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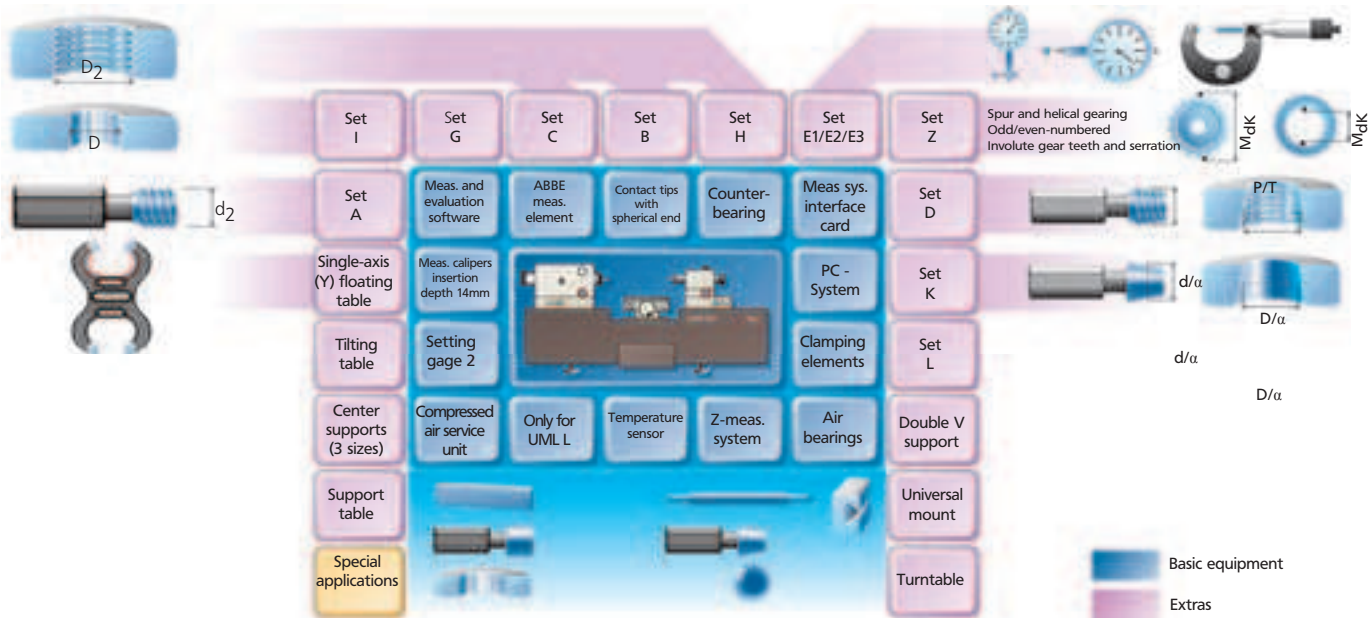
Precimar. ULM-E Length Measuring Instruments

LENGTH MEASURING INSTRUMENTS FOR CALIBRATION METROLOGY

The well-established ULM universal length measuring instruments are standard quality assurance instruments in industrial manufacturing environments and reference instruments for gage and test equipment calibration. They are used for high-precision length measurements on precision parts such as gears, journals, ball hubs, ball cages, ball rings, tapers, gear shafts etc. and for checking gages and test equipment. These instruments are available for several measuring ranges (300 mm to 1500 mm/11.81 in to 59 in), in various accuracy classes (0.3 µm or 0.09 µm/ 11.8 µin to 3.5 µin) and with the measuring system arranged in a number of different ways (in the measuring element or base or as a laser). This means that the right measuring instrument can be selected for each and every application. The varied sets of accessories and components are available as modules which also enables subsequent instrument additions.




