

DELTA OPERA

Gantry Coordinate Measuring Machines



Specifications

Specifications according to ISO 10360-2:2009, ISO 10360-5:2010 and ISO 10360-4:2000 [E_0/E_{150} , P_{FTU} , R_0 (μm); L(mm); THP/τ (μm/s)]

DELTA OPERA

Series	Temperature Range 19 - 21 °C				Temperature Range 18 - 22 °C				Temperature Range 16 - 26 °C			
	HH-A HP-TM, TP200, HP-THD, HP-S-X1S -X1H				HH-A HP-TM, TP200, HP-THD, HP-S-X1S -X1H				HH-A HP-TM, TP200, HP-THD, HP-S-X1S -X1H			
	$E_{0,MPE}/E_{150,MPE}$	$P_{FTU,MPE}$	$MPE_{THP/\tau}$	$R_{0,MPL}$	$E_{0,MPE}/E_{150,MPE}$	$P_{FTU,MPE}$	$MPE_{THP/\tau}$	$R_{0,MPL}$	$E_{0,MPE}/E_{150,MPE}$	$P_{FTU,MPE}$	$MPE_{THP/\tau}$	$R_{0,MPL}$
20.yy.15	3.4 + 3.0 L/1000	3.2	4.5/83	3.2	3.4 + 3.5 L/1000	3.2	4.5/83	3.2	3.6 + 5.2 L/1000	3.6	4.5/83	3.6
20.yy.20	3.6 + 3.2 L/1000	3.4	4.8/83	3.4	3.6 + 3.5 L/1000	3.4	4.8/83	3.4	3.8 + 6.5 L/1000	4.0	4.8/83	4.0
25.yy.15	3.6 + 3.0 L/1000	3.2	4.8/83	3.2	3.7 + 3.2 L/1000	3.2	4.8/83	3.2	3.9 + 5.2 L/1000	3.6	4.8/83	3.6
25.yy.20	3.7 + 3.2 L/1000	3.4	5.0/83	3.4	3.9 + 3.5 L/1000	3.4	5.0/83	3.4	4.3 + 6.5 L/1000	4.0	5.0/83	4.0
30.yy.20	3.8 + 3.2 L/1000	3.8	5.0/83	3.8	4.0 + 3.5 L/1000	4.0	5.0/83	3.8	4.4 + 6.5 L/1000	4.3	5.0/83	4.3
30.yy.25	5.0 + 3.6 L/1000	5.0	5.5/83	5.0	5.2 + 4.0 L/1000	5.0	5.5/83	5.0	5.6 + 8.0 L/1000	5.0	5.5/83	5.0
35.yy.20	4.9 + 3.2 L/1000	4.6	5.5/83	4.6	4.9 + 3.5 L/1000	4.6	5.5/83	4.6	5.0 + 6.5 L/1000	4.6	5.5/83	4.6
35.yy.25	5.8 + 3.6 L/1000	5.5	6.4/83	5.5	6.0 + 4.0 L/1000	5.5	6.4/83	5.5	6.1 + 8.0 L/1000	5.5	6.4/83	5.5
40.yy.20	6.0 + 3.2 L/1000	5.5	6.4/83	5.5	6.0 + 3.5 L/1000	5.5	6.4/83	5.5	6.1 + 6.5 L/1000	5.5	6.4/83	5.5
40.yy.25	7.0 + 3.6 L/1000	6.5	7.0/83	6.5	7.0 + 4.0 L/1000	6.5	6.4/83	6.5	7.1 + 8.0 L/1000	6.5	7.0/83	6.5

