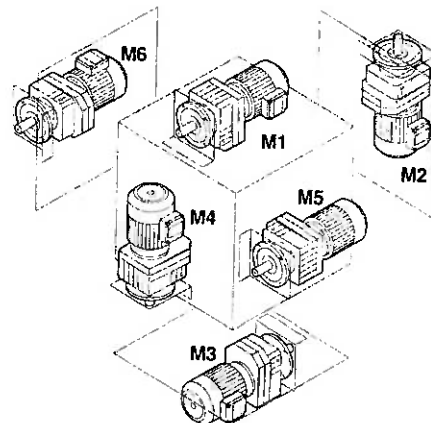
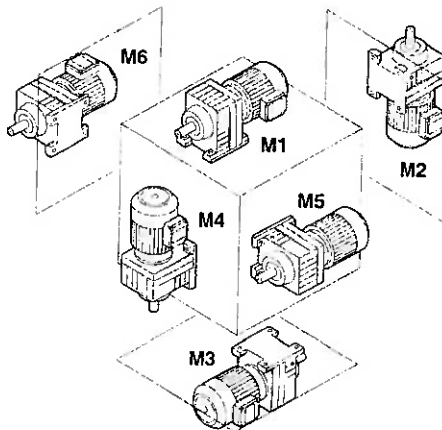


HEINRICH GEORG GMBH
MASCHINENFABRIK

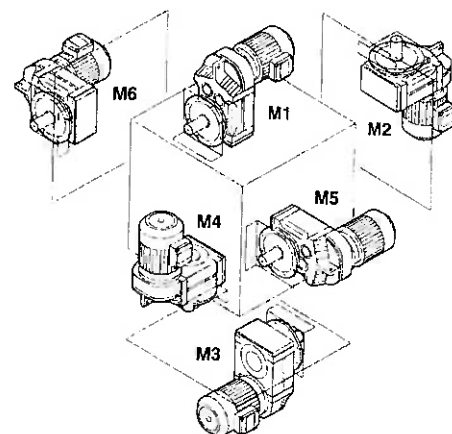
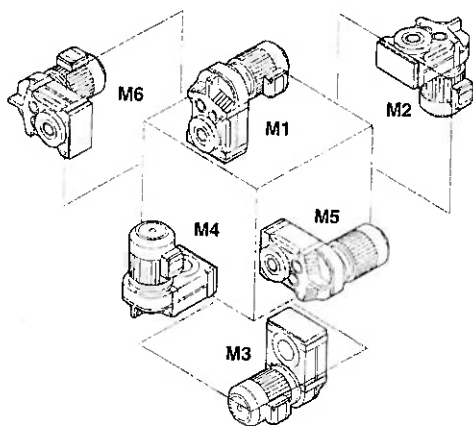
8. Mounting Positions

8.1 General comments on mounting positions

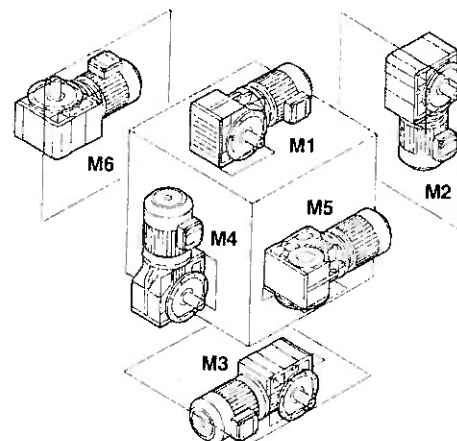
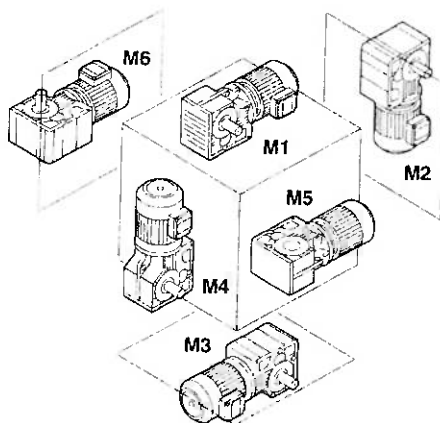
Mounting position designation: SEW has six mounting positions M1...M6 for geared motors. The following illustration indicates the spatial arrangement of the gear unit for mounting positions M1...M6.



Helical Geared Motors



Parallel Shaft Helical Geared Motors

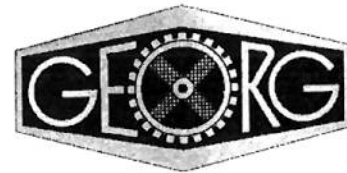


Right-angle Geared Motors

Fig. 9: Mounting positions M1...M6

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Comparison old/new

The following table indicates in which way the old SEW mounting position designations are integrated into the new system:

Gear Unit	New mounting position designation					
	M1	M2	M3	M4	M5	M6
R, RX	B3	V6	B8	V5	B6	B7
R..F	B35	V36	B85	V15	B65	B75
RF, RXF	B5	V3	B5II	V1	B5I	B5III
F FA..B FH..B FV..B	B6	V6	B6II	V5	B3 B8	B3I B8I
FF	B5	V3	B5II	V1	B5I	B5III
FA FHF FVF FH FAZ FV FHZ FAF FVZ	H1	H6	H2	H5	H4	H3
K KA..B KH..B KV..B	B3 B6I	B6 B8I	B8	B3I B6II	V5 V5I	V6 V6I
K/KH 166/167 186/187	B3 B5/I			B3I B5II	V1/ V15	V1/I
KF	B5I B3/B5I	B5 B65	B5III B8/B5III	B5II B6/B5II	V1 V15	V1I V6/V1I
KA KHF KVF KH KAZ KV KHZ KAF KVZ	H1	H4	H2	H3	H5	H6
S	B3 B6I B8II (S37 only)	B6 B8I	B8 B3II	B3I B6II	V5 V5I	V6 V6I V5II (S37 only)
SF	B5I	B5	B5III	B5II	V1	V1I
SA SH SAF SHF SAZ SHZ	H1	H4	H2	H3	H5	H6

Reading example

A KA77B helical-bevel geared motor with the old mounting position designation B3I or B6II, is now referred to with mounting position designation M4.



9. Lubricants

9.1 Lubricant fill quantities

The fill quantities are **recommended values**. The specific values vary depending on number of stages and ratio. Pay close attention to the **oil level plug to serve as indicator for the correct amount of oil**. The following tables list the recommended values for the lubricant fill quantities in reference to mounting positions M1...M6.

Helical (R-) gear units

Gear unit type	Fill quantity in liters					
	M1 ¹⁾	M2 ¹⁾	M3	M4	M5	M6
R17/R17F	0.25	0.6	0.35	0.6	0.35	0.35
R27/R27F	0.25/0.4	0.7	0.4	0.7	0.4	0.4
R37/R37F	0.3/1	0.9	1	1.1	0.8	1
R47/R47F	0.7/1.5	1.6	1.5	1.7	1.5	1.5
R57/R57F	0.8/1.7	1.9	1.7	2.1	1.7	1.7
R67/R67F	1.1/2.3	2.6/3.5	2.8	3.2	1.8	2
R77/R77F	1.2/3	3.8/4.3	3.6	4.3	2.5	3.4
R87/R87F	2.3/6	6.7/8.4	7.2	7.7	6.3	6.5
R97	4.6/9.8	11.7/14	11.7	13.4	11.3	11.7
R107	6/13.7	16.3	16.9	19.2	13.2	15.9
R137	10/25	28	29.5	31.5	25	25
R147	15.4/40	46.5	48	52	39.5	41
R167	27/70	82	78	88	66	69

Gear unit type	Fill quantity in liters					
	M1 ¹⁾	M2 ¹⁾	M3	M4	M5	M6
RF17	0.25	0.6	0.35	0.6	0.35	0.35
RF27	0.25/0.4	0.7	0.4	0.7	0.4	0.4
RF37	0.4/1	0.9	1	1.1	0.8	1
RF47	0.7/1.5	1.6	1.5	1.7	1.5	1.5
RF57	0.8/1.7	1.8	1.7	2	1.7	1.7
RF67	1.2/2.5	2.7/3.6	2.7	3.1	1.9	2.1
RF77	1.2/2.6	3.8/4.1	3.3	4.1	2.4	3
RF87	2.4/6	6.8/7.9	7.1	7.7	6.3	6.4
RF97	5.1/10.2	11.9/14	11.2	14	11.2	11.8
RF107	6.3/14.9	15.9	17	19.2	13.1	15.9
RF137	9.5/25	27	29	32.5	25	25
RF147	16.4/42	47	48	52	42	42
RF167	26/70	82	78	88	65	71

1) The larger gear unit in multi-stage gear units must be filled with the larger oil quantity.

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
RX57	0.6	0.8	1.3	1.3	0.9	0.9
RX67	0.8	0.8	1.7	1.9	1.1	1.1
RX77	1.1	1.5	2.6	2.7	1.6	1.6
RX87	1.7	2.5	4.8	4.8	2.9	2.9
RX97	2.1	3.4	7.4	7	4.8	4.8
RX107	3.9	5.6	11.6	11.9	7.7	7.7

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
RXF57	0.5	0.8	1.1	1.1	0.7	0.7
RXF67	0.7	0.8	1.5	1.7	1	1
RXF77	0.9	1.5	2.4	2.5	1.6	1.6
RXF87	1.6	2.5	4.9	4.7	2.9	2.9
RXF97	2.1	3.6	7.1	7	4.8	4.8
RXF107	3.1	5.9	11.2	10.5	7.2	7.2

Helical-bevel (K-) gear units

K., KA..B, KH..B, KV..B

Gear unit type	Fill quantity in Liters					
	M1	M2	M3	M4	M5	M6
K..37	0.5	1	1	1.3	1	1
K..47	0.8	1.3	1.5	2	1.6	1.6
K..57	1.2	2.3	2.5	3	2.6	2.4
K..67	1.1	2.4	2.6	3.4	2.6	2.6
K..77	2.2	4.1	4.4	5.9	4.2	4.4
K..87	3.7	8	8.7	10.9	7.8	8
K..97	7	14	15.7	20	15.7	15.5
K..107	10	21	25.5	33.5	24	24
K..127	21	41.5	44	54	40	41
K..157	31	62	65	90	58	62
K..167	35	100	100	125	85	85
K..187	60	170	170	205	130	130

KF..:

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
KF37	0.5	1.1	1.1	1.5	1	1
KF47	0.8	1.3	1.7	2.2	1.6	1.6
KF57	1.3	2.3	2.7	3	2.9	2.7
KF67	1.1	2.4	2.8	3.6	2.7	2.7
KF77	2.1	4.1	4.4	6	4.5	4.5
KF87	3.7	8.2	9	11.9	8.4	8.4
KF97	7	14.7	17.3	21.5	15.7	16.5
KF107	10	22	26	35	25	25
KF127	21	41.5	46	55	41	41
KF157	31	66	69	92	62	62

KA., KH., KV., KAF., KVF., KAZ., KHZ., KVZ.:

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K..37	0.5	1	1	1.4	1	1
K..47	0.8	1.3	1.6	2.1	1.6	1.6
K..57	1.3	2.3	2.7	3	2.9	2.7
K..67	1.1	2.4	2.7	3.6	2.6	2.6
K..77	2.1	4.1	4.6	6	4.4	4.4
K..87	3.7	8.2	8.8	11.1	8	8
K..97	7	14.7	15.7	20	15.7	15.7
K..107	10	20.5	24	32	24	24
K..127	21	41.5	43	52	40	40
K..157	31	66	67	87	62	62
KH167	35	100	100	125	85	85
KH187	60	170	170	205	130	130

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Parallel shaft helical (F-) gear units

F., FA..B, FH..B, FV..B:

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
F..37	1	1.2	0.7	1.2	1	1.1
F..47	1.5	1.8	1.1	1.9	1.5	1.7
F..57	2.6	3.7	2.1	3.5	2.8	2.9
F..67	2.7	3.8	1.9	3.8	2.9	3.2
F..77	5	7.3	4.3	8	6	6.3
F..87	10	13.0	7.7	13.8	10.8	11
F..97	18.5	22.5	12.6	25.2	18.5	20
F..107	24.5	32	19.5	37.5	27	27
F..127	40.5	55	34	61	46.5	47
F..157	69	104	63	105	86	78

FF..:

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
FF37	1	1.2	0.7	1.3	1	1.1
FF47	1.6	1.9	1.1	1.9	1.5	1.7
FF57	2.8	3.8	2.1	3.7	2.9	3
FF67	2.7	3.8	1.9	3.8	2.9	3.2
FF77	5.1	7.3	4.3	8.1	6	6.3
FF87	10.3	13.2	7.8	14.1	11	11.2
FF97	19	22.5	12.6	25.5	18.9	20.5
FF107	25.5	32	19.5	38.5	27.5	28
FF127	41.5	56	34	63	46.5	49
FF157	72	105	64	106	87	79

FA., FH., FV., FAF., FHF., FVF., FAZ., FHZ., FVZ..:

Gear unit type	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
F..37	1	1.2	0.7	1.2	1	1.1
F..47	1.5	1.8	1.1	1.9	1.5	1.7
F..57	2.7	3.8	2.1	3.6	2.9	3
F..67	2.7	3.8	1.9	3.8	2.9	3.2
F..77	5	7.3	4.3	8	6	6.3
F..87	10	13.0	7.7	13.8	10.8	11
F..97	18.5	22.5	12.6	25.0	18.5	20
F..107	24.5	32	19.5	37.5	27	27
F..127	39	55	34	61	45	46.5
F..157	68	103	62	104	85	77

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Spiroplan® (W-) gear units

All Spiroplan® gear units **always** have the same fill quantity independent of the mounting position:

Gear unit type	Fill quantity in liters (independent of mounting position)
W..10	0.16
W..20	0.26
W..30	0.5

Helical worm (S-) gear units

S..:

Gear unit type	Fill quantity in liters					
	M1	M2	M3 ¹⁾	M4	M5	M6
S37	0.25	0.4	0.5	0.6	0.4	0.4
S47	0.35	0.8	0.7	1.1	0.8	0.8
S57	0.5	1.2	1	1.5	1.3	1.3
S67	1	2.0	2.2/3.1	3.2	2.6	2.6
S77	1.9	4.2	3.7/5.4	6	4.4	4.4
S87	3.3	8.1	6.9/10.4	12	8.4	8.4
S97	6.8	15	13.4/18	22.5	17	17

¹⁾ The larger gear unit in multi-stage gear units must be filled with the larger oil quantity.

SF..:

Gear unit type	Fill quantity in liters					
	M1	M2	M3 ¹⁾	M4	M5	M6
SF37	0.25	0.4	0.5	0.6	0.4	0.4
SF47	0.4	0.9	0.9	1.2	1.0	1
SF57	0.5	1.2	1	1.6	1.4	1.4
SF67	1	2.2	2.3/3	3.2	2.7	2.7
SF77	1.9	4.1	3.9/5.8	6.5	4.9	4.9
SF87	3.8	8	7.1/10.1	12	9.1	9.1
SF97	7.4	15	13.8/18.8	23.6	18	18

¹⁾ The larger gear unit in multi-stage gear units must be filled with the larger oil quantity.

SA., SH., SAF., SHF., SAZ., SHZ.:

Gear unit type	Fill quantity in liters					
	M1	M2	M3 ¹⁾	M4	M5	M6
S..37	0.25	0.4	0.5	0.6	0.4	0.4
S..47	0.4	0.8	0.7	1.1	0.8	0.8
S..57	0.5	1.1	1	1.6	1.2	1.2
S..67	1	2	1.8/2.6	2.9	2.5	2.5
S..77	1.8	3.9	3.6/5	5.9	4.5	4.5
S..87	3.8	7.4	6/8.7	11.2	8	8
S..97	7	14	11.4/16	21	15.7	15.7

¹⁾ The larger gear unit in multi-stage gear units must be filled with the larger oil quantity.

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



HEINRICH GEORG GMBH
MASCHINENFABRIK

Recommended lubricants for SEW drives

Gear unit type	Ambient temperature range				Lubricant type DIN (ISO)	ISO viscosity resp. NLGI class	Mobil	Shell	KLOBER LUBRICATION	ARAL	BP
	-50	0°C	50	100							
Helical gear units, helical-bevel gear units, parallel gear units	-10	Standard	+40		CLP (CC)	VG 220	Mobilgear 630	Shell Omala 220	Klüberoil GEM 1-220	Aral Degol BG 220	BP Energol GR-XP 220
	-25			+80	CLP PG	VG 220	Mobil Glygoyle 30	Shell Tivela WB	Klübersynth GH 6-220	Aral Degol GS 220	BP Enersyn SG-XP 220
	*-40			+80	CLP HC	VG 220	Mobil SHC 630	Shell Omala 220 HD	Klübersynth GEM 4-220	Aral Degol PAS 220	
	*-40		+40			VG 150	Mobil SHC 629		Klübersynth GEM 4-150		
	-20		+25		CLP (CC)	VG 150 VG 100	Mobilgear 629	Shell Omala 100	Klüberoil GEM 1-150	Aral Degol BG 100	BP Energol GR-XP 100
	-30		+10		HLP (PM)	VG 68-46 VG 32	Mobil D.T.E. 15M	Shell Tellus T 32	Klüberoil GEM 1-68	Aral Degol BG 46	
	*-40		+10		CLP HC	VG 32	Mobil SHC 624		Klübersynth GEM 4-32		
	*-40	-20			HLP (HM)	VG 22 VG 15	Mobil D.T.E. 11M	Shell Tellus T 15	ISOFLEX MT 30 ROT		BP Energol HLP-HM 10
		Standard	+40		CLP (CC)	VG 680	Mobilgear 636	Shell Omala 680	Klüberoil GEM 1-680	Aral Degol BG 680	BP Energol GR-XP 680
	-20		+60		CLP PG	VG 680 1)	Mobil Glygoyle HE 680		Klübersynth GH 6-680		BP Enersyn SG-XP 680
Helical-worm gear units	*-30		+80		CLP HC	VG 460	Mobil SHC 634	Shell Omala 460 HD	Klübersynth GEM 4-460		
	*-40		+10			VG 150	Mobil SHC 629		Klübersynth GEM 4-150		
	-20		+10		CLP HLP	VG 150 VG 100	Mobil D.T.E. 18M	Shell Omala 100	Klüberoil GEM 1-150	Aral Degol BG 100	BP Energol GR-XP 100
	-25		+20		CLP PG	VG 220 1)	Mobil Glygoyle 30		Klübersynth GH 6-220		
	*-40		0		CLP HC	VG 32	Mobil SHC 624		Klübersynth GEM 4-32		
	-20	Standard	+40		SEW PG	VG 460 3)			Klüber SEW HT-460-5		
	*-40		+10		API GL5	SAE 75W90 (~ VG 100)	Mobilube SHC 75 W90-LS				
	*-30		+40		Food ind. oil	HCE	VG 460	Shell Cassida Fluid GL 460	Klüberöl 4UH1-460	Aral Eural Gear 460	
R 32 R 302	-25		+60		Grease DIN 51181	00 2)	Glygoyle Grease 00	Shell Tivela Compound	Klübersynth GE 46-1200		
	-15	Standard	+40			000 - 0 2)	Mobilux EP 004	Shell Alvania		Aralub MFL 00	BP Energol LS-EP 00

■ = synthetic lubricants

□ = mineral lubricants

1) Helical-worm gear units with PG oil. Consult SEW-Eurodrive

2) Consult SEW-Eurodrive for other gear units

3) Special lubricant for Spiroplan gear units only

* Please note critical startup behaviour at low temperatures

CLP PG = polyglycol

CLP HC = synth. Hydrocarbon

E = diester oil (water contamination class WGK 1)

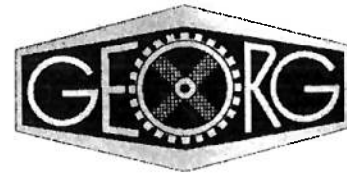
HCE = synth. hydrocarbons + diester oil (USDA - H1 approval)

CLP = mineral oil

HLP = hydraulic oil

Technical Documentation

Gear Units Series R., F., K., S., Spiroplan® W



HEINRICH GEORG GMBH
MASCHINENFABRIK

Recommended lubricants for SEW drives

Gear unit type	Ambient temperature range				Lubricant type DIN (ISO)	ISO viscosity resp. NLGI class	Tribol			
	-50	0°C	50	100						
Helical gear units, helical-bevel gear units, parallel gear units	-10	Standard	+40		CLP (CC)	VG 220	Tribol 1100/220	Meropa 220	Optigear BM 220	Renolin CLP 220
	-25			+80	CLP PG	VG 220	Tribol 800/220	Synlube CLP 220	Optiflex A 220	
	*-40			+80	CLP HC	VG 220	Tribol 1510/220	Pinnacle EP 220	Optigear Synthetic A220	Renolin Unisyn CLP 220
	*-40		+40		CLP	VG 150				
	-20		+25		CLP (CC)	VG 150 VG 100	Tribol 1100/100	Meropa 150	Optigear BM 100	Renolin CLP 150
	-30		+10		HLP (PM)	VG 68-46 VG 32	Tribol 1100/68	Anubia EP 46	Optigear 32	Renolin B 46 HVI
	*-40		+10		CLP HC	VG 32		Cetus PAO 46		
	*-40	-20			HLP (HM)	VG 22 VG 15		Aircraft Hydr. Oil 15		
Helical-worm gear units		Standard	+40		CLP (CC)	VG 680	Tribol 1100/680	Meropa 680	Optigear BM 680	Renolin CLP 680
	-20			+60	CLP PG	VG 680 1)	Tribol 800/680	Synlube CLP 680		
	*-30			+80	CLP HC	VG 460				
	*-40		+10		CLP	VG 150				
	-20		+10		CLP HLP	VG 150 VG 100	Tribol 1100/100	Meropa 100	Optigear BM 100	Renolin CLP 150
	-25		+20		CLP PG	VG 220 1)	Tribol 800/220	Synlube CLP 220	Optiflex A 220	
	*-40		0		CLP HC	VG 32		Cetus PAO 46		
					SEW PG	VG 460 3)				
W Gear units	-20	Standard	+40		API GL5	SAE 75W90 (~ VG 100)				
R, K, F, S Gear units	*-30		+40		Food ind. Oil	HCE	VG 460		Optileb GT 460	
	-20		+40		Bio oil	E	VG 460		Optisynth BS 460	
R 32 R 302	-25		+60		Grease	DIN 51181	00 2)	Multifak 6833 EP 00		
	-15	Standard	+40			000 - 0 2)		Multifak EP 000	Longtime PD 00	Renolit SF 7-041

= synthetic lubricants
 = mineral lubricants

1) Helical-worm gear units with PG oil. Consult SEW-Eurodrive

2) Consult SEW-Eurodrive for other gear units

3) Special lubricant for Spiroplan gear units only

* Please note critical startup behaviour at low temperatures.

CLP PG = polyglycol

CLP HC = synth. Hydrocarbon

E = diester oil (water contamination class WGK 1)

HCE = synth. hydrocarbons + diester oil (USDA - H1 approval)

CLP = mineral oil

HLP = hydraulic oil

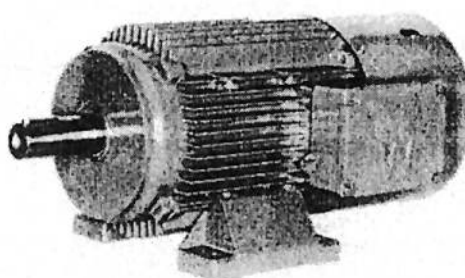


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

**DT/DV AC Motors
CT/CV Asynchronous Servomotors**

Type

SEW¹⁾



Contents ²

	Page
1. Important Notes	2
2. Safety Instructions	2
3. Inspection / Maintenance	3
3.1 Inspection and maintenance intervals	3
3.2 Preparation for motor and brake maintenance	4
3.3 Inspection / maintenance of the motor	5
3.4 Brake inspection and maintenance	7
4. Operation and Service	13
4.1 Motor troubleshooting table	13
4.2 Brake problems	14
4.3 Problems in the operation with frequency inverters	14
5. Technical Data	15
5.1 Working air gap, brake torques B03, BMG 05-8	15
5.2 Working air gap, brake torques BM 15 - 62	16

¹ SEW-EURODRIVE GmbH & Co, Postfach 3023, D-76642 Bruchsal

² Source: Operating instructions 0919 8512 / EN, Edition 04/2000

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

1. Important Notes

Safety and warning notes

Please note the safety and warning notes in this publication!



Electrical hazard

Could result in: death or severe injuries



Imminent danger

Could result in: death or severe injuries



Dangerous situation

Could result in: slight or minor injuries



Harmful situation

Could result in: damage of unit or operating environment.



Close adherence to the operating instructions is required for fault-free operation and fulfillment of any claims under the warranty. Read these instructions carefully before you start operating the unit!

These operating instructions contain vital servicing information and should be kept in the vicinity of the unit.

Disposal



This product consists of:

- Iron
- Aluminium
- Copper
- Plastic
- Elektronik components

All components should be disposed of in accordance with applicable regulations

2. Safety Instructions



The following safety instructions refer to the use of motors.

When using **geared motors**, please observe safety instructions for gear units in the operating instructions. **Please refer to the additional safety instructions in the individual sections of these operating instructions.**

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK



Installation, connection, startup, and maintenance and repair work may only be performed by qualified specialists while taking the following into account:

- These instructions
- Warning and instruction labels on the motor/geared motor
- All other project planning documentation, startup instructions, and schematic diagrams
- System-specific regulations and requirements
- Current national/regional regulations

Intended use

These electrical motors are intended for industrial systems. They conform to valid standards and regulations and meet the requirements of the Low Voltage Directive 73/23/EEC.

Technical data and information on approved conditions on site can be found on the nameplate and in these operating instructions.

These details must be observed!

3. Inspection / Maintenance

Caution



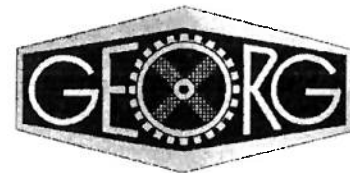
- Use only original parts in accordance with the valid spare parts list!
- When changing the brake coil, always change the control unit at the same time!
- Motors can become very hot during operation - danger of burns!
- Secure or lower hoist applications (danger of dropping).
- Isolate the motor and brake from the supply and safeguard against unintentional start before commencing work!

3.1 Inspection and maintenance intervals

Unit / unit part	Interval	What to do?	See page
Brake B03, BMG 05-8, BM 15 - 62	with use as a working brake: at least every 3,000 hours of operation ¹⁾ with use as a holding brake: depending on the loading characteristics: ¹⁾	Inspect the brake - working air gap - brake disc - armature plate - driver / gear teeth - pressure rings Extract abraded matter Inspect switch contacts, replace if necessary (e.g., if worn)	27 ff
Motor	every 10,000 hours of operation	Inspect the motor - inspect ball bearings and change if necessary - change oil seal Clean cooling air passages	24 ff
Motor with backstop		Change low viscosity grease in the backstop	32
Tachogenerator		Inspection / maintenance in accordance with supplied operating manual	-
Drive	varies (depending on external factors)	Touch up or renew anticorrosion coating	-

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

¹⁾Wear times are influenced by many factors that can shorten the life between service calls.
Determine the required inspection or maintenance interval in accordance with the project design documentation (e. g. *Practical Drive Engineering*, volume 4) from the system manufacturer.

3.2 Preparation for motor and brake maintenance



Caution:

Isolate motor and brake from the supply and safeguard against unintentional start before commencing work!

3.2.1 Removal of EV1C, EV1R, EV1S, EV1T incremental encoders

1. Remove the hood cover (361). Remove the forced cooling fan first, if fitted.
2. Remove the screw (366) on the adapter flange and cover plate (369).
3. Remove the terminal board on the coupling.
4. Loosen the retaining screws (232) and rotate conical spring washer (251) outward.
5. Remove the encoder (220) together with coupling (233).
6. Pry off the adapter flange (236) after removing bolts (234).

Note:

During reassembly, ensure that concentricity of the shaft end is • 0.05 mm.

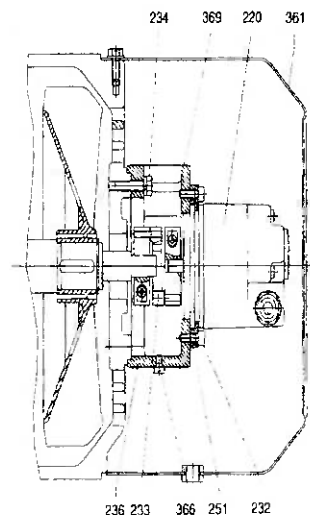


Figure 17: EV1 C, R, S, T incremental encoder

3.3.2 Removal of ES1.. / ES2.. incremental encoders

1. Remove the hood cover (361) and open the screw cover on the backplate of the encoder (220).
2. Open the central retaining screw (367) approx. two to three turns and loosen cone with a slight blow on the screw head. Remove retaining screw and pull out the encoder.

Note:

For reassembly:

- apply Noco-Fluid® to the encoder pin
- fasten central retaining screw (367) with 2.9 Nm.

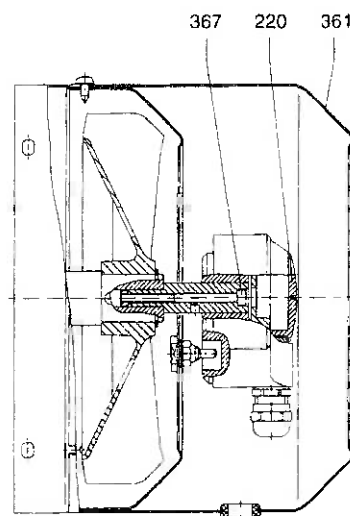


Figure 18: ES1../ES2..incremental encoder

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

3.2.3 Removal of NV1./NV2. proximity sensor



Caution! Fan wheel must not be in motion!

1. Remove the connector.
2. Remove the fan guard including NV1./NV2 and do not tilt during removal to prevent damage to the initiator.

If the mounting socket has been removed from the fan guard or has become loose, the following instructions must be observed **during reinstallation**:

The switching face of the initiator must be readjusted with a 3.5 mm clearance from the prism edge (• Figure 19).

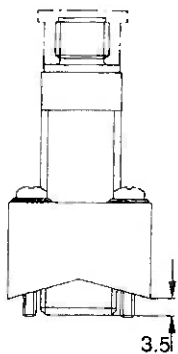


Figure 19: NV1./2. proximity sensor

3.3 Inspection / maintenance of the motor

Legend

- 1 circlip
- 2 oil flinger
- 3 oil seal
- 4 screw plug
- 5 A-(flange) bearing end shield
- 6 circlip
- 7 ball bearing
- 8 circlip
- 9 rotor
- 10 nilos ring
- 11 ball bearing
- 12 equalizing ring
- 13 stator
- 14 B-bearing end shield
- 15 hex-head screw
- 16 V-ring
- 17 fan
- 18 circlip
- 19 fan guard
- 20 housing screw

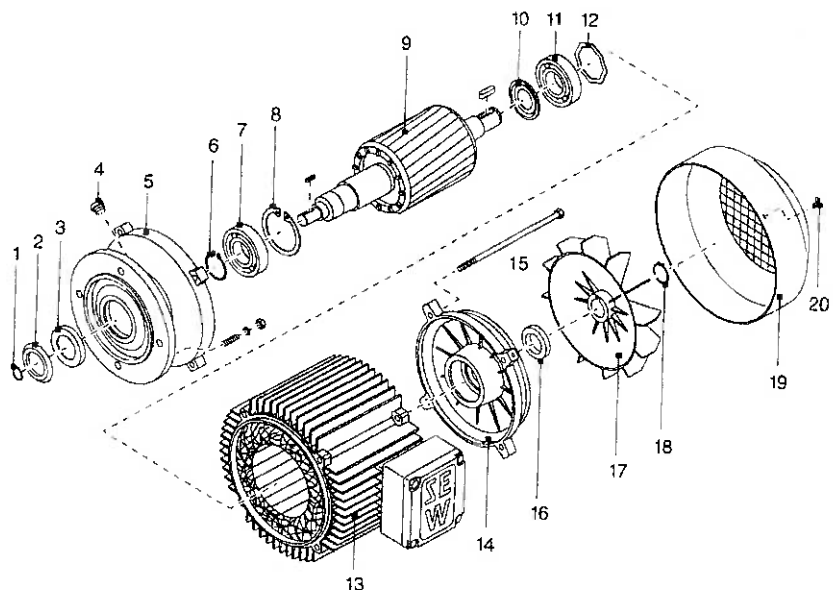


Figure 20: Example Motor DFT 90

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

Procedure



1. **Isolate motor and brake and safeguard against unintentional start**
2. If equipped, remove forced cooling fan and encoder (• Section 3.2 "Preparation for motor and brake maintenance")
3. Remove flange cover and fan guard (19)
4. Remove hex-head screws (15) from drive end (5) and non-drive end bearing end shields (14), and detach stator (13) from drive end bearing end shield
5. a) motors with brake
 - open terminal box cover and disconnect brake cable from rectifier.
 - press non-drive end bearing end shield with brake from stator and carefully remove it (run brake cable along with trailing wire, if necessary)b) pull back stator by approx. 3 to 4 cm.
6. Visual inspection:
 - are there traces of condensation or gear oil inside the stator?
 - if not, continue with 9.
 - if condensation is present, continue with 7.
 - if gear oil is present, the motor must be repaired by a specialized workshop.
7. a) geared motors: remove the motor from the gear unit
b) motors without gear unit: remove drive end flange
c) remove the rotor (9)
8. Clean the windings, dry and conduct electrical tests (• Section "Preparation after extended storage").
9. Replace the ball bearings (7, 11) (only exchange with approved bearing types [• Section "Approved bearing types"]).
10. Replace the oil seal (3) in the drive-end bearing end shield.
11. Reseal the stator seat, install motor, brake, etc.
12. Check the gear unit, if applicable (• Gear Unit Operating Instructions).

3.3.1 Lubrication of the backstop

The backstop is lubricated in the factory with Mobil LBZ low-viscosity grease. If another type of grease is used, it must conform to NLI grade 00/000 with a basic oil viscosity of 42 mm²/s at 40 °C with lithium soap and mineral oil base. The temperature range of the application ranges from -50 °C to +90 °C. The required amount of grease is illustrated in the following table.

Motor type	71/80	90/100	112/132	132M/160M	160L/225
Grease [g]	9	15	15	20	45

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

3.4 Brake inspection and maintenance

3.4.1 Brake B03

Legend

- 1 brake end shield
- 2 equalizing ring
- 3 O-ring
- 4 brake coil complete
(with brake cable)
- 5 circlip
- 6 brake spring
- 7 armature plate
complete
- 8 circlip
- 9 counter spring
- 10 rubber sealing collar
- 11 brake fan, complete
- 12 releasing yoke,
complete with lever
- 13 resetting spring
- 14 hex nut

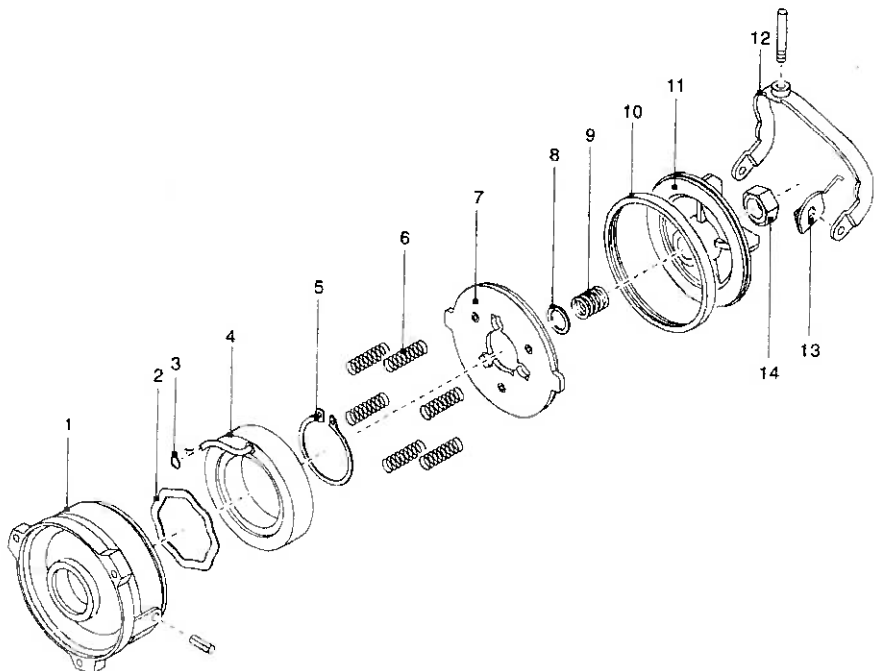


Figure 21: Brake B03

Inspecting brake B03, adjusting working air gap

1. Isolate motor and brake and safeguard against unintentional start
2. Remove the fan guard
3. Between armature plate (7) and brake fan (11):
 - measure the brake lining
 - if brake lining • 1.5 mm (• "Parts subject to wear changing brake B03") otherwise
4. Remove the rubber sealing collar (10), extract the brake dust
5. Between armature plate and brake coil (4): measure the working air gap with the feeler gauge (at three positions separated by approx. 120°).
6. Reaffix the hex nut (14) until the working air gap is set correctly. (• Section 5.1 "Switched energy up to readjustment, working air gap, brake torques B03, BMG 05-8")
7. Attach rubber seal collar and install fan guard

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

Parts subject to wear changing brake B03

Replace the following parts (Fig. 20) when the brake lining has worn to a thickness of 1.5 mm:

- complete brake fan (11)
- counter spring (9)
- brake springs (6)
- armature plate (7)
- rubber sealing collar (10)
- hex nut (self-locking) (14)



1. Isolate motor and brake and safeguard against unintentional start
2. (on models with manual brake release: remove the releasing lever (12) loosen the hex nut (14)
3. Remove the brake fan
 - use the pull-off device on the armature plate (7), if present
4. Remove the armature plate, replace the brake springs (6) and counter spring (9)
 - position the brake springs symmetrically
5. Install the new armature plate and the new brake fan
6. Install the new hexagon nut
 - (on models with manual brake release: fit the releasing lever)
7. Measure and adjust the working air gap
 - (• "Inspecting brake B03, adjusting working air gap" Points 5 to 7)



Note:

Do not allow the new lining to come into contact with grease or oil!

Changing the brake torque B03

The brake torque can be changed gradually (• Section 5.1 "Switched energy up to readjustment, working air gap, brake torques B03, BMG 05-8"):

- by installing various brake springs
- by changing the number of brake springs



1. Isolate motor and brake and safeguard against unintentional start
2. Remove the fan guard
3. (on models with manual brake release: remove the releasing lever (12))
loosen the self-locking hex nut (14).
4. Remove the brake fan (11).
 - use the pull-off device on the armature plate (7), if necessary
5. Remove the armature plate, change or add the brake springs (6)
 - position the brake springs symmetrically
6. Install the brake
 - install a new hex nut (particularly with repeated installation), if necessary
7. Measure the working air gap and adjust it
 - (• "Inspecting brake B03, adjusting working air gap" Points 5 to 7)

Technical Documentation

DT/DV AC Motors

CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

3.4.2 Brake BMG 05-8, BM 15 - 62

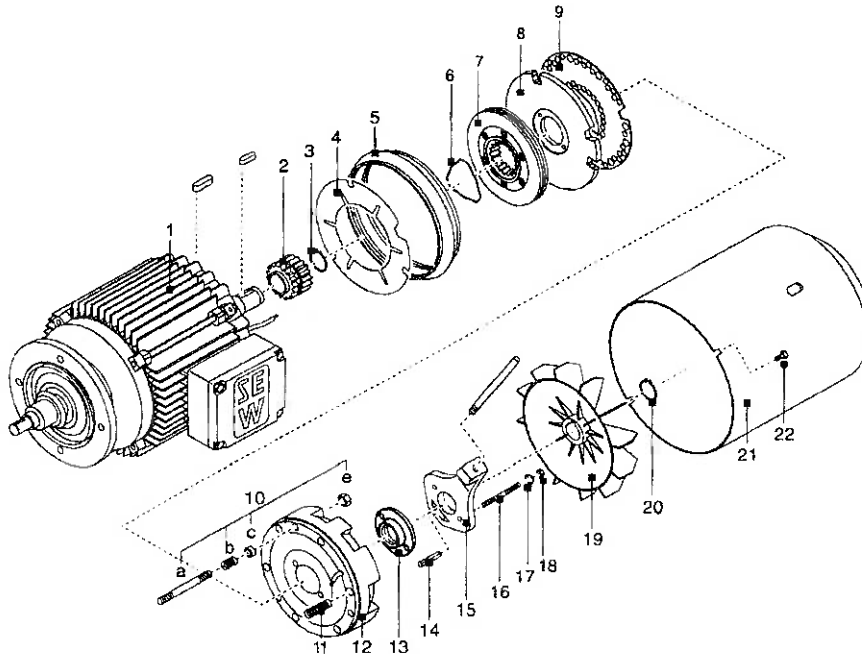


Figure 22: Brake type BM(G) 05- 15

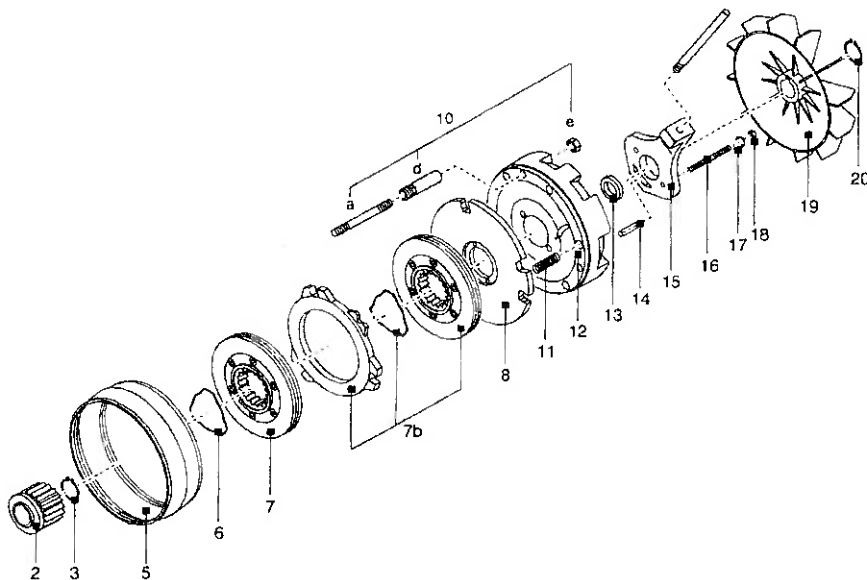


Figure 23: Brake type BM 30- 62

Legend:

1 motor with brake end shield	7b BM 32, 62 only: Brake stationary disc, Annular spring, brake disc	c pressure ring	lever
2 carrier	8 armature plate	e hexagon nut	16 stud (2x)
3 circlip	9 damping plate	11 brake spring	17 conical coil spring
4 stainless steel disc (BMG only)	(only for BMG)	12 brake coil body	18 setting nut
5 rubber sealing collar	10 a stud (3x)	13 with BMG: sealing washer with BM: V-ring	19 fan
6 annular spring	b counter spring	14 dowel pin	20 circlip
7 brake disc		15 releasing lever with hand	21 fan guard
			22 housing screw

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

Inspecting brake BMG 05-8, BM 15-62, setting the working air gap



1. Isolate the motor and brake and safeguard them against unintentional start
2. Remove:
 - forced cooling fan, tachogenerators/encoders (• Section 3.2 "Preparation for motor and brake maintenance"), if fitted.
 - remove flange and fan guard (21)
3. Remove rubber sealing collar (5)
 - loosen the clamp if necessary
 - extract abraded matter
4. Measure the brake disc (7, 7b):
if the brake disc measures
 - • 9 mm with brake motors up to size 100
 - • 10 mm with brake motors from size 112change brake disc (• Section "Replacing the brake disc BMG 05-8, BM 15-62 ") otherwise
5. **with BM 30-62:**
loosen setting sleeve (10d) by turning in the direction of the bearing end shield
6. Measure the working air gap A
(with the feeler gauge at three positions separated by approx. 120°) • Figure 24.
 - for BM brakes: between armature plate (8) and coil body (12)
 - for BMG brakes: between armature plate and damping plate (9)
7. Retighten hex nuts (10e)
 - until the working air gap is set correctly (• Section 9.1, 9.2)
 - for BM 30-62 until the working air gap = 0.25 mm
8. **with BM 30-62:**
tighten the setting sleeves
 - against the coil body
 - until the working air gap is set correctly (• Section 9.1, 9.2)
9. Install the rubber sealing collar and reinstall removed parts

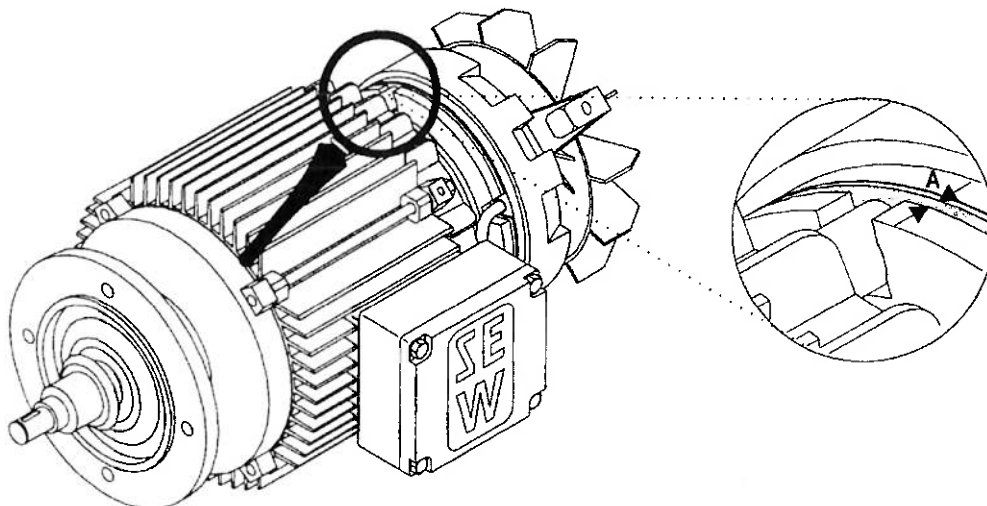


Figure 24: Measuring the working air gap A

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

Replacing the brake disc BMG 05-8, BM 15-62

When replacing brake disc¹⁾, inspect the other removed parts and replace them, if necessary.