Precimar. ULM System Overview



Main Applications

Calibration of

- Plain plug and ring gages
- Setting rings
- Snap gages
- Spherical gages, gages for deep bores
- Gage blocks
- Thread gages
- Taper thread gages
- Spline gages
- Dial indicators
- Dial comparators
- 2-point internal measuring instruments
- Micrometers
- 2-point inside micrometers

Reasons for Choosing ULM

Universal length measuring machines

Technical solution	User benefit
Granite Air bearing technology	Variable length and highly rigid Greater productivity through rapid movement of Abbe measuring element and tailstock
Online temperature monitoring	Correction of different expansion behavior of granite and metal and correction of systematic measuring errors due to temperature fluctuations in testpiece and setting standard
Z measuring system	Greater productivity and option of 2D measuring methods by incorporating Z position and travel values
Large number of accessories	Adaptability to measurement tasks thanks to specially configured accessory sets and individual components
Laser meas. system (with ULM L-E)	Large direct measuring range with maximum measuring accuracy
Powerful MS Windows software	Maximum convenience; inside thread measurement is supported with automatic Z-positioning

ULM-E Universal Length Measuring Instruments

ULM-E
Direct measuring range: 100 mm (4 in)

MPE_{E1} = (0.09+L/2,000) µm
or MPE_{E1} = (0.3+L/1,500) µm

Measuring system configuration:

Application ranges:

ULM 300-E
external up to 305 mm, internal up to 150 mm
MPE_{E1} = (0.09+L/2,000) µm
Id No. 5350258

ULM 600-E
external up to 640 mm, internal up to 485 mm
with air bearing units
MPE_{E1} = (0.3+L/1,500) µm
Id No. 5350259
MPE_{E1} = (0.09+L/2,000) µm
Id No. 5350260

ULM 1000-E
external up to 1060 mm, internal up to 905 mm
with air bearing units
MPE_{E1} = (0.3+L/1,500) µm
Id No. 5350261
MPE_{E1} = (0.09+L/2,000) µm
Id No. 5350262

ULM 1500-E
external up to 1,560 mm,
internal up to 1,405 mm
with air bearing units
MPE_{E1} = (0.3+L/1,500) µm
Id No. 5350265
MPE_{E1} = (0.09+L/2,000) µm
Id No. 5350266

ULM S-E
Direct measuring range = application range

with meas. element (100 mm/4 in meas. range):
MPE_{E1} = (0.09+L/2,000) µm
with base meas. systems:
MPE_{E1} = (0.6+L/1,000) µm

Measuring system configuration:

Application ranges:

ULM 520 S-E
external up to 520 mm, internal up to 365 mm with air bearing units
Id No. 5350267

ULM 1000 S-E
external up to 1,025 mm, internal up to 870 mm with air bearing units
Id No. 5350268

ULM L-E
Direct measuring range: 525 / 1,115 mm (20.67/43.90 in)

MPE_{E1} = (0.1+L/2,000) µm

Measuring system configuration:

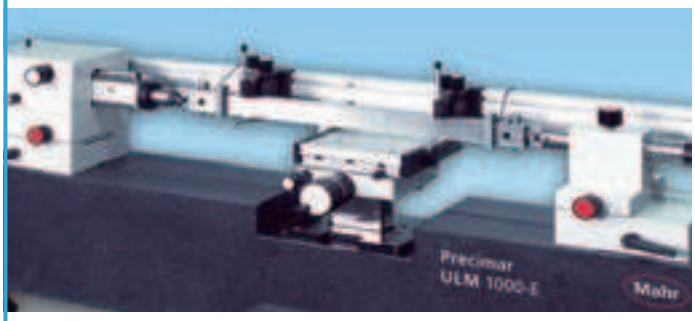
Application ranges:

ULM 800 L-E
external up to 830 mm, internal up to 670 mm with air bearing units
Id No. 5350263

ULM 1500 L-E
external up to 1,620 mm,
internal up to 1,465 mm
with air bearing units
Id No. 5350264