DELTA OPERA

Series	Temperature Range 19 - 21 °C				Temperature Range 18 - 22 °C				Temperature Range 16 - 26 °C			
	HP-S-X5 / HP-S-X5HD				HP-S-X5 / HP-S-X5HD				HP-S-X5 / HP-S-X5HD			
	$E_{0,MPE}/E_{150,MPE}$	$P_{FTU,MPE}$	$MPE_{THP/\tau}$	$R_{0,MPL}$	$E_{0,MPE}/E_{150,MPE}$	$P_{FTU,MPE}$	$MPE_{THP/\tau}$	$R_{0,MPL}$	$E_{0,MPE}/E_{150,MPE}$	$P_{FTU,MPE}$	$MPE_{THP/\tau}$	$R_{0,MPL}$
20.yy.15	3.2 + 3.0 L/1000	3.0	4.5/83	3.0	3.2 + 3.5 L/1000	3.0	4.5/83	3.0	3.6 + 5.2 L/1000	3.6	4.5/83	3.6
20.yy.20	3.4 + 3.2 L/1000	3.2	4.8/83	3.2	3.4 + 3.5 L/1000	3.2	4.8/83	3.2	3.8 + 6.5 L/1000	4.0	4.8/83	4.0
25.yy.15	3.5 + 3.0 L/1000	3.0	4.8/83	3.0	3.5 + 3.2 L/1000	3.0	4.8/83	3.0	3.9 + 5.2 L/1000	3.6	4.8/83	3.6
25.yy.20	3.7 + 3.2 L/1000	3.2	5.0/83	3.2	3.7 + 3.5 L/1000	3.2	5.0/83	3.2	4.3 + 6.5 L/100	4.0	5.0/83	4.0
30.yy.20	3.8 + 3.2 L/1000	3.6	5.0/83	3.6	3.8 + 3.5 L/1000	3.6	5.0/83	3.6	4.4 + 6.5 L/1000	4.0	5.0/83	4.0
30.yy.25	5.3 + 3.6 L/1000	4.9	5.5/83	4.9	5.3 + 4.0 L/1000	4.9	5.5/83	4.9	5.6 + 8.0 L/1000	5.0	5.5/83	5.0
35.yy.20	4.7 + 3.5 L/1000	4.5	5.5/83	.5	4.7 + 3.5 L/1000	4.5	5.5/83	.5	5.0 + 6.5 L/1000	4.6	5.5/83	4.6
35.yy.25	5.8 + 3.6 L/1000	5.4	6.4/83	5.4	5.8 + 4.0 L/1000	5.4	6.4/83	5.4	6.1 + 8.0 L/1000	5.5	6.4/83	5.5
40.yy.20	5.8 + 3.2 L/1000	5.4	6.4/83	5.4	5.8 + 3.5 L/1000	5.4	6.4/83	5.4	6.1 + 6.5 L/1000	5.5	6.4/83	5.5
40.yy.25	6.9 + 3.6 L/1000	6.4	7.0/83	6.4	6.9 + 4.0 L/10	6.4	7.0/83	6.4	7.1 + 8.0 L/1000	6.5	7.0/83	6.5



Non-contact sensors	HH-A/HP-L-5.8 ¹⁾	HH-A/HP-L-10.6	HH-A/HP-L-20.8
²⁾ Probing form error	22 µm	22 µm	25 µm
Point spacing	53 µm	30 - 60 µm	13 - 50 µm
Lines per second (max.)	40 Hz	53 Hz	100 Hz

Dynamics	
Max. 3D Speed ³⁾	666 mm/s
Max. 3D Acceleration	from 20.yy.15 up to 25.yy.20: 1000 mm/s ² from 30.yy.20 up to 40.yy.25: 400 mm/s ²

Performance test according to the following specifications			
Ambient temperature	19 °C ÷ 21 °C	18 °C ÷ 22 °C	16 °C ÷ 26 °C
Max. air temperature variation	0.5 °C/h - 1 °C/24h	1 °C/h - 2 °C/24h	1 °C/h - 5 °C/24h
Max. gradient in space	vertical 1 °C/m transversal 1 °C longitudinal 1 °C	vertical 1 °C/m transversal 1 °C longitudinal 1.5 °C	vertical 1 °C/m transversal 1 °C longitudinal 1.5 °C