1. Isolate motor and brake and safeguard against unintentional start
2. Remove:
 - forced cooling fan, tachogenerators/encoders (• Section 3.2 "Preparation for motor and brake maintenance"), if fitted
 - flange cover or fan guard (21), circlip (20), and fan (19)
3. Remove rubber sealing collar (5), and dismantle manual brake release:
 - setting nuts (18), conical coil springs (17), studs (16), release lever (15), dowel pin (14)
4. Undo the hex nut (10e) carefully pull back the coil body (12) (use caution with the brake cable!) and remove brake springs (11).
5. Remove damping plate (9), armature plate (8) and brake disc (7, 7b). Clean the brake parts
6. Install the new brake disc
7. Reinstall the brake parts
 - except for rubber sealing collar, fan and fan cover, set the working air gap (• "Inspecting brake BMG 05-8, BM 15-62, setting the working air gap", Points 5 to 8).
8. For manual brake release: set floating clearance "s" via setting nuts between conical coil springs (pressed flat) and setting nuts. (• Figure 25).

Brake	Floating clearance s [mm]
BMG 05-1	1,5
BMG 2-8	2
BM 15-62	2

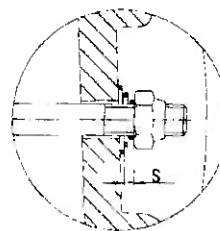


Figure 25: Adjust floating clearance



Important: This floating clearance "s" is necessary so that the armature plate can be moved forward when the brake lining wears. Otherwise, safe braking cannot be ensured.

9. Install the rubber sealing collar and reinstall the removed parts.

Note:

- The lockable manual release brake (Type HF) is released if resistance is encountered when operating the manual release brake screw.
- The self-reengaging manual brake release (Type HR) can be opened by hand



Caution: On brake motors with a self-reengaging manual brake release, the lever must be removed after startup/maintenance! A bracket for the lever is attached to the motor.

1) if brake disc for BMG 05-4 measures • 9 mm
for BMG 8-BM 62 measures • 10 mm

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

Changing the brake torque BMG 05-8, BM 15-62 (• Figure 22 to Figure 24)

The brake torque can be changed gradually (• Section 7.1, 7.2)

- by installing various brake springs
- by changing the number of the brake springs



1. Isolate motor and brake and safeguard against unintentional start
2. Remove
 - forced cooling fans, tachogenerators/encoders (• Section 3.2 "Preparation for motor and brake maintenance"), if fitted
 - flange cover or fan guard (21), circlip (20), and fan (19)
3. Remove the rubber sealing collar (5) and dismantle the manual brake release:
 - setting nuts (18), conical coil springs (17), studs (16), release lever (15), dowel pin (14).
4. Loosen the hex nuts (10e), carefully pull back the coil body (12)
 - by approx. 50 mm (2 inches) (use caution with the brake cable!)
5. Change or add brake springs symmetrically (11)
 - position the brake springs symmetrically
6. Reinstall the brake parts
 - except for rubber sealing collar, fan and fan cover, set the working air gap (• "Inspecting brake BMG 05-8, BM 15-62 setting the working air gap", Points 5 to 8)
7. For manual brake release: Set floating clearance "s"
 - via setting nuts between conical coil springs
 - (pressed flat) and setting nuts. (• Figure 26)

Brake	Floating clearance s [mm]
BMG 05-1	1,5
BMG 2-8	2
BM 15-62	2

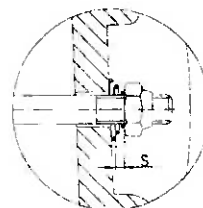


Figure 26: Adjust floating clearance



Important: Floating clearance "s" is necessary for the armature plate to move forward when brake lining wears. Otherwise, safe braking cannot be ensured

8. Install rubber sealing collar and reinstall removed parts.

Note

In case of repeated removal, replace setting nuts (18) and hex nuts (10e)!

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

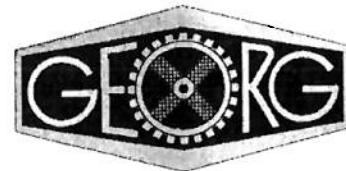
4. Operation and Service

4.1 Motor troubleshooting table

Problem	Possible cause	Solution
Motor does not start	Cable broken	Inspect the connections and correct them
	Brake does not release	• Section 4.2
	Fuse blown	Replace the fuse
	Circuit breaker tripped	Check the setting of the circuit breaker; adjust if necessary
	Motor contactor does not trip, control system fault	Inspect the motor contactor control system, rectify fault if necessary
Motor will not start or starts with difficulty	Motor is designed for delta connection, but connected as star	Correct wiring
	Voltage or frequency deviates significantly from the setpoint, at least during switch on	Ensure stable mains conditions; inspect the cross-sections of the cables
Motor does not start when connected in star, but only with delta	Insufficient torque available with star	If the delta starting current is not too high, switch on directly; otherwise use a larger motor or special design (consult SEW)
	Contact fault on star-delta switch	Remedy fault
Incorrect direction of rotation	Motor is wired incorrectly	Rearrange two phases
Motor hums and draws too much current	Brake does not release	• Section 4.2
	Winding is faulty	Motor may only be repaired in a specialized workshop
	Rotor brushes	Repair the short circuit
Fuses blow or the circuit breaker trips immediately	Short circuit in the cable	Fault must be repaired in a specialized workshop
	Short circuit in the motor	Correct wiring
	Cables incorrectly connected	Fault must be repaired in a specialized workshop
	Ground fault on the motor	Measure performance and use a larger motor or reduced load if necessary
Significant speed loss under load	Overload	Increase the cross-section of the cables
	Voltage drops	Measure performance and use a larger motor or reduced load if necessary
Motor overheats (measure the temperature)	Overload	Correct the cooling air supply or free the cooling passages; retrofit forced cooling fan, if necessary
	Insufficient cooling	Observe permissible temperature range
	Ambient temperature too high	Correct wiring
	Motor is connected as delta instead of star as intended	Correct the loose contact
	Loose contact (one phase missing)	Determine the cause and rectify (see above), replace the fuse
	Fuse blown	Adapt the motor to the mains voltage
	The mains voltage deviates by more than $\pm 5\%$ from the rated motor voltage. Higher voltage is particularly detrimental with low-speed motors as the idle current is close to the rated current under normal rated voltage conditions.	Adjust rated duty type of the motor to required operating conditions; a specialist should be consulted to determine the correct drive
	Rated operation type (S1 to S10, DIN 57530) is exceeded, e.g., starting frequency too high	

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

Problem	Possible cause	Solution
Noise generation too high	Ball bearings distorted, contaminated or damaged	Re-align the motor, inspect the ball bearings (• Section 9.4), grease (• Section 9.5), replace if necessary
	Vibration of rotating parts	Remedy the cause or correct the imbalance
	Foreign bodies in cooling air passages	Clean cooling air passages

4.2 Brake problems

Problem	Possible cause	Solution
Brake does not release	Incorrect voltage on brake control unit	Set the correct voltage (• Section 3.1)
	Brake control unit failure	Change the brake control unit, check internal resistance and insulation of the brake coil, inspect the control unit
	Maximum permissible working air gap exceeded because the brake lining is worn	Inspect the working air gap
	Voltage loss >10 % along cable	Ensure correct connection voltage Inspect the cable cross-section
	Insufficient cooling, brake overheats	Replace brake rectifier type BG with BGE
	Brake coil has winding or casing short circuit	Exchange the complete brake with brake control unit (specialized workshop), inspect the switching devices
Motor does not brake	Incorrect working air gap	Inspect the working air gap
	Brake lining is worn	Replace the complete brake disc
	Incorrect brake torque	Change the brake torque
	Only BM(G): Working air gap is so large that setting nuts come in contact	Inspect the working air gap
	Only BM(G): Manual release device set incorrectly	Adjust the setting nuts
Braking action is delayed	The brake is switched in the AC circuit	Simultaneous switch off in the DC and AC circuits (e.g., BSR); please refer to wiring diagram
Noise from the brake	Gearing wear caused by jerky start	Check the configuration
	Oscillation torque resulting from incorrectly set frequency inverter	Check/adjust the setting of the frequency inverter in accordance with the operating instructions

4.3 Problems in the operation with frequency inverters



During the operation of the motor with frequency inverter, the symptoms described in Section 4.1 may occur. The significance of occurring problems and instructions on rectifying them can be found in the frequency inverter operating instructions.

Please submit the following information if you require assistance from customer service:

- the data on the nameplate
- the type and nature of the fault
- when and under what operating conditions the fault occurred
- the presumed cause

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

5. Technical Data

5.1 Switched energy up to readjustment, working air gap, brake torques B03, BMG 05-8

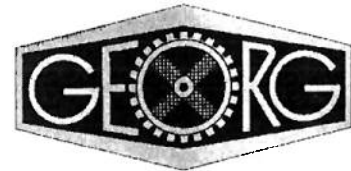
Brake type	For motor frame size	Switched energy up to readjustment [10 ⁶ J]	Working air gap [mm]		Brake torque settings				
			min.1)	max.	Brake torque [Nm]	Type and number of springs		Spring order numbers	
						normal	red	normal	red
B 03	DFT 63	80	0,3	0,6	3,2	6	-	183 319 7	183 320 0
					2,4	4	2		
					1,6	3	-		
					0,8	-	6		
BMG 05	71	60	0,25	0,6	5,0	3	-	135 017 X	135 018 X
					4,0	2	2		
					2,5	-	6		
					1,6	-	4		
					1,2	-	3		
BMG 1	80	60			10	6	-	135 150 8	135 151 6
					7,5	4	2		
					6,0	3	3		
BMG 2	90 100	130			20	3	-	135 150 8	135 151 6
					16	2	2		
					10	-	6		
					6,6	-	4		
					5,0	-	3		
BMG 4	100	130			10	6	-	184 845 3	135 570 8
					30	4	2		
					24	3	3		
BMG 8	112M 132S	300			0,3	1,2	75	6	-
			55	4			2		
			45	3			3		
			37	3			-		
			30	2			2		
			19	-			6		
			12,6	-			4		
			9,5	-			3		

1) Observe while checking the working air gap:

After a test run, deviations of σ 0.1 mm may occur due to parallelism tolerances of the brake disc.

Technical Documentation

DT/DV AC Motors
CT/CV Asynchronous Servomotors



HEINRICH GEORG GMBH
MASCHINENFABRIK

5.2 Switched energy up to readjustment, working air gap, brake torques BM 15 - 62

Brake type	For motor frame size	Switched energy up to readjustment [10 ⁶ J]	Working air gap [mm]		Brake torque [Nm]	Brake torque settings		Spring order numbers	
			min.1)	max.		Type and number of springs		normal	red
						normal	red		
BM 15	132M, ML 160M	500	0,3	1,2	150	6	-	184 486 5	184 487 3
					125	4	2		
					100	3	3		
					75	3	-		
					50	-	6		
					35	-	4		
					25	-	3		
BM 30	160L 180	750	0,3	1,2	300	8	-	136 998 9	136 999 7
					250	6	2		
					200	4	4		
					150	4	-		
					125	2	4		
					100	-	8		
					75	-	6		
BM 31	200 225	750	0,3	1,2	50	-	4	136 998 9	136 999 7
					300	4	-		
					250	2	4		
					200	-	8		
					150	-	6		
					100	-	4		
					600	8	-		
BM 32 ²⁾	180	750	0,4	1,2	500	6	2	136 998 9	136 999 7
					400	4	4		
					300	4	-		
					250	2	4		
					200	-	8		
					150	-	6		
					100	-	4		
BM 62 ²⁾	200 225	750	0,4	1,2	600	8	-	136 998 9	136 999 7
					500	6	2		
					400	4	4		
					300	4	-		
					250	2	4		
					200	-	8		
					150	-	6		
					100	-	4		

1) Observe while checking the working air gap:

After a test run, deviations of ± 0.1 mm may occur due to parallelism tolerances of the brake disc.

2) Double disc brake



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

**Low-backlash planetary gear reducers
(SP 060- 240; SP^{High-Speed} 075- 210; SPK 060- 180)
Type**

ALPHA¹

SP 060 – SP 240



M-version S-version

SP^{High-Speed} 075 – SP 210



M-version

SPK 060 – SPK 180



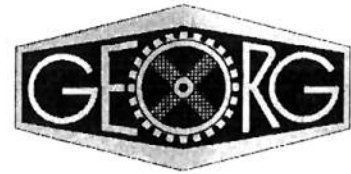
K-version

Contents ²

	Page
1. Safety-Notice	2
2. General Information	2
3. Equipment as supplied	2
4. Storage	2
5. Technical Design and Principle of Operation of the Low Backlash Planetary Gear Reducer	3
5.1 Design of the Motor-Mounted version "M" (Sizes 060 – 240)	3
5.2 Design of the Self-Contained version "S" (Sizes 060 – 180)	3
5.3 Design of the Angular version "K" (Sizes 060 – 180)	4
6. Gear Data – Nameplate	5
7. Motor – Mounting	5
7.1 Mounting on Type B5/B14 motors	6
8. Mounting the Gear Unit	8
9. Lubrication and Maintenance	8
9.1 General	8
9.2 Mounting Position	9
9.3 Oil Quantities	10
9.4 Oil Change	11
10. Bolt Connections	11
11. Motormounting instructions	13
11.1 Motormounting instructions SP B5	13
11.1 Motormounting instructions SP B 14	15
11.1 Motormounting instructions SP/SPK B5	17

¹ Alpha Getriebbau GmbH; Herrenwiesenstraße 4-9; D-97999 Igersheim

² Source: 07.99



Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK

1. Safety-Notice

These Operating Instructions and the safety information should be read carefully and complied with before taking the gear reducer into service. Compliance with these instructions is essential in order to ensure that future warranty claims are honored.

The Operating Instructions are included in the scope of supply. The instructions of the motor manufacturers and of the national employers' liability insurance associations must be **observed** when putting the gear reducers into service.

2. General Information

The Operating Instructions are intended as a help for using the gear unit, observing the relevant regulations, allowing to make full use of the gear reducer. All the requisite technical specifications can be found in the brochure.

In addition they contain important information regarding maintenance. The CE mark and the EC declaration of conformity are not required, since neither gear reducers nor geared motors are machines as defined by the EC Directive on the safety of machines.

3. Equipment as supplied

Motor-Mounted-/ Angular Gear Reducer

The gear units are supplied either without a motor but ready for mounting the motor, or with the motor mounted. They **have been lubricated** at the factory. In- and output are treated with corrosion protection. The shafts are protected against damage with protective caps.

Self-Contained Gear Reducer

The gear reducers have been filled with oil at the factory. In- and output are treated with corrosion protection.

All versions have to be cleaned from corrosion protection before mounting the gear reducer.

Attention:

The flange should not be cleaned using high pressure air jets, which can pressurise the gearbox.

Packaging

The gear reducers are packed in cardboard boxes with paper paddings for shipment within Europe. The paper paddings can be reused several times and can also be recycled. For shipment oversea the gear reducers are wrapped in plastic sheeting and foamed into cardboard boxes.

4. Storage

The gear units can be stored for a max. of 2 years at 0°C to + 30°C, dry in a horizontal position in the original packing. For the storage logistic we recommend "first in - first out".

Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK

5. Technical Design and Principle of Operation of the Low-backlash Planetary Gear-Reducer

The gear reducers are planetary gear reducers or angular gear reducers or a combination of both. For different applications the gear reducer will be offered as Motor-mounted version "M" (Fig. 5.1.1 / 5.1.2), Self-contained version "S" (Fig. 5.2.1/5.2.2) and as Angular version "K" (Fig. 5.3.1-5.3.3). The real angular gear will be named "SK" and the angular gear with planetary stage "SPK".

5.1 Technical Design of the "M"-Motor-Mounted Version (Sizes 060 - 240)

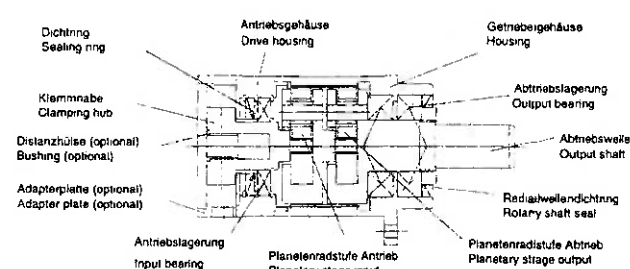
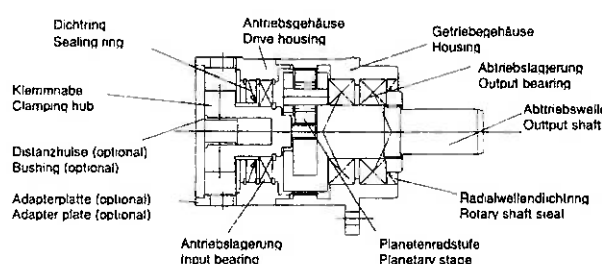


Fig 5.1.1 Technical Design of the single stage Motor-mounted version

Fig 5.1.2 Technical Design of the two stage Motor mounted version

- The output shaft bearing is designed to withstand high external tilting moments and axial forces
- The gear reducers are filled with oil by the manufacturer. The input and output sides are sealed by rotary shaft seals. The High-Speed-version is lubricated for lifetime, the input side is sealed with a shaft seal and the output side with a rotary shaft seal.
- The reducer can be mounted on the motor very quickly and easily via the clamping hub.
- The motor is centered in relation to the reducer axis via the clamping hub and not via the adapter plate. This excludes the risk of radial distortion of the motor.
- The gear reducers can be adapted to a variety of motors with the aid of the adapter plate and bushing, thus ensuring a high degree of flexibility.
- The gear reducer is designed with an integrated thermal length compensation, which will compensate the motorshaft length extension in case of heating.

5.2 Technical Design of the "S"-Self-Contained Version (Sizes 060 - 180)

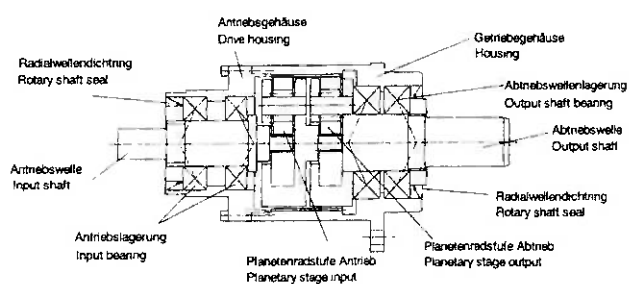
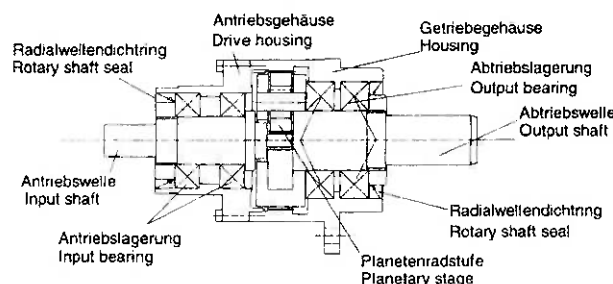


Fig. 5.2.1 Technical Design of the single stage Self-Contained version

Fig 5.2.2 Technical Design of the two stage Self-Contained version

Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK

- The input shaft offers the possibility to drive the gear reducer directly e.g. with a pulley.
- The input and output shaft bearing is designed to withstand high external tilting moments and axial forces.
- The gear reducer is filled with oil by the manufacturer. The input and output sides are sealed by rotary shaft seals.

5.3 Technical Design of the "K"-Angular Gear Version (Sizes 060 - 180)

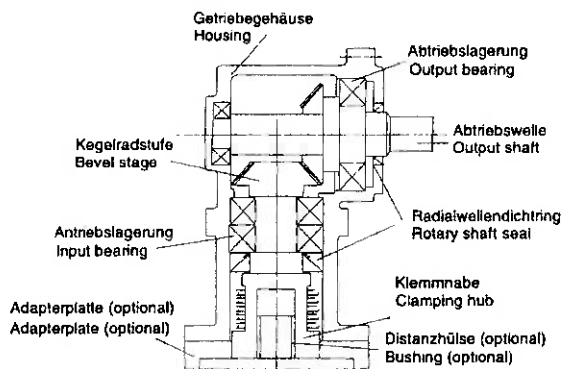


Fig 5.3.1 Technical Design of the single stage angular gear version (SK)

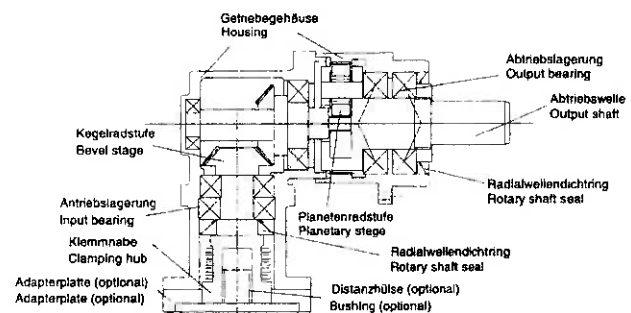


Fig 5.3.2 Technical Design of the two stage angular gear version (SPK)

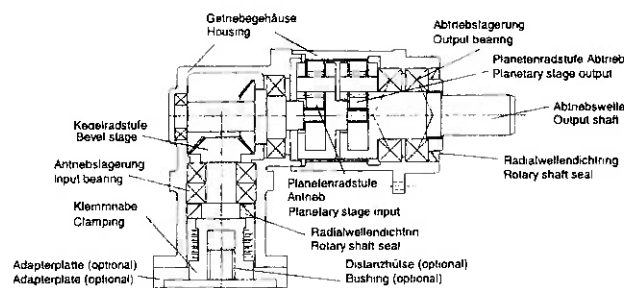


Fig. 5.3.3 Technical Design of the three stage Angular gear version (SPK)

- The right-angled arrangement of the components offers the possibility for a space-saving motor mounting.
- The output shaft bearing is designed to withstand high external tilting moments and axial forces.
- The gear reducer is filled with oil by the manufacturer. The input and output sides are sealed by rotary shaft seals.
- The reducer can be mounted on the motor very quickly and easily via the clamping hubs.
- The motor is centered in relation to the reducer axis via the clamping hub and not via the adapter plate. This excludes the risk of radial distortion of the motor.
- The gear reducers can be adapted to a variety of motors with the aid of the adapter plate and bushing, thus ensuring a high degree of flexibility.
- The gear reducer is designed with an integrated thermal length compensation, which will compensate the motorshaft length extension in case of heating.



Low Backlash Planetary Gear Reducer Type ALPHA

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

6. Gear Data - Nameplate

You can find the nameplate for the "M" and "K"-version on the adapter plate. The name plate for the "S"-version is located on the input flange.

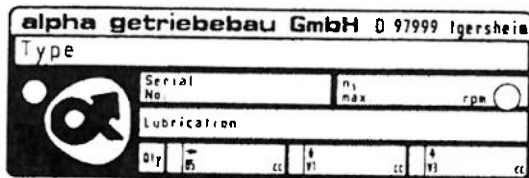


Fig. 6.1 Nameplate for M- and S-version

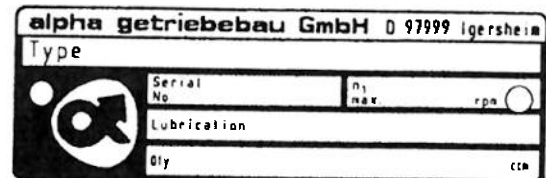


Fig. 6.2 Nameplate for K-version

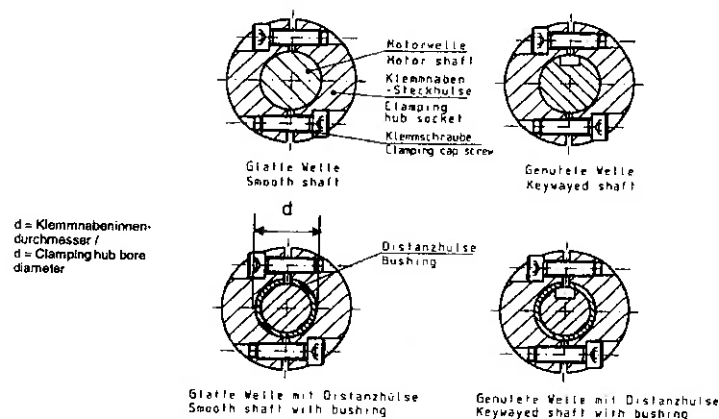
7. Motor Mounting "M"- and "K"-version

These gear reducers can be mounted on virtually any motor (M-version: type B5 as well as B14; K-version type B5) with the aid of simple adapter parts. The input shaft of the gear reducer is connected to the motor shaft via a bearing supported clamping hub. The motor is centered by these clamping hub. This makes it unnecessary to center the motor by means of the flange. The bore in the adapter plate is just a clearing hole. The clamping hubs have been directly adapted to the standard motor shaft diameters.

Distance sleeves (bushings) allow easy adaption to less current motor shafts (see Fig. 7.1). These bushings are slotted and the slot must be turned to coincide with one of the slots in the clamping hub (K-version always with at least one bushing).

The key is removed from motors in which such a key has been fitted. We recommend the use of motors with a smooth motor shaft and the concentric running accuracy "N" to DIN 42 955.

M-Version



K-Version



Fig 7.1: Adapting to different motor shafts

Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK

7.1 Mounting on Type B5 motors (M- and K-version) and B14 motors (M-version)

Thoroughly clean the motor shaft, the hole in the clamping hub and any fitted bushing. Similarly, clean the plain surfaces on the motor and gear unit.

B5 (Bild 7.1.1): Turn the clamping hub such that the clamping screws are located coincident with the access holes in the adapter plate (K-version: only one clamping screw). Put the motor into the gear reducer until the adapter plate and the motor fit closely. There is to be no gap between the motor and the gear reducer.

B14 (Bild 7.1.2): The adapter plate is bolted to the planetary gear reducer via stud bolts and nuts. Remove the adapter plate from the gear reducer and screw it onto the motor; secure with Loctite 221. Turn the clamping hub so that the locking screws coincide with the assembly holes in the adapter plate. Put the motor with the adapter plate onto the gear reducer until the adapter plate and the motor fit closely. There is to be no gap between the adapter plate and gear reducer. There needn't be any problem to put the motor easily into the gear reducer.

Attention: To avoid distortions caused by the own weight of the motor and/or of the gear we recommend you to carry out the adaptation process in the vertical position. While doing this the axial force on the clamping hub is not to surpass the value given in the tables 7.1.1 and 7.1.2. If the value allowed is surpassed in spite of that, the longitudinal neutralization in case of a thermal expansion of the motor shaft is no longer guaranteed. This may cause damages to the motor and/or the gear reducer.

Attention: In case of motors with shaft collar respectively with a great transitional radius and in case of motors with shafts that are longer than the value allowed for the specific gear reducer:

The shaft collar respectively the radius or the shaft end may already fit closely to the clamping hub before the adapterplate and the motor fit closely. If in this case the motor and the gear reducer are screwed together, it may cause the destruction or the damaging of the motor and/or of the gear reducer because of distortions. In cases like this, please check the edges with the help of measuring or checking the measures according to the information given in our catalogue and the information given by the manufacturer of the motor. In both cases the problems can be solved by using a broader adapterplate respectively an intermediate flange.

The clamping screws should initially be screwed in without torque (K-version: it exists only one clamping screw)

B5: Screw the motor and the adapterplate crosswise together

B14: Screw the adapterplate crosswise onto the gear reducer (stud bolts and nuts); Secure with Loctite 221. Then alternately tightened the clamping screws to the specified torque in at least three stages (K-version: 1 stage). The applicable tools and tightening torques are listed in table 7.1.1 and table 7.1.2. The enclosed plugs must be pressed into the assembly holes of the adapterplate until they are flush with the surface. The parts are disassembled in reverse order.

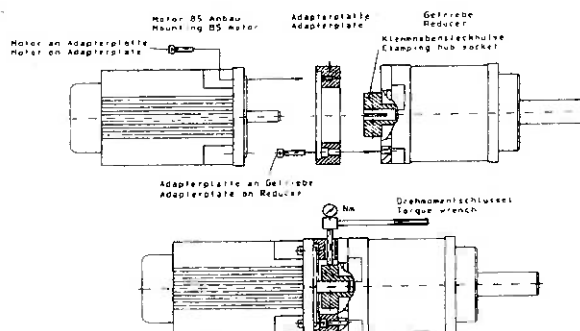


Fig. 7.1.1: Mounting on B5 type motors

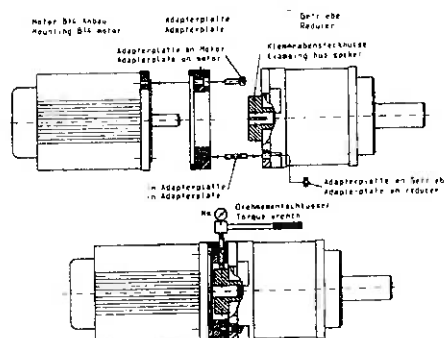


Fig. 7.1.2: Mounting on B14 type motors



Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK

Table 7.1.1: Screws and width across flats for the clamping hubs (M-version)

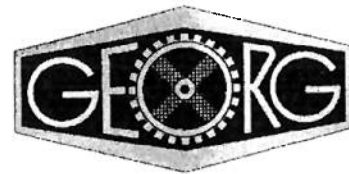
Gear reducer size		Clamping hub bore dia. [mm] ¹⁾	Clamping cap screws DIN 912 12.9	Width across flats [mm]	Tightening torque [Nm]	Max. Axial load [N]
060		• 14	M 4	3	5,0	80
075		• 19	M 5	4	9,5	100
100		• 14	M 5	4	9,5	100
		> 14 • 19	M 6	5	16,0	
		> 19 • 32	M 8	6	39,0	
140		• 19	M 6	5	16,0	150
		> 19 • 24	M 8	6	39,0	
		> 24 • 38	M 10	8	77,0	
180		• 19	M 6	5	16,0	1-stufig 190
		> 19 • 24	M 8	6	39,0	2-stufig 150
		> 24 • 48	M 10	8	77,0	
210	1-stufig	• 55	M 12	10	135,0	220
	2-stufig	• 48	M 10	8	77,0	190
240	1-stufig	• 60	M 16	14	330,0	250
	2-stufig	• 48	M 10	8	77,0	190

¹⁾ see pic. 7.1

Table 7.1.2: Screws and width across flats for the clamping hubs (K-version)

Gear reducer size		Clamping hub bore dia. [mm] ¹⁾	Clamping cap screws DIN 912 10.9	Width across flats [mm]	Tightening torque [Nm]	max. axial load [N]
SK / SPK 060		• 14	M 5	4	8,0	17
SK 075 / SPK 075 2-stage		• 19	M 6	5	14,0	51
SPK 075 3-stage		• 14	M 5	4	8,0	17
SK 100 / SPK 100 2-stage		• 28	M 8	6	30,0	49
SPK 100 3-stage		• 19	M 6	5	14,0	51
SK 140 / SPK 140 2-stage		• 35	M 10	8	65,0	80
SPK 140 3-stage		• 28	M 8	6	30,0	49
SK 180 / SPK 180 2-stage		• 48	M 12	10	115,0	118
SPK 180 3-stage		• 35	M 10	8	65,0	80

¹⁾ see pic. 7.1



Low Backlash Planetary Gear Reducer Type ALPHA

Tools for tightening the clamping hub:

The clamping screws M 4 to M 8 can be tightened through the mounting holes in the adapterplate using socket wrenches with a 1/4 inch square drive. With the M 10 clamping screw a socket wrench with a 3/8 inch square drive and with the M12 and M16 a socket wrench with a 1/2 inch square drive must be used. In addition, torque wrenches for the torque range are required.

8. Mounting the gear unit

Remove the protective shaft cap and thoroughly clean the shaft, centering mechanism and mating faces. When fitting the gear unit, distortion-free mounting should be ensured. Gear wheels or toothed-belt sprockets should be mounted on the output shaft without force. They should never be pulled on by forcing or hammering.

Gear units may be used in any position. Please refer to Table 9.3.1 to 9.3.3. regarding this.

(Attention: Tables not valid for SP-High-Speed-Gear Reducers!)

9. Lubrication and Maintenance

9.1 General

A high quality synthetic gear oil in the viscosity class ISO VG 220 is used for lubrication. The gear units are filled at the factory with silicone-free Renolin PG 220 from the company Fuchs. For special applications Renolin PG 68, PG 100 or grease Optimol PD1 can be used. The filled-in lubricant as well as the required oil quantities are stated on the nameplate. These oil quantities apply for typical positioning operating modes and for the mounting orientation stated with the order. If the mounting orientation on ordering is not known, then the oil quantity for horizontal mounting (B5) is supplied. If necessary, the oil quantity must be corrected according to Table 9.3.1. to 9.3.3.

Lubrication	Permissible Gear Reducer Temperature
Renolin PG 220 / Fa. Fuchs	- 10°C thru + 90°C

Table 9.1.1: Permissible Gear Reducer Temperature

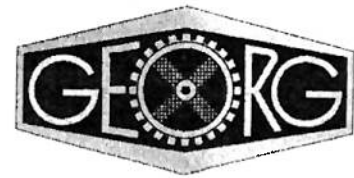
The SP-High-Speed-Gear Reducer is lubricated for lifetime and maintenancefree with permissible Gear Reducer Temperature -10°C thru +110°C

The same oil grade and the same amount of oil is normally also used in continuous operation (S1). Other quantities and oil grades may be required under extreme service conditions. The same also applies for service under higher temperatures than those specified here. Please consult alpha getriebebau GmbH in such cases.

Important:

Correction of the oil quantity may only take place with the oil stated on the nameplate. If this is not available, then a complete oil change is necessary (point 9.4). Alternative oils acc. to viscosity class ISO VG 220 can be taken from Table 9.1.2. **Do not mix different oils!**

Technical Documentation



Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK

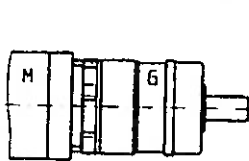
Table 9.1.2: Suitable alternative synthetic gear oils acc. to viscosity class ISO VG 220

Manufacturer	Lubricant
Aral	Degol GS 220
BP	Energol SG-XP 220
DEA	Polydea CLP 220
Fuchs	Renolin PG 220
Klüber	Klübersynth GH 6-220
	Syntheso HAT 220/ Syntheso D 220 EP
Mobil	Glygoyle 30 / Glygoyle HE 220
Molyduval	Synholube G 220 EP
Optimol	Optiflex 220
Shell	Tivela Öl WB (PG 220)
Tribol	800/220

Attention:
No lubrication
exchange is necessary
for SP-High-Speed-
Gear Reducers!

9.2 Mounting Positions

9.2.1 Mounting Positions (M- and S-version)



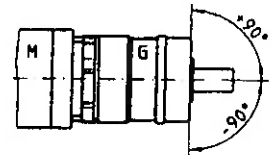
B5 - horizontal



V1 - vertical
Output shaft facing
downwards

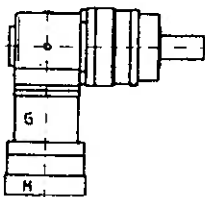


V3 - vertical
Output shaft facing upwards

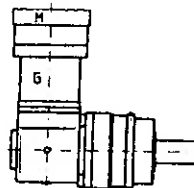


Can be pivoted . 90° from the
horizontal

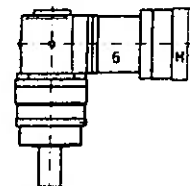
9.2.2. Mounting Positions (K-version)



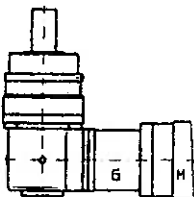
B5/V3 - Output shaft horizontal
Motor shaft facing upwards



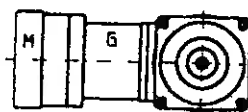
B5/V1 - Output shaft horizontal, Motor
shaft facing downwards



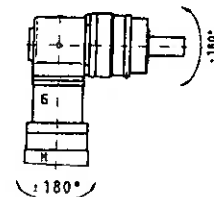
V1/B5 - Output shaft facing
downwards, Motor shaft horizontal



V3/B5 - Output shaft facing upwards,
Motor shaft horizontal



B5/B5 - Output shaft horizontal,
Motor shaft horizontal



S - can be pivoted 360°

Technical Documentation



Low Backlash Planetary Gear Reducer Type ALPHA

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

9.3 Oil Quantities (not valued for SP-High-Speed-Gear Reducers)

Table 9.3.1: Oil quantities for different installation positions by cycle and continuous duty operation (M-version)

M-Version	Oil quantity for installation position [cm ³]							
	B5		V1		V3		S	
	1	2	1	2	1	2	1	2
060	18	30	18	35	18	38	18	38
075	35	45	35	65	35	65	35	65
100	75	120	75	160	75	160	75	160
140	150	250	150	335	150	335	150	335
180	450	450	450	650	550	450	550	650
210	800	800	800	1300	800	1100	800	1300
240	1200	1100	1200	2100	1200	1600	1200	2100

Table 9.3.2: Oil quantities for different installation positions by cycle and continuous duty operation (S-version)

S-Version	Oil quantity for installation position [cm ³]							
	B5		V1		V3		S	
	1	2	1	2	1	2	1	2
060	18	30	18	35	18	35	18	35
075	35	45	35	65	40	75	40	75
100	95	120	95	165	95	165	95	165
140	150	250	150	335	150	335	150	335
180	450	500	450	650	450	650	450	650

Table 9.3.3: Oil quantities for different installation positions by cycle and continuous duty operation (K-version)

K-Version	Oil quantity for installation position [cm ³]																	
	B5 / V3			B5 / V1			V1 / B5			V3 / B5			B5 / B5			S		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
SK 060 SPK 060	35	50	55	35	50	55	35	50	95	35	95	95	35	50	55	35	95	95
SK 075 SPK 075	75	100	70	75	100	70	75	100	115	75	180	115	75	100	70	75	180	115
SK 100 SPK 100	170	250	180	170	250	180	170	250	290	170	370	290	170	250	180	170	370	290
SK 140 SPK 140	250	450	380	250	450	380	250	450	590	250	550	590	250	450	380	250	550	590
SK 180 SPK 180	900	1250	600	900	1250	600	900	1250	1000	900	2100	1000	900	1250	600	900	2100	1000



Low Backlash Planetary Gear Reducer Type ALPHA

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

9.4 Oil Change (not valued for SP-High-Speed-Gear Reducers)

The sizes 060 up to 075 are maintenance free. All other gear units are virtually lubricated for life.

We recommend however that the oil is changed approximately every 10,000 operating hours even with synthetic oils, since the oil becomes contaminated, causing increased wear.

Before changing the oil, bring the gear reducer to operating temperature. Drain the oil through one of the drain plugs. Open one of the drain plugs at the top as well in order to vent the gear reducer.

All residual oil and dirt inside the gear reducer must be flushed out. For this purpose, fill with oil, screw in the drain plugs and briefly let the gear reducer run. Drain off the oil and fill the gear reducer with the specified amount of oil.

The screw plugs must now be sealed with Loctite 573. The gear reducer must also be flushed as described above when changing to a different oil grade. The number and position of the drain plugs can be found in Table 9.4.1.

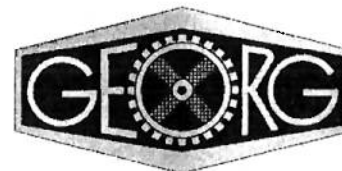
Disposal of waste oil

Waste oil must be disposed of in accordance with the directions of the relevant national associations and the applicable regulations.