Precimar ULM 300-E / 600-E / 1000-E / 1500-E

Universal length measuring instruments



Description

Model
Comparator with horizontal base (highly homogeneous and rigid granite)

Measuring system

X-axis:	Incremental, high-precision Heidenhain length measuring system, 100 mm (4 in) long
Z-axis	Incremental high-precision RENISHAW length measuring system, 80 mm (3.15 in) long

Drives

X-axis:	Manual movement and fine motion control
Y-axis:	Micrometer, 25 mm (0.98 in) (analog or digital)
Z-axis:	Permanent field motor for motorized adjustment of object table height with ergonomic manual control panel

Measuring force generation
Mechanical using weights

Operation
- Measuring spindle, manual
- Air bearings make it very easy to position the measuring element and counter-bearing (not with ULM 300)
- Height of object table can be adjusted using buttons (also positioning of given increments)

Features

- Excellent measuring accuracy
- 100% compliance with Abbe comparator principle
- Online temperature measurement with 2 or 3 sensors
- Computer-aided correction of systematic machine errors (CAA)
- Computer-aided stabilization of instrument zero point
- Computer-aided correction of temperature and measuring force influences
- Measuring force remains constant over the entire measuring spindle adjustment range
- Large object table (load capacity 25 kg (55 lbs)) guided with high precision in the Z-direction
- Automatic reversal point recognition for static and dynamic measured value acquisition
- Inside thread measurement is supported by automatic Z-positioning
- Great flexibility in the application range
- Large number of modular accessory sets and components to solve the most diverse measurement tasks, including threads, tapers, taper threads and gears
- Measuring and evaluation software runs under MS Windows
- Possible to use measuring axis risers

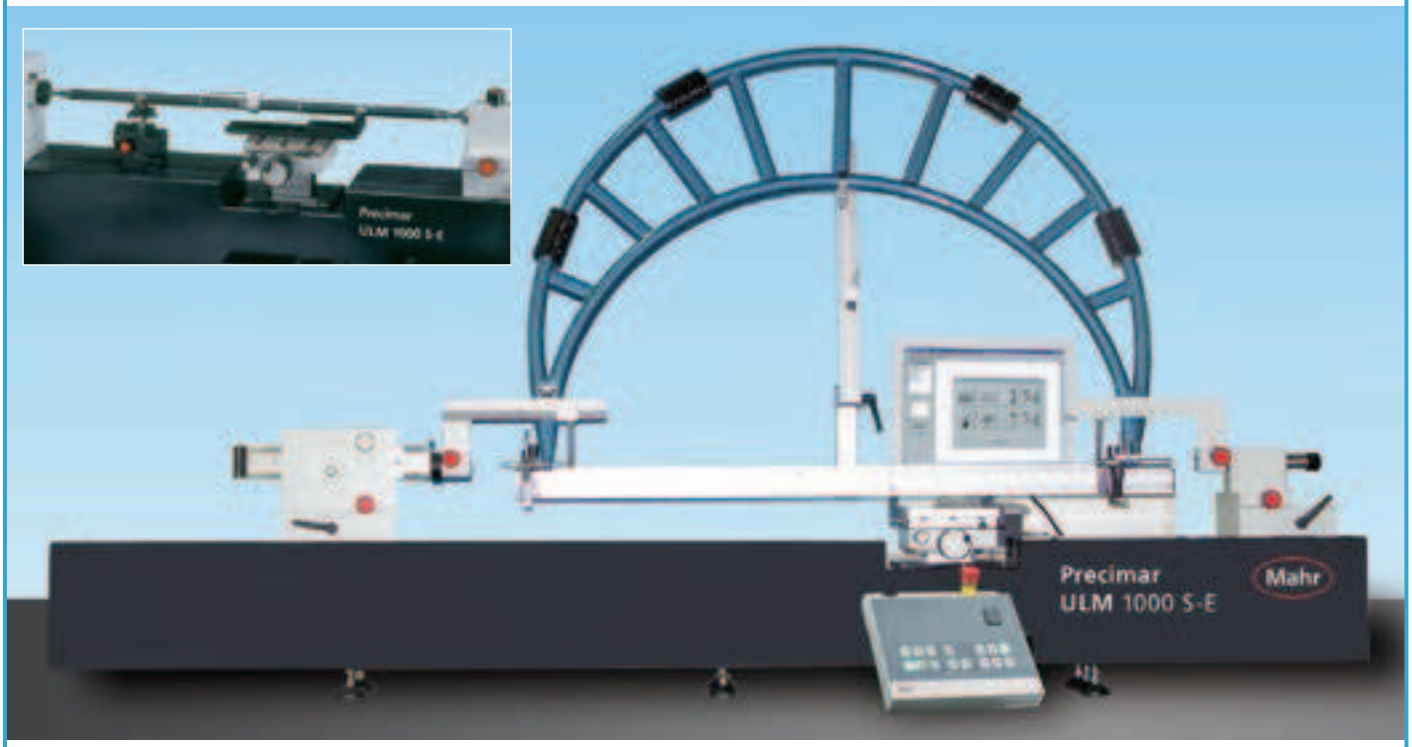
Details on metrological accessories are available on request.