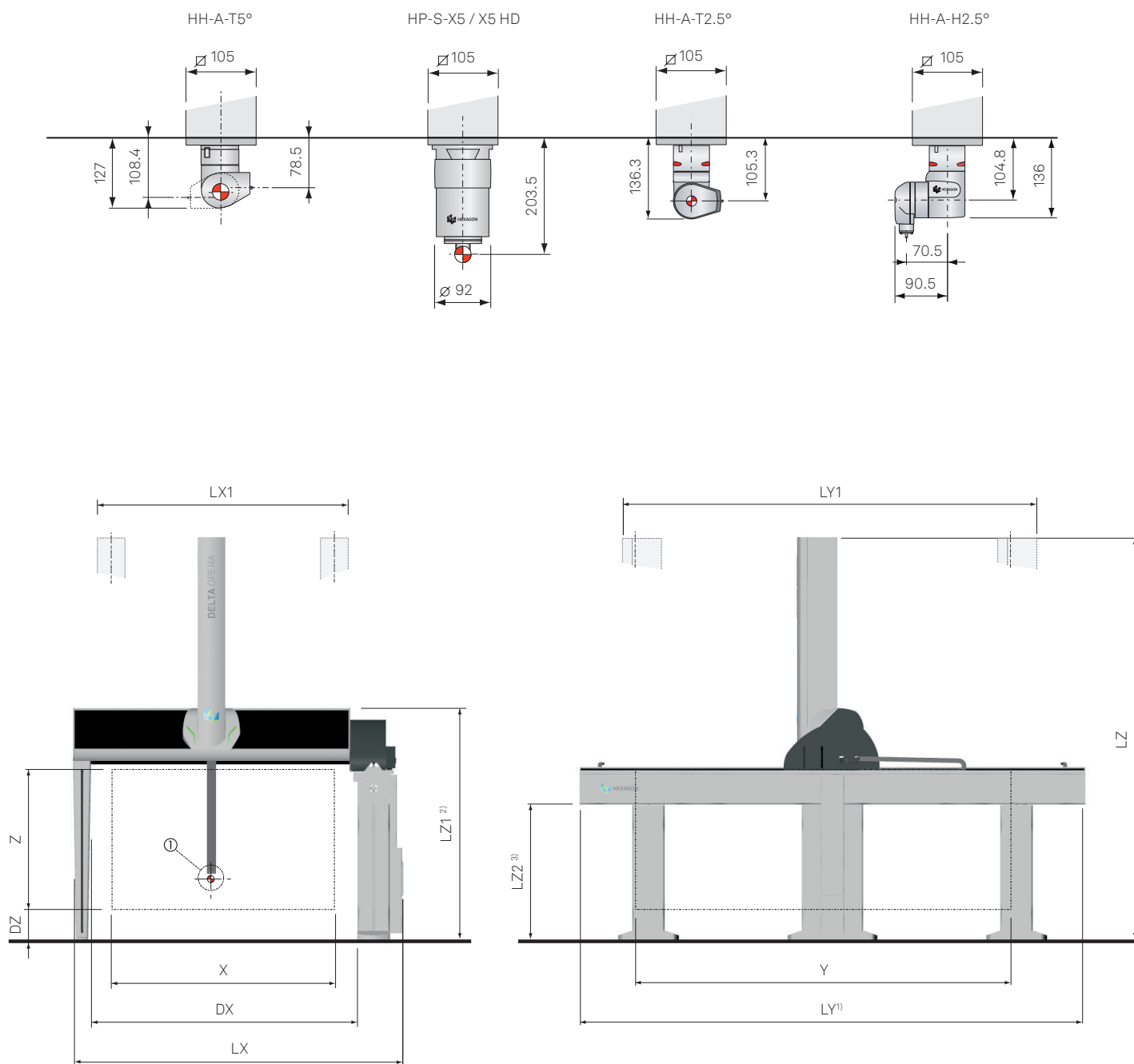
$E_{0, \text{MPE}}/E_{150, \text{MPE}}$ specifications are to be formally understood as $E_{0, \text{MPE}}^*/E_{150, \text{MPE}}^*$ for the case where non-normal CTE material calibrated test lengths are used.

¹⁾ Restrictions may apply to CMMs in special sizes equipped with a HP-L-5.8 sensor or systems with machine/controller wiring longer than 15m

²⁾ Maximum Permissible Probing Form Error PForm.Sph.1x25.Tr:ODS, MPE according to ISO10360-8:2013. Values are including expanded measurement uncertainty according ISO/TS 17865:2016. Measured using a manufacturer supplied sphere- and plane artefact, each certified by an independent accredited lab.

³⁾ When machine perimeter guarding is not installed, the maximum 3D speed will be reduced to 250 mm/s.

Strokes, dimensions and weights



Z stroke of 3.000 mm and special Y strokes can be evaluated on request.