Attention: no lubrication exchange is necessary for SP-High-Speed-Gear Reducers! The Gear Reducer is maintenance free!

Table 9.4.1: Drain plugs (position, quantity and size)

Gear reducer size	Version	Drain plugs in drive housing	Gear reducer size	Version	Drain plugs in bearing flange
060	M / S	1xM8x1	060	M / S / K	-
	K	3xM8x1			
075	M / S	1xM8x1	075	M / S / K	-
	K	3xM8x1			
100	M	3xM12x1,5	100	M/S/K 2 u. 3-stufig	1xM8x1
	S	3xM8x1		K 1-stufig	-
	K	3xM12x1,5			
140	M / S / K	3xM12x1,5	140	M/S/K 2 u. 3-stufig	1xM8x1
				K 1-stufig	-
180	M / S / K	3xM12x1,5	180	M/S/K 2 u. 3-stufig	1xM8x1
				K 1-stufig	-
210	M	3xM12x1,5	210	M	1xM8x1
240	M	3xM12x1,5	240	M	1xM12x1,5



Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK

10. Bolt Connections

The gear reducer is connected to the customer's construction via the four holes in the gear reducer. Secure the screws with Loctite, screw security adhesive. The screw sizes and tightening torques are listed in table 10.1. as a function of the reducer size and reducer variation.

Table 10.1: Bolt connections to customer's construction

Getriebe- größe	Version	Lochkreis ■ [mm]	Schrauben- größe	4 x Durch- messer [mm]	Festigkeits- klasse	Anzugsmomente [Nm]
060	M / S / K	68	M 5	5,5	12.9	10
075	M / S / K	85	M 6	6,6	12.9	17
100	M / S / K	120	M 8	9,0	12.9	41
140	M / S / K	165	M10	11,0	12.9	83
180	M / S / K	215	M12	13,0	12.9	145
210	M	250	M16	17,0	12.9	365
240	M	290	M16	17,0	12.9	365

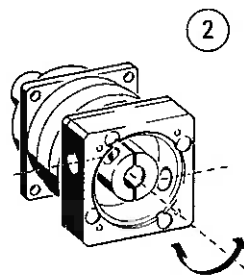
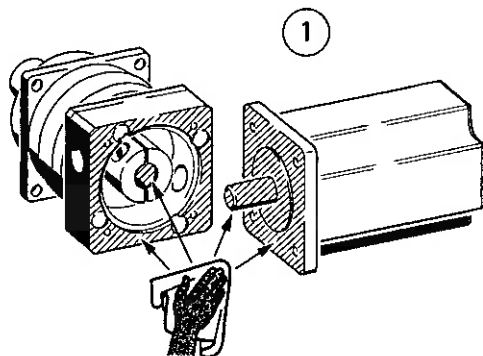
Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK

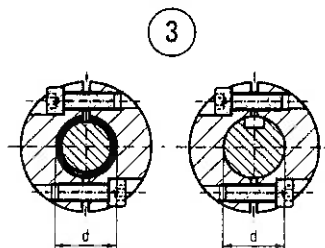
11. Motormounting instructions

11.1 Motormounting instructions SP B5

Read before operating unit !

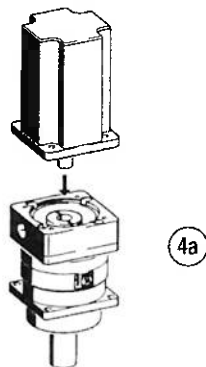


2. Turn to align holes with set-screws

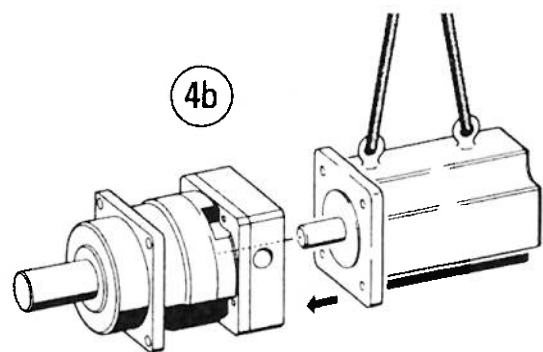


3. If bushing or keyway, mount in proper position. Remove key

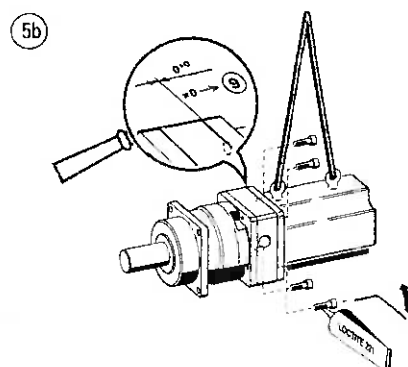
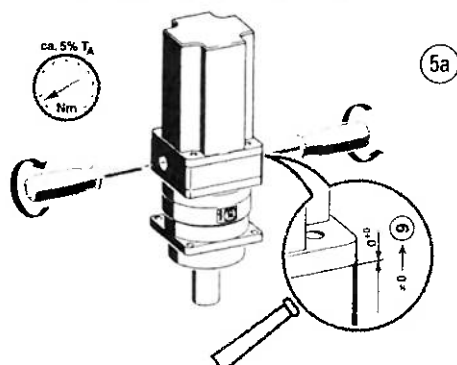
d...Clamping hub bore diameter



a = vertical – preferred method



b = horizontal

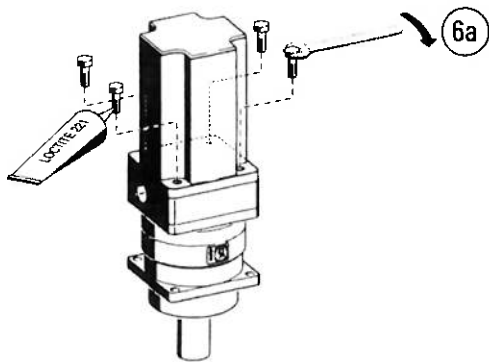


Technical Documentation



Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK



6b

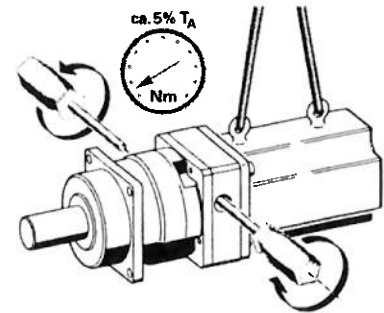
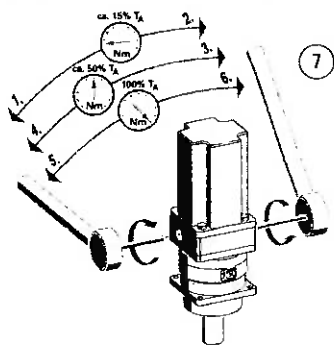
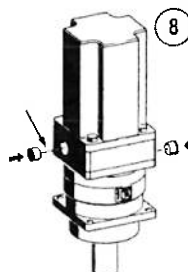


Table tightening torque (T_A)



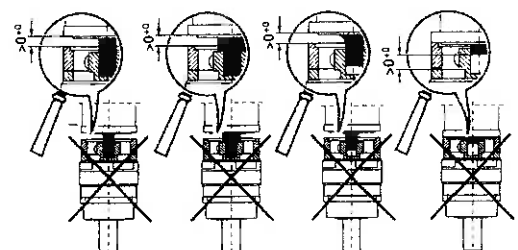
Gear Reducer size	Clamping hub bore • [mm]	Width across flats [mm]	Tightening torque T_A [Nm]
SP 060	• 14	3	5,0
SP 075	• 19	4	9,5
SP 100	• 14	4	9,5
	> 14 • 19	5	16,0
	> 19 • 32	6	39,0
SP 140	• 19	5	16,0
	> 19 • 24	6	39,0
	> 24 • 38	8	77,0
SP 180 1-stufig	• 48	8	77,0
SP 180 2-stufig	• 19	5	16,0
	> 19 • 24	6	39,0
	> 24 • 38	8	77,0
SP 210 1-stufig	• 55	10	135,0
SP 210 2-stufig	• 48	8	77,0
SP 240 1-stufig	• 60	14	330,0
	• 48	8	77,0

Flush



Note: In these cases
reread operating
instructions!

9



Technical Documentation

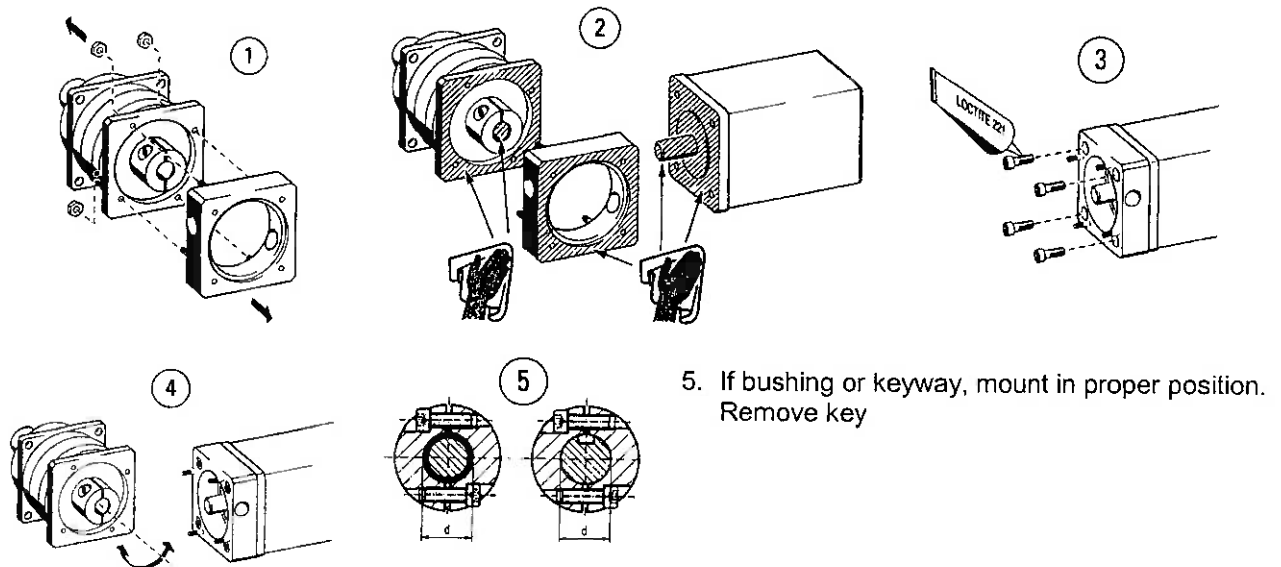


Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK

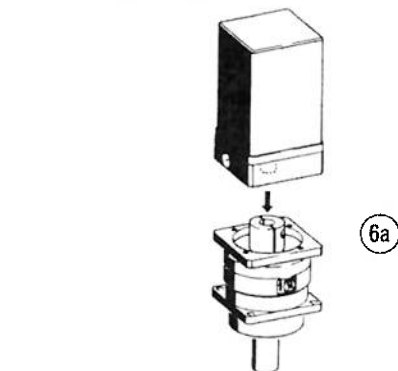
11.2 Motormounting instructions-SP B14

Read before operating unit !

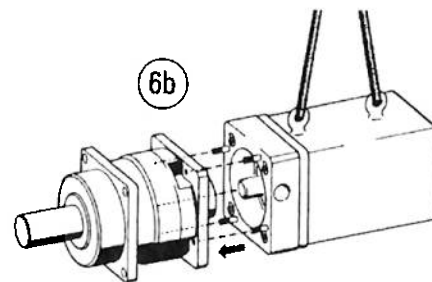


4. Turn to align holes with
setscrews

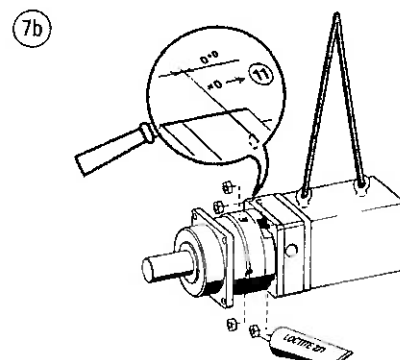
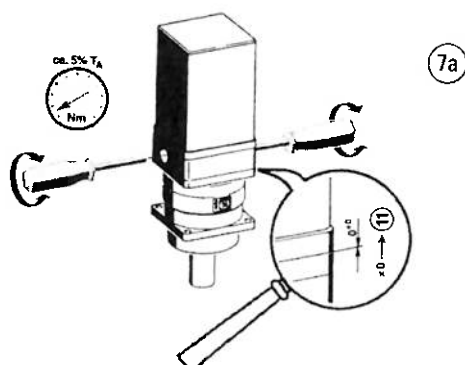
d...clamping hub bore
diameter



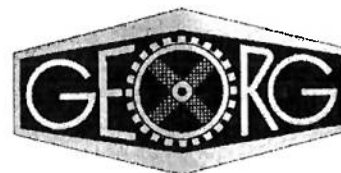
a = vertical – preferred method



b = horizontal

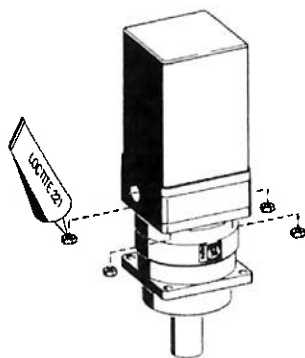


Technical Documentation



Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK



8a

8b

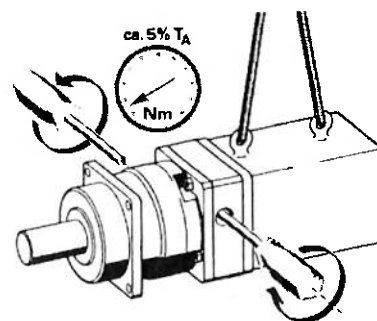
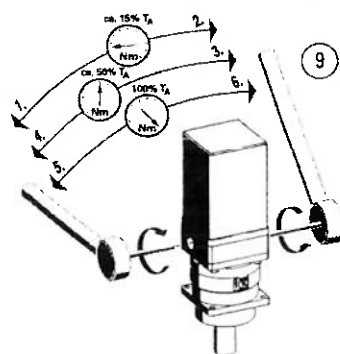
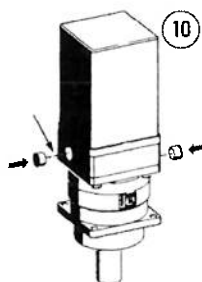


Table tightening torque (T_A):



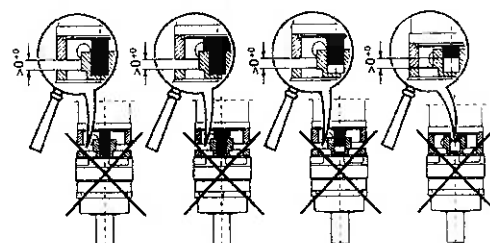
Gear Reducer size	Clamping hub bore $\square$, [mm]	Width across flats [mm]	Tightening torque T_A [Nm]
SP 060	• 14	3	5,0
SP 075	• 19	4	9,5
SP 100	• 14	4	9,5
	> 14 • 19	5	16,0
	> 19 • 32	6	39,0
SP 140	• 19	5	16,0
	> 19 • 24	6	39,0
	> 24 • 38	8	77,0
SP 180 1-stufig SP 180 2-stufig	• 48	8	77,0
	• 19	5	16,0
	> 19 • 24	6	39,0
	> 24 • 38	8	77,0
SP 210 1-stufig	• 55	10	135,0
SP 210 2-stufig	• 48	8	77,0
SP 240 1-stufig SP 240 2-stufig	• 60	14	330,0
	• 48	8	77,0

Flush



Note: In these cases
reread operating
instructions!

11



Technical Documentation

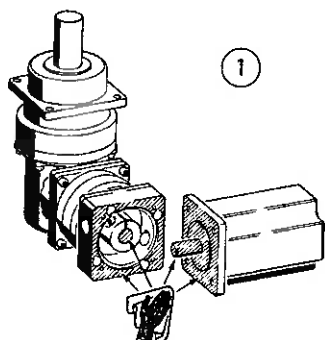
Low Backlash Planetary Gear Reducer Type ALPHA



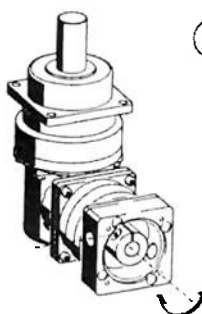
**HEINRICH GEORG GMBH
MASCHINENFABRIK**

11.3 Motormounting instructions– SK/SPK B5

Read before operating unit !

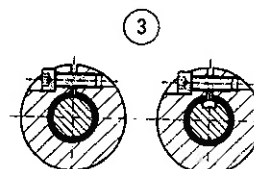


①



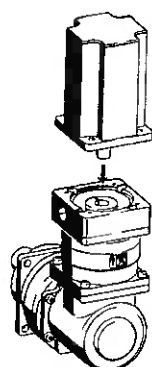
②

2. Turn to align
holes with
setscrews



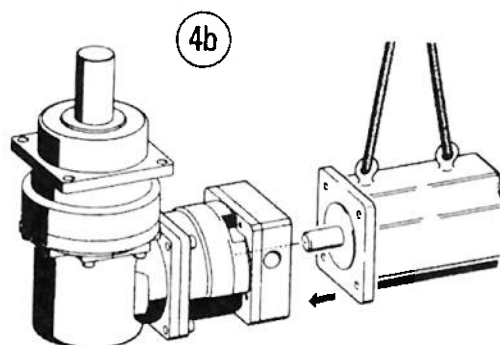
③

3. For keyed
motorshaft, mount
slot and keyway in
proper position



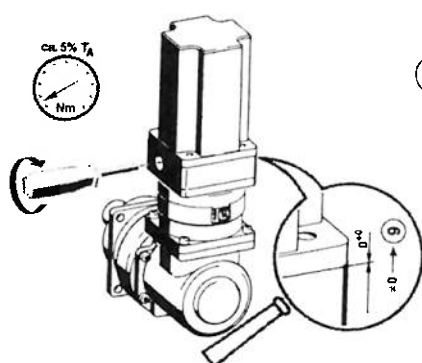
④a

a = vertical – preferred method



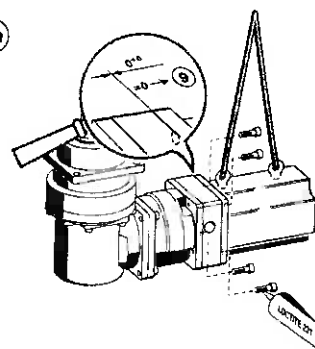
④b

b = horizontal

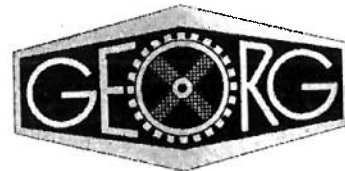


⑤a

⑤b

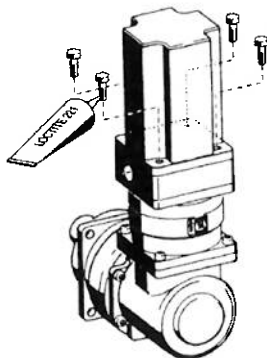


Technical Documentation



Low Backlash Planetary Gear Reducer Type ALPHA

HEINRICH GEORG GMBH
MASCHINENFABRIK



6a

6b

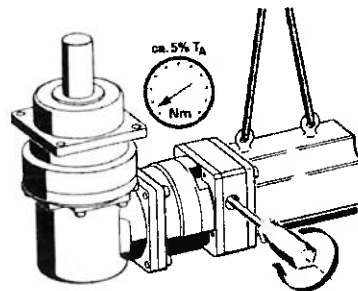
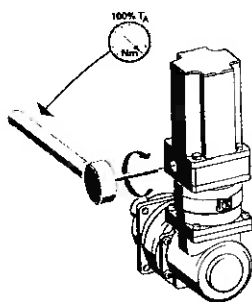


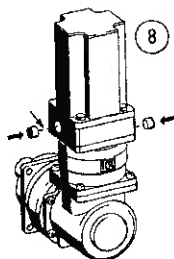
Table tightening torque (T_A)



7

Gear Reducer size	Width across flats [mm]	Tightening torque T_A [Nm]
SK 060, SPK 060	4	8
SK 075, SPK 075 2-stage	5	14
SPK 075 3-stage	4	8
SK 100, SPK 100 2-stage	6	30
SPK 100 3-stage	5	14
SK 140, SPK 140 2-stage	8	65
SPK 140 3-stage	6	30
SK 180, SPK 180 2-stage	10	115
SPK 180 3-stage	8	65

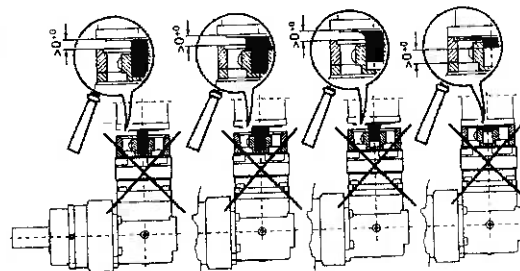
Flush
(Press in
to leave no
ridge)



8

Note: In these cases
reread operating
instructions!

9



Technical Documentation

OP- 0060-0e.doc

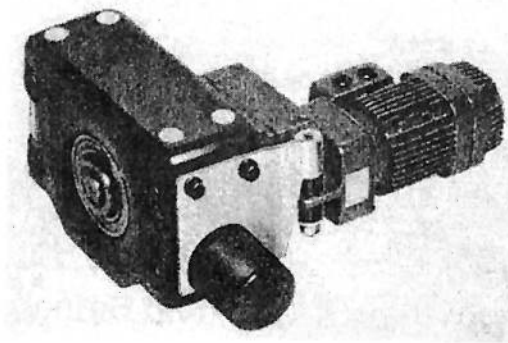


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

RS Wheel Blocks

Type

MANNESMANN DEMAG FÖRDERTECHNIK¹



Contents²

1. General
2. Anti friction bearings
3. Removing bearings

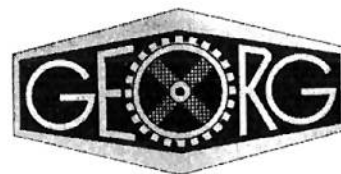
Page
2
3
4

¹ Mannesmann Demag Fördertechnik

² Source: 206 284 44 0694 DE

Technical Documentation

RS Wheel Blocks Type MANNESMANN DEMAG FÖRDERTECHNIK



HEINRICH GEORG GMBH
MASCHINENFABRIK

1. General

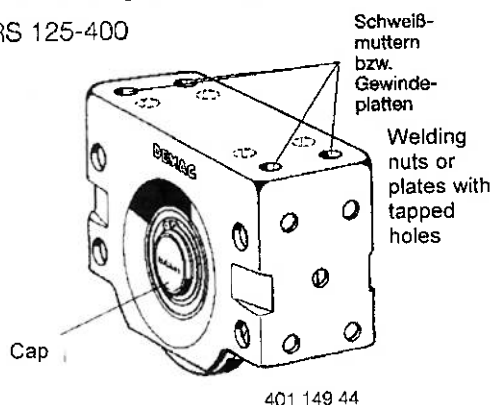
The Demag wheel block is a welded, compact module, resistant to bending and torsional stresses, composed of two deep-drawn, crimped shells, the type A-G travel wheel and the anti-friction bearings. The block is symmetrical. In order to simplify alignment, one outer face of the wheel flange is machined.

Standard: The wheel block can be used at temperatures between -30°C and $+70^{\circ}\text{C}$.

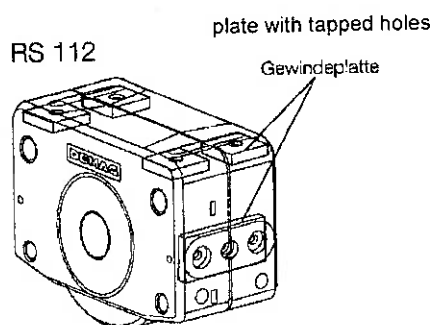
RS wheel blocks are maintenance-free (with bearings lubricated for life).

The RS wheel block forms an ideal drive unit in conjunction with the smooth running hollow-shaft gearbox AFM 03, 04, 05, 06, AFL 04, AF 04/AF/AFW 05/06/08/ 10/12, which can be modified to meet the demands of various operating conditions and design situations in a number of variants.

Scope of supply: Lieferumfang: Radblock
Wheel block
RS 125- 400 RS 125-400



RS 112



Technical Documentation

RS Wheel Blocks Type MANNESMANN DEMAG FÖRDERTECHNIK



HEINRICH GEORG GMBH
MASCHINENFABRIK

2. Anti-friction bearings

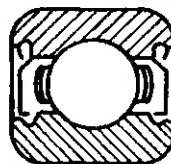
Standard anti-friction bearings: Grooved ball bearings 2 Z DIN 625, RS 125/6209, RS 160/6211, RS 250/6217, RS 315/6219, RS 400 with self-aligning roller bearing 22220 with special seal on either side lubricated for life.

2.1 Standard

For use in temperatures from -30°C to +70°C and normal ambient conditions.

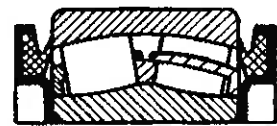
RS 112-RS 315

Bearings sealed by cover plates.
Lubricated for life, maintenance-free.



RS 400

Bearings specially sealed.
Lubricated for life, maintenance-free.



2.2 Extreme conditions

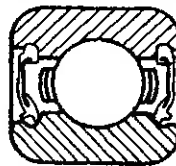
For use in temperatures from -20°C to +150°C and in moist and dusty conditions.

All bearings have the following additional features:

- Metal cage
- Dimensional stability
- High-temperature grease

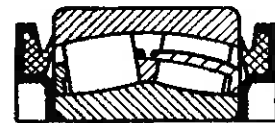
RS 125-RS 315

Improved sealing of bearing.
Lubricated for life, maintenance-free



RS 400

Bearings specially sealed up to 150°C.
Lubricated for life, maintenance-free.



2.3 Furnace trolley bearings

For use in temperatures from +150°C to +350°C. For use only with top connection.

+150°C - +350°C. For use only with top connection.

RS 125-RS 315

Bearings phosphated against corrosion and grease-lubricated. The wheel load reduces according to temperature by the values given in the table below. No relubrication required.

RS	+180° C	+200° C	+250° C	+300° C	+350° C
125- 315	0,7	0,65	0,6	0,55	0,44

Technical Documentation

RS Wheel Blocks Type MANNESMANN DEMAG FÖRDERTECHNIK

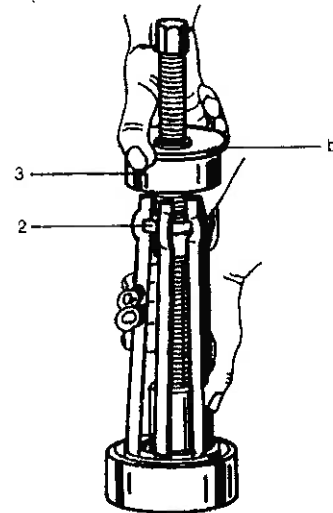


HEINRICH GEORG GMBH
MASCHINENFABRIK

3. Removing bearings

3.1 Wheel blocks RS 315, RS 400

Remove the circlips from the travel wheel hubs on the RS 315 and 400. Use the gap (tolerance) between the circlip and the flange edge of the housing when moving the travel wheel (by tapping lightly with a hammer on the hub), in order to ease the bearings out of their seat. The gaps in the crimps can then be used to fully remove the bearings



3.2 Wheel blocks RS 125, 160

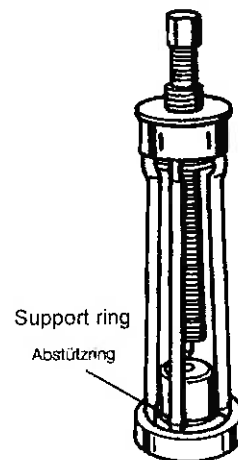
These extractors are used to remove ball bearings,

fitted on the travel wheel hub in the housing

For ball bearings: RS 125 (6209)
RS 160 (6211)

Simple operation:

Place hooks between the balls in the outer bearing race. The cover or sealing disc must be destroyed prior to this, in order to place the ball bearing extractor in position. Remove the circlip on the travel wheel hub. Place the support ring with the relevant bearing number on the inner race of the bearing. Press the hooks together at the top and press their recesses around the rim of threaded bush (2). Then tighten tensioning disc (b), thus pushing cap (3) over the hooks. Then pull out the ball bearing.



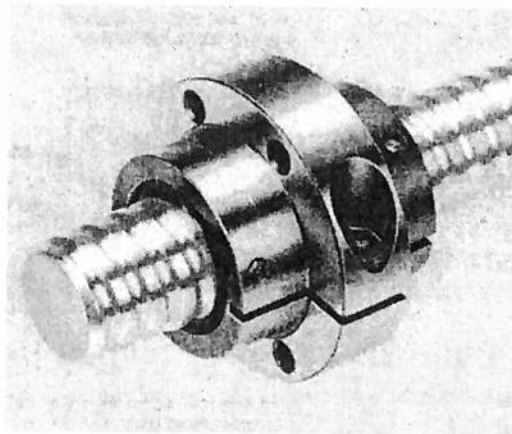


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Ball Screw Assemblies

Type

STAR¹



Contents²

	page
1. Storage	2
2. Installation into the machine	2
3. Mounting the nut onto the screw	2
4. Adjustable-preload single nut; Adjusting to zero clearance or preload	3
5. Inserting the wiper-type seal	3
6. Lubrication	4
6.1 Oil lubrication	4
6.2 Grease lubrication	4

¹ Deutsche STAR GmbH; 97419 Schweinfurt

² Source: RD 83 300/03.95

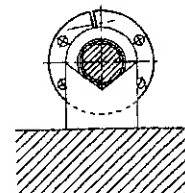
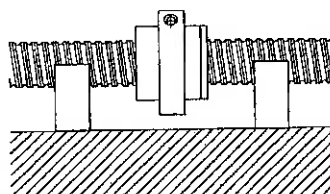
Ball Screw Assemblies Type STAR

HEINRICH GEORG GMBH
MASCHINENFABRIK

1.0 Storage

Ball screw assemblies are high-quality systems and must be treated with due care. To prevent damage and contamination, the elements should not be removed from their protective foil wrapping until immediately before installation.

Once removed from their packaging, the units must be set down only on V-shaped cradles (see Fig. 1).



2.0 Installation into the machine

It is not normally necessary to remove the preservative coating before installation.

- If ball screw assembly is contaminated, clean it (do not use trichlorethylene!) and lubricate it before installation.
- Push the nut into the bore, taking care to avoid jolting and misalignment.
- Tighten the holding screws, preferably with the aid of a torque wrench. Refer to Table 1 for the tightening torques for the various screw strength classes. Be sure to observe the instructions for lubrication.

Screw diameter (mm)	Tightening torque (Nm) for screws of strength classes to DIN ISO 898:		
	8.8	10.9	12.9
M 3	1,3	1,8	2,1
M 4	2,7	3,8	4,6
M 6	9,5	13	16
M 8	23	32	39
M 10	46	64	77
M 12	80	110	135
M 16	195	275	330

3.0 Mounting the nut onto the screw

Ground-thread ball screws with single nut, adjustable-preload single nut or with double nut

Ground-thread ball screw assemblies are always delivered with the nut unit already assembled. Nut unit and screw must not be disassembled. Please consult us if disassembly should become necessary for any reason.

Rolled-thread ball screws with double nut

Nut unit and screw must not be disassembled. Please consult us if disassembly should become necessary for any reason.

Rolled-thread ball screws with single nut or with adjustable-preload single nut

Never attempt to mount a nut except with the aid of a mounting sleeve. The outside diameter of the sleeve should be about 0.1 mm smaller than the root diameter of the screw. In most cases, the transport arbor on which the nut is delivered can be used to mount the nut on rolled-thread ball screws. The end of the thread on the screw must be chamfered to prevent damage to the seal or to the internal components of the nut unit (see Fig. 2).

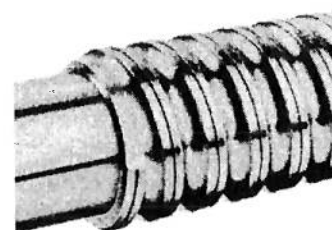


Fig.: 2

Mount the nut as follows:

Remove the rubber ring from one end of the arbor (Fig. 3).

Push the arbor with nut until it engages with the start of the thread (Fig. 4). The arbor must make good contact without axial play. Now turn the nut unit onto the thread, applying only light axial pressure. Do not remove the arbor until the entire nut unit is seated on the screw thread (Fig. 5). To remove the nut from the screw, proceed in the reverse order. Take particular care not to damage the nut, shaft, or internals, as this could lead to failure of the ball screw assembly.

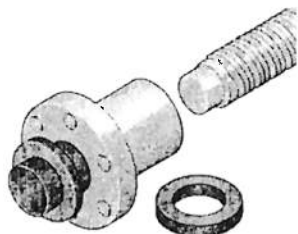


Fig.: 3

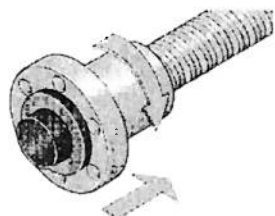


Fig.: 4

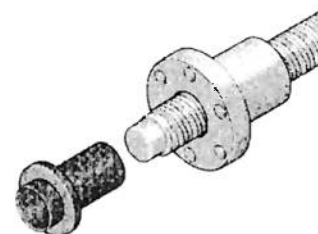


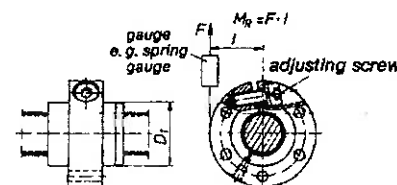
Fig.: 5

4.0 Adjustable-preload single nut - Adjusting to zero clearance or preload

When the nut has been mounted on the screw, reduce the clearance in the nut by turning the adjusting screw (Fig. 6) to the idle-running torque indicated in Table 2 (assembly lightly oiled).

Check this torque along the entire length of the thread; if the torque at any point on the thread is higher than the figure given in the table, adjust accordingly.

When the desired torque has been established, the centering diameter D_1 as shown in Figure 6 must be as indicated in Table 2. Cover the head of the screw with a cap.



Size d _o x p			M _R • 30% [Nm]	M _{RD} Approx. [Nm]	Centering diameter D ₁ after adjustment (mm)				Size d _o x p			M _R • 30% [Nm]	M _{RD} Approx. [Nm]	Centering diameter D ₁ after adjustment (mm)		
8	x	2,5	0,015	0,015	15,979	-	15,954		40	x	5	0,56	0,40	55,965	-	55,925
12	x	5	0,050	0,03	23,975	-	23,940		40	x	10	1,09	0,40	62,965	-	62,925
16	x	5	0,120	0,08	27,975	-	27,940		40	x	20	0,88	0,40	62,965	-	62,930
16	x	16	0,090	0,08	32,973	-	32,945		40	x	40	1,11	0,40	71,965	-	71,940
20	x	5	0,160	0,10	32,970	-	32,935		50	x	5	0,74	0,50	67,965	-	67,920
20	x	20	0,200	0,12	37,970	-	37,945		50	x	10	1,96	0,60	71,965	-	71,925
25	x	5	0,210	0,12	37,970	-	37,935		50	x	20	2,23	0,60	84,959	-	84,919
25	x	10	0,210	0,15	37,970	-	37,935		50	x	40	1,63	0,60	84,962	-	84,934
25	x	25	0,300	0,20	47,973	-	47,945		63	x	10	2,57	0,70	84,959	-	84,919
32	x	5	0,360	0,25	47,970	-	47,930		63	x	20	2,89	1,20	94,959	-	94,919
32	x	10	0,420	0,25	47,970	-	47,930		63	x	40	2,12	1,20	94,959	-	94,934
32	x	20	0,380	0,25	55,965	-	55,940		80	x	10	3,96	1,40	104,959	-	104,919
32	x	32	0,380	0,25	55,968	-	55,940		80	x	20	11,16	2,20	124,952	-	124,912

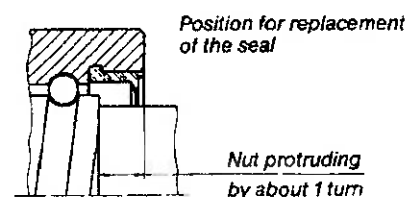
M_R = idle-running torque at preload
 $F_v = 0.05 C$, without wipers

M_{RD} = idle-running torque of two wipers

Total idle-running torque =
 $M_R + M_{RD}$

5.0 Inserting the wiper-type seal

Position the nut on the screw as shown in Figure 7. Insert the wiper with its projection in the recess provided and press in until it clicks into the groove. Observe the wiper lip while turning the nut on the screw and, if necessary, straighten the lip by applying pressure to the end surface. Please take care not to damage the lip.





Ball Screw Assemblies Type STAR

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

6.0 Lubrication

Before putting the ball screw assembly into operation, fill the nut with lubricant through the lubricating nipple. Graphite and MoS₂ additives must not be used.

Standard lubrication practices as applied for antifriction bearings can be used for ball screw assemblies, too. Either oil or grease can be used as lubricant. Because of the axial motion between screw and nut, however, lubricant loss is slightly greater than in conventional antifriction bearings. This means that in most cases the initial supply of grease will not last for the entire service life of the assembly.

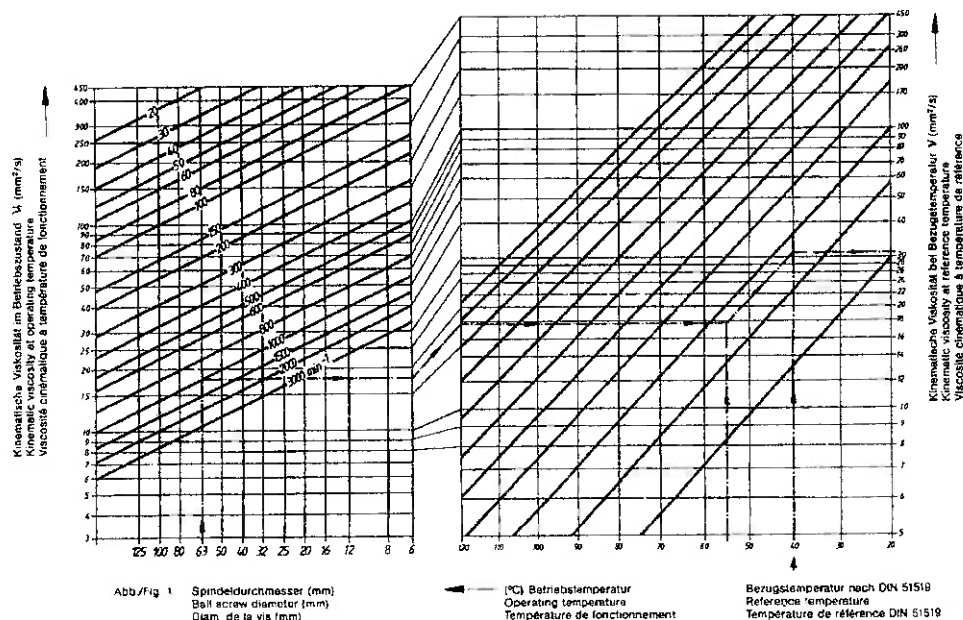
6.1 Oil lubrication

Temperature is one of the major influences affecting the performance of ball screw assemblies. This is because thermal expansion will interfere with the positioning accuracy of the assembly. One of the advantages of oil lubrication is that it keeps heat-up of the ball screw assembly low, especially at medium and high speeds. In principle, all commercially available mineral oils as used for antifriction bearings are suitable for use with ball screw assemblies, too. The viscosity required depends on the speed, temperature and load conditions of the specific application (see DIN 51501, DIN 51517 and DIN 51519). The graph in Figure 1 is an aid to selection of a suitable oil.

6.2 Grease lubrication

The advantage of grease lubrication is that the ball screw assembly can run for 500 to 1000 hours without re-greasing. In many cases, this means that a lubricating system will not be required. All commercially available antifriction bearing lubricating greases can be used but should not be mixed. Ball screw assemblies subjected to normal loads should be lubricated with a lithium-base grease of the consistency class **DIN 51818-2**.

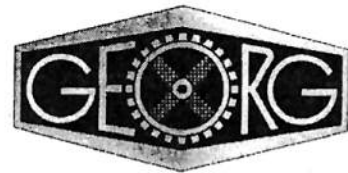
The grease supply should be enough to approximately half-fill the pockets.



Example: Determination of kinematic viscosity of lubricating oil.

Ball screw dia.: 63 mm; Speed: 1000 min⁻¹; Operating temp.: 55° C; Reference temp.: 40° C DIN 51519

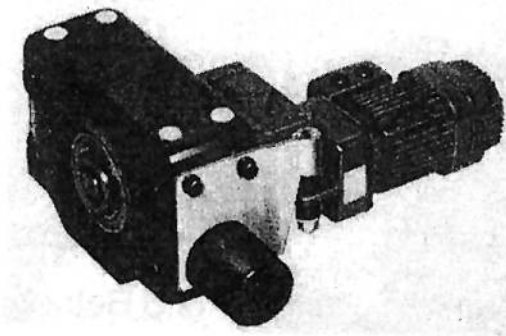
The required viscosity as obtained from the graph in Fig. 1 is 31 mm²/s. An oil of the next higher viscosity class should be used as lubricant. The next higher viscosity class is ISO VG 32 DIN 51519.



RS Wheel Blocks

Type

MANNESMANN DEMAG FÖRDERTECHNIK¹



Contents²

1. General
2. Anti friction bearings
3. Removing bearings

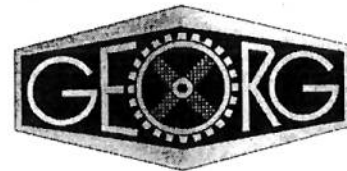
	Page
1. General	2
2. Anti friction bearings	3
3. Removing bearings	4

¹ Mannesmann Demag Fördertechnik

² Source: 206 284 44 0694 DE

Technical Documentation

RS Wheel Blocks Type MANNESMANN DEMAG FÖRDERTECHNIK



HEINRICH GEORG GMBH
MASCHINENFABRIK

1. General

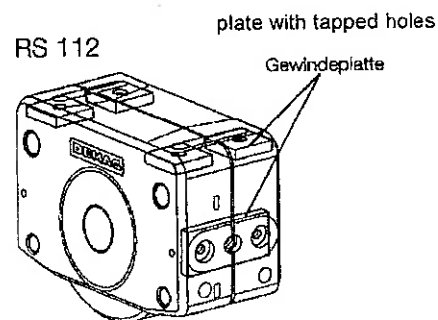
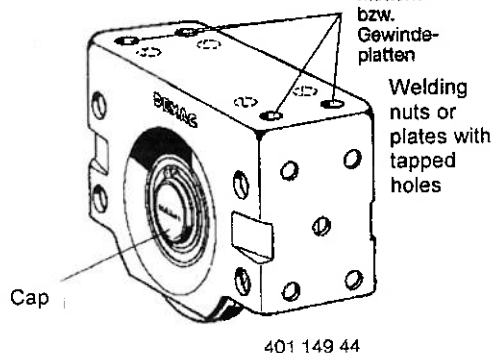
The Demag wheel block is a welded, compact module, resistant to bending and torsional stresses, composed of two deep-drawn, crimped shells, the type A-G travel wheel and the anti-friction bearings. The block is symmetrical. In order to simplify alignment, one outer face of the wheel flange is machined.