Versions

ULM 300-E
ULM 600-E
ULM 1000-E
ULM 1500-E

Precimar ULM 520 S-E / 1000 S-E

Large universal length measuring instruments with large direct measuring range



Description

Model
Comparator with horizontal base (highly homogeneous and rigid granite)

Measuring system

X-axis:	In the measuring element, incremental high-precision Heidenhain length measuring system, 100 mm (4 in) long; in the base, incremental Heidenhain reflected light measuring systems over entire length of base to left and right of object table
Z-axis:	Incremental high-precision RENISHAW length measuring system, 80 mm (3.15 in) long

Drives

X-axis:	Manual movement and fine motion control
Y-axis:	Micrometer, 25 mm (0.98 in) (analog or digital)
Z-axis:	Permanent field motor for motorized adjustment of object table height with ergonomic manual control panel

Measuring force generation
Mechanical using weights

Operation
- Measuring spindle, manual
- Air bearings make it very easy to position the measuring element and counter-bearing
- Height of object table can be adjusted using buttons (also positioning of given increments)

Features

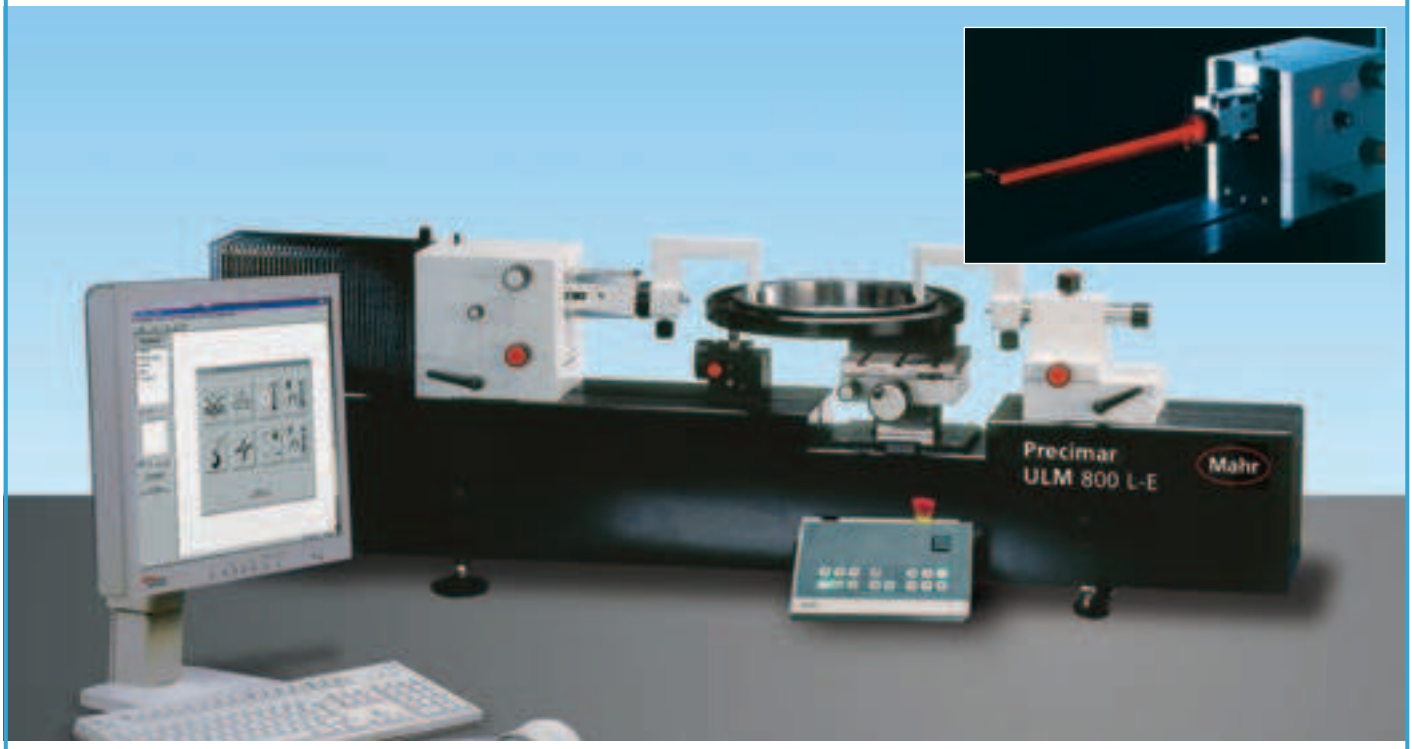
- Combined measuring instrument for very high-precision measurements in the range up to 100 mm (4 in) and standard-precision measurements over the entire range of movement of the measuring element and counter-bearing. X measured value formed from the measuring systems of the measuring element and the base
- Particularly recommended for measurements on large testpieces, but also suitable for measurements on smaller testpieces