Models	Measuring Range (mm)			Overall Dimensions (mm)							Daylights (mm)		No of pillars	CMM weight approx (kg) ⁴⁾	Max. part weight (kg)
	X	Y	Z	LX	LX1	LY ¹⁾	LY1	LZ	LZ1 ²⁾	LZ2 ³⁾	DX	DZ			
20.51.15	2000	5100	1500	3.580	2.380	6.504	5.640	4.645	2.570	1.425	2.572	500	3	6.000	13.000
20.63.15	2000	6300	1500	3.580	2.380	7.704	6.851	4.645	2.570	1.425	2.572	500	3	6.400	16.000
20.80.15	2000	8000	1500	3.580	2.380	9.404	8.551	4.645	2.570	1.425	2.572	500	4	7.000	16.000
20.51.20	2000	5100	2000	3.580	2.380	6.504	5.640	5.645	3.070	1.925	2.572	500	3	6.200	13.000
20.63.20	2000	6300	2000	3.580	2.380	7.704	6.851	5.645	3.070	1.925	2.572	500	3	6.900	16.000
20.80.20	2000	8000	2000	3.580	2.380	9.404	8.551	5.645	3.070	1.925	2.572	500	4	8.450	16.000
25.51.15	2500	5100	1500	4.080	2.880	6.504	5.640	4.645	2.570	1.425	3.072	500	3	6.050	16.000
25.63.15	2500	6300	1500	4.080	2.880	7.704	6.851	4.645	2.570	1.425	3.072	500	3	6.500	20.000
25.80.15	2500	8000	1500	4.080	2.880	9.404	8.551	4.645	2.570	1.425	3.072	500	4	7.100	20.000
25.51.20	2500	5100	2000	4.080	2.880	6.504	5.640	5.645	3.070	1.925	3.072	500	3	6.300	16.000
25.63.20	2500	6300	2000	4.080	2.880	7.704	6.851	5.645	3.070	1.925	3.072	500	3	7.000	20.000
25.80.20	2500	8000	2000	4.080	2.880	9.404	8.551	5.645	3.070	1.925	3.072	500	4	8.550	20.000
25.100.20	2500	10000	2000	4.080	2.880	11.404	11.404	5.645	3.070	1.925	3.072	500	4	12.300	20.000
30.51.20	3000	5100	2000	4.705	3.380	6.504	5.640	5.645	3.070	1.925	3.572	500	3	6.400	20.000
30.63.20	3000	6300	2000	4.580	3.380	7.704	6.851	5.645	3.070	1.925	3.572	500	3	7.100	24.000
30.80.20	3000	8000	2000	4.580	3.380	9.404	8.551	5.645	3.070	1.925	3.572	500	4	8.650	24.000
30.100.20	3000	10000	2000	4.580	3.380	11.404	11.404	5.645	3.070	1.925	3.572	500	4	12.400	24.000
30.51.25	3000	5100	2500	4.580	3.380	6.504	5.640	6.645	3.570	2.425	3.572	500	3	7.000	20.000
30.63.25	3000	6300	2500	4.580	3.380	7.704	6.851	6.645	3.570	2.425	3.572	500	3	7.700	24.000
30.80.25	3000	8000	2500	4.580	3.380	9.404	8.551	6.645	3.570	2.425	3.572	500	4	9.400	24.000
30.100.25	3000	10000	2500	4.580	3.380	11.404	11.404	6.645	3.570	2.425	3.572	500	4	13.150	24.000
35.51.20	3500	5100	2000	5.080	3.880	6.504	5.640	5.645	3.070	1.925	4.072	500	3	6.500	20.000
35.63.20	3500	6300	2000	5.080	3.880	7.704	6.851	5.645	3.070	1.925	4.072	500	3	7.200	24.000
35.80.20	3500	8000	2000	5.080	3.880	9.404	8.551	5.645	3.070	1.925	4.072	500	4	8.750	24.000
35.100.20	3500	10000	2000	5.080	3.880	11.404	11.404	5.645	3.070	1.925	4.072	500	4	12.500	24.000
35.51.25	3500	5100	2500	5.080	3.880	6.504	5.640	6.645	3.570	2.425	4.072	500	3	7.100	20.000
35.63.25	3500	6300	2500	5.080	3.880	7.704	6.851	6.645	3.570	2.425	4.072	500	3	7.800	24.000
35.80.25	3500	8000	2500	5.080	3.880	9.404	8.551	6.645	3.570	2.425	4.072	500	4	9.500	24.000
35.100.25	3500	10000	2500	5.080	3.880	11.404	11.404	6.645	3.570	2.425	4.072	500	4	13.250	24.000
40.51.20	4000	5100	2000	5.580	4.380	6.504	5.640	5.645	3.070	1.925	4.572	500	3	6.600	20.000
40.63.20	4000	6300	2000	5.580	4.380	7.704	6.851	5.645	3.070	1.925	4.572	500	3	7.300	24.000
40.80.20	4000	8000	2000	5.580	4.380	9.404	8.551	5.645	3.070	1.925	4.572	500	4	8.850	24.000
40.100.20	4000	10000	2000	5.580	4.380	11.404	11.404	5.645	3.070	1.925	4.572	500	4	12.600	24.000
40.51.25	4000	5100	2500	5.580	4.380	6.504	5.640	6.645	3.570	2.425	4.572	500	3	7.200	20.000
40.63.25	4000	6300	2500	5.580	4.380	7.704	6.851	6.645	3.570	2.425	4.572	500	3	7.900	24.000
40.80.25	4000	8000	2500	5.580	4.380	9.404	8.551	6.645	3.570	2.425	4.572	500	4	9.600	24.000
40.100.25	4000	10000	2500	5.580	4.380	11.404	11.404	6.645	3.570	2.425	4.572	500	4	13.350	24.000