Standard: The wheel block can be used at temperatures between -30°C and +70°C.

RS wheel blocks are maintenance-free (with bearings lubricated for life).

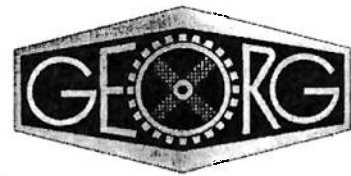
The RS wheel block forms an ideal drive unit in conjunction with the smooth running hollow-shaft gearbox AFM 03, 04, 05, 06, AFL 04, AF 04/AF/AFW 05/06/08/ 10/12, which can be modified to meet the demands of various operating conditions and design situations in a number of variants.

Scope of supply: Lieferumfang: Radblock
Wheel block
RS 125- 400 RS 125-400



Technical Documentation

RS Wheel Blocks Type MANNESMANN DEMAG FÖRDERTECHNIK



HEINRICH GEORG GMBH
MASCHINENFABRIK

2. Anti-friction bearings

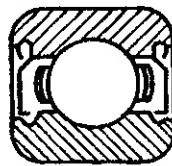
Standard anti-friction bearings: Grooved ball bearings 2 Z DIN 625, RS 125/6209, RS 160/6211, RS 250/6217, RS 315/6219, RS 400 with self-aligning roller bearing 22220 with special seal on either side lubricated for life.

2.1 Standard

For use in temperatures from -30°C to +70°C and normal ambient conditions.

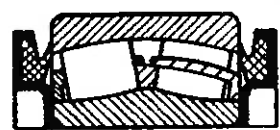
RS 112-RS 315

Bearings sealed by cover plates.
Lubricated for life, maintenance-free.



RS 400

Bearings specially sealed.
Lubricated for life, maintenance-free.



2.2 Extreme conditions

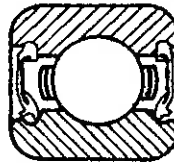
For use in temperatures from -20°C to +150°C and in moist and dusty conditions.

All bearings have the following additional features:

- Metal cage
- Dimensional stability
- High-temperature grease

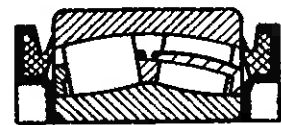
RS 125-RS 315

Improved sealing of bearing.
Lubricated for life, maintenance-free



RS 400

Bearings specially sealed up to 150°C.
Lubricated for life, maintenance-free.



2.3 Furnace trolley bearings

For use in temperatures from +150°C to +350°C. For use only with top connection.

+150°C - +350°C. For use only with top connection.

RS 125-RS 315

Bearings phosphated against corrosion and grease-lubricated. The wheel load reduces according to temperature by the values given in the table below. No relubrication required.

RS	+180° C	+200° C	+250° C	+300° C	+350° C
125- 315	0,7	0,65	0,6	0,55	0,44

Technical Documentation

RS Wheel Blocks Type MANNESMANN DEMAG FÖRDERTECHNIK

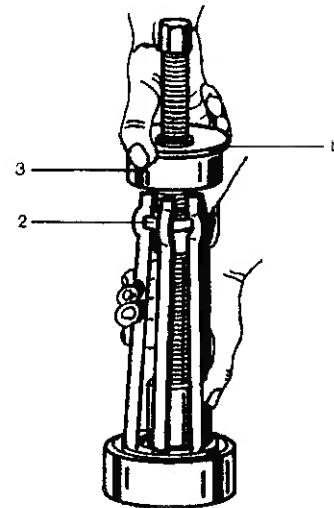


HEINRICH GEORG GMBH
MASCHINENFABRIK

3. Removing bearings

3.1 Wheel blocks RS 315, RS 400

Remove the circlips from the travel wheel hubs on the RS 315 and 400. Use the gap (tolerance) between the circlip and the flange edge of the housing when moving the travel wheel (by tapping lightly with a hammer on the hub), in order to ease the bearings out of their seat. The gaps in the crimps can then be used to fully remove the bearings



3.2 Wheel blocks RS 125, 160

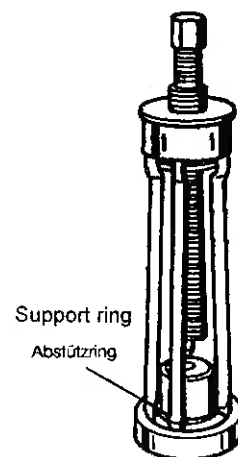
These extractors are used to remove ball bearings,

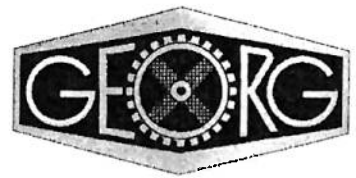
fitted on the travel wheel hub in the housing

For ball bearings: RS 125 (6209)
RS 160 (6211)

Simple operation:

Place hooks between the balls in the outer bearing race. The cover or sealing disc must be destroyed prior to this, in order to place the ball bearing extractor in position. Remove the circlip on the travel wheel hub. Place the support ring with the relevant bearing number on the inner race of the bearing. Press the hooks together at the top and press their recesses around the rim of threaded bush (2). Then tighten tensioning disc (b), thus pushing cap (3) over the hooks. Then pull out the ball bearing.



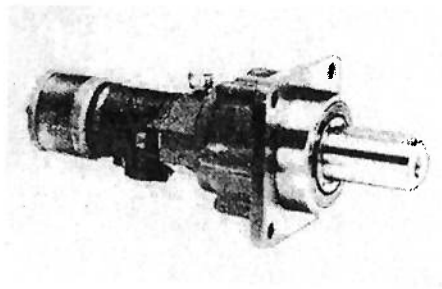


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Planetary Gears

Type

BRINKMANN¹



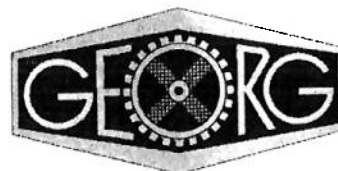
Contents ²

Maintenance instruction for planetary gears series P5-25 and P5- 25V

Page
2

¹ Gebr. Brinkmann Maschinen und Zahnräderfabrik 32760 Detmold- Remminghausen
² Source:

Technical Documentation



Planetary Gears Type BRINKMANN

HEINRICH GEORG GMBH
MASCHINENFABRIK

Planetary gear type P5-25 und P5-25V

as top gear for "Danfoss" hydraulic motors of the line of product OMP and OMR

1. Assembly instruction

a) Assembly of the hydraulic motor

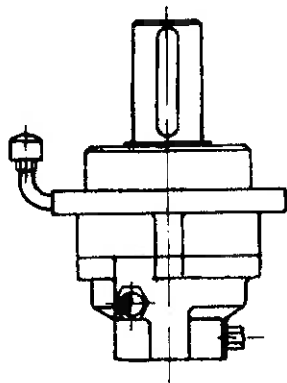
- 1.) Vertical positioning of the gear, if possible (driven shaft downwards)
- 2.) Removal of wood cover
- 3.) Take the drive pinion from the gear and displace it to the motor shaft via coupling
Take care that the compression spring and the ball are centrally located in the pinion
stick the ball with grease
- 4.) Carefully introduce the motor with drive pinion which is vertically adjusted
and anchor it with the connecting flange.

b) Elements to be mounted at the side of the driven shaft like spur gear, sprocket gear, belt disk etc.

For this please use the thread centring mounted into the driven shaft (with thread M 16)

Lubricating instruction

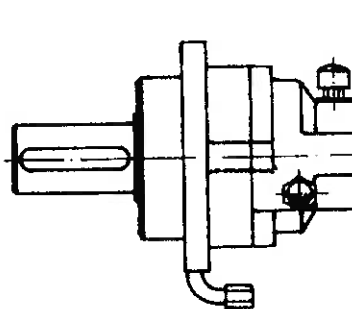
The gears are delivered without oil. Gear oil according to SAE 90 with a viscosity of approx. 85 - 150 cSt/50 C is used. It is advised not to use other oils with considerably deviating nominal values due to an inadequate lubrication of the gear parts. The first oil exchange should be effected after approx. 300 hours of operation, any further ones after 1000 hours of operation .



Size V 3

Driven shaft upwards the threaded hole in vertical direction, provided in the cover

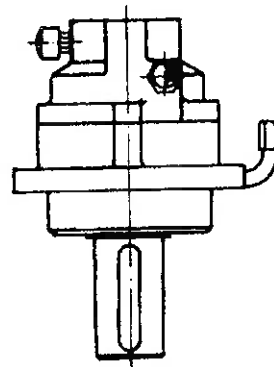
Oil quantity: 560 cm³; by means of a screw turn the knee piece by plug. 180° and attach the exhauster . Then close the threaded hole provided in the cover by means of a screw plug.



Size B 5

Driven shaft in horizontal direction

Oil quantity: 100 cm³



Size V 1

Driven shaft downwards
Driven shaft downwards in vertical direction

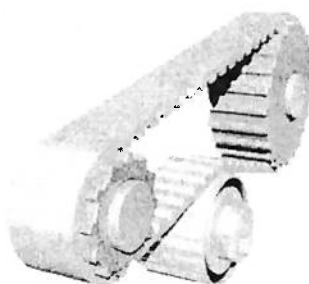
Oil quantity: 450 cm³



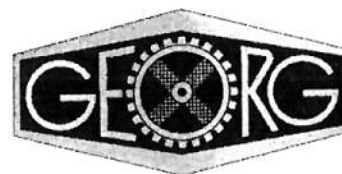
**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Remarks
concerning

BELT DRIVES



Contents ²



Belt Drives

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

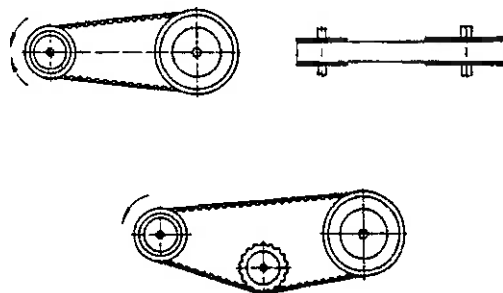
Toothed Belt Drives

Toothed belts contain glass fiber strands to avoid any permanent elongation during operation. The need for retightening the belt is thus obviated. The belt body consists of a neoprene mix which is resistant to most mineral oils and permits an ambient temperature of -30°C to $+85^{\circ}\text{C}$. A tough wear resistant nylon-fabric having a low coefficient of friction protects the teeth from wear and renders lubrication superfluous. Toothed belt gears provided with involute tooth flanks permit smooth meshing and vibrationless running with an efficiency of 98%. The gears are statically or dynamically balanced. For circumferential velocities of more than 30 m/sec it is recommended to dynamically balance the gears to 3 gr/cm. Toothed belt drives permit high circumferential velocities at positive synchronous power transmission (no slip). Minimal bearing load is achieved owing to the low belt tension (20 - 30%).

Arrangement of Toothed Belt Drives

Toothed belt drives are suitable for drives with parallel shafts irrespective of whether these are positioned horizontally or vertically. If the need arises to install idler pulleys for constructive reasons, toothed internal pulleys that are not spring-mounted or resilient should be used for fast running drives, if possible.

External pulleys cause unfavourable alternate bending conditions.



Centre Distance - Shaft Parallelism

Although the toothed belt is a precision formed part made of rubber, there is still the need to compensate for small longitudinal deviations during installation. We therefore recommend to provide for a means for adjustment of the centre distance in accordance with the table on the right. Straight belt run is governed by careful parallel alignment of the shafts.

Centre distance mm	to 160	to 400	to 750	to 1000
Centre distance adjustment range mm	$\pm 0,3$	$\pm 0,4$	$\pm 0,5$	$\pm 0,6$
Shaft misalignment	$\pm 1,5^{\circ}$	$\pm 1^{\circ}$	$\pm 0,75^{\circ}$	$\pm 0,5^{\circ}$

Mounting Notes

Due to their limited extensibility, toothed belts should never be forced onto the toothed pulleys or flanged pulleys. The easiest way of mounting is by changing the centre distance. Once the belt is installed, belt tension is to be adjusted. If the tension is too high, the load on the bearings is increased resulting in wear on the teeth. Too little tension may result in the belt skipping some teeth, in cases of small overloads, and being destroyed.

After mounting has been carried out, it is to be checked whether the belt runs true. It should only barely contact one flanged wheel. In the case of off-the-track running, parallelism or alignment of the toothed pulleys is to be checked.

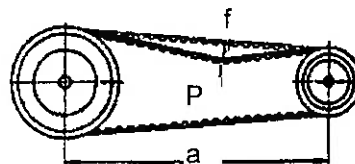
Belt tension is adjusted correctly if the belt can be deflected at half the length by the amount f under application of test load P .

Technical Documentation



Belt Drives

HEINRICH GEORG GMBH
MASCHINENFABRIK



Centre distance a	80	160	250	400	500	750	1000
Amount f mm	1,5	2,5	4,0	6,5	8,0	12,0	16,0

Belt pitch	$\frac{1}{5}$ "	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{1}{2}$ "	$\frac{1}{8}$ "
Belt pitch	$\frac{3}{8}$ "	$\frac{3}{4}$ "	1"	2"	2"
Test load P N	3	9	30	70	80

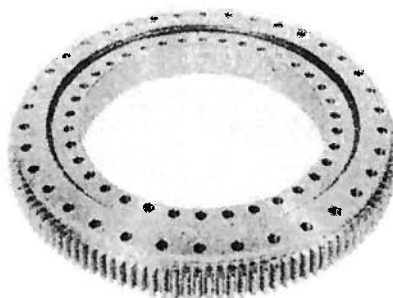


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Slewing Ring

Type

SNR ¹

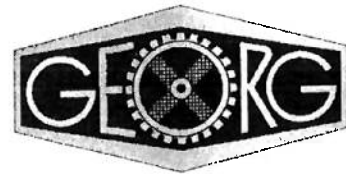


Contents ²

Installation and Maintenance

¹ SNR

² Source: Installation and Maintenance



Slewing Ring Type SNR

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

WARNING

The guarantee given by ROLLIX DEFONTAINE is only valid as long as the instructions or assembly, use and maintenance of slewing rings, as laid down in the ROLLIX technical literature already sent to you, are followed.

In particular nominal, or exceptional loads should not exceed the capacity of the bearing, gear and attachment. Only bolts recommended by ROLLIX must be used for fixing holes.

FITTING

The use of a slewing ring in any specific application calls for certain precautions or operations to be carried out prior to ensure that the ring is operating under the best conditions and gives the life expected. The following will assist in enabling the fitting operation to be carried out correctly.

Red mark: this mark corresponds to the hardening junction of the bearing raceway.

Blue mark: on the tooth

This mark corresponds the point of max. eccentricity of the adjusting and positioning of the pinion.

STRUCTURES

The slewing ring is an essential element in any mechanical assemblies; it is necessary that the structure is sufficiently stiff and adequately designed.

a) DESIGN OF THE SUPPORT FRAME

In order to avoid any deformation, the support frame must be integral with the chassis and sufficiently ribbed, especially in areas which are particularly subject to stresses.

They will be places directly beneath these areas, that is to say directly beneath the middle of the raceways (see fig. 1).

The stiffness of the supporting base/frame assembly must be such that under maximum loads the amount of deflection does not exceed the following values:

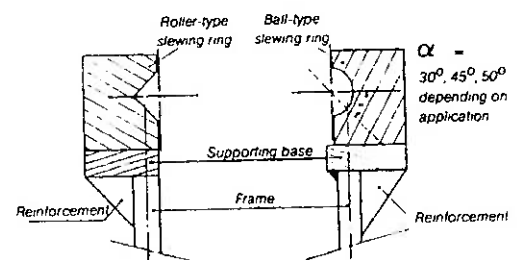


Fig. 1

Average ring Ø (in mm)	500	750	1000	1250	1500	2000	2500	3000
Max. deflection (in mm)	0,30	0,40	0,50	0,65	0,80	1,00	1,25	1,50

b) THICKNESS OF THE SUPPORTS

It is obvious that the design of the supporting base is determined by:

- the stresses and the moments to be transmitted
- its installation into the rest of the structure
- the geometric dimensions of the slewing ring.

We recommend the following minimum thicknesses:

Average slewing ring Ø (in mm)	500	750	1000	1250	1500	2000	2500	3000
Minimum thickness (in mm)	25	30	35	40	45	55	65	80

In all cases the supporting base is at least as wide as the surface of the slewing ring to which it is assembled.

Slewing Ring Type SNR

HEINRICH GEORG GMBH
MASCHINENFABRIK

c) FLATNESS OF THE SUPPORTING BASE

The tolerance of flatness is the greatest distance allowed between any point of the supporting base and its horizontal plane (see fig. 2).

This includes any defects in the supporting base:

- not loaded
- assembled on the frame.

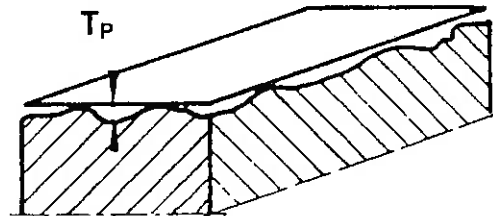


Fig. 2

Average slewing ring Ø (in mm)	500	750	1000	1250	1500	2000	2500	3000
Minimum thickness (in mm)	0,125	0,15	0,20	0,25	0,30	0,35	0,40	0,45

It is therefore obvious that the supporting base must be machined. In case it is impossible to do so, the use of plastic cement is allowed. In this case it is imperative that we are advised.

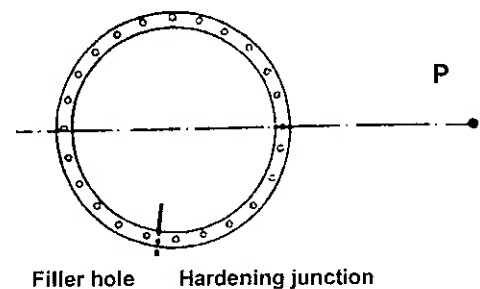
ASSEMBLY

The quality and safety of the assembly depend to a large extent on the position of the filler hole and the end of hardening zone.

The position of the filler plug is marked on the ring and is situated in the end of hardening zone.

Rotating ring (ie. moves with the load)

The hardening junction and the filler hole must be positioned in the area of least stress. This area is located at 90° to the axis of the jib or arm supporting the load P.



Fixed ring (on the chassis) The hardening junction must be located, if possible, in a compression area.

ATTACHMENT

The standard bolting arrangement proposed is designed to suit the capacity of the ring. Specific bolting patterns are available and can be designed for the application on demand. Calculating the number of bolts required is based on the loads to be applied. In all cases it is assumed that the ring is supported and is not unslung.

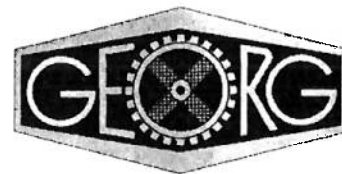
The ISO standard has defined a bolt and assembly elements classification. According to this standard and also calculations based on the specification VDI 2230. ROLLIX DEFONTAINE recommends for its slewing rings, the use of high tensile bolts and studs, the classes, descriptions and tightening requirements of which are given below.

SCREW AND STUD CLASSIFICATION

The quality classes of screws and studs are designated by a symbol consisting of two numbers together will give the approximate yield strength of the screws or studs used.

For the attachment of slewing rings, ROLLIX DEFONTAINE recommends the use of the following classes of bolts.

Technical Documentation



Slewing Ring Type SNR

HEINRICH GEORG GMBH
MASCHINENFABRIK

Grade (ISO) Description	Mechanical Properties			
	Tensile	Strength in N/ mm ² Yield	Fatigue	Elongat. %
8.8	800	640	200	12
10.9	1000	900	277	11
12.9	1200	1080	338	9

NUT CLASSIFICATION

The quality classes of nuts are designated by a grade number. The grades indicated by ISO are:

Classes :4 - 5 - 6 - 8 -10 - 12.

For the attachment of slewing rings, ROLLIX DEFONTAINE recommends the use of high-strength nuts, the grade of which depends upon the grade of the screws.

NUTS		USE WITH SCREW	
Grade	Specific stress N/mm ² in	Normal pitch grade	Fine pitch grade
8	800	8.8	6.9
10	1000	10.9	8.8
12	1200	12.9	10.9

DESIGNATION

Bolt designation is to specify all the main characteristics of the thread and nut:

-Shape of the head - Diameter - Length -Finishing code symbol -Quality class.

To ensure satisfactory bolting down of their slewing rings ROLLIX DEFONTAINE recommend the use of:

-Hexagonal head bolts code H

-Square head bolts symbole Q

Moreover, the surface finish of the bolt heads must meet the requirements of a semi fine class, code T.

Example reference: Bolt HM 18 - 90T - Class 10.9.

SELECTION OF THE MOUNTING BOLTS

To ensure that the slewing ring is correctly and efficiently clamped down, the following parameters must be taken into consideration:

- number of bolts class and quality of the bolts - necessary clamping force
- Bolt head, bearing and seating surfaces must be machined and must comply with our specifications regarding supports and surface finish.

number of bolts and screws must be sufficient not only to ensure good fitting but also to avoid any deformation of external and internal rings. It must correspond to the number of fixing holes which are in the ring.

CALCULATION CONDITIONS

-equidistant bolts, ie.equally positioned on the pitch circle. -slewing rings and supports in steel.

-rigid structure.

-slewing ring bolted directly to its support without using "plastic cement".

- use of centring spigots; in this case, there is practically no shear load on the bolts.

- high tensile bolts.

- calculations based on the ring having the most heavily stressed bolts.

- calculations carried out on the fixed ring are the most usual.

Ident-Nr.: OP-0089-0e.doc	Revision 1 20.11.96			Page 4 of 7
------------------------------	------------------------	--	--	-------------



ASSEMBLY RECOMMENDATIONS

- The bolts must be greased before assembly.
- Tightening must be progressive and at 180° intervals.
- Final tightening must be uniform at all points of the slewing ring.
- Flat washers may not be used if their strength is less than 700 N/mm²

Lock washers of the following types GROWER, BELLEVILLE and SERRATED, are absolutely prohibited. The use of these washers will mean the cancelling of the guarantee.

TIGHTENING TENSION - TIGHTENING TORQUE

The tightening tension is equal to 80% of the value of the yield strength (friction coefficient: 0.12 to 0.16).

SCREW CLASS		8.8		10.9		12.9		
ISO	Ø	Section mm ²	Tension T en kN	Torque C en Nm	Tension T en kN	Torque C en Nm	Tension T en kN	Torque C en Nm
M 5		12,7	6,4	6	9	8	10,5	10
M 6		17,9	9	10	12,5	14	15	17
M 8		32,8	16,5	25	23	35	28	41
M 10		52,3	26	49	37	69	44	83
M 12		76,2	38	86	54	120	64,5	145
M 14		104	52,5	135	74	190	88,5	230
M 16		144	73	210	102	295	123	355
M 18		175	86	290	124	405	148	485
M 20		225	114	410	160	580	192	690
M 22		281	141	550	199	780	239	930
M 24		324	164	710	230	1000	276	1200
M 27		427	215	1050	302	1500	363	1800
M 30		518	262	1450	368	2000	412	2400

NOTE: Check the tightness after 100 hours of operation and recheck 3 months later. The frequency of future checking will depend upon operating conditions.

IMPORTANT:

- The best bolting arrangement is the use of through bolts and nuts, provided that the stretched length is sufficient and the loss of tension is minimal
Recommended stretch length should be greater than or equal to five times the bolt diameter
- When the ring is held down with tap bolts (tapped holes in the ring or the support) the depth of tapped hole (T) should be as follows
T should be greater than 1.5 x bolt diameter
T should never be smaller than 1.25 x bolt diameter

MAINTENANCE- LUBRICATION

An important factor influencing the lifetime of the gear and the raceway.

Technical Documentation



Slewing Ring Type SNR

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

GREASE CHARACTERISTICS

There are two types of grease used for slewing rings, each one having its own particular function.

FOR BEARING RACEWAY:

Lithium soap or lead soap grease High stability

- Normal service temperature - 30°C to + 120° C
- Penetration at 25°C according ASTM D 217

Unworked (UvV)	269
Worked (W) 10000 cycles	284
- Drop point according to ASTM D 566	187
-Viscosity at 50°C (for th basic oil)	110
-Timken test OK load in Lbs greater than	50

FOR GEAR TEETH (OR GEAR):

Extreme-pressure grease

- BTRA viscosity at 25°C minimum 100
- Engler viscosity at 50°C 1,65

STANDARD SLEWING RINGS:

The parts are delivered pre-greased.

Type of grease: ESSO BEACON EP 2.

Frequency of lubrication: approx. 950 hours

In the case of long term lubrication-up to 1,800 hours - it is important to use greases suitable for each application and conforming to the recommendations of our engineering department.

Some greases are recommended:

Klüber Isoflex NBU 15; Isoflex NB 52; Structovis PN 600 MF

ROLLIX DEFONTAINE RECOMMENDATIONS

FOR THE BEARING RACEWAY:

The slewing rings are equipped with greasing holes tapped to the European standard and suitable for:

- centralized greasing,
 - standard greasing: straight or angled spherical head grease nipples (AFNOR norms NFR 165-21 - DIN 3410).
- It is important to rotate the slewing ring during lubrication and to complete the lubrication after rotation.

FOR GEAR TEETH:

Depending on the operating conditions, we recommend the following for:

- a gear subject to strong vibrations
MOBIL DORCIA 30
- a gear subject to normal working conditions
ESSO SURRET FLUID 30 F.

In both cases, before greasing, the gear teeth must be cleaned especially at the bottom of the teeth, using a solvent. However, our anti-rust protection is compatible with the greases which will be used for the gear.

It is possible to use other brands of grease as long as they offer greasing characteristics similar to the types listed above. See Table.



Slewing Ring Type SNR

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

CORRESPONDANCE TABLE

BRANDS GREASE	BEARING	GEAR
Gear	Epexa EP2	Pebron engrenege 1401
Bp	Energrease LS EP2	GR 154 GS
Castrol	Spheerol EP2	
Elf	Elf EP2	Elfnera 4900 x fluid
Esso	Beacon EP2	Surett fluid 30 F
Fina	Marson EPL2	
Igol	Perfect	
Klüber	Centoplex EP2	Grafloscon CG 901 Grafloscon AC SG 40
Labo	GS 2061	
Mobil	Mobilux EP2	Dorcia 30
Shell	Alvania EP2	Cardium EP fluid H
Texaco	Mubifak EP2	Crater 2 x fluid
Total	Multis EP22	
Tribol	Molub Alloy	

TRANSPORT AND STORAGE

Slewing rings are mechanical elements. They must be handled with care; shocks are to be avoided, especially those along the radial axis.

Slewing rings must be stored horizontally and sheltered from bad weather. The normal coating protects the rings from humidity for 6 months.

As indicated in the chapter concerning Warnings, this leaflet only contains installation and maintenance instructions for our standard slewing rings. All previous information relates only to normal applications. For specific applications: Consult us.



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Torque Limiter

Type

KTR¹

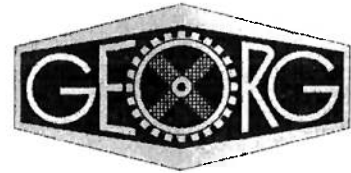


Contents ²

	Page
1. General	2
2. Operating and assembly	2
2.1 The KTR Torque limiter consists of the following elements	2
3. Disc spring combinations	2
3.1 Practicable arrangements of disc spring combinations	3
4. Friction linings	3
5. Centre bush	3
6. Torque adjustment	4
6.1 Size 00 - 5	4
6.2 Size 6 - 8	4
6.3 Instructions for adjustment	4
6.4 Example for size 2	5
7. Mounting torque limiters on shaft and other arrangements with driving elements	5
8. Maintenance - Assembly	5

¹ KTR Kupplungstechnik GmbH 48407 Rheine

² Source: 1-RU/SI-K-e-07/95



Torque Limiter Type KTR

HEINRICH GEORG GMBH
MASCHINENFABRIK

1. General

A great many drives in machinery need protection against dangerous overloading and unknown peak torques for reasons of safety and to avoid expensive failures and repairs.

KTR-RU - Torque limiters are machined all over and protected against corrosion and by virtue of design, are tolerant of dirty conditions.

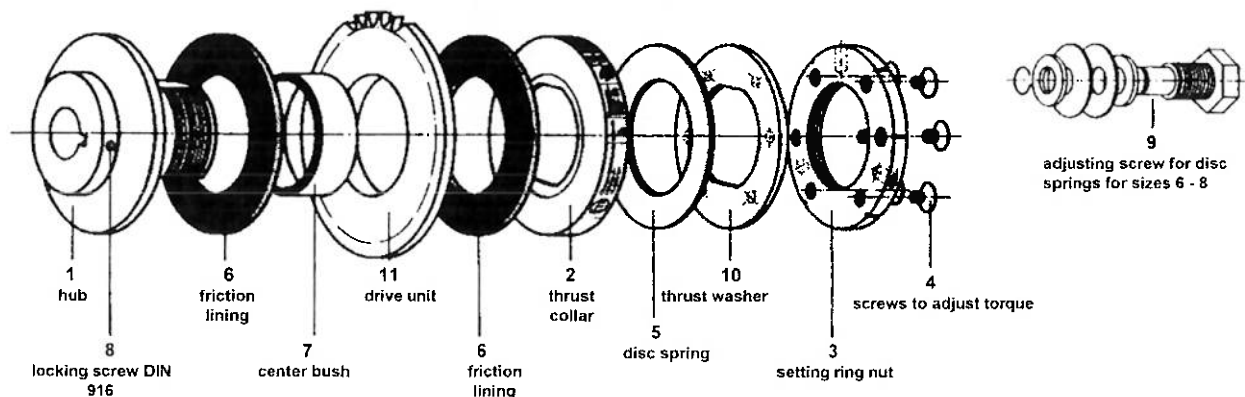
2. Operation and assembly

Firstly fit the driving element (11) between the two linings (6). Then fit the thrust collar (2), the disc springs (5) and the thrust washer (10). The setting ring nut (3) is then screwed finger-tight up to the thrust collar (10). On sizes 00-5 the countersunk torque setting screws (4) are then fully tightened.

On sizes 6 - 8 the hex-head screws (9) are fully tightened. On both types the maximum torque is thereby achieved.

If a lower torque setting is required, slacken the torque adjusting screws (4 / 9) and unscrew the setting ring nut (3) in line with the next graduation marks on the thrust collar (2). Then fully tighten all torque adjusting screws (4 / 9) and a reduced torque is achieved.

2.1 The KTR Torque limiter consists of the following elements



3. Disc spring combinations

Three standard combinations are possible:

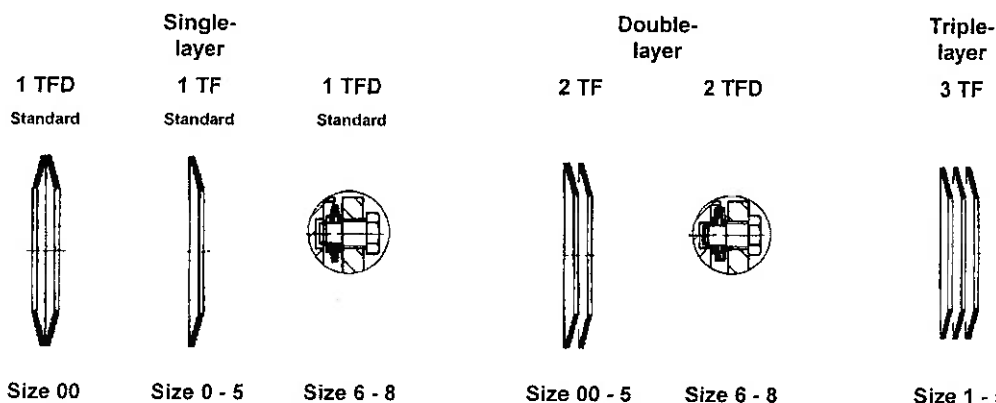
- Single layer (1 TF or 1 TFD) for very low torques. Application with Sizes 00 - 8.
 - Double layer (2 TF or 2 TFD) for medium torques. Application with Sizes 00 - 8.
 - Triple layer (3 TF) for high torques. Application with Sizes 1 - 5.
- Only for use in machines with limited space.



Torque Limiter Type KTR

HEINRICH GEORG GMBH
MASCHINENFABRIK

3.1 Practicable arrangements of disc spring combinations



From experience and tests, single layers cause low wear of friction lining, double layers cause average wear and triple layers cause rapid wear, when the torque limiter runs in a tripped state. The actual amount of wear depends of course on the set torque, the slipping speed, the length of slipping time and the frequency of tripping.

4. Friction linings

An asbestos and rust-free friction lining is used which is suitable for explosion protection drives. We would ask for your inquiry for particular applications, especially if a rust-free running surface is required.

5. Centre bush

The centre-bush is of new design in oil-free sintered iron using dry lubricants for long life operation. Unless specially requested we supply the centre bush with standard length. Shorter lengths to suit the application are available.

The calculation of the length "ZenBu" is made as:

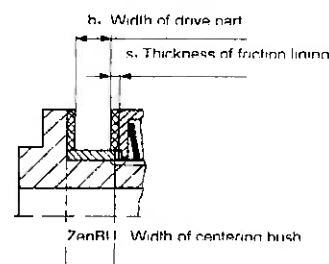
$$\text{ZenBu} = 1,5 \times s_1 + b_1$$

Example:

KTR-RU - Torque limiter Size 1
Length of drive element $b_1 = 8 \text{ mm}$
Thickness of friction lining $s_1 = 3 \text{ mm}$

$$1,5 \times 3 + 8 = \underline{12,5 \text{ mm}}$$

When placing order without indication of length of drive element, delivery will be made with max. length of centre bush.



KTR- RU - Size	00	0	01	1	2	3	4	5	6	7	8
Standard length of centre bush	4,2	10	13	15	17	21,5	24,5	28	31	33	33

6. Torque adjustment

6.1 Size 00 - 5

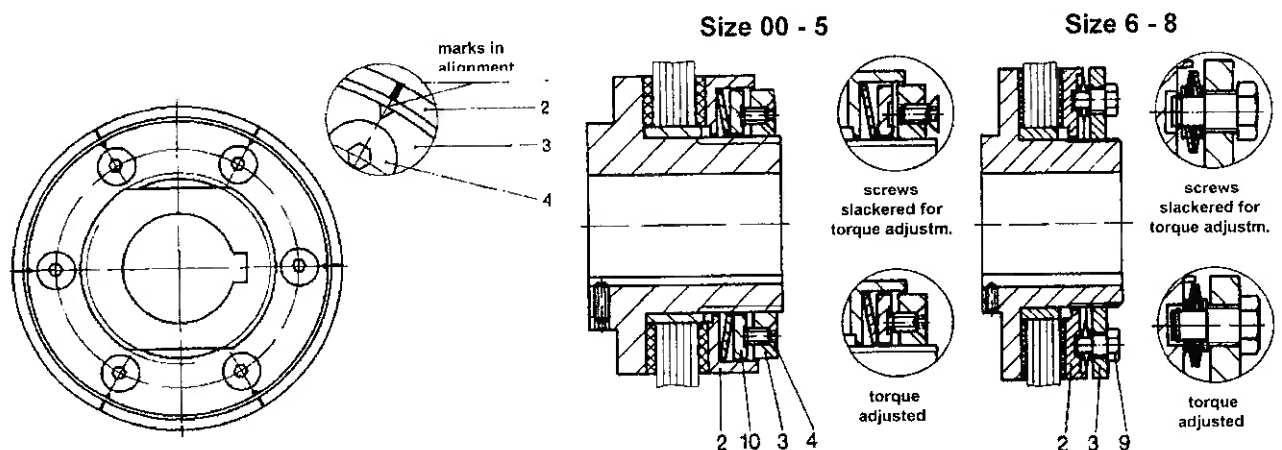
Screw setting ring nut (3) finger-tight up to thrust washer (10), adjust to the next nearest graduation. Now fully tighten the counter sunk screws (4) to achieve maximum torque setting. If a lower torque setting is required, slacken the screws (4) and turn the setting ring nut (3) using the graduation marks on the thrust collar (2) as indication, then retighten the screws (4) fully tight. Precise adjustment of the torque is possible as on the face of the thrust collar (2) and on the outer diameter of the setting ring (3) graduation marks are stamped. With counted and aligned graduations as well as with fully tightened screws (4 or 9) a precise torque setting is possible.

6.2 Size 6 - 8

Screw setting ring nut finger-tight up to thrust washer (2) and fully tighten adjusting screws (9) (hex. bolts) to achieve maximum torque setting.

If a lower torque setting is required, slacken the adjusting screws (9) and turn the screw setting ring nut (3) using the graduation marks on the thrust collar as indication, then retighten the screws (9) fully tight.

All torque limiters are labelled on the thrust collar (2) with stickers to facilitate changes from one torque setting to another.



6.3 Instructions for adjustment:

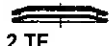
The set torque is especially depending on the kind of surface of the driving element (ground), the standard parts tolerances as well as the run-in period. Environmental influences (e.g. humidity, oil or other factors that cannot be exactly determined) may have a negative effect on the adjusted set torque.

On all torque limiters (except size 00 and 0) there is an adhesive table on the thrust collar enabling the simple conversion of the existing torques to the torques required.

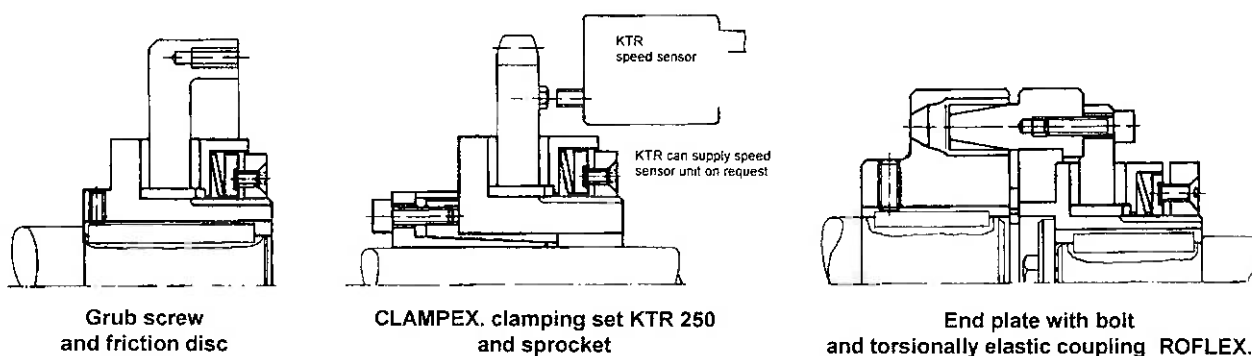
Torque Limiter Type KTR

HEINRICH GEORG GMBH
MASCHINENFABRIK

6.4 Example for size 2

Torque limiter 2	ground driving element running-in friction lining max. torque: screw setting ring finger tight To reduce torque slacken off setting ring to graduation marks.	adjust to graduation marks 	 	graduation marks TD	TF max. Nm	1	2	3	4	5
				1 TF torque Nm	130	110	90	50	25	12
				2 TF torque Nm	250	220	180	100	50	25

7. Mounting torque limiters on shaft and other arrangements with driving elements



A commonly used method is with a cup point grub screw acc. to DIN 916 at the rear of the hub. Alternatively the torque limiter may be axially clamped onto the shaft with a bolt and washer. Both methods require a keywayed shaft. A better method requiring no key and permitting thinner hubs is to use our Clampex clamping element KTR-250.

These avoid the time and expense of machining keyways and fitting keys or drilling and tapping for fixing screws and additional savings can be made from reduced diameter shafts.

8. Maintenance - Assembly

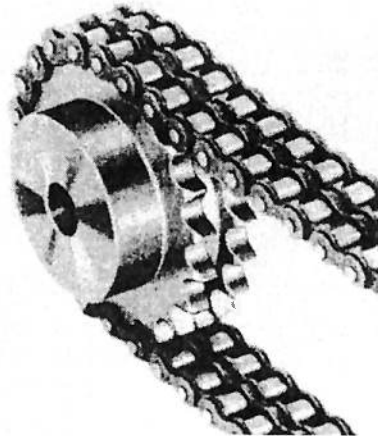
By virtue of their design KTR-Torque Limiters are insensitive to dirt. If unexpected wear of the friction lining occurs, it is possible to reset the torque limit to compensate, but if the linings are worn down more than 50%, they must be replaced. Avoid oil or grease getting onto the friction linings, otherwise the coefficient of sliding friction will be reduced and the torque limiter will slip a lower figure than required.

Special maintenance is not required.



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Roller Chains



Contents

	Page
1. Roller Chain Drives	2
2. Life of Steel Link Chains	2
3. Lubrication of Link Chains	2
4. Sprockets	3
5. Assembly of Steel Link Chains	3
6. Inspection and Measuring of Steel Link Chains	3



Roller Chains

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

1. Roller Chain Drives

Roller chain drives are used everywhere and especially where belt drives or gear drives are no longer suitable. All the advantages of the belt and gear drives are united in the roller chain drive, but without the attendant disadvantages. Roller chain drives though of robust design offer high precision and run at 98 % efficiency without slip. They can be used over a very wide range of shaft centre distances and are tolerant in accommodating alterations in centre distance. Their essential advantage over the gear drive is that their transmission ratio is independent of the centre distance.

2. Life of Steel Link Chains

Generally the pressure per unit of bearing area and the breaking load are the essential features for chain determination. However, because of the very large field of applications safety factors are also taken into account. Chain life, therefore, is not dependent solely on the breaking load, but wear- resistance of the -round parts (pins, bushes, rollers) is of paramount importance. Basically, every chain should be dimensioned in such a way that there should never occur a breakdown in any component part; rather the round parts should wear out gradually. Wear in the chain joints inevitably causes extension of chain pitch, and consequently the chain wheel will no longer mesh properly. Chain wear elongation should not exceed 3 %. In summary, the important factors having effect on chain life are correct design and calculation of the chain in relation to the operating conditions, accurate fitting and regular care and maintenance.