- Online temperature measurement with 3 sensors
- Computer-aided stabilization of instrument zero point and correction of systematic machine errors (CAA)
- Measuring force remains constant over the entire measuring spindle adjustment range
- Computer-aided correction of temperature and measuring force influences
- Large object table (load capacity 25 kg (55 lbs)) guided with high precision in the Z-direction
- Large number of modular accessory sets and components to solve the most diverse measurement tasks, including threads, tapers, taper threads, gears and ball faces

Versions

ULM 520 S-E
ULM 1000 S-E

Precimar ULM 800 L-E / 1500 L-E

Universal length measuring instruments with laser measuring system



Description

Model
Comparator with horizontal base (highly homogeneous and rigid granite)

Measuring system

X-axis:	Interferential laser measuring system, 525/1,115 mm (20.67/43.90 in) long
Z-axis:	Incremental high-precision RENISHAW length measuring system, 80 mm (3.15 in) long

Drives

X-axis:	Manual movement and fine motion control
Y-axis:	Micrometer, 25 mm (0.98 in) (analog or digital)
Z-axis:	Permanent field motor for motorized adjustment of object table height with ergonomic manual control panel

Measuring force generation
Mechanical using weights

Operation
- Measuring spindle, manual
- Air bearings make it very easy to position the measuring element (with laser reflector) and counter-bearing
- Height of object table can be adjusted using buttons (also positioning of given increments)