¹⁾ with SF option LY + 500 mm

²⁾ with SF option LZ1+ 50 mm

³⁾ with SF option LZ2- 20 mm

⁴⁾ Approximate weight. With SF option:

for all models with Y= 5100 mm: weight + 450 kg

for all models with Y= 6300 mm: weight + 500 kg

for all models with Y= 8000 mm: weight + 580 kg

for all models with Y= 10000 mm: weight + 680 kg

Probe head and sensors



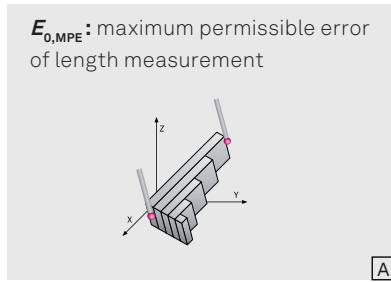
Technical Characteristics	HH-A-T5°	HH-A-T2.5°	HH-A-H2.5°
Angular rotation	A axis: +90° / -115° B axis: ±180°	A axis: ±105° B axis: ±180°	A axis: ±180° B axis: ±180°
Angular rotation step	5°	2.5°	2.5°
Rotation speed	90° in 2 seconds	90° in 2.5 seconds	90° in 2.5 seconds
Positioning repeatability	0.5 Nm	0.5 µm	0.5 µm
Max. applied torque	0.6 Nm	1.4 Nm	1.7 Nm
Extensions	Max. length 300 mm or according to Max. applied torque	Max. length 450 mm or according to Max. applied torque	Max. length 750 mm or according to Max. applied torque

Technical Characteristics	HP-S-X5 / X5 HD
Resolution	<0.1 µm
Measuring range	± 1 mm in all axes
Overtravel range	± 2 mm in all axes
Linear stiffness	5 N/mm
Stylus joint	M5
Max. stylus weight	500 g / 650 g
Max. stylus length	500 mm / 800 mm

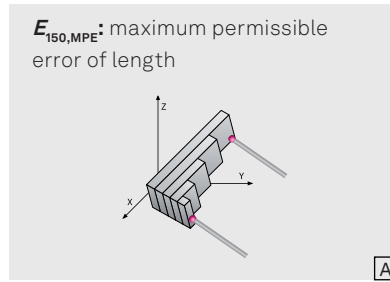


Technical Characteristics	HP-L-5.8	HP-L-10.6	HP-L-20.8
Laser	Visible blue, class 2	Visible red, class 2	Visible red, class 2
Standoff and depth of FOV	140 ± 40 mm	170 ± 30 mm	180 ± 40 mm
Line-Width at mid-field of view	47 mm	24, 60, 124 mm user selectable	25, 51, 63, 130, 220 mm user selectable
Ambient light immunity of the sensor	5 000 lx	40 000 lx	40 000 lx
Protection against dust and water	All HP-L Sensors: IP64 (IEC 60529) (except for warm-up connection)		
Sensor size L x W x H	116 x 62 x 86.5 mm	134 x 72 x 60 mm	137 x 76 x 85 mm