3. Lubrication of Link Chains

After assembly and inspection generally every chain is treated with a rust preventive. Prior to starting operation all articulations must be correctly lubricated. The field of application will determine the method of lubrication, taking into account chain speed and environmental influences. Mineral oil SAE-30 to 50 and the following methods of lubrication are recommended for steel link chains:

v [m/s]	Method of Lubricant	No.
≤ 2	manual lubrication - occasionally, with a brush or from spout oil can	1
≤ 8	drip-feed lubrication - permanently, from drip-cups	2
≤ 14	oil bath or splash lubrication - by slinger disc	3
≥ 14	forced lubrication by circulating pump - preferably with autocool	4

Lubricants such as oil and grease should always be applied between the inner and outer link plates on the side facing the chain wheel. Periodic cleaning of the chain to remove abrasive elements, dirt and sticky materials will prolong the working life. In addition to the lubricants mentioned, dry lubricants may be employed for particular applications. These are generally springled, sprayed or brushed on before chain assembly.



4. Sprockets

Chain life, of course, depends also on the correct construction and tooth form of the sprockets. In general, the number of teeth on a driving pinion is at least 19. Tensioner pinions and wheels used in secondary duty jobs may have a minimum of 13 teeth. For high-speed and impulsive drives it is recommended that the teeth be heat treated to increase wear resistance. Chain wrap on the wheels should not be less than 120°, and the transmission ratio of 1: 8 should not be exceeded. The number of teeth on the sprockets and the number of links in the chain should be calculated in such a way that the same roller will not after each revolution, engage in the same tooth gap. In extreme cases, conveyor chains with large pitches and running at relatively low speeds will operate over wheels with a minimum of 6 teeth, due to very high polygonal action.

5. Assembly of Steel Link Chains

Steel link chains are generally joined by connecting links. Wherever possible, chains with an **even number of links** should be used, so that the individual chain length commencing and finishing with inner link can be joined by a **straight connecting link**. Spring-clip to be mounted in direction of chain travel. An **uneven number of links** will necessitate the use of a **cranked link**, which will adversely affect the chain's breaking load and decrease it by about 20 %. When cutting continuous chain into specific lengths the outer link taken off must under no circumstance be re-used. Sprockets must be in perfect axial alignment and should be mounted as close as possible to the point of support. Care should also be taken that the shafts are well in parallel. As to the positioning of shafts an inclination of 60° to the horizontal is recommended. Vertically arranged centre drives necessitate constant tension adjustment to prevent the chain from disengaging from the lower wheel. Chain sag must not exceed 2 % of the centre distance, and should be as little as possible on impulsive drives. Chain sag can be adjusted either by alteration of shaft centres, by retightening the tension station, or by adjusting the tensioner pinion or tension rail. Overtightening of the chain should be avoided, since, in addition to imposing an extra load on the bearings, this will lead to quick wear and noisy running. The tightener should have a tension adjusting movement of at least 1,5 times the pitch to allow for removal of a 2pitch assembly. Chain drives need no pre-tensioning.

Attention: Never grind off rivet heads or rivet chain pins without wearing protection glasses and gloves.

6. Inspection and Measuring of Steel Link Chains

All raw materials for the manufacture of chains and sprockets are carefully inspected on arrival in our factory. At each stage of production chain components are controlled to ensure precision of all dimensions, adherence to tolerances, degree and depth of hardness as well as surface quality. After riveting, the dry undipped chain is checked for length under load. For roller chains to DIN 8187 (B.S.) the maximum permissible length tolerance is + 0.15 % over a length of 49 pitches. Finally, the chains undergo static and dynamic tests employing the latest technical methods.



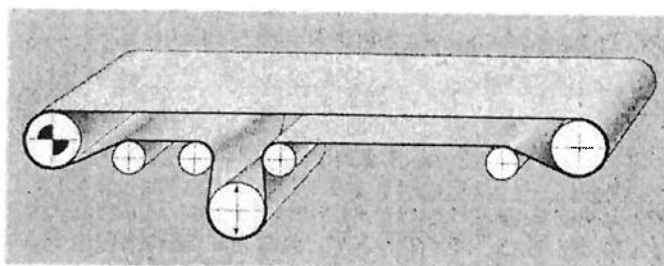


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Transilon Conveyor Belts

Type

SIEGLING¹



Contents²

	Page
Fundamentals of conveyor belt tracking	2
TRANSILON types which can be made endless with a Z-splice	8
TRANSILON types which can be made endless with a stepped overlap splice:	10
TRANSILON-types which can be made endless with a keyed connection	13

¹ SIEGLING GmbH Postfach 5346 D-30053 Hannover

² Source: Issue 04.94/2

Technical Documentation



Transilon Conveyor Belts Type SIEGLING

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

TRANSILON conveyor and processing belts for an efficient flow of goods in the light materials handling industry.

In the early 60s the idea of developing conveyor belting for light materials handling began to materialize, and a line called TRANSILON was created. With its diverse array of types, the TRANSILON range has continually proved responsive to virtually every demand of the market.

TRANSILON is successfully used worldwide in manufacturing, commerce and service industries.

Our market-oriented product range offers more than 70 belt types which facilitate the choice of the right belt for any application.

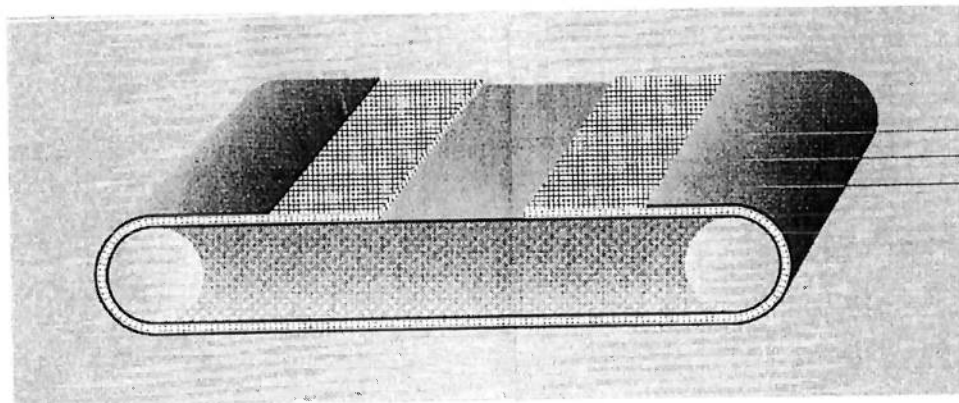
With its TRANSILON range, SIEGLING can offer intelligent application- and industry-specific solutions for all conveying tasks.

Depending on the coating selected, TRANSILON is:

- abrasion resistant
- antistatic
- conductive on surface to ISO and DIN
- largely impervious to oils, greases and many chemicals
- of food quality (BGA, FDA and USDA specifications)
- low noise
- high or low grip
- smooth or patterned

Materials used

The standard TRANSILON finish consists of a polyester fabric carcass with plastic or elastomer coatings.



Underside
Carcass
Top face

Advantages

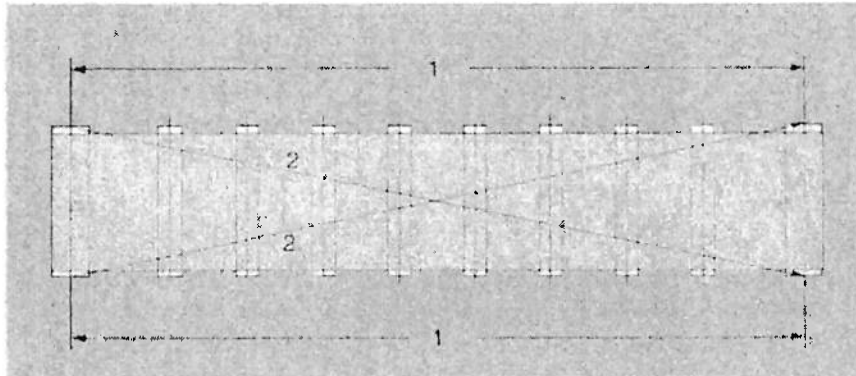
small take-up ranges are possible
unaffected by fluctuations in humidity and temperature
environmentally friendly by reducing noise emissions
small-diameter drums and knife edges may be used
wide belts run flat
long belts can be handled easily
tough and wear-resistant, wide range of applications
adapts easily to troughed rollers
complies with EN 20340, DIN 22103 and ISO 340
measured to DIN 22104 and ISO 284

Properties

TRANSILON offers decisive advantages in use and, depending on the carcass, is

- virtually stretchless
- dimensionally stable
- low-noise operation
- longitudinally flexible
- laterally stiff
- light and thin
- rugged
- troughable
- flame-retardant
- highly conductive

Fundamentals of conveyor belt tracking



The conveyor should be as rigid as possible. It must not be distorted by the forces exerted by the belt.

All drums and rollers, especially the drive drum, must be clean. Remove anticorrosion coatings, oil and dirt deposits from skid plates, drums and rollers. Replace damaged or heavily worn parts.

Align knife edges, drive and end drums, and support rollers such that they are parallel.

To do this, first align the end drums such that they are parallel to each other and at right angles to the conveyor frame by adjusting the drums until each centre distance 1 and each diagonal 2 are equal.

Another method is first to align the drive drum using a set square and then to adjust the end drum until the centre distances 1 are equal.

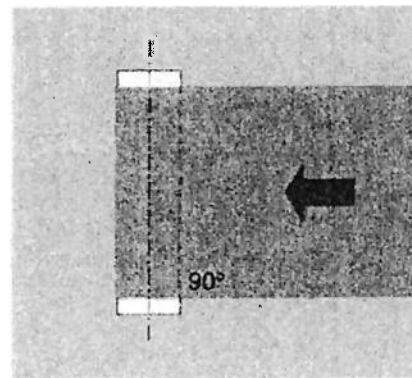
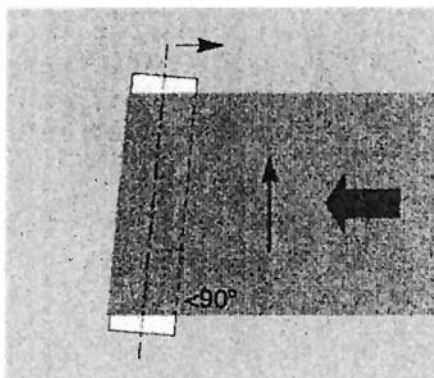
It is then possible, starting from one of the end drums, to align each support roller or skid plate section individually such that the axes are parallel.

Goods should always be loaded onto the centre of the belt in the direction of travel. Large drops should be avoided if at all possible.

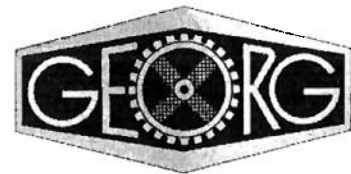
Attention should be paid to the surface quality of the drums.

Drum whose axes are not at right angles to the running direction of the belt will cause mistracking

Straight running due to right-angled alignment of drum



Technical Documentation



Transilon Conveyor Belts Type SIEGLING

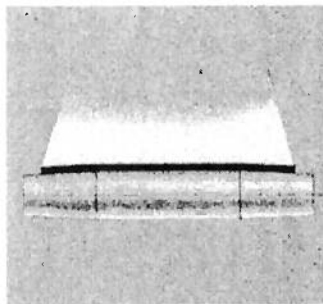
HEINRICH GEORG GMBH
MASCHINENFABRIK

Effect of conicity and belt width

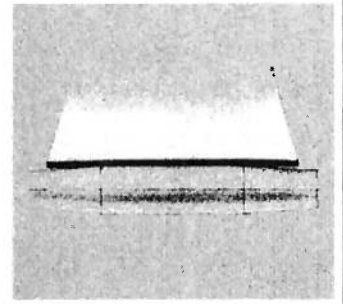
A conveyor belt is tracked to the centre of the conveyor by a tapered/cylindrical drum. The higher the belt speed and the larger the drum diameter, the greater the centring effect.

Recommendations on conicity can be found on pages 4 and 5.

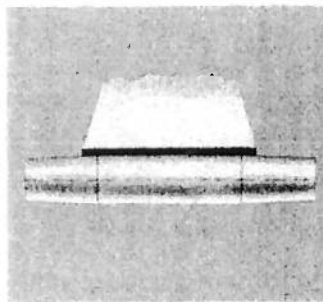
The drive drum is tapered/cylindrical.



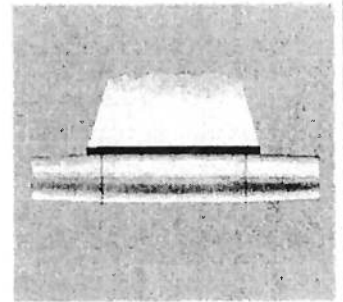
Excessive conicity. Belt does not hug drum, thus losing tracking effect.



Belt is too narrow.
Solution: Match drum proportions to belt width.

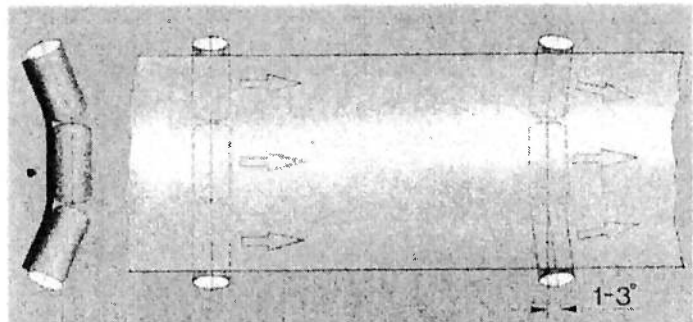


Belt wider than drum. To be avoided at all costs because of non-uniform tracking effects, particularly with laterally flexible belt types.

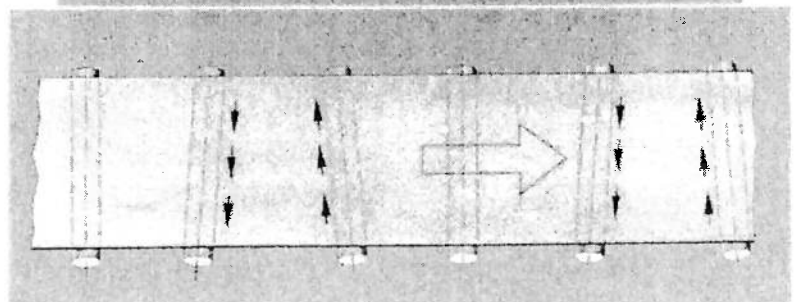


Effect of support rollers

The tracking of troughed belts can be controlled by angling the side rollers of some sets in the direction of belt travel by up to approx. 3°, depending on the belt speed.



Non-troughed belts can often be tracked sufficiently by installing some support rollers whose position can be adjusted horizontally and then pivoting them through approx. 2° - 4°. This system is recommended for long belts.



Effect of temperature

If a tracked belt is exposed to a considerable degree of asymmetrical heating and loading, this can lead to a non-uniform change in its inner tension state. The result of this are tracking forces which may cause the belt to run off to the side. An automatic belt tracking device is recommended.

Transilon Conveyor Belts Type SIEGLING

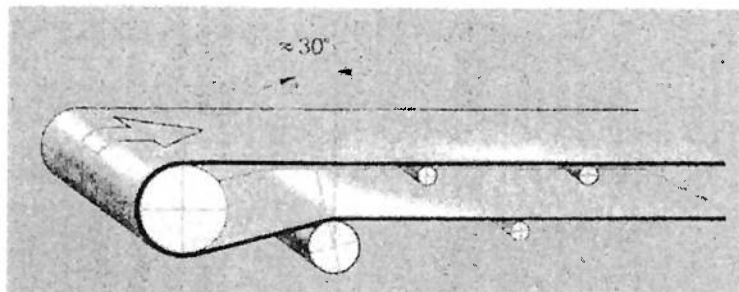
**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Effect of snub and tracking rollers

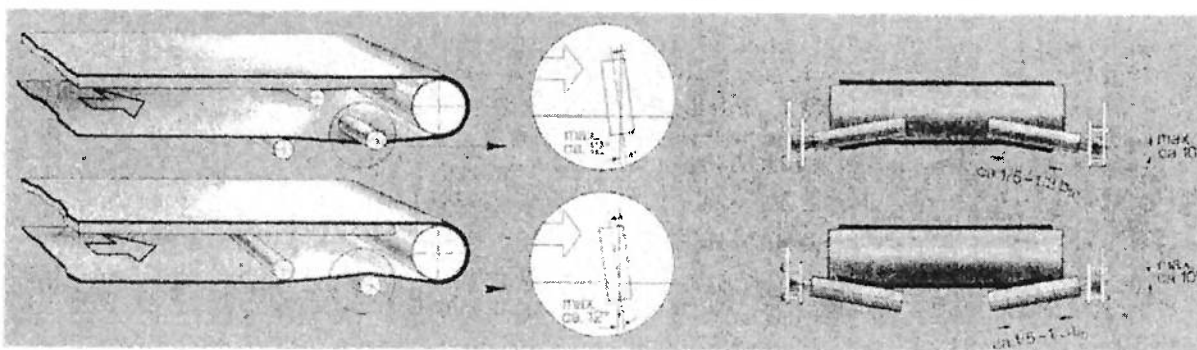
An adjustable roller can be installed prior to the end drum to assist with belt tracking.

The higher the coefficient of friction achieved between the tracking roller and the belt surface, the greater the tracking effect.

In the case of a conveyor belt without a top face coating, the coefficient of friction can be increased by installing a lagged snub roller.



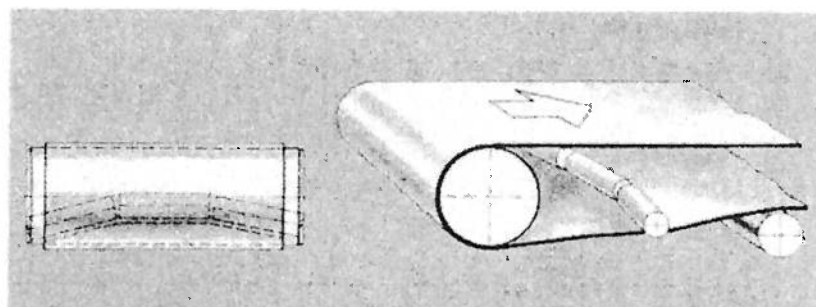
In order to provide a sufficiently large tracking effect, the arc of contact should be approx. 30°.



Belts with a low-friction underside are easier to track than those with a high-grip coating.

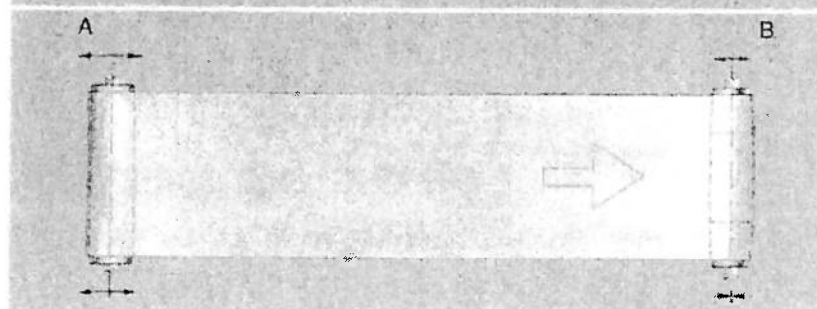
Belts which can be easily tracked by drums at low peripheral speeds often tend towards creasing at higher speeds and prove very difficult to track. In such cases, therefore, cylindrical drive and tail drums are used, and additional rollers are installed to aid with tracking.

Effect of negatively troughed roller sets



Belt tracking with tapered/cylindrical drums

Tapered/cylindrical drive drums should be adjustable in order to be able to compensate for production tolerances in the conveyor and belt.



With conveyor lengths of ≥ 5 m both terminals should be tapered/cylindrical.

If tapered/cylindrical drums do not provide sufficient belt tracking, angled rollers or automatic tracking devices can be used.

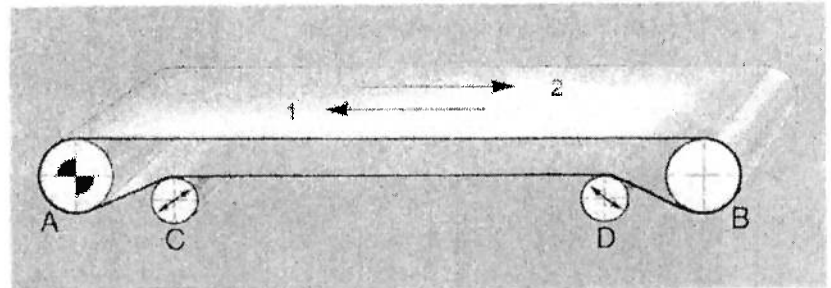
Transilon Conveyor Belts Type SIEGLING

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Initial tracking

- Fit the belt and tension drums A + B such that their axes are parallel until the required working elongation at fitting is attained.
- Belt tracking can be adjusted by tensioning or slackening one end of the tensioning drum A. The belt will move towards the slacker belt edge.
- It may be necessary to install a belt guidance system near the end drum (e.g. with short, wide belts).

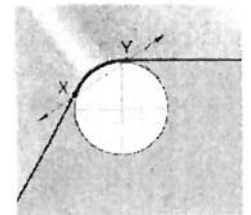
Use of snub rollers



The tracking effect is particularly marked when snub rollers C, D are used, especially if they are in contact with a coated belt face (giving a high friction coefficient).

The greatest tracking effect is always provided by the snub roller contacted by the belt immediately prior to the end drum, i.e. by snub roller D when the belt is running in direction 1, and by roller C in direction 2.

The snub rollers should be adjustable along the XY axis (see right - linking the points of contact and release). In this way, there is scarcely any effect on the belt edges, and major distortion of the fabric can be avoided.



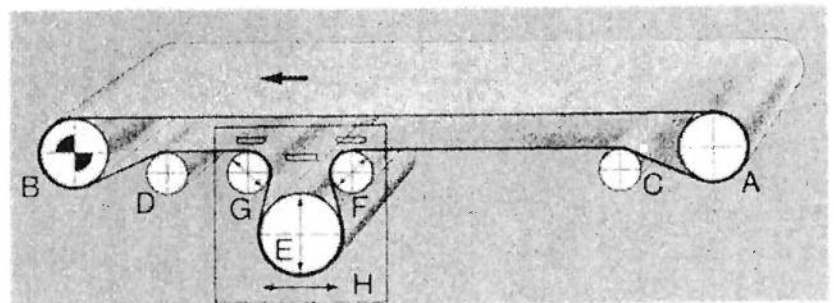
Initial tracking

- Locate all drums/rollers in their initial positions such that their axes are parallel.
- Fit the belt and adjust the tensioning drum B, ensuring that it remains parallel to the other drums, until the required working elongation at fitting is attained.
- Adjust belt tracking using roller C or D, as appropriate. It may be necessary to install a belt guidance system using roller C or D as the tracking roller.

Tension take-up on return side

The snub roller G and F and the tensioning drum E are adjustable in the direction of the arrow. The tensioning drum can also operate as the drive drum.

One simple design solution is for drums G, F and E to be mounted on a plate H as a single unit which is then adjustable in the direction of the arrow.



Please refer to the previous and following pages for details of the configuration, finish and tracking properties of drums A, B, C and D.

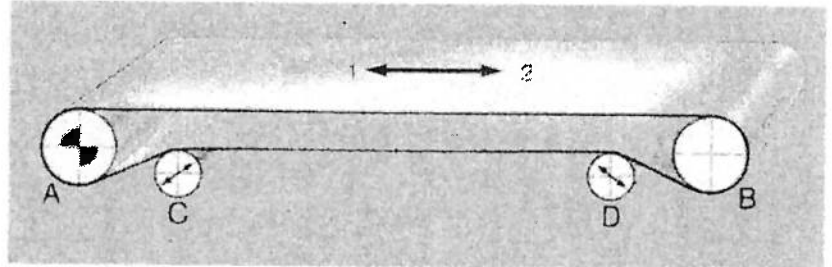
Initial tracking

- Locate all drums/rollers in their initial positions such that their axes are parallel.
- Fit the belt and adjust the tensioning drum E, ensuring that it remains parallel to the other drums, until the required working elongation at fitting is attained.
- Adjust belt tracking using snub roller C, and correct if necessary using deflection rollers G and F or plate H. It may be necessary to install a belt guidance system here too.

Transilon Conveyor Belts Type SIEGLING

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Reversible conveyors



The important factor with conveyors which can reverse their direction of travel is the precision with which the conveyor and the belt have been manufactured.

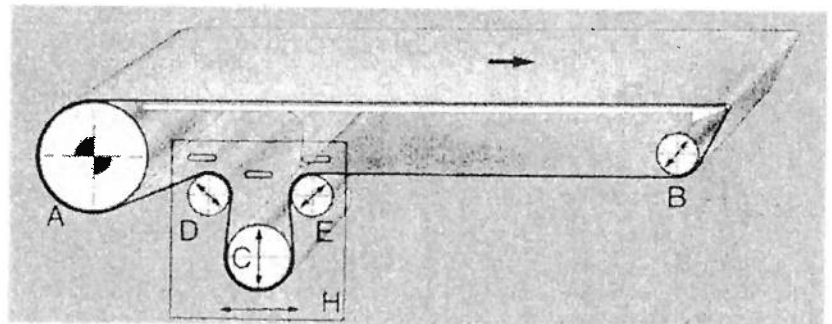
Initial tracking of belts for reversible conveyors is not entirely straight-forward. Once belt tracking has been achieved in one direction, it is often found that the belt mistracks when the direction is reversed.

It takes some time until the snub rollers are correctly adjusted. A belt guidance system is recommended for very short and wide conveyors.

Initial tracking

- Locate all drums/rollers in their initial positions such that their axes are parallel.
- Fit the belt and adjust the tensioning drum B, ensuring that it remains parallel to the other drums, until the required working elongation at fitting is attained.
- With reversible conveyors belt tracking should be adjusted at the tapered/cylindrical terminals, not at the snub rollers.

Knife-edge conveyors



Relatively short knife-edge belts can be tracked as shown above. The drive drum A should be tapered/cylindrical, while deflection drums B, D and E and the tensioning drum C should be cylindrical and adjustable in the direction of the arrow for tracking purposes.

Belt edge guidance systems are generally used with lengthy knife-edge conveyors (e.g. cooling tunnels).

Drums C, D and E can be mounted on an adjustable plate H, as also described on page 18.

Initial tracking

- Locate all drums/rollers and the knife edge in their initial positions such that their axes are parallel.
- Fit the belt and adjust the tensioning drum C, until the required working elongation at fitting is attained. Ensure that the operating tension is as low as possible in order to avoid unnecessarily high mechanical and thermal (as a result of friction) loading on the knife edge.
- Adjust belt tracking using rollers B, C, D and E and/or plate H. A belt tracking system may be advantageous.

Technical Documentation



Transilon Conveyor Belts Type SIEGLING

HEINRICH GEORG GMBH
MASCHINENFABRIK

TRANSILON types which can be made endless with a Z-splice.

TRANSILON types which can be made endless with a Z-splice:				Splicing material		Cover splice with:					Press temperature °C
				PU-Z foil** (85 mm wide) placed		PU-S paste	Embossing mat	Silicone fabric no. 1	Glossy separating paper	Matt separating paper	
				on	under						
				Z-splice							
Type				Thickness (mm)							
E 2/1 U0/U0-NA	tr	FDA		0.25				•			160
E 2/1 U0/U2	white	FDA		0.15					•	•	140
E 2/1 U0/U2 RF	brown	FDA		0.15			RF				150
E 2/2 U0/U0	tr	FDA			0.25			•			160
E 3/1 U0/U0	white	FDA		0.25				•			160
E 3/1 U0/U2 MT-NA	white	FDA		0.15						•	140
E 3/1 U0/U2 M-F-NA	blue	FDA		0.15					•	•	140
E 3/1 U0/U2	white	FDA		0.15						•	140
E 3/1 U0/U2 MT-C	white	FDA		0.15						•	140
E 3/1 U0/U2 RF	brown	FDA		0.15			RF				150
E 3/1 U2/U2 FSTR/GL-NA blue		FDA		0.15							140
E 3/1 E0/E0	tr	FDA		0.25				•			160
E 3/1 E2/E2 MT/GL-C	tr	FDA		0.15					•	•	150
E 3/2 U0/U0	tr	FDA		0.25	0.15			•			160
E 3/2 U0/U0	grey	FDA		0.25	0.15			•			160
E 3/2 U0/U2-NA	white	FDA		0.15					•	•	140
E 3/2 U0/U2	white	FDA		0.15					•	•	140
E 3/2 U0/U2 MT	blue	FDA		0.15						•	140
E 4/1 UH/UH-HC	black			0.15				•			160
E 4/2 U0/U0-NA	white	FDA		0.25	0.15			•			150
E 4/2 U0/U2 MT-NA	white	FDA		0.15						•	150
E 4/2 U0/U2 MT	white	FDA		0.15						•	150
E 4/2 U0/U2H-HC	black	FDA			0.25				•	•	150
E 6/1 U0/UH	green	FDA		0.25				•			160
E 6/1 U0/F20	white	FDA			0.25			•			160
E 6/1 U1/Z30-NA	tr	FDA			0.15			•			150
E 8/2 U0/U2 9830	green			0.25					•	•	150
E 8/2 U0/U2 9483	green				0.25				•	•	160
E 8/2 U0/U2 MT	white	FDA		0.15						•	140
E 8/2 U0/U2 M-F-NA	white	FDA		0.15						•	140
E 8/2 U0/U2 STR-HC	black			0.25			STR				150
E 8/2 U0/U4 GSTR	green			0.25			GSTR				150
E 8/2 U0/U8	tr	FDA		0.25					•		140
E 8/2 U0-U10 LG	green			0.25			LG			•	150
E 8/2 E0/E0	tr			0.25					•		160
E 12/2 U0/U0	tr			0.25	0.15			•			160
E 12/2 U0/U0	black			0.25				•			160
E 12/2 U0/U0-C	tr			0.25	0.15						160
E 12/2 U0/UH	tr			0.25					•	•	160
E 12/2 U0/UH	green			0.25					•	•	160
E 12/2 U0/U2-C	green			0.25					•	•	150
E 12/2 U0/U4 MT	black			0.20					•	•	140
E 12/2 U0/U10 MT	black			0.20					•	•	140
E 12/2 U0-U20 GSTR	green				2 x 0.25		GSTR				160
E 10/MU1/U3-NA	green			0.15	0.25				•		150
E 10/MU1/U3 GSTR-NA	green			0.15	0.25		GSTR				150
E 10/MU1/U3-NA-9350	white			0.15	0.25				•	•	150
E 20/MU1/U3-NA	green			0.15	0.25	•			•	•	150
E 20/MU1/U3 GSTR-NA	green			0.15	0.25	•	GSTR		•	•	150

SIEGLING

* cover with glossy or matt separating paper depending on belt surface
** foil and PU-S paste should be same colour as belt
*** see point 6.1.

Transilon Conveyor Belts Type SIEGLING

HEINRICH GEORG GMBH
MASCHINENFABRIK

Required equipment and material:

- TRANSILON THP heating press with accessories
- PU-Z hot-melt foil or PU-S paste (see table)
- Acetone for wiping foil clean

Prepare belt ends by punch cutting them with ZSG 70/M as per instructions ref. no. 369 or with ZSG 70P as per instructions 357.

1. Place pressure equalizing metal sheet (1)* on lower press platen and cover with silicone fabric no. 1 (2), *(fabric face towards TRANSILON material).
2. Measure belt thickness. In the case of textured/patterned top faces, measure belt thickness in depressions of texture/pattern. Insert splice laps and push them together tightly.

3. Place shim bars (3)* having same thickness as TRANSILON belt along belt edges.

For belt types with textured top faces, use shim bars which are 1 mm thinner than TRANSILON material and then add 1 mm thick padding strips on top to protect splice coverings.

If belt is narrower than press by more than 200 mm, insert additional set of shim bars (plus padding strips for textured top face) to prevent press from buckling.

4. Mark lines on splice (fig. 1). Pull fingers apart to a distance of approx. 6 mm between markings so that an even gap is created between fingers. Align belt edges and clamp belt and inserts in hold-down bars (fig. 2).
5. Cut PU-Z foil to size, wipe it clean with acetone and place it on or underneath Z-splice as specified in table (fig. 3).
- 5a. With E 20/M types use PU-S paste as splicing material instead of Z-foil. Distance between fingers should be left larger so that paste can be worked into gaps more easily.

Process PU-S paste at temperatures above + 15 °C (59°F) only. Should PU-S paste have thickened due to cold storage, immerse closed cartouche in warm water - approx. 40 °C (104°F). Paste will be processible again after approx. 10 - 15 minutes.

Fill in gap between teeth with PU-S paste. Push splice ends back together again to approx. 6 mm distance. Remove excess paste.

Hot-Pressing

6. Cover splice and inserts as per table (fig. 4).

Then place pressure equalizing metal sheet (5)* on top of splice coverings (4)*.

7. Put heating platen and pressure beam in place. Tighten nuts by hand. Provide pressure required (see press) by using compressor or other suitable air pump.
8. Insert thermometers (6) in bores provided for that purpose in heating platens. Connect cooling hoses of heating platens' quick-cooling system (see 7 in drawing) and heat press up.

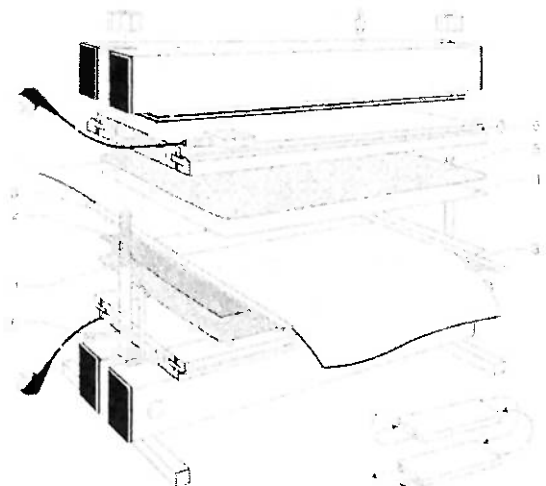
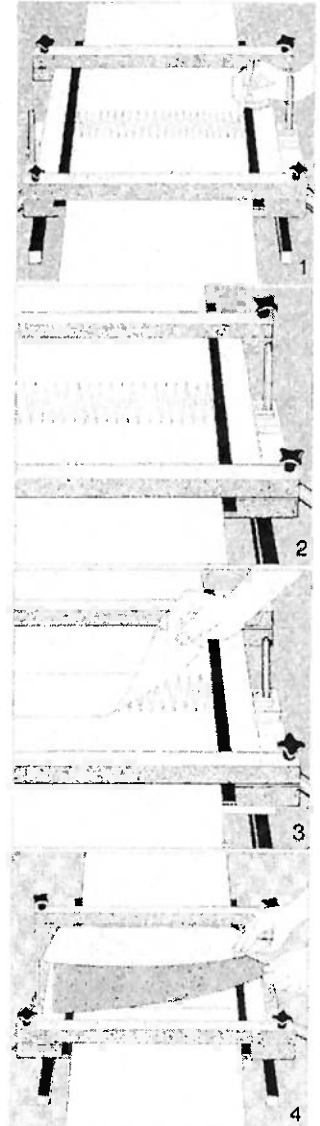
Once proper temperature has been reached switch off current.

Switch on heating platens' quick-cooling system (let water circulate) only after current has been switched off. After a few minutes heating platens will have cooled down.

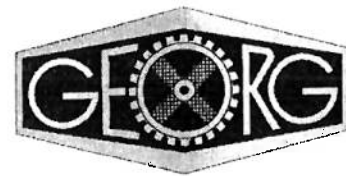
9. Do not open press until temperature has fallen to approx. 30 °C (86 °F). Remove TRANSILON belt from press and trim splice edges.

Belt is now ready for use.

Einlegen der Bandenden in die Heizpresse



Technical Documentation



Transilon Conveyor Belts Type SIEGLING

HEINRICH GEORG GMBH
MASCHINENFABRIK

TRANSILON types which can be made endless with a stepped overlap splice:

Length of steps mm (measured at belt edge)	Type	Cover splice with:						
		Splice distance in m	Embossing mat	Embossing plate	Slitting table no. 1	Glossy separating paper	Mat separating paper	Pre- temperature °C
	E 4/1 U0/V5H MT green	70						
	E 4/1 V5/V5 STR-GL green	70						
	E 3/2 U0/V1 NA transp.	70						
	E 4/2 U0/V2 MT-HC black	70						
	E 5/2 0/V3 MT-NA white	70						
	E 5/2 0/V4 MT black	70						
	E 5/2 0/V5 green	70						
	E 5/2 0/V5H MT black	70						
	E 5/2 0/V15 AR green	70	Mini AR					
	E 8/2 U0/V2H MT white	70						
	E 8/2 U0/V2H MT green	70						
	E 8/2 U0/V3 MT-HC black	70						
	E 8/2 Y0/V4 GSTR 6125 black	70	GSTR					
	E 8/2 U0/V5 green	70						
	E 8/2 U0/V5 STR green	70	STR					
	E 8/2 U0/V5 MT white	70						
	E 8/2 U0/V5 NP white	70	NP					
	E 8/2 0/V5 S/MT-SE black	70						
	E 8/2 0/V5H S/MT black	70						
	E 8/2 0/V7 S/SG black	70	SG					
	E 8/2 U0/V10 SG green	70	SG					
	E 8/2 U0/V12H MT black	70						
	E 8/2 U0/V12 STR-SE black	70	STH					
	E 8/2 U0/V15 LG green	70	LG					
	E 8/2 U0/V15 S/LG black	70	LG					
	E 8/2 U0/V20 green	70						
	E 8/2 U0/V20 AR green	70	AR					
	E 8/2 U0/V20 AR black	70	AR					
	E 8/2 0/V20 S/WAR black	70	WAR					
	E 8/2 U0/V20 AR-SE black	70	AR					
	E 8/2 0/V20 S/WAR-SE black	70	WAR					
	E 8/2 U0/V20 KN green	70		KN				
	E 12/2 U0/V3 C green	70						
	E 12/2 U0/V3 MT-C black	70						
	E 12/2 U0/V5 STR-C SE black	70	STR					
	E 12/2 U0/V7 green	70						
	E 12/2 U0/V20 green	70						
	E 12/2 U0/V20 MT-NA white	70						
	E 12/2 U0/V20 FG-NA white	70	FG					
	E 12/2 U0/V40 R green	70		H				
	E 8/2 V5/V5 STR-GL green	70						
	E 8/2 V5/V5 STR-MT white	70						
	E 8/2 V5/V20 STR-AR green	70	AR					
	E 12/2 V5/V20 STR-GL green	70						
	E 12/2 U4/V5 STR-GL green	70						
	EC 12/2 0/V0-NA transp.	70						
	E 3/2 0/0 transp.	70						
	E 3/2 U0/V U2H MT green	70						
	E 3/2 U0/V U20 green	70						
	E 12/2 U0/V-U0 transp.	70						
	E 12/2 U0/V U0-SE black	70						
	E 12/2 U0/V U2H-MT green	70						
	E 12/2 U0/V U4 GSTR C black	70	GSTR					
	E 12/3 U0/V U0 transp.	122						
	E 12/3 U0/V20 green	122						
	E 12/3 V5/V20 STR-GL green	122						
	E 12/3 U0/V U2H MT green	122						
	E 12/3 U0/V U2H MT green	122						
	E 12/3 U0/V U2H MT green	122						
	E 12/3 U0/V U2H MT green	122						

* cover with glossy or mat separating paper depending on belt surface



Transilon Conveyor Belts Type SIEGLING

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Splicing material:

K 10 cement* + H1 hardener = cement for hot-pressing

PVC paste + AV activator = paste for hot-pressing

Measure belt length, add splice allowance (see table) and cut off belt at angle required (80° or 90°).

Mark step(s) on belt edges in accordance with lengths specified in table and prepare belt laps as described below:

1. One-ply belts:

Without damaging fabric, carefully remove V coating using rotary wire brush**.

Rough up U0 surfaces. Wear safety goggles!

When processing plastic products, especially when grinding, welding etc., ensure good ventilation. Do not inhale fumes or dust.

2. Two and three-ply belts:

Using knife**, make an incision in coating and in fabric plies at marked spots indicating step length (see drawings) - without, however, damaging underlying fabric ply.

3. With knife or screwdriver lift corner of cut layers and pull them off with a pair of flat-nosed pliers such that entire intermediate PVC layer remains intact on underlying fabric ply.

Then with rotary wire brush** carefully remove V or U2H coating from overlapping fabric surfaces - without damaging underlying fabric. Rough up U0 surfaces. Do not rough up 0 surfaces. Wear safety goggles!

4. Apply thin coating of K 10 cement mixed with H1 hardener to "a" fabric surfaces (see drawings beside table).

Apply thin and uniform coating of PVC paste mixed with AV activator to "b" fabric surfaces.

Air K 10 coating until it ceases being wet but still feels tacky.

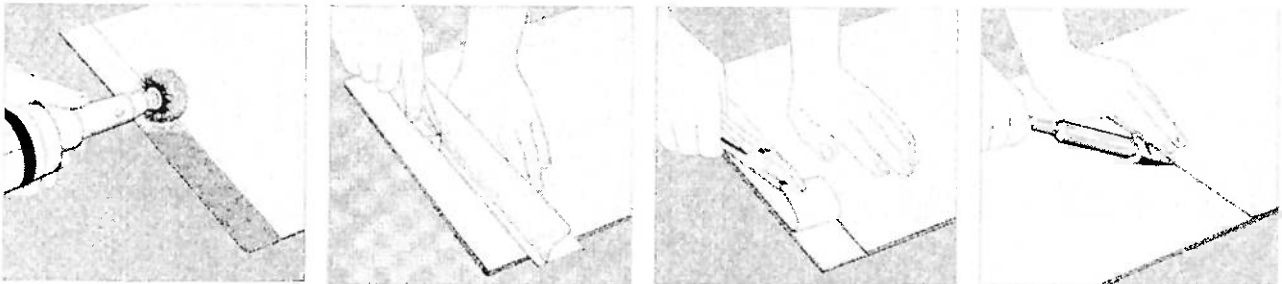
Please note:

No coating of PVC paste + AV activator is necessary on belts supplied "prepared".

Mate splice laps on flat base as shown in drawing and spot-weld them together using soldering iron.

* use white K 10 cement for white top face coatings; for other belt colours use transparent K 10 cement

** available ex stock



5. Place pressure equalizing metal sheet (1) and soft pad (2) on lower press platen. In the case of 0, U0 and UH undersides, cover with silicone fabric no. 1; in the case of V3 und V5 undersides, cover with textured fabric (3).

6. Insert splice. Measure belt thickness. In the case of textured/patterned top faces, measure belt thickness in depressions of texture/pattern.

7. Place shim bars (4) which are 0.1 mm thinner than belt along belt edges

For belt types with textured/patterned top faces, use shim bars which are 1 mm thinner than TRANSILON material and then add 1 mm thick padding strips on top to protect splice coverings.

Exception:

For TRANSILON types with AR (rough top) pattern, use shim bars and padding strips in the following thicknesses:

U0/V20 AR and V1/V20 AR: 1.3 mm shim bars + 2.5 mm padding strips = 3.8 mm.

V5/V20 AR: 1.8 mm shim bars + 2.5 mm padding strips = 4.3 mm.