Features

- A high-end length measuring instrument with a large direct measuring range
- 100% compliance with Abbe comparator principle
- Correction of laser in terms of environmental influences such as temperature and air pressure (humidity optional)
- Separate laser generating unit outside the measuring instrument and supply by means of light-conducting cable plus laser unit cover
- Computer-aided stabilization of instrument zero point and correction of systematic machine errors (CAA)
- Online temperature measurement and computer-aided correction of temperature and measuring force influences
- Measuring force remains constant over the entire measuring spindle adjustment range
- Large object table (load capacity 25 kg) guided with high precision in the Z-direction
- Automatic reversal point recognition for static and dynamic measured value acquisition
- Very flexible application range (both the very smallest and large testpieces can be measured)
- Large number of modular accessory sets and components to solve the most diverse measurement tasks, including threads, tapers, taper threads and gears

Versions

ULM 800 L-E
ULM 1500 L-E

ULM 300-E / 600-E / 1000-E / 1500-E and ULM 800 L-E / 1500 L-E. Technical Data

Measuring ranges		ULM 300-E	ULM 600-E / 1000-E / 1500-E	ULM 800 L-E /1500 L-E
External measurement	Direct	0 to 100	0 to 100	0 to 525 / 1,115
	Difference	0 to 305	0 to 640 / 1,060 / 1,560	0 to 830 / 1,620
Internal meas.		0.5 to 150	0.5 to 485 / 905 / 1,405	0.5 to 670 / 1,465
Taper meas.	External	0 to 305	0 to 640 / 1,060 / 1,560	0 to 830 / 1,620
Internal		4 to 150	4 to 485 / 905 / 1,405	4 to 675 / 1,465
Cylindrical thread	External d2 (P = 0.2 to 6)	0.8 to 200*	0.8 to 200*	0.8 to 200*
	Internal D2 (P = 0.45 to 6)	2.6 to 150	2.6 to 340 / 760 / 1,260	2.6 to 530 / 1,320
	Lead (P/T)	–	(0.35),0 to 5.5 (6.5)	(0.35)1.0 to 5.5 (6.5)
Taper thread	External d2	2.6 to 50	2.6 .to 85	2.6 to 85
	Internal D2	2.6 to 70	2.6 to 125	2.6 to 165(205)
Gear	External MdK	7 to 295	7 to 630 / 1,050 / 1,550	7 to 820 / 1,610
	Internal MdK	20 to 155	20 to 490 / 910 / 1,410	20 to 680 / 1,470
Measuring instruments with displays	Micrometers, dial indicators, dial comparators, lever-type test indicators, two-point internal measuring instr., inside micrometers	5 to 100	5.0 to 300 / 780 / 780	5.0 to 550 / 1340
		up to 100	up to 100	up to 100
		–	0 to 360 / 780 / 1,280	0 to 615 / 1,205
		0 to 305	0 to 640 / 1,060 / 1,560	0 to 830 / 1,620

Notes:
* Details in brackets with single measuring wires.
All values in mm.
In some cases, additional standards and optional accessories are required to achieve the measuring ranges indicated.

Values higher or lower than those given can be achieved with special accessories
The concrete geometry and weight of the testpiece may restrict the measuring ranges indicated.

Performance Data

Length meas. system X-axis	Resolution	selectable 0.01 µm or 0.1 µm		selectable 0.01 µm or 0.1 µm
Length meas.-system Z-axis	Resolution	0.1 µm		0.1 µm
Instr. system	Length measuring deviation MPE_{E1}	**) ≤(0.09+L/2,000) µm or ≤ (0.3+L/1,500) µm		≤ (0.1+L/2,000)µm
	Reproducibility	0.05 µm or 0.1 µm		0.05 µm
Travel speed	Object table adjustment	0.015 mm/s; 0.3 mm/s; 6 mm/s		0.015 mm/s; 0.3 mm/s; 6 mm/s
	Measuring spindle	(0 to 250) mm/s		(0.2 to 250) mm/s
Measuring forces		0.2 N; 1.0 N to 4.5 N; 11 N		0.2 N; 1.0 to 4.5 N; 11 N