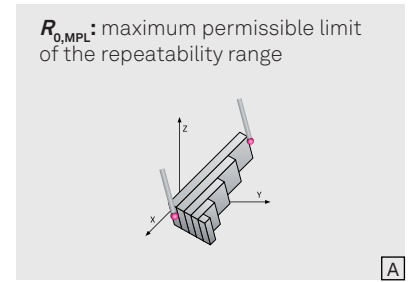
Performance verification



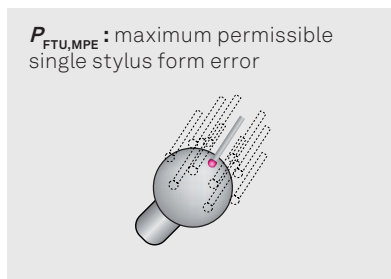
5 different calibrated test lengths have to be measured 3 times with one probing at each end, in 7 different directions. All measuring results must be within E_0 .



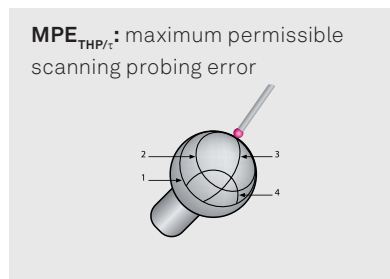
5 different calibrated test lengths have to be measured 3 times in the YZ- or XZ plane with opposite styli, mounted 150 mm off the Z spindle axis.



Extreme value of the repeatability range of the length measurement error, calculated by three repeated measurements on each size for a total of 35 values. The 35 repeatability range results must be within the specified $R_{0,MPL}$.



A precision sphere has to be measured with 25 probings. P_{FTU} is the range of all radii. $P_{FTU} = R_{max} - R_{min}$ = sphere form. Test sphere in the middle of the volume.



A precision sphere has to be scanned with 4 defined lines. THP is the range of all radii. $THP = R_{max} - R_{min}$ = sphere form, scanning. Test sphere in the middle of the volume.

Probe configuration for performance test:

- HP-THD / TP200: Standard Force Module, stylus length 10 mm, tip diameter 4 mm
- HP-TM: Standard Force Module, stylus length 20 mm, tip diameter 4 mm
- HP-S -X1S/H: stylus length 50 mm, tip diameter 5 mm
- HP-S-X5: stylus length 60 mm, tip diameter 5 mm

A The figures illustrate the testing principle only and may not necessarily show the exact type of calibrated test length that will be used.

Technical Characteristics

Mechanical Frame:	X beam: in aluminium alloy Pillars and longitudinal Y beams: in stress relieved steel Vertical Z spindle in Sintered Silicon Carbide
Sliding System:	All axes on air bearings
Transmission:	X/Z: timing belt; Y: rack and pinion sistem on the right Y beam
Measuring System:	METALLUR® dual reader on Y. System resolution: 0.1 µm
Temperature Compensation:	Structural multi-sensor temperature compensation
Ram Counterbalance:	Pneumatic, adjustable
Bellows and Guards:	SF option: full covering of Y longitudinal guideways and X traverse beam
Controller:	DC800I/O ready, protection IP54
Customer Supply:	Power: 100/120/230/240 V ± 10% - 50/60 Hz - 1,6 KVA Air: 0.6 MPa minimum - Class 4 according ISO 8573/1
Consumption:	Minimum air supply: 0.5 MPa  Air consumption: max. 400 NL/min
Operating Specifications:	Operating temperature: 10 ÷ 45 °C Relative humidity: 90 % non condensing



Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Manufacturing Intelligence division provides solutions that utilise data from design and engineering, production and metrology to make manufacturing smarter. For more information, visit hexagonmi.com.

Learn more about Hexagon (Nasdaq Stockholm: HEXA B) at hexagon.com and follow us [@HexagonAB](https://twitter.com/HexagonAB).