If belt is narrower than press by more than 200 mm, insert additional set of shim bars (plus padding strips for textured/patterned top faces) to prevent press from buckling.

Clamp belt and inserts in hold-down bars.



Transilon Conveyor Belts Type SIEGLING

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

8. Cover splice and inserts as per table (page 2).

Then place pressure equalizing metal sheet (6) on top of splice coverings (5).

9. Put heating platen and pressure beam in place. Tighten nuts by hand. Provide pressure required (see press) by using compressor or other suitable air pump.

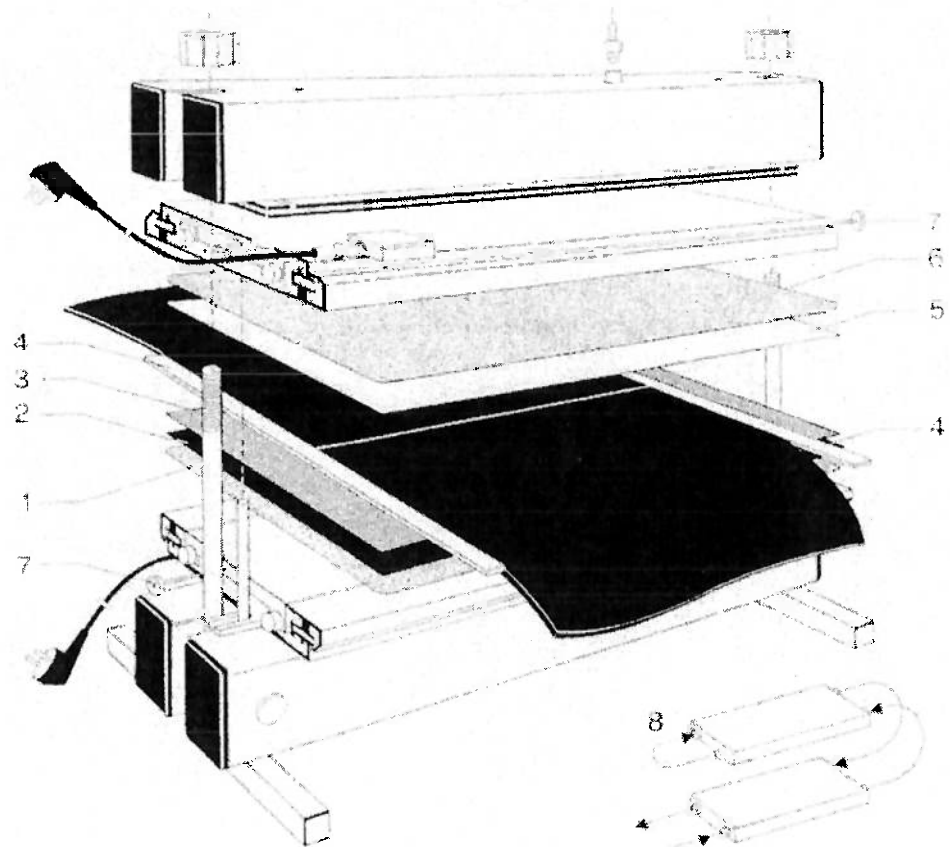
10. Insert thermometers (7) in bores provided for that purpose in heating platens. Connect cooling hoses of heating platens' quick-cooling system (see schematic 8) and heat press up.

Once 170 °C (338 °F) has been reached switch off current.

Switch on heating platens' quick-cooling system (let water circulate) only after current has been switched off. After a few minutes heating platens will have cooled down.

11. Do not open press until temperature has fallen to approx. 30 °C (86 °F). Remove TRANSILON belt from press and trim splice edges.

Belt is now ready for use.





Transilon Conveyor Belts Type SIEGLING

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

TRANSILON-types which can be made endless with a keyed connection:

Please note before starting:

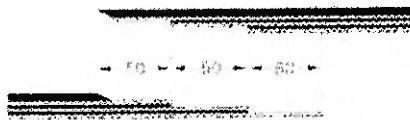
Use standard splice for belts exposed to normal stresses. For extreme conditions - e.g. as processing belt on stone grinders - belts must be hot-pressed with special splice.

Steps 4 and 6 of this leaflet should only be carried out if it is essential for belt and splice region to be of uniform thickness (tolerance ± 0.2 mm).

Length of steps (mm) measured at belt edges

Standard splice (for normal belt stresses)
Splice allowance 150 mm

Special splice (for extreme belt stresses)
Splice allowance 270 mm



Measure belt length. Add splice allowance (as above) and cut belt off at right angle (90°).

Splicing material:

Standard splice: K 10 cement + H1 hardener = cement for hot-pressing splice

Special splice: K 10 cement + H 1 hardener = cement for hot-pressing splice

PVC paste + AV activator + Z splice foil = only necessary if fluctuations in thickness of splice region are to be evened out

Then proceed as follows:

1. Mark off length of steps on belt edges in accordance with specified dimensions. Use knife to score coating and/or fabric ply/plies along lines marked for steps - taking care not to damage fabric plies underneath (Fig. 1).
2. Lift one corner with knife or screwdriver and tear off scored layers with flat-nosed pliers (Fig. 2).
3. Remove coating from all fabric areas of laps with rotating wire brush (wire thickness 0.5 mm) and roughen fabric areas slightly (Fig. 3). Bevel off first approx. 10 mm of top face lap.

Note: only carry out step 4 if it is essential for belt and splice region to be of uniform thickness.

4. Use knife to score top face coating over whole splice region at intervals of approx. 30 mm - taking care not to damage fabric plies underneath.

Lift corners and tear off these strips with flat-nosed pliers (Fig. 4).

5. Position belt laps over each other and align them. Fold upper belt lap back. Coat both laps evenly with K 10 cement + H1 hardener and air for at least 20 mins. Airing time can be reduced with hot air (using blower etc.).

Then apply second coat and air until cement forms no threads when touched but still feels tacky. Mate splice laps and tap them together.

Note: only carry out step 6 if it is essential for belt and splice region to be of uniform thickness.

6. Apply thin coating of PVC paste + AV activator to fabric surface of top face.

Lay Z splice foil (0.5 mm thick) on coated surface and spot weld using soldering iron (Fig. 5).

7. Place pressure equalizing metal sheet (1) on lower part of press, cover with soft foil (2) and textured fabric (3) and then place splice on top.

When doing so please note: special splice is longer than heating press. It therefore has to be hot-pressed in two stages. Place shim bars (4) - of same thickness as belt outside splice - along belt edges.

If belt is more than 200 mm narrower than press platens extra shim bars must be used to prevent press buckling. Clamp belt and shim bars in hold-down bars.

Cover splice and shim bars with textured fabric (5) and pressure equalizing metal sheet (6).



Transilon Conveyor Belts Type SIEGLING

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

8. Re-locate heating platen and pressure beam and tighten nuts by hand. Provide required pressure (see press) via compressor or suitable air pump.

For non-pneumatic presses proceed as follows: Tighten nuts, set pressure with torque wrench. For proper torque values see table attached to press.

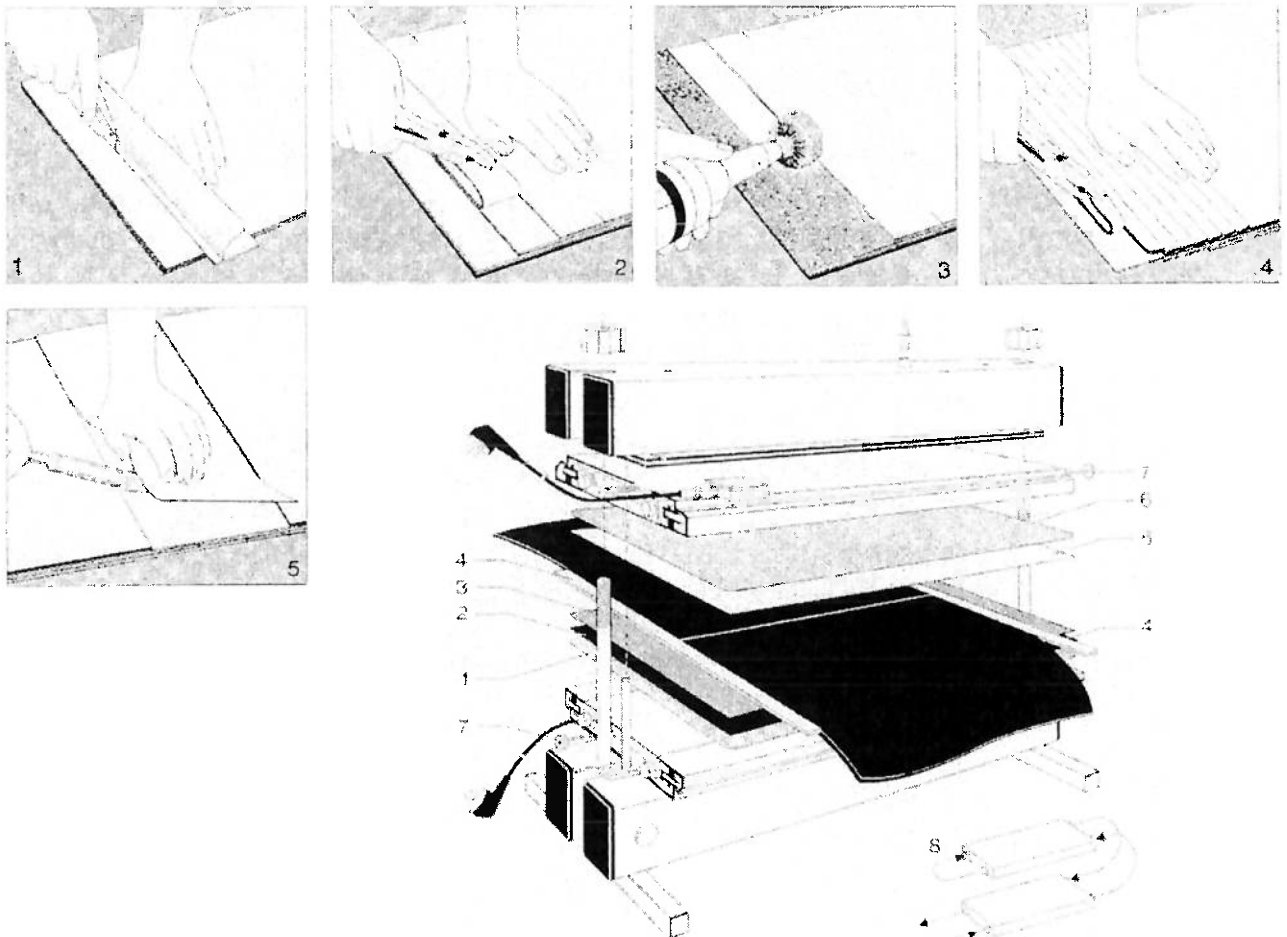
9. Place thermometers (7) in heating platen bores, connect cooling hoses to high-speed press cooling unit (see 8 in drawing above) and heat press.

Once temperature of 170°C(338°F) has been reached switch off current.

Switch on heating platens' quick-cooling system (let water circulate) only after current has been switched off. Heating platens will cool off in a few minutes.

10. Do not open press until temperature has gone down to approx. 30 °C (86 ° F).

Remove TRANSILON belt and trim splice edges.



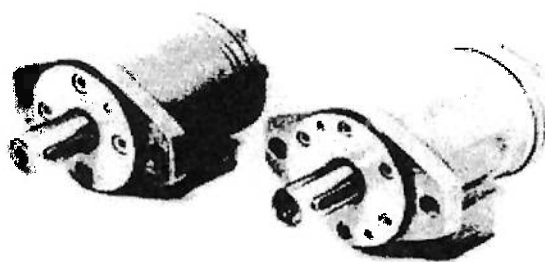


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Hydraulic Motors (MPR)

Type

IMD-Hydraulik¹



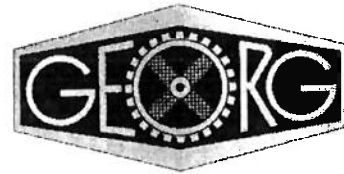
Contents:²

	Page
1. Use.....	2
2. Assembling.....	2
3. Fixing.....	2
4. Connection.....	2
5. General Demands on the Hydraulic System.....	3
5.1 Working Liquidity.....	3
5.2 Filtering.....	3
6. Motor Working in the Hydraulic System.....	3
6.1 Pressure in the Oil Leakage Pipe.....	3
6.2 Adjustment of the Pressure Control Valve in the Hydraulic System.....	4
6.3 Single Operation.....	4
6.4 Serial Operation.....	4
6.5 Parallel Operation.....	4
6.6 Allowed Fin Loading.....	4
6.7 Direction of Rotation.....	4

¹ IMD-HYDRAULIK GmbH, Postfach 5002, 58428 Witten.

² Source: IMD-HYDRAULIK GmbH; without titles or other declarations; Catalogue - Handbook: Planetary Motors.

Technical Documentation

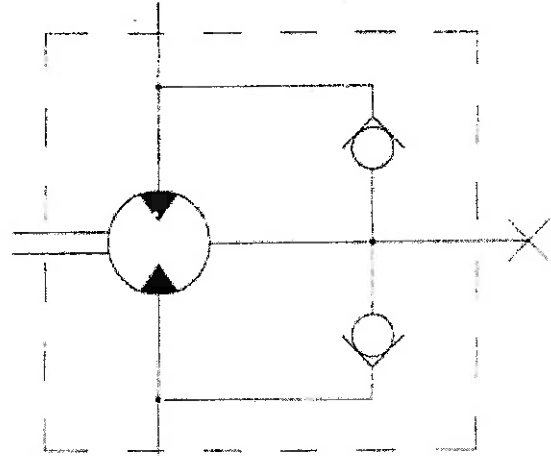


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Hydraulic Motors Type IMD-Hydraulik

1. Use

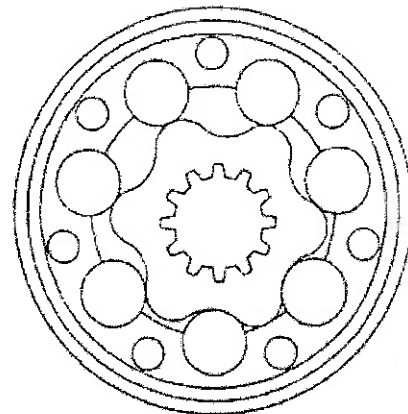
The planetary motors change the flowing energy of the pressure liquid in a mechanic form of energy for turning movements of the working parts. The hydraulic planetary motors are used in travelling gears of slowly moving conveying means, in hydraulic systems of agricultural machines, construction machines and mining machines, lines for the food and metalurgical industry, shipbuilding industry, conveyors, robots and so on., where a stepless adustment of the turning speed and an easy installation are required.



Symbolic Marking

2. Assembling

The planetary motors are hydraulic ousting units. The special gerotor performance of the gearwheel with sixfold effect allows to reach even at very small measures a big geometric ousting volume and therefore a higher torque can be handed over. The control of the fin revolutions is effected by changing the feeded oil stream



Assembly

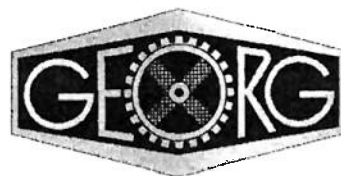
3. Fixing

The fixing is effected by a flange and two screws M 12 mounted at the units which have to be driven.

4. Connection

The planetary motors have to be connected via screw-tapping M 22 x 1,5 or G ½. A flange connection is also possible, where the flanges are tightened at the pipelines by means of two screws M 8 and where they are front sided sealed with an O-ring (recommended measure 23,6 x 2,65).

If an external oil leakage pipe is planned, in first place the stopper has to be tightened off and connected via a threaded connection.



Hydraulic Motors Type IMD-Hydraulik

5. General Demands on the Hydraulic System

5.1 Working Liquidity

For the work of the hydraulic motors we recommend the use of hydraulic oils on the base of mineral oils with a kinematic viscosity $20 \div 800 \text{ mm}^2 / \text{s}$. For optimal operating the viscosity should be $35 \text{ to } 75 \text{ mm}^2 / \text{s}$. The temperature of the working liquidity should be between $-40 \text{ to } +90^\circ \text{C}$. We recommend a temperature range of $30 \div 60^\circ \text{C}$.

5.2 Filtering

The service life of the hydraulic motor depends extremely on the filtering quality of the operation liquidity. In the system a return filter with a fineness of $20 - 25 \mu\text{m}$ should exist. After 50 working hours the oil should be renewed (Filtering fineness $10 \mu\text{m}$)

To deaerate the motors we recommend to do idle runnings of 10-15 min at different revolutions when the motor is put into operation.

6. Motorworking in the Hydraulic System

6.1 Pressure in the Oil Leakage Pipe

The two reflux valves which are installed in the motor casing connect the oil leakage room with the entry or respectively the exit and allow in that way to run the motor without return oil pipe.

The motor requires an oil leakage pipe in case of the pressure of the return pipe exceeding the permissible exit pressure on the rotary shaft seal, for example longer recirculating pipings with throstle elements, serial connection of the hydro-motors and so on. The maximum permissible pressure in the oil leakage pipe for MPR-motors is 10 bar and for MPRA-motors 75 bar, the measure of the MPRA-motors depends on the number of revolutions:

up to 75 bar - for revolutions up to 100 tr/min
up to 50 bar - for revolutions of 100 to 300 tr/min
up to 25 bar - for revolution over 300 tr/min



6.2 Adjustment of the Pressure Control Valve in the Hydraulic System

In principle the pressure control valve in the hydraulic system, where the hydraulic motor works, is adjusted on such a pressure that the adjusted pressure cannot exceed the nominal pressure at the entry of the motor. The maximum pressure adjustment is stated in the technical data.

6.3 Single Operation

Each motor can be driven in an opened or closed hydraulic system

6.4 Serial Operation

The return oil pours from one motor to the next. So each motor uses the complete oil stream of the pump. Small differences in the displacements and in the oil leakage streams should be taken into consideration. The amount of the decrease pressure of the complete motors should not exceed the stated nominal pressure (max. pressure).

6.5 Parallel Operation

In parallel operation the entire oil stream, provided by the pump, is distributed to the parallel switched motors and the maximum differential pressure can be entirely used.

6.6 Allowable Fin Loading

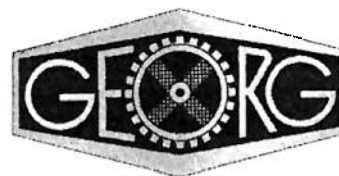
The presented curve is the expression of the maximum permissible fin load as function of the number of revolutions. The curve applies to radial working strengthes, whose lay mark is 30 mm from the mounting flange. With the other distances L (mm) from the mounting flange the following formula can be applied:

$$Pr = \frac{800}{n} \cdot \frac{25000}{95 + L}, (\text{daN})$$

6.7 Direction of Rotation

The direction of the fin rotation of the hydraulic motor depends on the opening, which is supplied with the working liquidity. This is shown on the scheme.

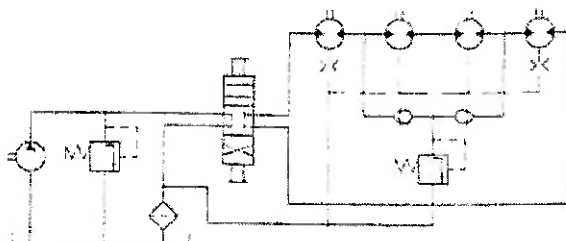
Technical Documentation



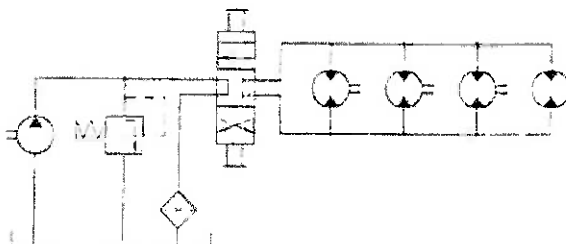
Hydraulic Motors Type IMD-Hydraulik

**HEINRICH GEORG GMBH
MASCHINENFABRIK**

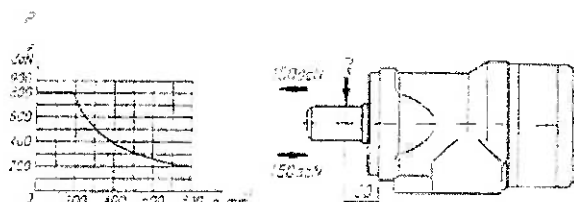
Serial Operation



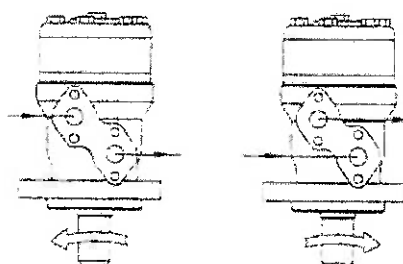
Parallel Operation



Permissible fin load



Turning Direction

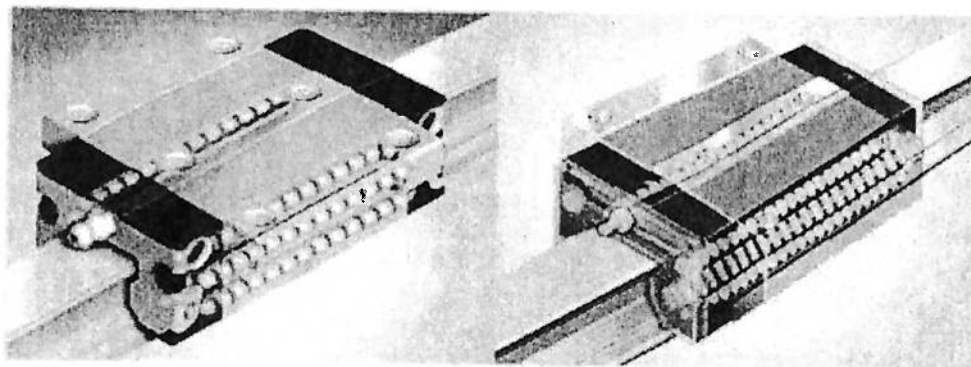




Monorail guidance system

Type

REXROTH STAR ¹



Contents ²

Page

1. Ball Rail Systems

1, 143-156

2. Roller Rail Systems

**1, 20- 25 and
141- 145**

¹ Rexroth Star GmbH, D-97419 Schweinfurt

² Source: ; Ball Rail Systems RE 82 202/2002-12; Roller Rail Systems RE 82 302/2003-04

Industrial
Hydraulics

Electric Drives
and Controls

Linear Motion and
Assembly Technologies

Automation

Service
Automation

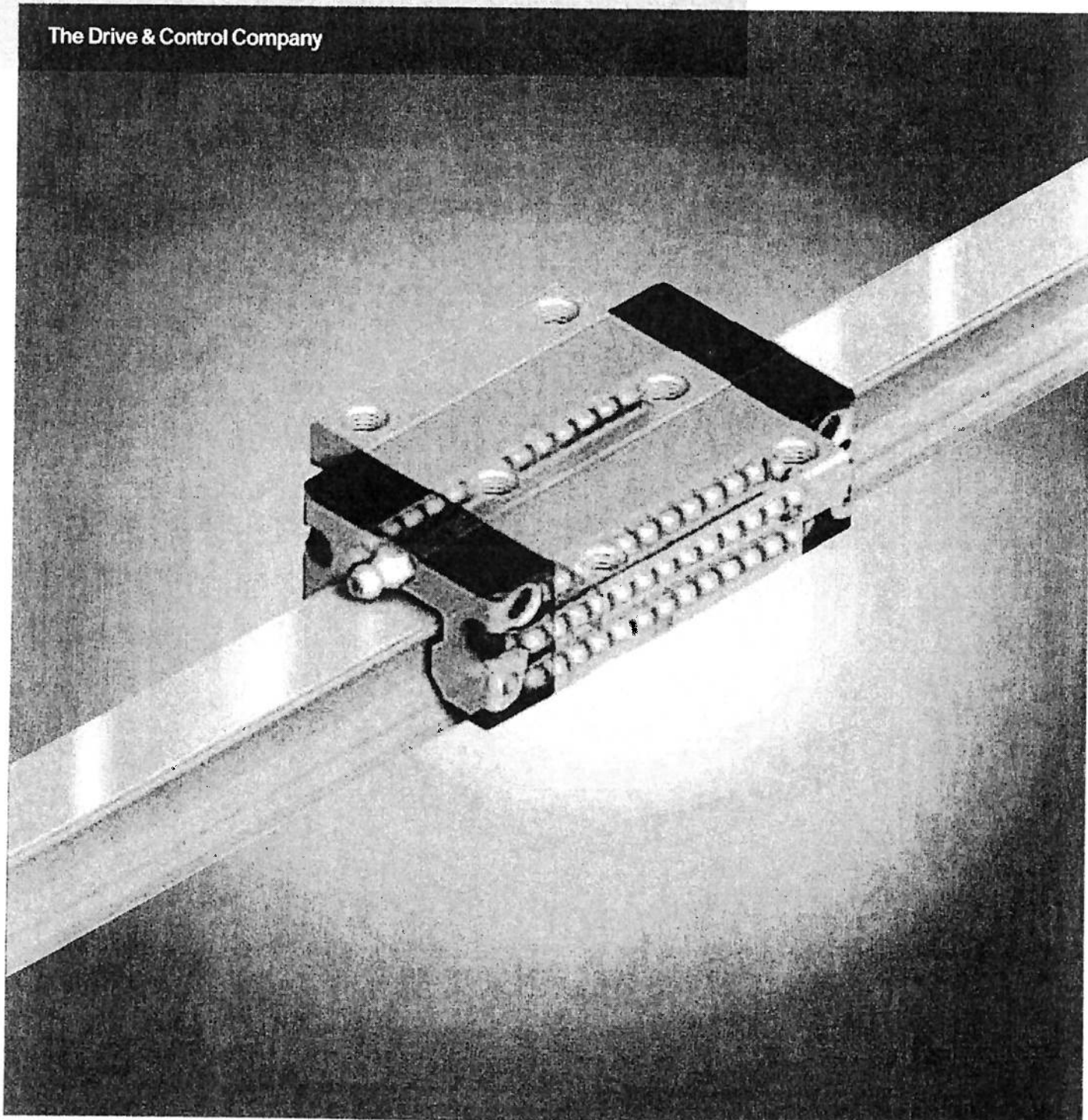
Mobile
Hydraulics

Rexroth
Bosch Group

Ball Rail Systems

RE 82 202/2002-12

The Drive & Control Company



General Mounting Instructions

General Notes

The following notes relating to mounting apply to all ball rail systems.

However, different specifications exist with regard to the parallelism of the guide rails and to mounting the runner blocks with locating pins.

This information is provided separately alongside the descriptions of the individual types.

Rexroth Ball Rail Systems are high-grade quality products.

Particular care must be taken during transportation and subsequent mounting.

All steel components are protected with anti-corrosion oil.

Preservative substances do not need to be removed provided the recommended lubricants are used.

Mounting examples

Guide rails:

Each guide rail has ground contact surfaces on both sides.

Possibilities for side fixing:

- 1 Reference edges
- 2 Retaining strips
- 3 Wedge-profile retaining strip

Note

Guide rails without side fixing have to be aligned straight and parallel when mounting, preferably to an auxiliary strip. (recommended limits for side load if no additional lateral retention is provided, see individual types)

Runner Blocks:

Each runner block has a ground reference edge on one side (! Dimension V_1 in the dimension drawings).

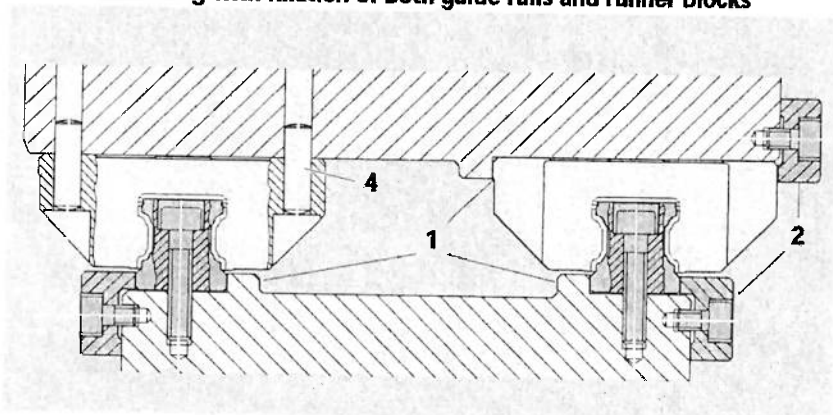
Possibilities for additional fixing:

- 1 Reference edges
- 2 Retaining strips
- 4 Locating pins

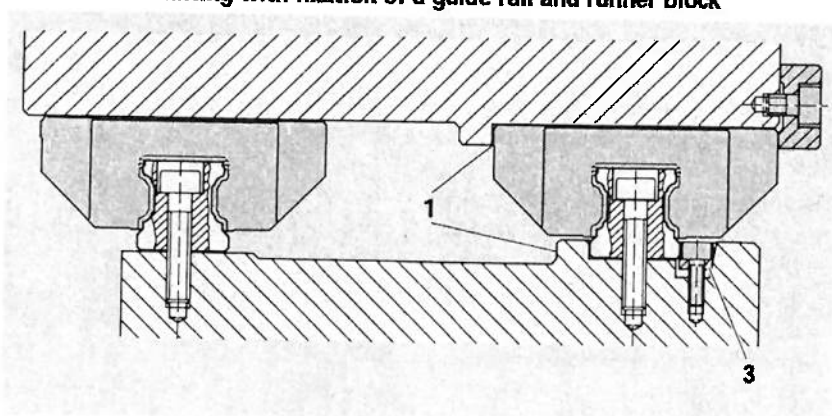
Note

After mounting, it should be possible to move the runner block easily.

Mounting with fixation of both guide rails and runner blocks



Mounting with fixation of a guide rail and runner block



Mounting Instructions

For detailed mounting steps, see "Mounting Instructions for Ball Rail Systems" RDEFI 82 270.

Rexroth Ball Rail Systems Mounting Instructions

Reference edges, corner radii,
mounting screw sizes and
tightening torque

Steel Runner Block
1651-, 1653-, 1693-, 2001-
aluminum Runner Block 1631-
– Standard Width

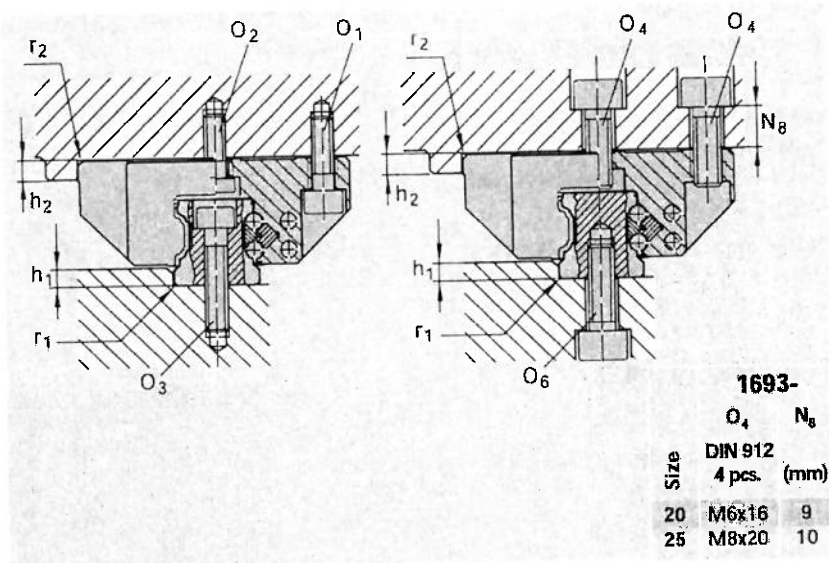
Guide Rails

left:

- For mounting from above
1605-, 1645-, 2045-

right:

- For mounting from below
1607-, 1647, 2047-



Steel Runner Blocks
1621-, 1622-, 1623-, 1624-, 1694-,
2011-

Aluminum Runner Blocks 1632-
– Slimline

Guide rail

- For mounting from above 1605-, 1645-,
2045-

Note

The indicated combinations represent
examples. It is basically possible to
combine any runner block with all the
offered guide rail types.

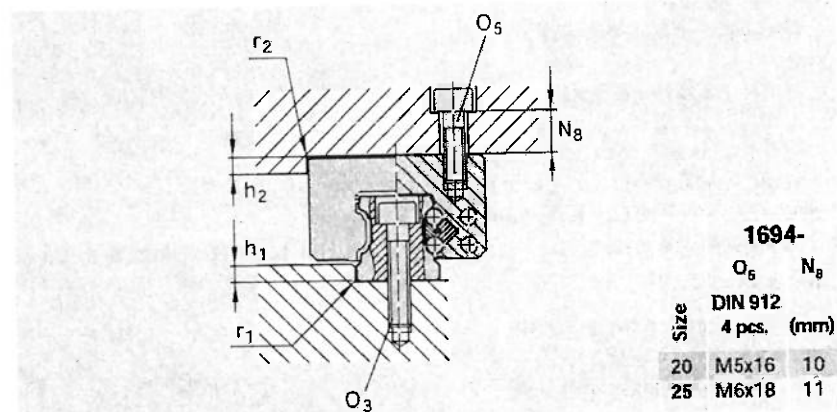
**Dimensions and recommended limits
for side load if no additional lateral
retention is provided**

- 1) When mounting the runner block
from above using only 4 O₄ screws:
– Permissible side force 1/3 lower
– Lower rigidity
- 2) For runner block mounting
with 6 screws:
Tighten screws with
torque of strength class 8.8.
- 3) When mounting with 2 O₂ screws and
4 O₁ screws

**Runner Blocks 1621-, 1622-, 1651,
1694-, 1693-, 1631-, 1632-, 2001-,
2011-**

Runner Blocks 1623-, 1624-, 1653-

**Tightening torque of the
mounting screws**



Size	h ₁		r ₁	h ₂	r ₂	O ₁	O ₂ ²⁾	O ₄ ¹⁾²⁾	O ₅	O ₃	O ₆	N ₈
	min.	max.	max.		max.	DIN 912	DIN 6912	DIN 912	DIN 912	DIN 912	DIN 912	
	(mm)	(mm)	(mm)	(mm)	(mm)	4 pcs.	2 pcs.	6 pcs.	4 pcs.			(mm)
15	2.5	3.5	0.4	4	0.6	M4x12	M4x10	M5x12	M4x12	M4x20	M5x12	6
20	2.5	4.0	0.6	5	0.6	M5x16	M5x12	M6x16	M5x16	M5x25	M6x16	9
25	3.0	5.0	0.8	5	0.8	M6x20	M6x16	M8x20	M6x18	M6x30	M6x20	10
30	3.0	5.0	0.8	6	0.8	M8x25	M8x16	M10x20	M8x20	M8x30	M8x20	10
35	3.5	6.0	0.8	6	0.8	M8x25	M8x20	M10x25	M8x25	M8x35	M8x25	13
45	4.5	8.0	0.8	8	0.8	M10x30	M10x25	M12x30	M10x30	M12x45	M12x30	14
55	7.0	10.0	1.2	10	1.0	M12x40	M12x30	M14x40	M12x35	M14x50	M14x40	20
65	7.0	10.0	1.2	14	1.0	M14x45	M14x35	M16x45	M16x40	M16x60	M16x45	22

Screw strength class	Runner blocks				Guide rails			
8.8	0.11 C	0.15 C ³⁾	0.23 C	0.11 C	0.06 C	0.06 C		
12.9	0.18 C	0.22 C ³⁾	0.35 C	0.18 C	0.10 C	0.10 C		
8.8	0.08 C	0.13 C ³⁾	0.18 C	0.08 C	0.04 C	0.04 C		
12.9	0.14 C	0.18 C ³⁾	0.26 C	0.14 C	0.07 C	0.07 C		
	M4	M5	M6	M8	M10	M12	M14	M16
8.8	2.7	5.5	9.5	23	46	80	125	195
12.9	4.6	9.5	16	39	77	135	215	330

Mounting Instructions

Locating pins

If the recommended values for permissible side forces are exceeded (see table), the runner block must be additionally fixed by means of locating pins or reference edges.

Recommended dimensions for the pin holes are indicated in the drawings and table.

Possible pin types:

- Taper pin (hardened) or
- Straight pin DIN ISO 8734

Note

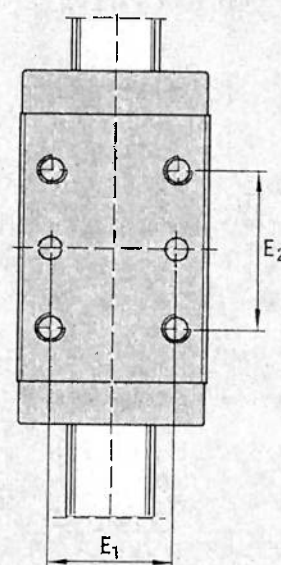
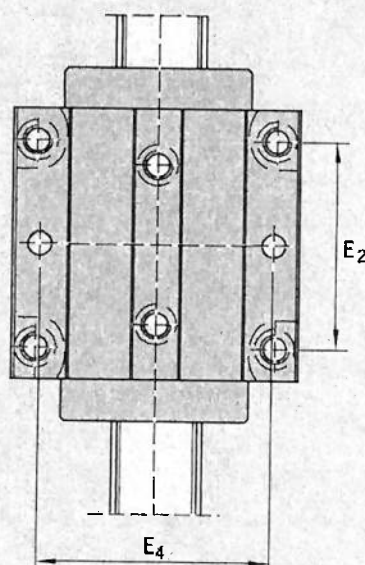
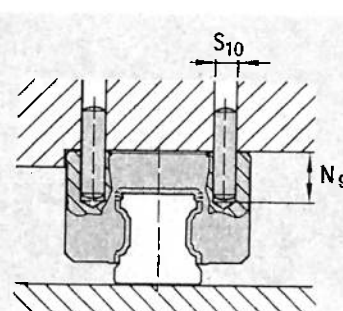
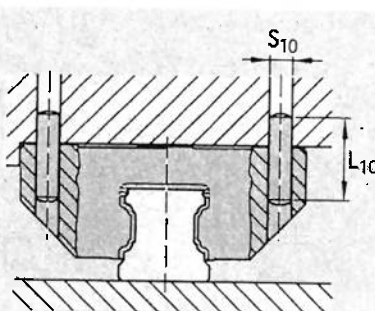
Ready-drilled holes made for production reasons may exist at the recommended pin hole positions (dia. < S_{10}).

These may be extended and bored open to accommodate the locating pins.

If the locating pins have to be driven in at another point (e.g. when the lube port is central), dimension E_2 must not be exceeded in the longitudinal direction (for dimension E_2 , see the tables for the individual types).

Observe dimensions E_1 and E_4 !

Only prepare the pin holes after the installation is complete (see also "General Mounting Instructions").



Standard Width 1651-, 1653-, 1631-, 2001-
Standard Width, low profile 1693-

Slimline 1622-, 1623-, 1632-, 2011-
Slimline, high 1621-, 1624-
Slimline, low profile 1694-

Size	Taper pin (hardened) Straight pin (DIN 6325)		Dimensions (mm)					1693- 1694-
	S_{10}	L_{10}	E_1	E_4	N_9 (max)	E_4	N_9 (max)	
15	4	18	26	38	6.0	-	-	
20	5	24	32	53	7.5	49	6.5	
25	6	32	35	55	9.0	60	7.0	
30	8	36	40	70	12.0	-	-	
35	8	40	50	80	13.0	-	-	
45	10	50	60	98	18.0	-	-	
55	12	60	75	114	19.0	-	-	
65	14	60	76	140	22.0	-	-	

Rexroth Ball Rail Systems

Mounting Instructions

Reference edges, corner radii,
mounting screw sizes and
tightening torque

Super Runner Block S 1661 Runner
Block 1665-

□ Standard Width, short

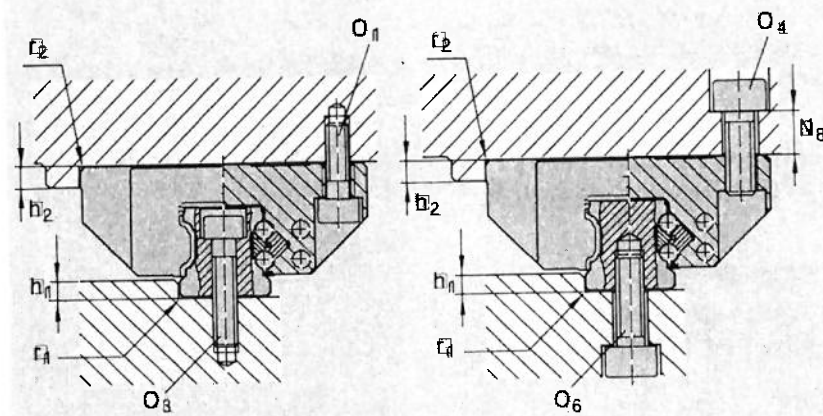
Guide Rails

left:

□ For mounting from above 1605-

right:

□ For mounting from below 1607-

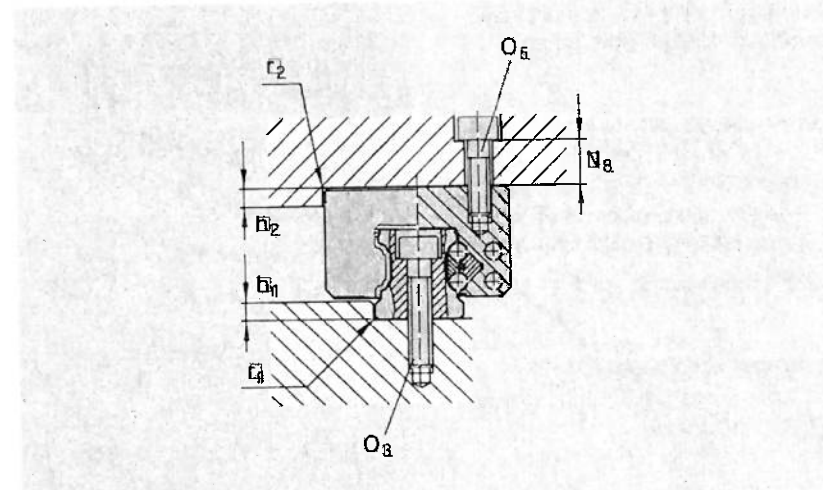


Super Runner Block S 1662 Runner
Block 1665-

□ Slimline, short

Guide Rails

□ For mounting from above 1605-



Note

The indicated combinations represent
examples. It is basically possible to
combine any runner block with all the
offered guid rail types.

Screw mounting of runner blocks using
two screws is fully sufficient up to
maximum load.

(See maximum permissible force and
moment loads indicated under the
individual types.)