Dimensions, Weights and Operating Conditions

Instrument-dimensions,	L x W x H	685 x 280 x 480	1,080/ 1,500/ 2,000 x 380 x 480	1,500 / 2,300 x 380 x 480
Instrument weight	in kg	110	160 / 215 / 280	220 / 325
Testpiece weight	for testpiece table	25 kg	25 kg	25 kg
	for support table	-	10 kg	10 kg
Electrical connection data	Instrument, PC, laser	220 (110) V; 50 Hz to 60 Hz; approx. 750 VA		220 (110) V; 50 Hz to 60 Hz; approx. 750 VA
Compressed air		-	3 bar (0.3 MPa)	3 bar (0.3 MPa)
Air consumption		-	≤ 4 l/min at 3 bar	≤ 4 l/min at 3 bar
Humidity		-	≤ 60%	≤ 60%
Ambient temperature for operational readiness		+15 °C to +35 °C		+15 °C to +35 °C

** ULM 300-E only ≤(0.09+L/2,000) µm

ULM 520 S-E / 1000 S-E. Technical Data

Measuring ranges		ULM 520 S-E	ULM 1000 S-E
External measurement	Direct	0 to 520	0 to 1,025
	Difference	0 to 520	0 to 1,025
Internal meas.		0.5 to 365	0.5 to 870
Taper measurement	External	0 to 520	0 to 1,025
	Internal	4 to 365	4 to 870
Cylindrical thread	External d2 (P=0.2 to 6)	0.8 to 200*	0.8 to 200*
	Internal D2 (P=0,45 .to 6)	2.6 to 195	2.6 to 615
	Lead (P/T)	(0.35) 1.0 to 5.5 (6.5)	(0.35) 1.0 .to 5.5 (6.5)
Taper thread	External d2	2.6 to 85	2.6 to 85
	Internal D2	2.6 to 165**	2.6 to 165**
Gear	External MdK	7 to 510	7 to 1,015
	Internal MdK	20 to 370	20 to 875
Measuring instruments with displays	Micrometers, dial indicators, dial comparators, lever-type test indicators, two-point internal measuring instr., inside micrometers	5 to 180	5 to 745
		up to 100	up to 100
		–	–
		0 to 520	0 to 1,025

Notes:
* Details in brackets with single measuring wires.
** Reduced accuracy if > 125 mm
All values in mm.
In some cases, additional standards and optional accessories are required to achieve the measuring ranges indicated.
Values higher or lower than those given can be achieved with special accessories.
The concrete geometry and weight of the testpiece may restrict the measuring ranges indicated.

Performance Data

Length meas. system X-axis	Resolution	selectable 0.01 µm or 0.1 µm
Length meas. system Z-axis	Resolution	0.1 µm
Instr. system	Length measuring deviation	With ABBE measuring element only: $MPE_{E1} = (0.09 + L/2{,}000)$ µm With base measuring system: $MPE_{E1} = (0.6 + L/1{,}000)$ µm
	Reproducibility	0.1 µm
Travel speed	Object table adjustment	0.015 mm/s; 0.3 mm/s; 6 mm/s
	Measuring spindle	(0 to 250) mm/s
Measuring force		0.2 N; 1.0 to 4.5 N; 11 N

Dimensions, Weights and Operating Conditions

Instrument	L x W x H	1,080 x 380 x 480	1,500 x 380 x 480
Instrument weight in kg		160	215
Testpiece weight	for testpiece table	25 kg	25 kg
	for support table	10 kg	10 kg
Electrical connection data	Instrument, PC, laser	220 (110) V; 50 Hz to 60 Hz; approx. 750 VA	
Compressed air		3 bar (0.3 MPa)	
Air consumption		≤ 4 l/min at 3 bar	
Humidity		≤ 60%	
Ambient temperature for operational readiness		+15 °C to +35 °C	