Dimensions and recommended limits
for side load (if no additional lateral
retention is provided)

(Runner Blocks 1665-, 1665-)

h_1	h_2	r_1	r_2	O_1	O_2	O_3	O_4	O_5	N_8
min.	max.	min.	max.	max.	DIN 912	DIN 912	DIN 912	DIN 912	DIN 912
(mm)	(mm)	(mm)	(mm)	(mm)	2 pcs.	2 pcs.	2 pcs.	(mm)	(mm)
15	25	3.5	5.4	4	0.6	M4x12	M6x12	M8x12	M10x20
20	25	5.0	6.8	5	0.6	M5x18	M6x18	M8x18	M10x25
25	30	5.0	6.8	5	0.6	M6x20	M8x20	M10x20	M12x25
30	30	5.0	6.8	6	0.6	M8x25	M10x25	M12x25	M16x30
35	35	5.0	6.8	6	0.6	M8x25	M10x25	M12x25	M16x35

Runner blocks	Guide rails
Strength class	
6.8	0.09 C
10.9	0.13 C
	0.15 C

Tightening torque of the
mounting screws

	M4	M5	M6	M8	M10	M12	M16	M20
min.	2.0	5.5	5.5	23	46	80	125	185
max.	4.0	8.5	16	39	77	135	215	350

Mounting Instructions

Locating pins

If the recommended values for permissible side forces are exceeded, the runner block must be additionally fixed by means of locating pins or reference edges.

Recommended dimensions for the pin holes are indicated in the drawings and table.

Possible pin types:

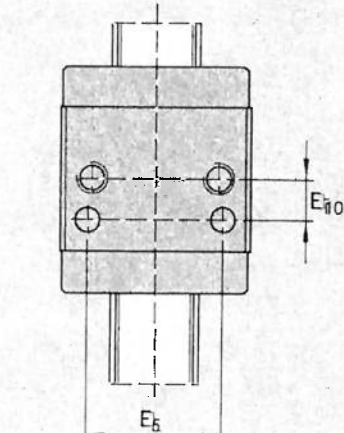
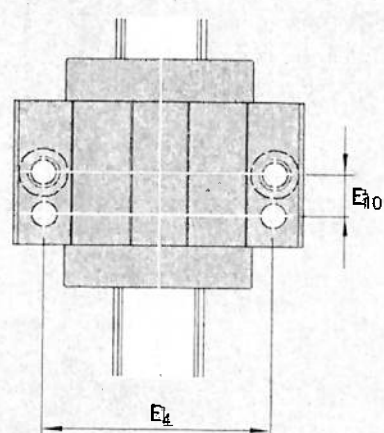
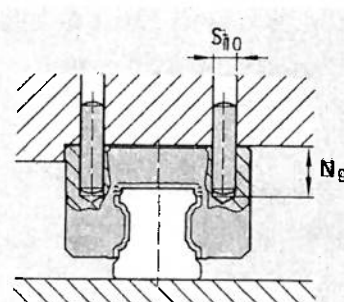
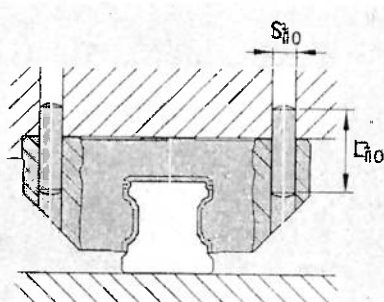
- Taper pin (hardened) or
- Straight pin DIN ISO 8734

Note

Ready-drilled holes made for production reasons may exist at the recommended pin hole positions ($d_{\text{dr}} \leq S_{\text{H0}}$).

These may be extended and bored open to accommodate the locating pins.

Only prepare the pin holes after the installation is complete (see also "General Mounting Instructions").



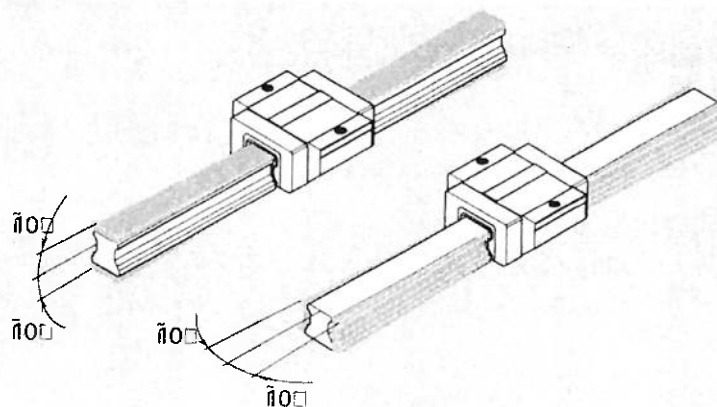
Super Runner Blocks § 1661-
Standard Width, short 1665-
Standard Width, short, low profile 1663-

Super Runner Blocks § 1662-
Slimline/ short 1666-
Slimline/ short, low profile 1664-

Size	Taper pin (hardened) Straight pin (DIN 8234)		Dimensions (mm)						1663- 1664-	
	S_{H0}	L_{H0}	E_L	E_B	E_{H0}	$N_{H0 \text{ (max)}}$	E_L	$N_{H0 \text{ (max)}}$	E_L	$N_{H0 \text{ (max)}}$
15	4	18	32	26	9	3.0	—	—	—	—
20	5	24	54	32	10	3.5	43	2	—	—
25	6	32	55	35	11	7.0	60	5	—	—
30	8	36	70	40	14	10.0	—	—	—	—
35	8	40	80	50	15	12.0	—	—	—	—

Permitted alignment error for Super Runner Blocks §

at the guide rail and at the runner block



Rexroth Ball Rail Systems

Mounting Instructions

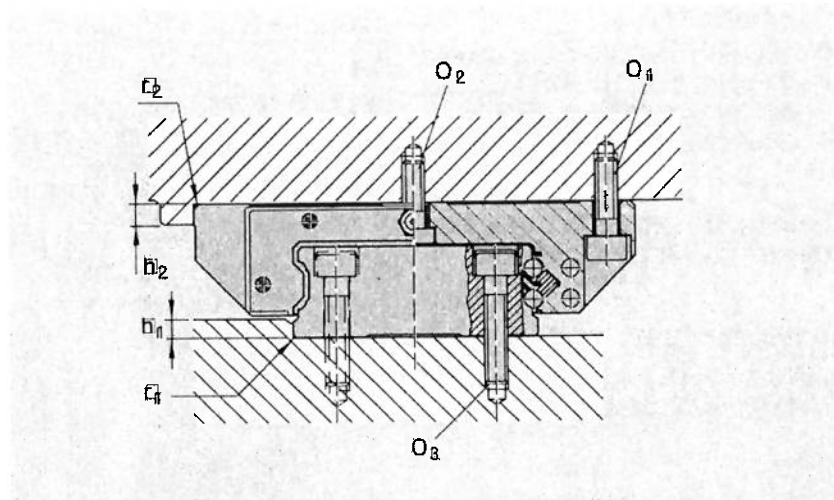
Reference edges, corner radii,
mounting screw sizes and
tightening torque

Runner Block 1671-

→ wide

Guide rail:

→ Wide, for mounting from above 1675-

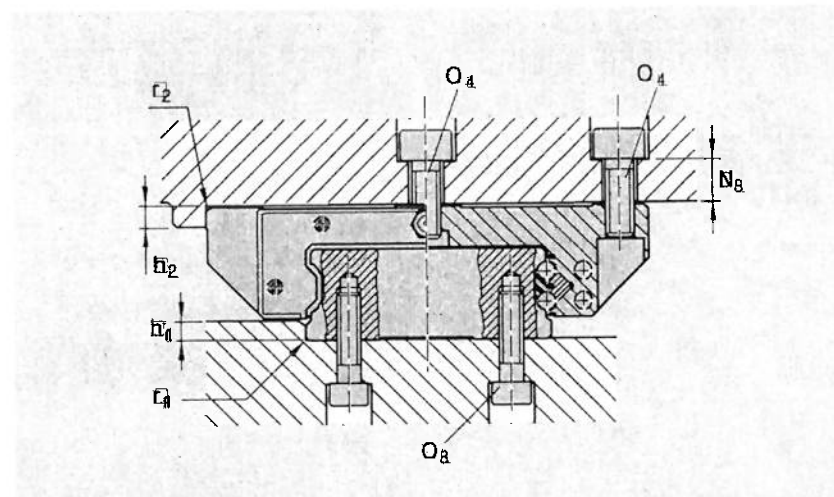


Runner Block 1671-

→ wide

Guide rail:

→ wide, for mounting from below 1677-



Dimensions and recommended limits
for side load (if no additional lateral
retention is provided)

- 1) When mounting the runner block from
above using only 4 O₁ screws:
→ Permissible side force 1/3 lower
→ Lower stiffness

- 2) For runner block mounting with 6
screws:
→ Tighten the centerline screws with
... the torque for strength class 8.8

- 3) When mounting with 2 O₂ screws and
4 O₁ screws

Size	b ₁ min. max. max. max. (mm) (mm) (mm) (mm)	r ₁ (mm)	r ₂ (mm)	O ₁ DIN 912 4 pcs.	O ₂ ¹⁾ DIN 912 2 pcs.	O ₃ ²⁾ DIN 912 6 pcs.	O ₄ DIN 912	N ₈ (mm)
25/30	2.0 2.5 0.5 4	0.5	0.5	M5x16	M5x12	M6x16	M4x20	9.5
25/70	3.0 4.5 0.8 5	0.8	0.8	M6x20	M6x16	M8x20	M6x20	10.0
35/50	3.5 5.0 0.8 6	0.8	0.8	M8x25	M6x20	M10x25	M8x25	13.0

Screw	Runner block	RAIL
strength class		
8.8	0.08 C	0.08 C
12.9	0.13 C	0.13 C

Tightening torque of the mounting
screws

	M4	M5	M6	M8	M10
8.8	2.7	5.5	5.5	13	48
12.9	4.6	9.9	16	39	77

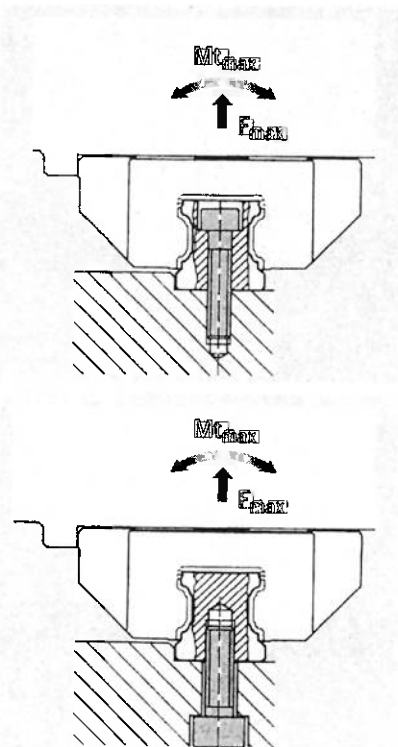
Mounting Instructions

Load on the screwed connection between guide rail and base

The screw connections specified in the standard DIN 645-1 can be subjected to excessive loads due to the performance capability of the profile guide rails. The mounting screws between guide rail and base are critical. If the lifting loads (F) or moments (M) are higher than the applicable load values in the table, the screw connections must be re-calculated separately.

The data applies to the following conditions:

- Mounting screws, quality A2-9
 - Screws tightened using a torque wrench
 - Screws lightly oiled
- (For screws of quality 8.8, an approximate break factor of 0.6 can be applied)



Lift-off Loads and Moments

Guide rail mounted from above

Runner Screws	1653, 1654, 1655, 1656	1621, 1622, 1651, 1693, 1694, 2001, 2011	1623, 1624, 1653			
Size	F_{max} (N)	M_{max} (Nm)	F_{max} (N)	M_{max} (Nm)		
15	6 040	41	7 050	47	8 060	54
20	11 000	90	11 700	106	13 400	121
25	14 600	154	17 100	180	19 500	205
30	—	350	32 400	420	37 100	480
35	27 500	440	32 100	510	36 700	580
45	—	—	78 100	1 680	89 300	1 920
55	—	—	107 800	2 690	123 200	3 080
65	—	—	152 300	4 490	174 100	5 180

Guide rail mounted from below

Runners Rocks:	1663, 1664, 1665 1666	1621, 1622, 1651, 1693, 1694, 2001, 2011	1623, 1624, 1653			
Size	F_{max} (N)	M_{max} (Nm)	F_{max} (N)	M_{max} (Nm)	F_{max} (N)	M_{max} (Nm)
15	-	67	11 600	78	13 300	89
20	-	128	16 500	149	18 900	170
25	14 300	150	16 700	170	19 100	200
30	-	350	31 700	410	36 200	470
35	27 100	480	31 600	500	36 200	520
45			77 700	1 670	89 800	1 900
55			106 800	2 670	122 100	3 050
65			150 850	4 450	172 400	5 080

Wide Rail Rail Systems

	Size	F_{max} (N)	M_{max} (Nm)
1675	20/40	14 100	227
	25/70	33 500	890
	35/90	64 800	2 380
1677	20/40	13 800	224
	25/70	33 700	900
	35/90	31 700	2 350

Rexroth Ball Rail Systems

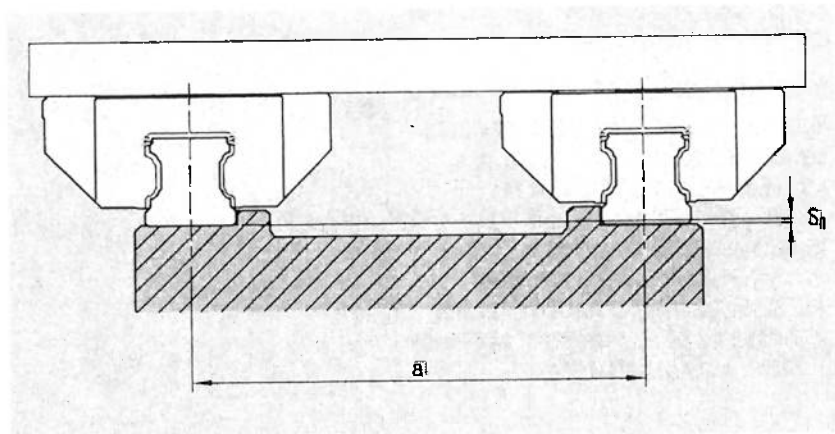
Mounting Instructions

Vertical offset

The vertical offset values apply to all runner blocks of the standard program.

Values around 20% higher are permissible for the runner block 1665: (Standard Width, short) and 1665: (slimming, short).

If the admissible vertical offset S_v and S_h is not exceeded, reduction in travel life will as a rule be negligible.



Permissible vertical offset in the transverse direction

The permissible offset S_v includes the tolerance for dimension l as given in the table under "Technical Data".

$$S_v \approx a \cdot Y$$

S_v = Permissible vertical offset (mm)
 a = Distance between rails (mm)
 Y = Calculation factor

Calculation factor Y
 for steel runner blocks

Calculation factor	for preload class:			
	up to approx. 10 µm clearance	Preload -0.02 C	Preload -0.05 C	Preload -0.15 C
Y	$4.8 \cdot 10^{-4}$	$2.8 \cdot 10^{-4}$	$1.7 \cdot 10^{-4}$	$1.2 \cdot 10^{-4}$

Calculation factor Y
 for Super Runner Blocks S

Calculation factor	up to approx. 10 µm clearance	Preload -0.02 C
Y	$6 \cdot 10^{-4}$	$6 \cdot 10^{-4}$

Calculation factor Y
 for aluminum runner blocks

Calculation factor	up to approx. 10 µm clearance	Preload -0.02 C
Y	$7 \cdot 10^{-4}$	$5 \cdot 10^{-4}$

Mounting Instructions

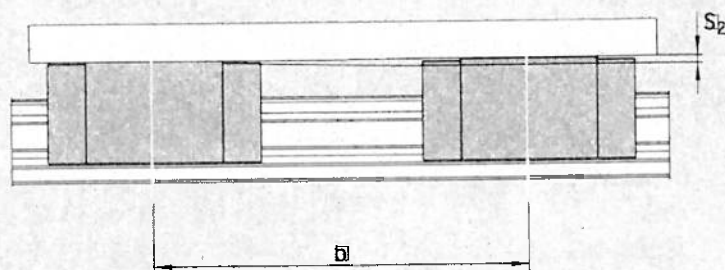
Permissible vertical offset in the longitudinal direction

For steel and aluminum runner blocks

The permissible vertical offset S_z takes into account the tolerance for the "max" difference in dimensions H on the same rail according to the table given in the "Technical Data" section

Values around 40% higher are permissible for the runner block 1665+ (Standard Width, short) and 1666+ (Slimline, short).

Values around 30% lower are permissible for runner block 1653+ (standard width long), 1623+ (slimline, long) and 1624+ (slimline, high, long).



Permitted deviation S_z for steel runner blocks

$$S_z = b \cdot 4,5 \cdot 10^{-5}$$

S_z = Permissible vertical offset (mm)
 b = Distance between runner blocks (mm)

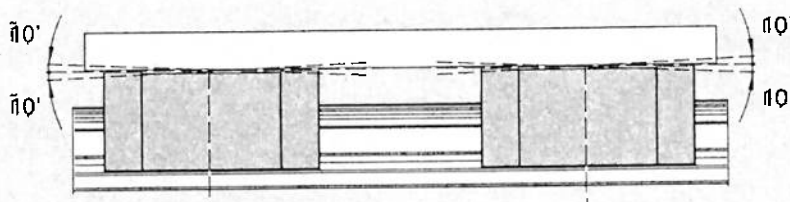
Permitted deviation S_z for aluminum runner blocks

$$S_z = b \cdot 6 \cdot 10^{-5}$$

S_z = Permissible vertical offset (mm)
 b = Distance between runner blocks (mm)

Permissible deviation from straightness in the longitudinal direction with two consecutive Super Runner Blocks

The runner blocks can automatically compensate for a nonlinearity of $\pm 0^\circ$ in the longitudinal direction.



Rexroth Ball Rail Systems

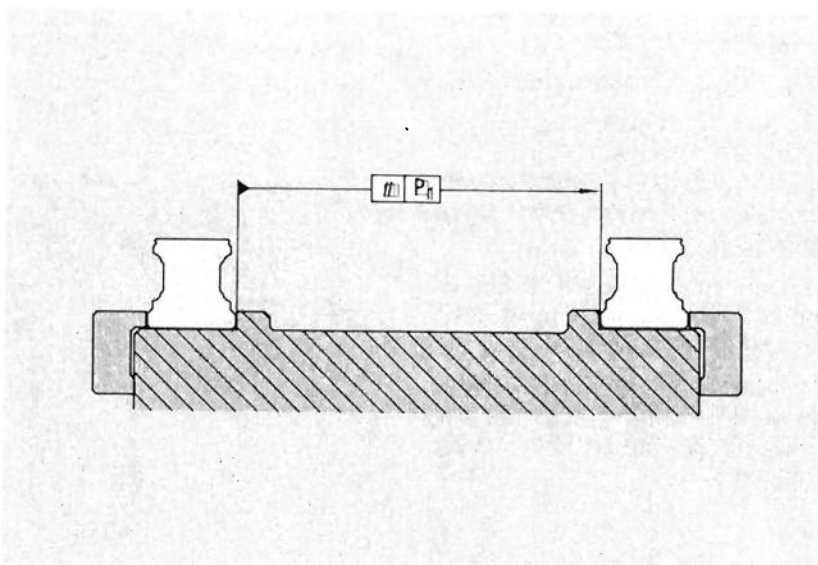
Mounting Instructions

Parallelism of the rails after mounting

measured at the guide rails and at the runner blocks

The values for parallelism offset P_1 apply to all runner blocks of the standard range.

Values around 20% higher are permissible for the runner block H665+ (Standard Width, short) and H665+ (slimline, short).



Parallelism offset P_1 for steel runner blocks

The parallelism offset P_1 causes a slight increase in preload on one side of the assembly.

If the tolerances given in the table are not exceeded, reduction in travel life will be negligible.

The given values apply to precision mounting.

For standard mounting, double the stated values can be used.

Size	Parallelism offset P_1 (mm)			
	up to approx. 10 µm clearance	Precision 0.02 C	Precision 0.05 C	Precision 0.15 C
15	0.015	0.009	0.005	0.004
20	0.018	0.011	0.006	0.005
25	0.019	0.012	0.007	0.006
30	0.021	0.014	0.009	0.008
35	0.023	0.015	0.010	0.009
45	0.025	0.016	0.012	0.009
55	0.028	0.018	0.014	0.011
65	0.048	0.030	0.022	0.016

Parallelism offset P_1 for Super Runner Blocks

Size	Parallelism offset P_1 (mm)	
	up to approx. 10 µm clearance	Precision 0.02 C
15	0.025	0.017
20	0.028	0.021
25	0.032	0.023
30	0.036	0.026
35	0.040	0.030

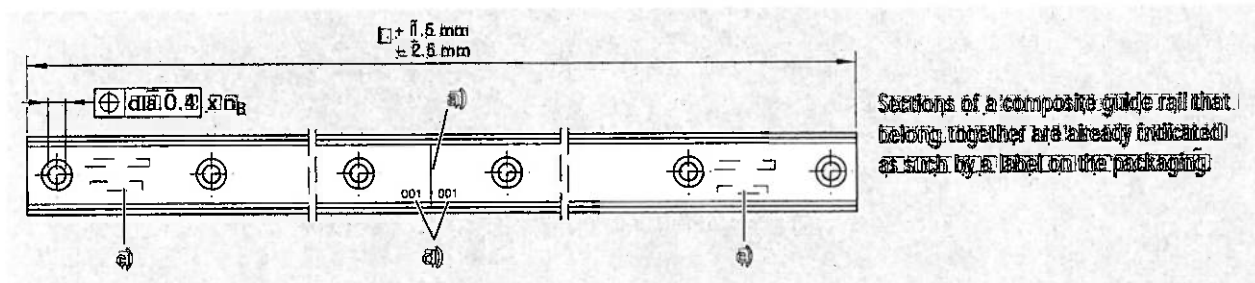
Parallelism offset P_1 for aluminum runner blocks

Size	Parallelism offset P_1 (mm)	
	up to approx. 10 µm clearance	Precision 0.02 C
15	0.021	0.014
25	0.026	0.017
30	0.028	0.019
35	0.036	0.022

Mounting Instructions

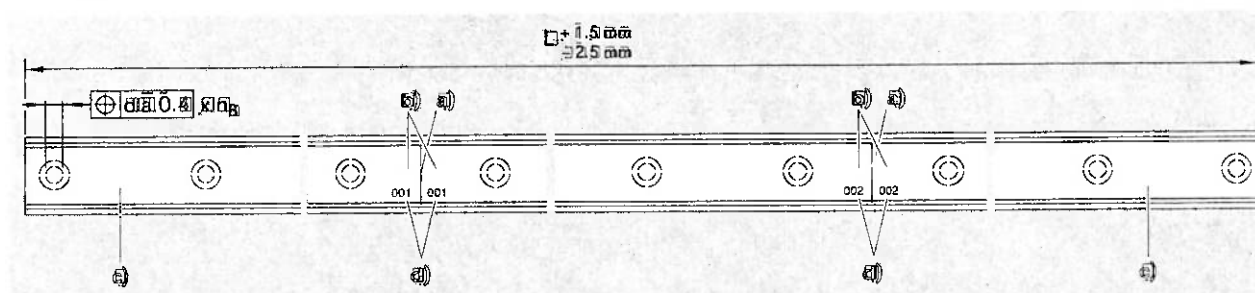
Composite guide rails

Guide rails made up of two sections



Guide rails made up of three or more sections

All sections of the same rail have the same number.



a) Number of holes

b) Joint

c) Counter number

d) Complete rail identification on first and last section

e) Code number of the joint

Note on rail seal cover strip

For composite guide rails, a one-piece rail seal to cover the total length L is supplied separately.

Rexroth Ball Rail Systems

Maintenance and Lubrication

Maintenance

Dirt can settle and encrust on guide rails, especially when these are not enclosed.

To ensure that seals and rail seal cover strips retain their functionality, this dirt must be removed at regular intervals.

It is advisable to run the machine through a full "cleaning cycle" over the entire installed rail length at least twice a day, but no later than at the end of every 8-hour shift.

Always run a cleaning cycle before shutting down the machine.

Lubrication

Rexroth Ball Rail Systems are delivered filled with an anti-corrosion agent. Either oil or grease can be used as a lubricant.

Before start-up, make sure the system has sufficient initial lubrication.

Grease Lubrication

⚠ Greases with solid lubricant content (such as graphite or MoS₂) must not be used!

We recommend a lubricant grease to DIN 51825:

- K2K with normal loads
 - KP2K with higher loads
- Consistency class NLGI 2 complying with DIN 51818, can be purchased through Rexroth (cartridge, content 400 g).
Part number: 8416-037-00

Observe the information provided by the manufacturers, in particular with regard to incompatibilities.

Always lubricate runner blocks before start-up (initial lubrication)

Initial lubrication requires a total of three times the partial quantity given in table 1:

1. Apply the first partial quantity of lubricant as per table 1 to runner block.
2. Slide runner block back and forth over at least three times the block length for three full cycles.
3. Repeat steps 1. and 2. two more times.
4. Check whether a film of lubricant is visible on the guide rail.

Size	Grease lubrication	
	Initial lubrication partial quantity lubrication (mm ²)	In-service (mm ²)
15	0.4 (x3)	0.4
20	0.7 (x3)	0.7
25	1.4 (x3)	1.4
30	2.2 (x3)	2.2
35	2.2 (x3)	2.2
40	3.7 (x3)	3.7
50	9.4 (x3)	9.4
60	15.4 (x3)	15.4
25/50	1.0 (x3)	1.0
35/50	1.4 (x3)	1.4
50/50	2.7 (x3)	2.7

Table 1

In-service lubrication of runner blocks:

- Once the in-service lubrication interval as given in table 2 or 3 is reached, apply the lubricant quantity as stated in table 1.

If the equipment is to operate in an environment subject to contamination, vibration, shock loads, etc., or where cooling lubricants are used, we recommend shortening the in-service lubrication interval.

The smaller the load, the longer the intervals between in-service lubrication will be.

For runner blocks, with ball retainers as an option: 15....-20, 15....-22

Size	In-service lubrication intervals under normal operating conditions (Travel (km))
	Load
	≤ 0.15 G
15	5000
20	5000
25	10000
30	10000
35	10000

Table 2

For runner blocks: 15....-10, 15....-11

Size	In-service lubrication intervals under normal operating conditions (Travel (km))
	Load
	≤ 0.15 G
15	1000
20	1000
25	1000
30	1000
35	500
40	250
50	150
60	100
25/50	1000
35/50	1000
50/50	500

Table 3

Maintenance and Lubrication

Oil lubrication

Oil quantities for initial and in-service lubrication



Add the entire oil quantity in one go!

Runner blocks that have been initially lubricated at the plant can be re-lubricated with oil!

If the equipment is to operate in an environment subject to contamination, vibration, shock loads, etc., or where cooling lubricants are used, we recommend shortening the in-service lubrication interval.

- * If runner block is not initially lubricated at the plant, perform initial lubrication with double the oil quantity.

For runner blocks, with ball retainer as an option! 161...-20, 161...-22

Size	Oil lubrication initial and in-service lubrication* (cm ³)
15	0.4
20	0.7
25	1.0
30	1.1
35	1.2

Size	Oil lubrication in-service lubrication interval under normal operating conditions Travel (km)
Load $\leq 0.15 \text{ G}$, $\psi \leq 1^\circ/\text{s}$	
15	3000
20	3000
25	5000
30	5000
35	3000

Table 1

For runner blocks: 161...-10, 161...-11

Size	Oil lubrication initial and in-service lubrication* (cm ³)
15	0.4
20	0.7
25	1.0
30	1.1
35	1.2
45	2.2
55	3.6
65	6.0

Size	in-service lubrication interval under normal operating conditions Travel life (km)
Load $\leq 0.15 \text{ G}$, $\psi \leq 1^\circ/\text{s}$	
20/40	0.7
25/70	1.1
35/80	1.8

Size	in-service lubrication interval under normal operating conditions Travel life (km)
Load $\leq 0.15 \text{ G}$, $\psi \leq 1^\circ/\text{s}$	
average	70

Table 2

One-point oil lubrication

Oil quantities and lubrication intervals of central lubrication

Notes:

Recommended interval between two pulses: 10 seconds.

Example for size 45:

4 pulses of 0.6 cm³ each in 30 seconds.

If the equipment is to operate in an environment subject to contamination, vibration, shock loads, etc., or where cooling lubricants are used, we recommend shortening the in-service lubrication interval.

- * If runner block is not initially lubricated at the plant, perform initial lubrication with double the number of pulses.

For runner blocks, with ball retainer as an option! 161...-20, 161...-22

Size	Oil lubrication quantity/Pulse (cm ³)	Pulses per lubrication cycle
15	0.6	1
20	0.6	1
25	0.6	2
30	0.6	2
35	0.6	2

Size	Oil lubrication in-service lubrication interval under normal operating conditions Travel (km)
Load $\leq 0.15 \text{ G}$, $\psi \leq 1^\circ/\text{s}$	
15	3000
20	3000
25	5000
30	5000
35	3000

Table 3

For runner blocks: 161...-10, 161...-11

Size	Oil lubrication quantity/Pulse (cm ³)	Pulses per lubrication cycle
15	0.6	1
20	0.6	1
25	0.6	2
30	0.6	2
35	0.6	2
45	0.6	4
55	1.5	3
65	1.5	7

Size	in-service lubrication interval under normal operating conditions Travel life (km)
Load $\leq 0.15 \text{ G}$, $\psi \leq 1^\circ/\text{s}$	
20/40	1
25/70	2
35/80	2

Size	in-service lubrication interval under normal operating conditions Travel life (km)
Load $\leq 0.15 \text{ G}$, $\psi \leq 1^\circ/\text{s}$	
average	70

Table 4

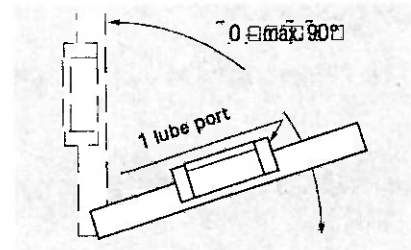
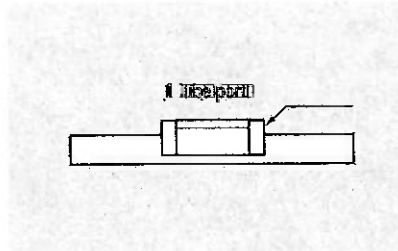
Rexroth Ball Rail Systems

Maintenance and Lubrication

Dependency on the travel length

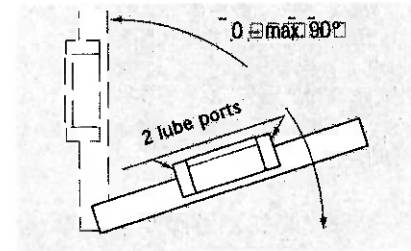
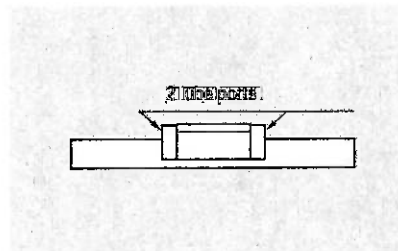
Stroke $\geq 2 \times$ runner block length

- Provide 1 lube port per runner block.
- Oil lubrication to ISO VG 220.
- Lubricant quantities as per previous page.



Stroke $< 2 \times$ runner block length

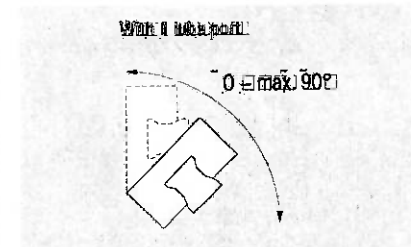
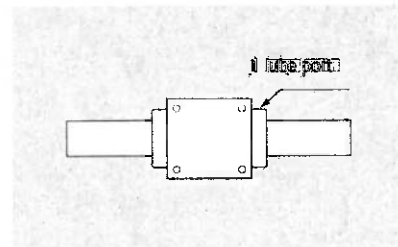
- Provide 2 lube ports per runner block.
- Apply the specified lubricant quantity per lube port.
- Oil lubrication to ISO VG 220.
- Lubricant quantities as per previous page.



Installation at an angle about the centerline (wall mounting)

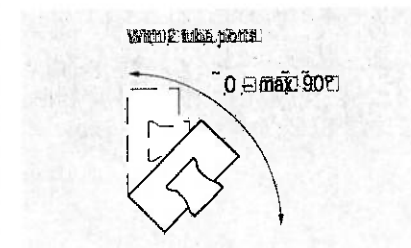
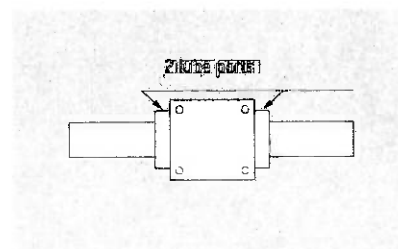
Stroke $\geq 2 \times$ runner block length

- Provide 1 lube port per runner block.
- Add the lubricant quantity as specified in table in one pulse.
- If the lubrication quantity cannot be added in one pulse, please consult us.



Stroke $< 2 \times$ runner block length

- Provide 2 lube ports per runner block.
- Add the lubricant quantity as specified in table in one pulse.
- If the lubrication quantity cannot be added in one pulse, please consult us.



Industrial
Hydraulics

Electric Drives
and Controls

Linear Motion and
Assembly Technologies

Industrial
Automation

Service
Automation

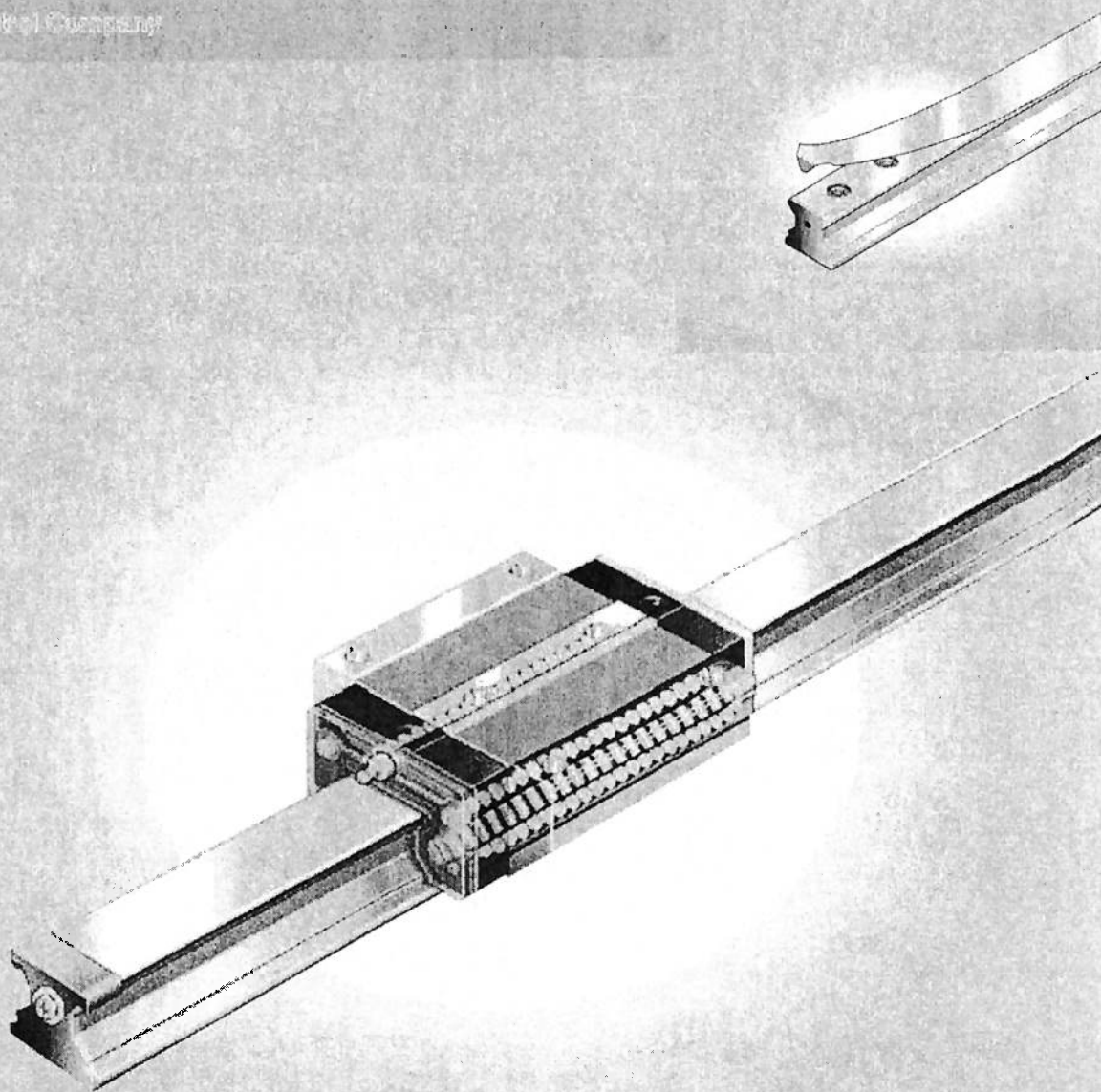
Valve
Hydraulics

Rexroth
Bosch Group

Roller Rail Systems

RE 82 302/2003-04

The Drive & Control Company



Rexroth Roller Rail Systems

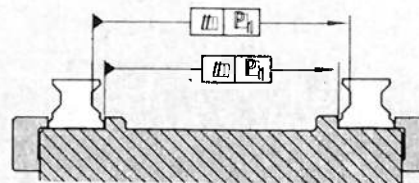
General Mounting Instructions

Parallelism offset of mounted rails (tolerance)

measured on the guide rails and the runner blocks

The parallelism offset P_1 causes a slight rise in the preload on one side.

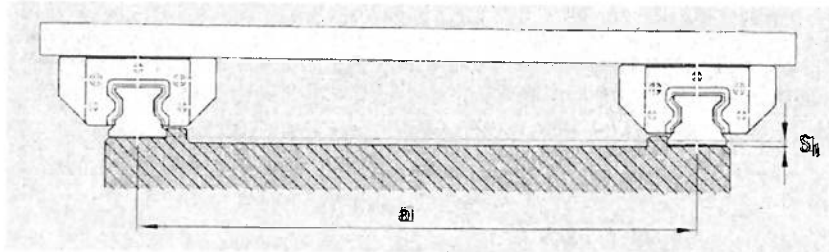
As long as the values specified in the table are met, the effect of this on the service life can generally be neglected.



Size	Parallelism offset P_1 (mm)	
	Preload $\sim 0.05 \text{ c}$	Preload $\sim 0.03 \text{ c}$
25	0.007	0.005
35	0.010	0.007
45	0.012	0.009
55	0.016	0.011
65	0.022	0.016
65/65	0.016	0.011
65/110	0.022	0.016
125	□	0.025

Vertical offset

Provided the vertical offset is kept within the stated tolerances for S_1 and S_2 , its influence on the service life can generally be neglected.



Permissible vertical offset in transverse direction S_1

$$S_1 = a \cdot Y$$

S_1 = permissible vertical offset (mm)

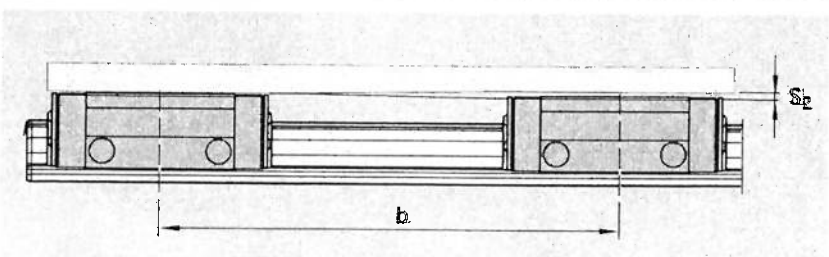
a = distance between guide rails (mm)

Y = calculation factor

Calculation factor	for preload dimension	
	Preload $\sim 0.05 \text{ c}$	Preload $\sim 0.03 \text{ c}$
Y	$1.2 \cdot 10^{-4}$	$1.2 \cdot 10^{-4}$

Permissible vertical offset in longitudinal direction S_2

The permissible vertical offset S_2 includes the tolerance max. difference in dimension b on the same guide rail, as given in the table on page 29.



Runner blocks 1851-, 1821-, 1861-

$$S_2 = b \cdot 4.3 \cdot 10^{-5}$$

S_2 = permissible vertical offset (mm)

b = distance between runner blocks (mm)

Runner blocks 1853-, 1824-, 1863-, 1872- (long version)

$$S_2 = b \cdot 8.0 \cdot 10^{-5}$$

General notes

The following installation notes apply to all Roller Rail Systems.

Rexroth roller rail systems are high quality, precision manufactured products and must therefore be handled with the utmost care (in transit and during subsequent installation).

The same care must be taken with cover strips (see the relevant mounting instructions).

All steel parts are treated with anti-corrosion oil prior to shipment. It is not necessary to remove this oil provided the recommended lubricants are used.

Mounting instructions

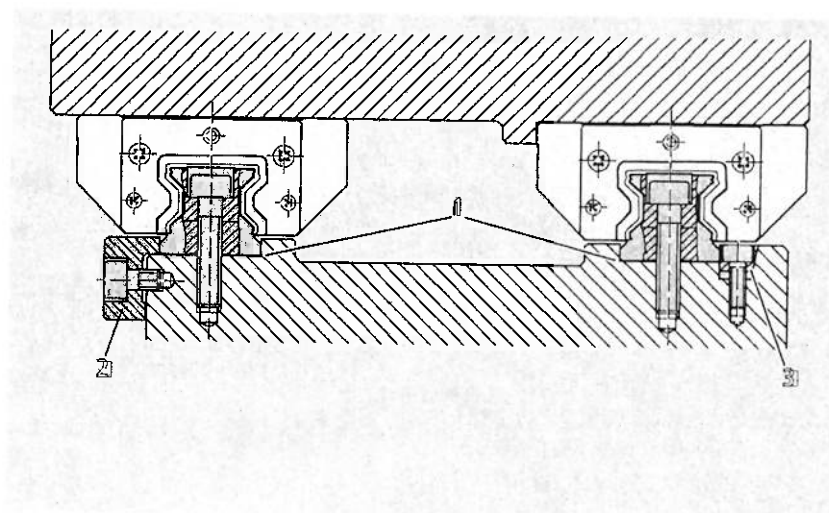
Mounting the guide rails:

Guide rail with lateral retention:

- If a cover strip is fitted, unclip it. (Observe the mounting instructions!)
- Push both rails into contact with the reference edges (1) and tighten the screws lightly.
- Fix the rails in place with retaining strips (2) or wedge profiles (3).
- Apply the specified torque to tighten the guide rail screws.
- Mount the cover strip or the mounting hole plugs. (Observe the mounting instructions!)

Note

For guide rails without lateral retention, we recommend using a straightedge to make sure the rails are properly aligned and parallel during assembly.



Rexroth Roller Rail Systems

General Mounting Instructions

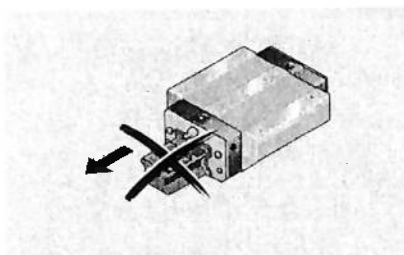
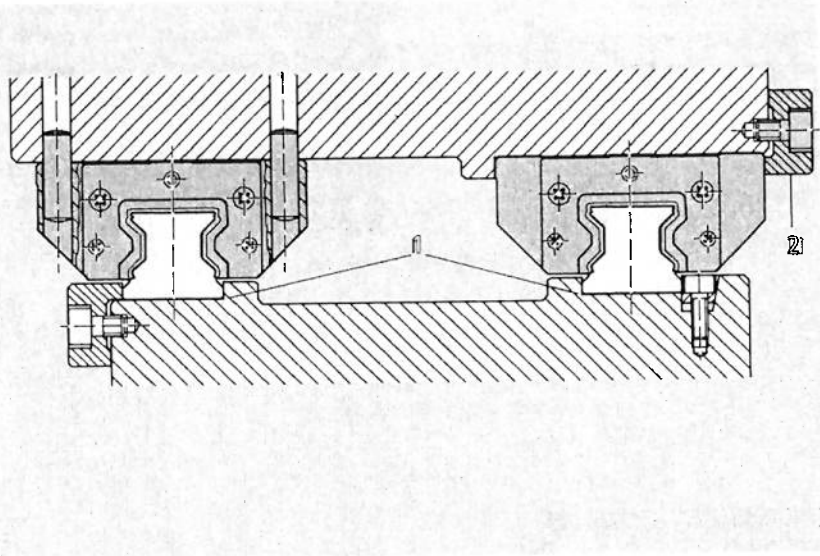
Mounting the runner block

⚠ Before mounting the runner block, oil or grease the bevel on the end face of the guide rail and the sealing lips of the runner block.

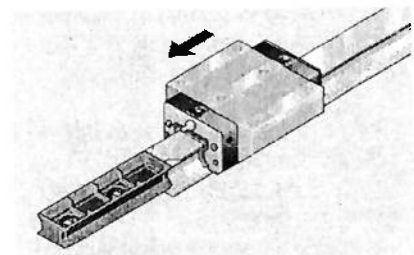
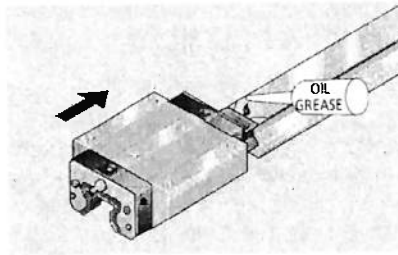
- ❑ Carefully slide the runner block onto the guide rail.
- ❑ Press the runner block on the first rail against the reference edge (1) and screw down.
- ❑ Screw down the runner block on the second rail and pin (if required). Do not drill holes for locating pins until after mounting.

If the system has been properly installed, the runner block should slide easily on the rail.

- ❑ Now apply the initial lubrication (see chapter "Lubrication").



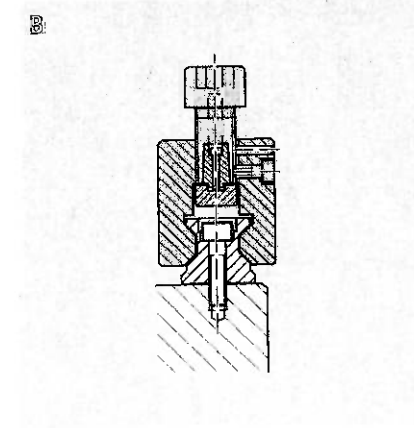
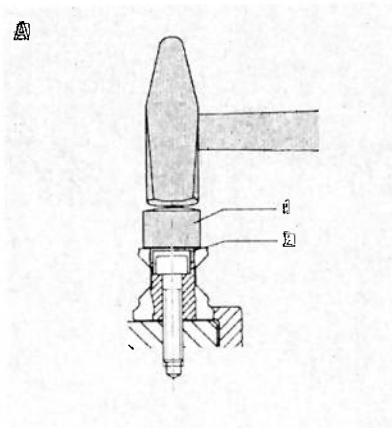
⚠ Do not remove the transport and mounting arbor from the runner block until the runner is safely on the rail! Otherwise, the rollers may fall out!



⚠ Use the mounting arbor again to remove runner blocks from the rail! When not installed on the guide rails, the runner blocks should always be kept on the arbor!

Inserting the mounting hole plugs

- A After mounting the guide rails, tap the plastic mounting hole plugs (2) into the screw holes with the aid of a plastic pad (1) until flush with the surface of the rail.
- B Steel mounting hole plugs: Always use the special mounting tool. The plugs must be flush with the rail surface before mounting the runner block. See mounting instructions.



Load on the screw connections between the guide rail and the mounting base

Rexroth high-performance profiled rail guideways permit the load limits for screw connections as specified in DIN 645-1 to be exceeded. The most critical point is the screw connection between the guide rail and the mounting base. Joints for which the lift-off loads (F_{max}) or moments (M_{max}) exceed the relevant load limits in the table must be separately recalculated.

The values shown here apply under the following conditions:

- ☐ Mounting screw quality 12.9
- ☐ Screws tightened with a torque wrench
- ☐ Screws lightly oiled
(for screws in quality 8.8, an approximation factor of 0.6 can be applied).

Standard roller rail systems

Guide rail	Size	Runner block			
		1821, 1851		1824, 1853	
		F_{max} (N)	M_{max} (Nm)	F_{max} (N)	M_{max} (Nm)
1805 1806 1808 1809	25	34300	360	39200	410
	35	64500	1030	73800	1180
	45	157800	3390	180400	3870
	55	216800	5400	247800	6100
1807 1809	65			339400	10100
	25	34300	360	39200	410
	35	64500	1030	73800	1180
	45	157800	3390	180400	3870
1847	55	216800	5400	247800	6100
	65			339400	10100

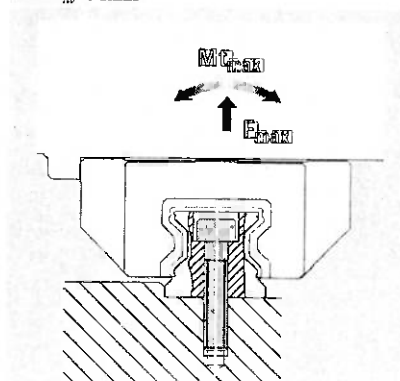
Wide roller rail systems

Guide rail	Size	Runner block	
		1872	
		F_{max} (N)	M_{max} (Nm)
1875	55/85	360000	10100
1873	65/100	491000	16500

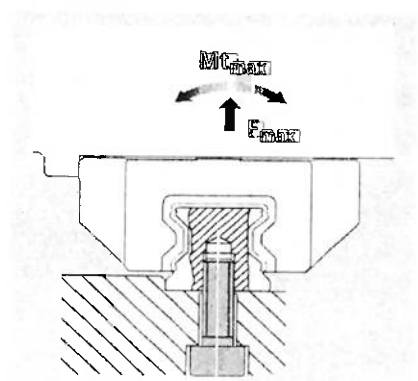
Heavy duty roller rail systems

Guide rail	Size	Runner block			
		1861		1863	
		F_{max} (N)	M_{max} (Nm)	F_{max} (N)	M_{max} (Nm)
1835 1865	125	1102500	66150	1280000	75500

Guide rail
mounted from above
1805-, 1806-, 1808-, 1809-, 1865-,
1875-, 1873-

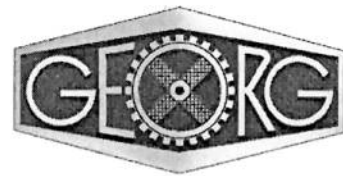


Guide rail
mounted from below
1807-, 1847-



Technische Dokumentation

Technical Documentation



HEINRICH GEORG GMBH
MASCHINENFABRIK

Kapitel 15

Chapter 15

Inhaltsverzeichnis

Contents

1. **Technische Information TR 020**
Technical information TR 020

Seite 1- 18
Page



Technical Information TR 020/ E - 1992

for cutting and stacking lines
for transformer laminations
with roll feed and measuring drive

State: October 30th, 1992

Contents

	Page
1. Comments on the information TR 020/E-1976	2
2. Remarks in TR 020- 1976	2
3. Hints on orders for transformer strip	3
3. Information TR 020 10th September 1976	4 - 18

Technical Information

Comments on the information TR 020/E-1976
Hints on orders for transformer strip



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

1. Comments on the information TR 020/E-1976

More than 16 years ago – in 1976 – the version of the TR information TR 020 was written which is still used today, and that with a principle justification.

But the world has changed since those days. In the early seventies it was our aim to prove to the customer that by using electronically controlled roller drives (entire novelty) the same cutting length accuracies could be achieved as with "cutting lines with fixed stop" that are obsolete nowadays.

(In this cutting lines all sheets were pushed at slow speed against a fixed stop plate and cut off. In this way a good precision was achieved and it was questioned whether the same accuracy could be reached with rolls and measuring drives as well. However, nobody talks about this old system today.)

Please note the concluding comment on the last page of TR 020.

The second reason for writing the instruction TR 020 was to explain to our customer **that GEORG can only guarantee for the production tolerances of the machine** and not for all tolerances and influences caused by the transformer strip. This is still valid today.

At that time we regarded the instructions of the European manufacturers of transformer sheet and the explanations of EURONORM 107-75 as best information on the quality of transformer strip. We therefore used chapter 2 of the EURONORM sheet and appropriate sketches and examples for our information sheet TR020 to show the extent of length and angle tolerances caused by the strip and not by the GEORG line.

Although we wrote that the Georg lines were manufactured to allow processing of conventional transformer strip we never recommended our customers to use the EURONORM 107-75 as purchase instruction.

Please take note of the following remarks in TR 020-1976:

Under item 2.3 we noted that we (GEORG) had not had problems with curvature and waviness in the strip until 1976, but that in case of larger values the strip had to be processed at reduced speeds.

Under item 2.5.3 it is mentioned that we measured a longitudinal curvature (camber) of less than 0.2 mm over a measuring length of 6 m at transformer strip with a width of 980 mm. This was already in 1976!

Under item 2.6 it is said that we (Georg) mainly found transformer strip with a camber of 0.3 mm over a measuring length of 3 to 4 m, whereas the EURONORM 107-75 states 3.2 mm / 3000 mm for this measuring length (according to the formula it corresponds to 0.8 mm / 1500 mm).

This means that already in 1976 we mainly found transformer strip with values that were ten times better than those stated in EURONORM 107-75.

Technical Information

Comments on the information TR 020/E-1976
Hints on orders for transformer strip



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Under item 4 we pointed out that the total tolerance of the individual plates was considerably influenced by the quality of the strip (refer to items 4.2, 4.3 and 4.4).

We therefore think that the technical information TR 020 clearly shows that the quality of the transformer strip should be as good as possible – also with regard to minimal sheet tolerances.

In the meantime many things have changed:

- The GEORG lines have become considerably more complicated and faster. Their degree of automation has been considerably increased. The requirements for very high strip qualities have become considerably higher, too.
- The transformer strip qualities available on the market have also been considerably improved since 1976. Today strip of a better quality than in 1976 is produced.

To avoid any future misunderstandings we ask all transformer plants to take note of the following recommendation.

2. Hints on orders for transformer strip

- 2.1 When placing orders for transformer strip please do not use the data as per GEORG information TR 020 or TR 020/E (English)
- 2.2 Please do not use or accept the data according to EURONORM 107-75 for orders for transformer strip, but define the individual parameters by yourself.
- 2.3 The more complicated, more powerful and more automated the design of the Georg line is the better should the transformer strip be that is processed on it. For lines with automatic stacking you should order strip of the highest quality available (unless you could gather different experience)
- 2.4 Order transformer steel with the smallest tolerances possible, and that with regard to dimensional accuracy, waviness, curvature and internal stresses.
- 2.5 Should considerations with regard to prices induce you to order strip of an inferior quality please test the "quality intended" before ordering larger amounts with these data to prevent problems.

etr.



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

TECHNICAL INFORMATION

for

Cutting Lines for Transformer Laminations

with Measuring Drive:

- **Design of TBA/M Lines**
- **Transformer Strip (Electric Strip)
Quality**
- **Adjustment of TBA/M Lines**
- **Dimensional Deviations of Core
Sheets**

Person responsible: E. Tröps
State: 10th September 1976
File: TR020E.TXT



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

INDEX

1. Set-up and Production Tolerances of GEORG TBA/M Lines

- 1.1 Strip side guides
- 1.2 Hole punches
- 1.3 V-Notches
- 1.4 Lateral shear adjustment
- 1.5 Angular shear adjustment
- 1.6 Scales and scale graduation
- 1.7 Spindles and nuts for lateral adjustment
- 1.8 Feed control unit

2. Deviation in Dimensions and shape of Electric Strip and Core Sheets

- 2.1 Strip thickness
- 2.2 Slit strip – strip in finished width
- 2.3 Flatness (waviness)
- 2.4 Permanent curvature on core steel
- 2.5 Stresses (cutting line deviations)
- 2.6 Straightness (edge deviation of straight line = camber)

3. Adjustment of GEORG TBA/M Lines

4. Dimensional Deviations of Longitudinal Edges of Core Sheets

- 4.1 Feed deviation
- 4.2 Strip width deviation
- 4.3 Cutting line deviation
- 4.4 Edge deviation (camber)
- 4.5 Guiding gap

5. Comments



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

1. SET-UP AND PRODUKTION TOLERANCES OF TBA/M LINES

1.1 Strip side guides

Roller tracks, hardened bars, lifting guides etc. that can be adjusted according to strip Width by means of spindle arrangement serve for lateral guidance of the transformer strip through the shearing line.

The alignment tolerance of these various guide components over the complete adjustment range is $\leq \pm 0.2$ mm per side. Due to the exact alignment method the total longitudinal alignment tolerance is also $\leq \pm 0.2$ mm

1.2 Hole punches

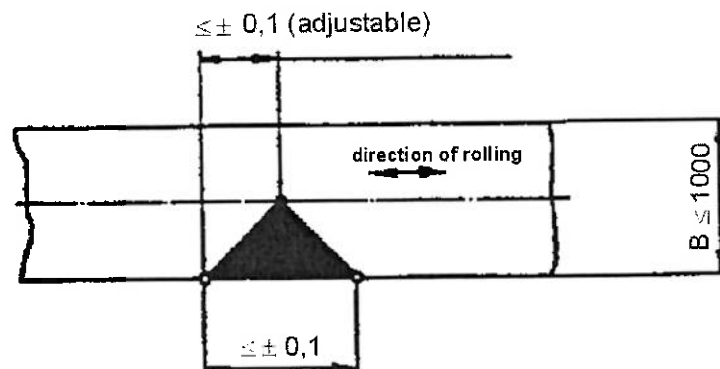
Fixed and adjustable hole punches can be set according to high precise scales as per DIN 866 Standards in longitudinal direction of the transformer strip or the shearing line. The adjustment tolerances are equal to the scale tolerances resulting in a setting or hole spacing accuracy of $\leq \pm 0.1$ mm.

In transverse direction the adjustment is effected by means of draw-in bolt and adjusting screw for the fixed hole punches and by means of screws and nuts for adjustable hole punches. Both adjustment tolerances are $\leq \pm 0.1$ mm.

1.3 V-Notches

Transverse and longitudinal adjustment of V-notches is made in the same way as for hole punches. Both adjustment tolerances are $\leq \pm 0.005^\circ$. See sketch 1:

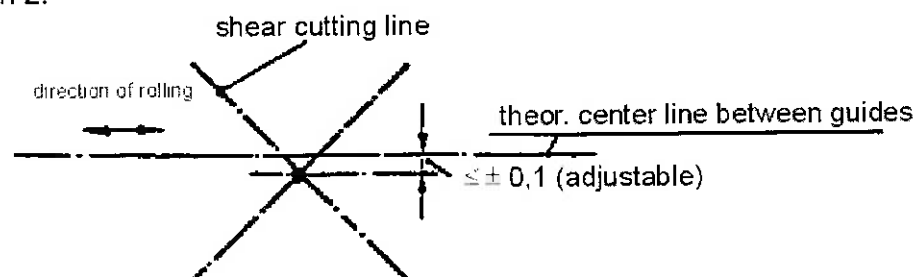
Sketch 1



1.4 Lateral shear adjustment

Setting accuracy to theoretical centre line between guides $\leq \pm 0.1$ mm. See sketch 2:

Sketch 2





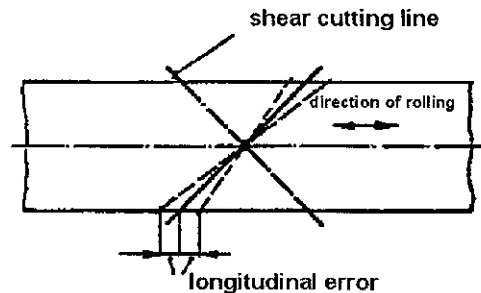
HEINRICH GEORG GMBH MASCHINENFABRIK

1.5 Angular shear adjustment

The swing shear and all shears can exactly be adjusted to the measurable angles by means of a corresponding mechanical arrangement

The cutting angle tolerance is $\leq \pm 0.005^\circ$. See sketch 3:

Sketch 3



1.6 Scales and scale graduation

The graduation of the precision measuring tapes conforms to the accuracy according to DIN 866 Standards. At 20° Celsius (68°F) the distance L between any graduation line selected at random and zero line must not exceed a tolerance of

$$= 0.02 \text{ mm} + \frac{L}{20,000} (\text{mm})$$

The tolerance of a measuring tape with a length of 2,000 mm is thus $\leq \pm 0.12$ mm.

1.7 Spindles and nuts for lateral adjustment

The lead accuracy of spindles generally used for shearing lines is $\leq \pm 0.1$ mm with material widths of 1,000 mm. As the adjustment of the side guides principally is done at medium strip widths, this small tolerance will even halve.

In special applications different backlash-free nut arrangements are used. Since all adjustments are made in one direction only, the play of about 0.1 mm between spindle and nut produces no effect.

1.8 Feed control unit

The transport and feed control unit almost operates without length deviations. This means that the friction-driven measuring roll follows the coil material without slipping and registers the respective feed length exactly. The control registers length variations of 0.05 mm.

When comparing i.e. 90° sheets with a length of 4,000 mm each that were fed and cut after only one feed motion with sheets that were cut after 10 feed motions of 400 mm each, no important feed difference is measurable.

Two different factors are specified for TBA shearing lines:

- a) Feed deviation about ± 0.2 mm
- b) Standard deviation $S_x = 0.1$ mm



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

Definition of the two values:

1.8.1 Feed deviation

The feed deviation is the difference between the nominal and the actual length. Such a difference can be compensated by a trim correction (a proportional length correction). After performance of this correction a difference between the nominal and actual length can only occur again when processing coil material with a quite different surface quality.

When transformer strip with the same outward surface quality (i.e. the operator can neither see nor feel a difference) is processed, the feed deviation is about ± 0.2 mm or, as this tolerance is length dependent, approx. $\leq \pm 0.1 + 0.05$ mm / m ($\leq \pm 0.004$ " + 0.0006 " / ft) for sheet length over 2,000 mm (6 ft).

To obtain the minimum feed deviation, the temperature of the coil material and in the plant where the shearing line is in operation should not diverge by more than $\pm 15^\circ$ Celsius from the temperature that was prevailing when the shearing line was set up for operation.

As a rule, a trim correction is only necessary when cutting extremely long core sheets or i.e. when punching holes in core sheets for which the exact distance to the sheet edge (as measured in longitudinal direction) is important, but only if a very different surface quality is used.

1.8.2 The Standard deviation (S_x)

according to DIN 55302 Standards is a measurement for the deviation of individual values from the arithmetic average value ($\bar{x}$).

The tolerance $S_x = 0.1$ mm was established after many measurements taken on 90° sheets, considering particularly the average sheet length.

The standard deviation is the sum of the statistical errors of the electronic feed control and of errors caused by changing stresses during cross cutting operation.

For additional explanations refer to item 2.

1.9 General remarks on items 1.1 – 1.8

The above specified tolerances should be considered as limit values that require a very precise mechanical manufacture. In order to maintain the above mentioned overall tolerances, the adding individual accuracies must not exceed $1/100$ mm ($.0004$ ").

A GEORG TBAM shearing line that is built accordingly is capable of producing core sheets from all electric steel qualities within a respective optimum dimensional accuracy.



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

2. DEVIATIONS IN DIMENSIONS AND SHAPE OF ELECTRIC STRIP AND CORE SHEETS

2.1 Strip thickness

According to EURONORM 107-75 the nominal thickness of transformer strip is 0.27, 0.30 and 0.35 mm (.0106" - .0118" and .0137"). The thickness deviation in rolling direction must not exceed 0.03 mm (.0011"). The thickness deviation at right angles to the rolling direction must not exceed 0.02 mm (.0008").

These standard thickness tolerances correspond to the figures stated by European strip manufacturers.

TBA/M shearing lines are especially built for the above nominal gauges and tolerances.

2.2 Slit strip – strip in finished width

Slit strip is generally ordered with plus or minus deviations. For the TBA lines GEORG recommends to order or to produce transformer steel with minus deviations.

According to EURONORM 107-75 the following variations from the nominal material width are permissible:

Nominal Width mm	Permissible Width Variation mm
≤ 150	0.2
> 150 ≤ 400	0.3
> 400 ≤ 750	0.5
> 750	0.6

The above permissible variations correspond to the indications of European strip manufacturers.

Other manufacturers i.e. in USA and Japan specify larger width variations, even plus and minus deviations.

By way of contrast, GEORG only rarely experienced width variations exceeding ± 0.4 mm (.0016") in the past, and actually manufacturers supplied in most cases slit strip with a width variation of about ± 0.2 mm (.008").

When noticing large width variations it is recommended to measure the width of each coil in order to set the side guides properly.

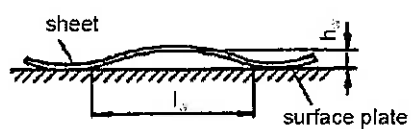
2.3 Flatness (waviness)

The waviness must not exceed 15 mm/1000 mm (.6" over 40" length).
See sketches 4, 5 and 6:

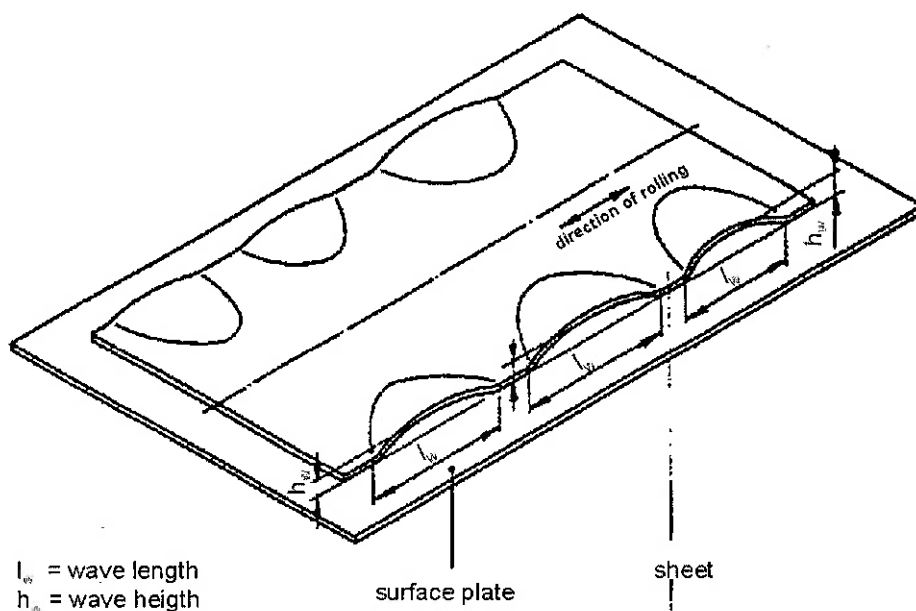


HEINRICH GEORG GMBH
MASCHINENFABRIK

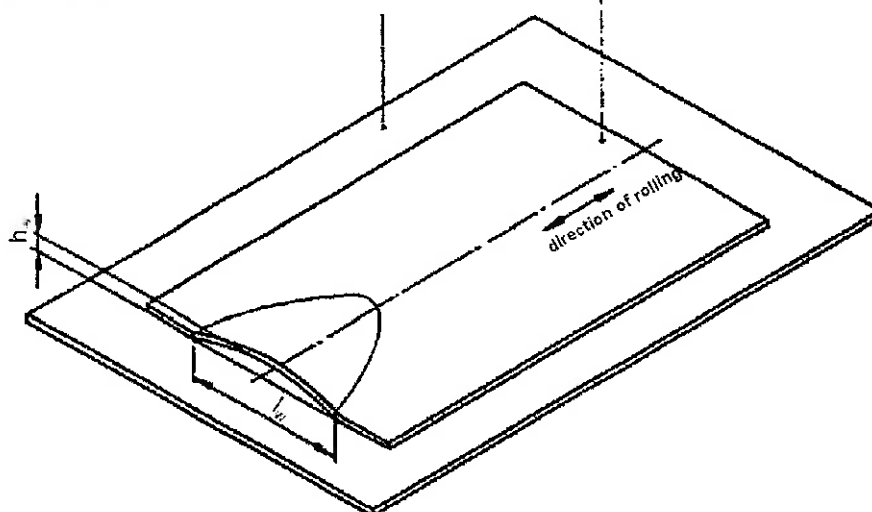
Sketch 4



Sketch 5



Skizze 6



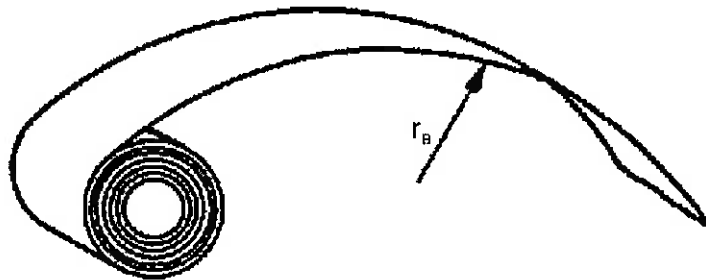


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

2.4 Permanent curvature on core steel

See sketches 7 and 8:

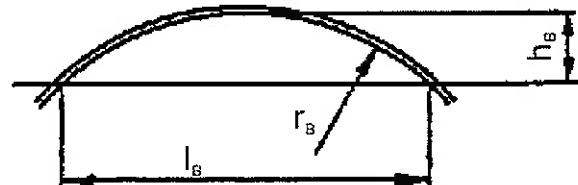
Sketch 7



Sketch 8

$$r_B = \frac{h_B}{2} + \frac{l_B^2}{8 h_B}$$

$$r_{B \text{ zul}} \geq 3\text{m}$$



Based on GEORG's experience it can be stated that waviness and permanent curvature within the EURONORM limits have not caused any difficulties up to now when processing this material on TBA lines. Larger curvature may make it necessary to reduce the line speed.

2.5 Stresses (cutting line deviations)

Coils with electric steel supplied by manufacturers always have internal stresses. These stresses are changed when slitting or cross cutting the coil material, which causes cutting line deviations (C). The cutting line deviation is a measurement for the internal stresses. This stress can be cured neither by slitting nor cut-to-length lines. This is only a principle statement. The quality of a slitting line has of course a considerable influence on the cutting line deviation. The cutting line deviation during slitting process is connected with the straightness of the material.

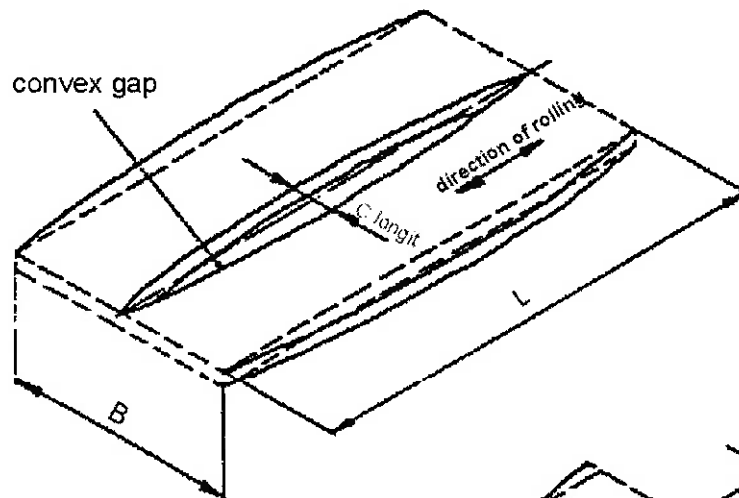


**HEINRICH GEORG GMBH
MASCHINENFABRIK**

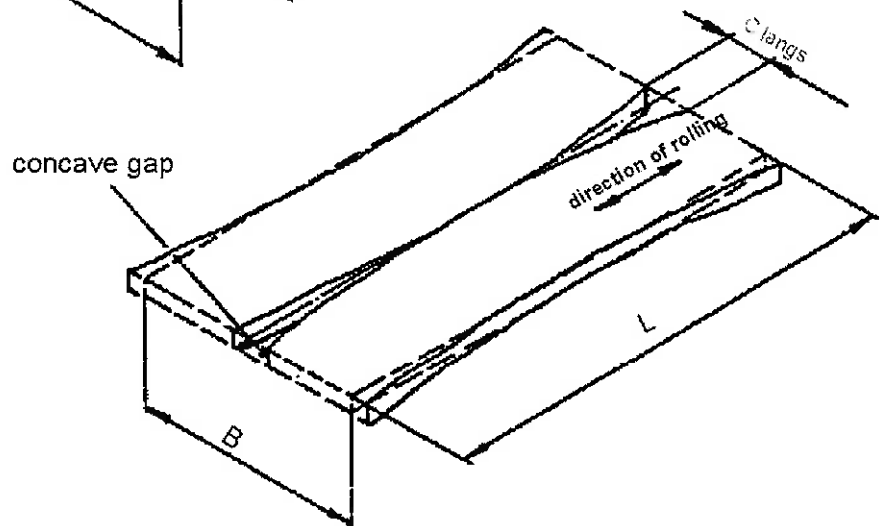
2.5.1 Cutting line deviation (C) during slitting operation

See sketches 9 and 10:

Sketch 9



Sketch 10



**B = Bandbreite
L = Bandlänge**

These sketches conform to the EURONORM 107-75 and DIN 50642 Standards.
The measuring length L should be 1.5 m (5 ft), a C-value is not specified.

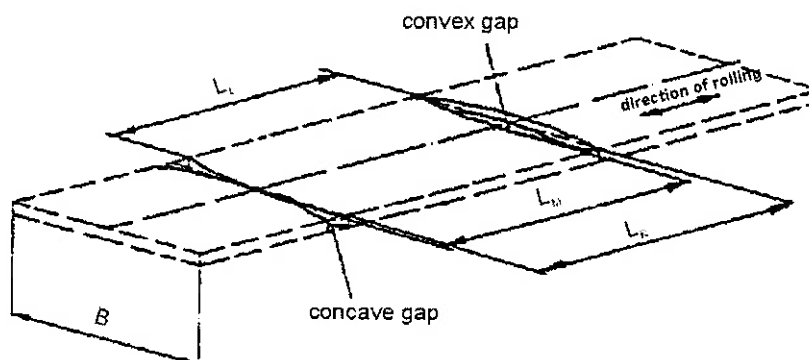


HEINRICH GEORG GMBH MASCHINENFABRIK

2.5.2 Cutting line deviation (C 90°) during 90° cut-to-length operations

See sketch 11:

Sketch 11



This illustration is not described in the EURONORM and DIN Standards. However, the internal stress also causes shape deviation during cut-to-length operation.

E.g. when measuring the edge (L_L), the centre length (L_M) and the length of the right edge (L_R) of numerous 90° sheets with a length of 3000 mm (9.8 ft), differences of ≤ 0.4 mm (.015") were very often found.

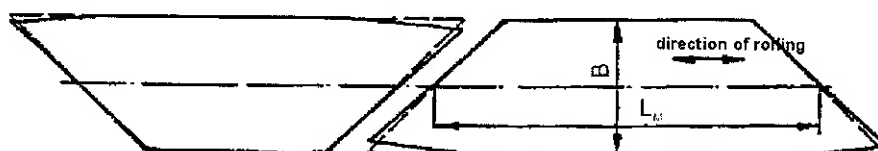
In extreme cases, the differences were 0.7 mm (.027") on sheets 3000 mm (9.8 ft) long and only 330 mm (13") wide.

(Therefore, it is impossible to judge the feed accuracy of the measuring drive exactly after measuring 90° sheets. Even with very narrow strips dimensional deviations, as a result of internal stresses, must be expected.)

2.5.3 Cutting line deviation (C 45°) during 45° cut-to-length operations

See sketch 12:

Sketch 12



Deviations also occur during 45° cut-to-length operation due to stress changes. The gap formed can be either concave or convex, as during cross cutting.

Furthermore, deviations are found not only on the cutting line but also on the outer sheet edges. The above sketch illustrates the deviations which were caused during the following test: Transformer steel with a width of 980 mm (36") was cut into 45° trapezoidal sheets with a



HEINRICH GEORG GMBH MASCHINENFABRIK

centre length of 4 m (13 ft). Measurements showed that the camber over 6 m (19.75 ft) measuring length was only ≤ 0.2 mm. After the 45° cutting operation many trapezoidal sheets showed deviations as illustrated in sketch 12.

As the edge distortions are only very small and can only be exactly detected by measuring devices, arc-shaped deviations can be seen along the rules of measuring tables. The shape deviation of the cutting line appears as an angular error and the length measurements vary accordingly.

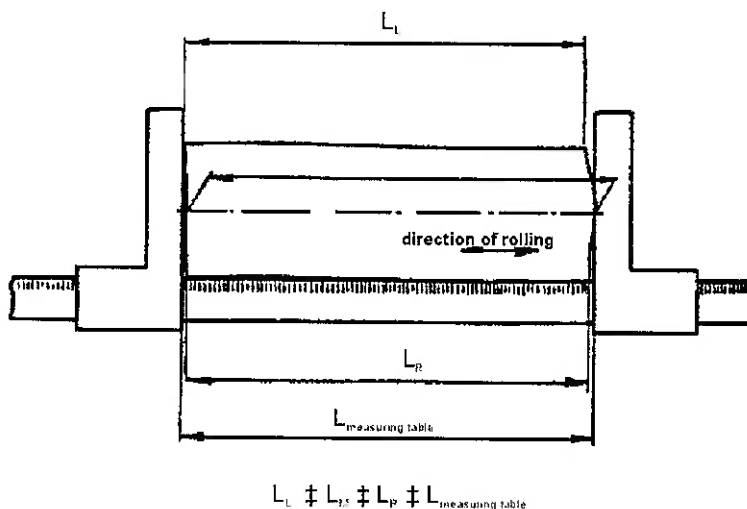
Due to the cutting line deviation different dimensional deviations are obtained when measurements are taken

- a) with adjustable measuring table rules and
- b) without rules, but on the same scale of the measuring table

When method a) is applied, the measuring table rules are in contact with the sheet somewhere along the distorted cutting edge, and with method b), only the outer edge length can be measured.

See sketch 13:

Sketch 13



The Standard Sheets can be ordered at:
BEUTH VERLAG GMBH, Berlin 30 or Cologne 1, Telex: 8881332, Tel.
0221 / 527022

2.6 Straightness (edge deviation from straight line = camber)

According to EURONORM 107-75 the edge deviation (camber) must not exceed 0.8 mm (.0315") over a measuring length of 1.5 m (5 ft).

It is shown as a broken line like the cutting line deviation.

Although this is exact, we can also say that under optic inspection the camber occurs as a circular arc. The distortions are not noticeable, but beginning, end and height of the arc (the deviation from the straight line) can be seen.



HEINRICH GEORG GMBH MASCHINENFABRIK

Provided that this deviation is an arc with constant radius, the arc heights "h" (the biggest deviation from the straight line) can be measured for all lengths (l_1 to l_n) according to the formula:

$$h_n = \left(\frac{l_n}{l_1} \right)^2 \times h_1 \quad (\text{only valid if } h/l \leq 1.5/1000)$$

See the following example of circular arc: **EURONORM 107-75**

h	0.35	0.8	1.42	2.22	3.2	4.35	5.7
l	1000	1500	2000	2500	3000	3500	4000

Many measurements of strip showed the following:

- a) The camber was generally ≤ 0.3 mm (.012") over 2 to 4 m (6.5 – 13 ft) measuring length. The camber on many strips was hardly measurable.
- b) In some cases the camber measured was ≤ 0.5 mm (.02") over 1 to 3 m (3.3 – 10 ft) measuring length.
- c) Only few coils showed larger deviations.
- d) Coils with deviations according to the above example were found very seldom.

Occasionally we found transformer strip that had a camber of 5 mm (and more) at a measuring length of 3 to 4 m. Excessive camber causes material flow problems in the shearing line and high dimensional deviations.

2.6.1 The camber of the straight line can appear as follows:

a) as a uniform arc to the right side

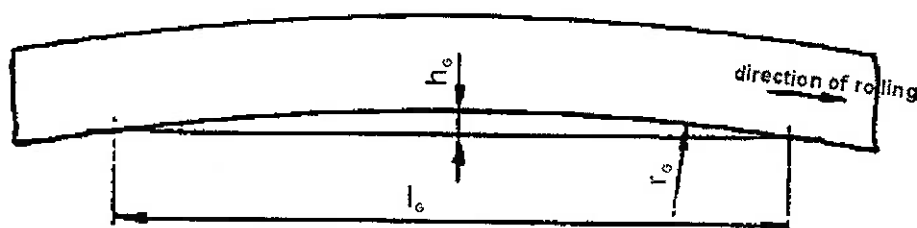
In this case, the radius varies from i.e. 1000 m (3280 ft) to infinite, see sketch 14:



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

R. H. camber

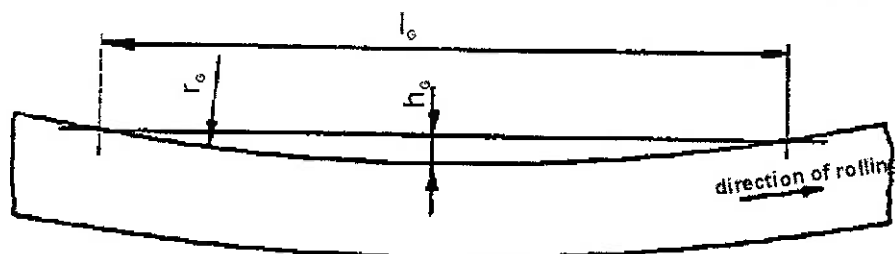
Sketch 14



b) as a uniform arc to the left side
with different radii, see sketch 15:

L. H. camber

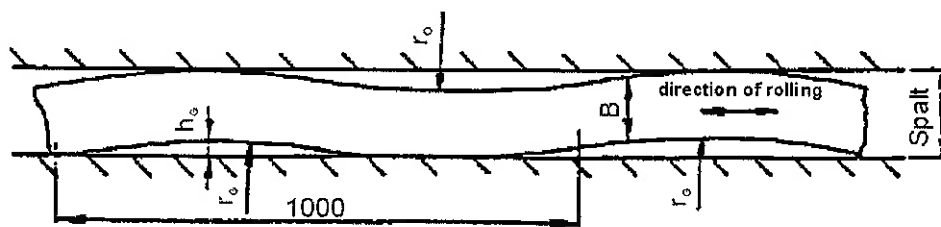
Sketch 15



c) as a wave type arc

with various radii the centre of which is alternately on the left or right side, see sketch 16:

Sketch 16

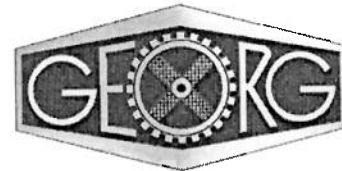


$$Spalt \geq B + h_{G 1000} + 0,2$$

d) as an arc according to a), b) or c) that occurs only at a few points of the coil

After measurement of only one strip section the quality of the whole coil cannot be rated.

The camber at the coil start and the coil end generally differs from the average camber size. It is larger there.



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

3. ADJUSTMENT OF GEORG TBAM LINES

Because of the different strip qualities, but above all due to the strip width and the edge deviation from the straight line, a different gap adjustment is necessary.

With 100 % straight strip the side guides could be adjusted camber is noted, the gap has to be increased to strip width + extent of deviation over 1000 mm measuring length + 0.2 mm. This is especially valid for wide strip with wave-type edge deviation according to sketch 16. The gap enlargement, of course, badly affects the dimensional accuracy. But this disadvantage cannot be avoided as even larger deviations will occur if gaps are too narrow.

Strips with a width of about ≤ 150 mm are an exception. They are a bit elastic (over the narrow edge), so that a correspondingly smaller guiding gap can be used.

If the strip width shall not be measured from coil to coil, the guide has to be set according to the largest strip width. The larger tolerances being formed at the core sheets then have to be accepted.

4. DIMENSIONAL DEVIATIONS OF LONGITUDINAL EDGES OF CORE STEEL

Causes for dimensional deviations:

4.1 Feed deviation

for $L \leq 2000$ approx. ± 0.2 mm

for $L > 2000$ approx. $\leq \pm 0.1$ mm + 0.05 mm/m

4.2 Strip width deviation

The plus/minus width deviation of transformer strip affects the length deviation of the 45° core sheets in the same way. This deviation only appears when edges are measured and not when measurements are made by means of measuring table rules.

4.3 Cutting line deviation (C 45° or 90°)

approx. $\leq \pm 0.0005 B$ (mm) = approximate average value

4.4 Edge deviation (camber)

This deviation causes plus deviations at the first trapezoidal sheets and minus deviations at the following trapezoidal sheets, because the strip contacts the guide at one side in the shearing section.

0.1 mm eccentricity causes approx. + 0.2 mm for the first sheet and – 0.2 for the second sheet.



**HEINRICH GEORG GMBH
MASCHINENFABRIK**

4.5 Guiding gap

In consideration of the edge deviation from the straight line the guides are adjusted to:

$$B + h_{G\ 1000} + 0.2\ \text{mm}$$

The length tolerance therefore is:

$$\leq \pm 2 (h_{G\ 1000} + 0.2)\ \text{mm}$$

5. COMMENTS

A comparison of the values shows that the feed deviation is the smallest deviation. The tolerances which are caused by cutting line deviation, edge deviation from the straight line (camber) and by the necessary play adjustment are far bigger. These tolerances are not produced by the TBA/M lines, but they cannot be removed by them either.

In practice, of course, the maximum deviations are only rarely cumulative.

Also TBA lines with fixed stop do not avoid tolerances caused by cutting line deviation, camber and guiding gap. With regard to the attainable length accuracy both systems can quite be compared.

10th September 1976
(revised translation 30th October 1992)
VK6 Tr/Bö/jü
TR020E.TXT