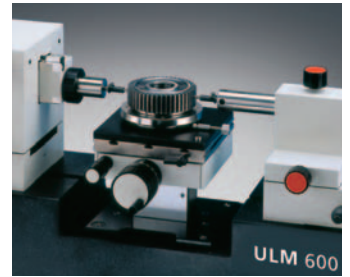
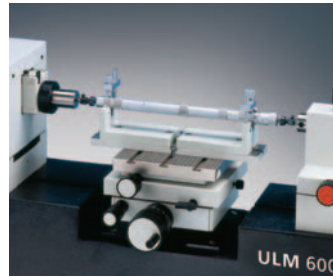
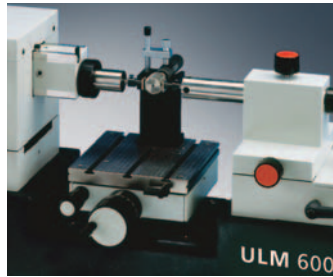
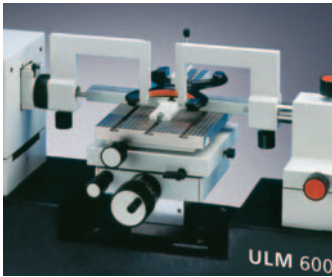


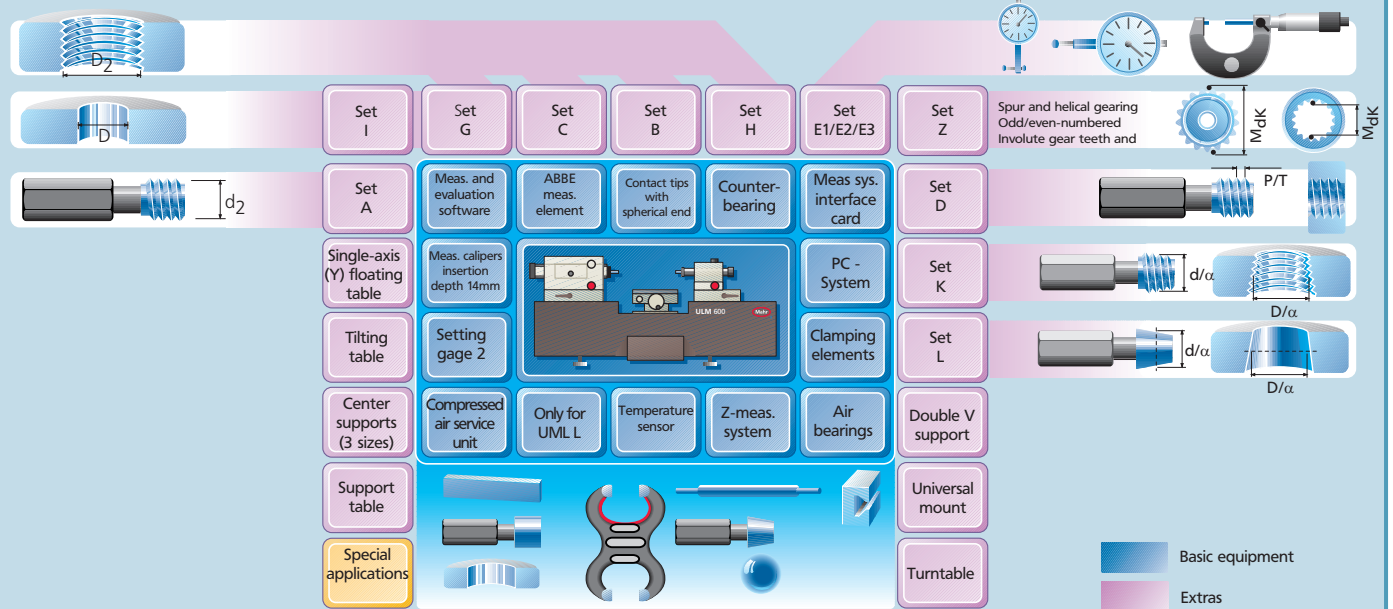
Precimar. ULM Length Measuring Instruments

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 1,700 mm/11.81 in to 66.93 in), in various accuracy classes (0.3 μm to 0.1 μm / 12 μin to 4 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



Calibration of

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

Reasons for Choosing ULM

Universal length measuring machines

Technical solution

- Granite
Air bearing technology
- Online temperature monitoring
- Z measuring system
- Large number of accessories
- Laser meas. system (with ULM L)
- Powerful MS Windows software

User benefit

- Variable length and rigid
Greater productivity through rapid movement of Abbe measuring element and tailstock
- Correction of different expansion behavior of granite and metal and correction of systematic measuring errors due to temperature fluctuations in testpiece and setting standard
- Greater productivity and option of 2D measuring methods by incorporating Z position and travel values
- Adaptability to measurement tasks thanks to specially configured accessory sets and individual components
- Large direct measuring range with maximum measuring accuracy
- Maximum convenience thanks to clear and simple user navigation

ULM Universal Length Measuring Instruments

ULM

Direct measuring range: 100 mm (4 in)

$$\text{MPE}_{E1} = (0.1+L/2,000) \mu\text{m}$$

or

$$\text{MPE}_{E1} = (0.3+L/1,500) \mu\text{m}$$

Measuring system configuration:



ULM S

Direct measuring range = application range

with meas. element (100 mm/4 in meas. range):

$$\text{MPE}_{E1} = (0.1+L/2,000) \mu\text{m}$$

with base meas. systems:

$$\text{MPE}_{E1} = (0.6+L/1,000) \mu\text{m}$$

Measuring system configuration:

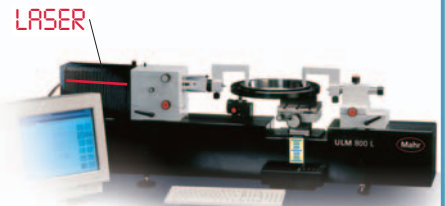


ULM L

Direct measuring range: 525 / 1,115 mm
(20.67/43.90 in)

$$\text{MPE}_{E1} = (0.1+L/2,000) \mu\text{m}$$

Measuring system configuration:



Application ranges:

ULM 300

external up to 305 mm, internal up to 150 mm

$$\text{MPE}_{E1} = (0.3+L/500) \mu\text{m}$$

Id No. 5355022

$$\text{MPE}_{E1} = (0.3+L/1,500) \mu\text{m}$$

Id No. 5355023

$$\text{MPE}_{E1} = (0.1+L/2,000) \mu\text{m}$$

Id No. 5355024

ULM 600

external up to 640 mm, internal up to 485 mm
with air bearing units

$$\text{MPE}_{E1} = (0.3+L/1,500) \mu\text{m}$$

Id No. 5355025

$$\text{MPE}_{E1} = (0.1+L/2,000) \mu\text{m}$$

Id No. 5355026

ULM 1000

external up to 1060 mm, internal up to 905 mm
with air bearing units

$$\text{MPE}_{E1} = (0.3+L/1,500) \mu\text{m}$$

Id No. 5355027

$$\text{MPE}_{E1} = (0.1+L/2,000) \mu\text{m}$$

Id No. 5355028

ULM 1500

external up to 1,560 mm,
internal up to 1,405 mm
with air bearing units

$$\text{MPE}_{E1} = (0.3+L/1,500) \mu\text{m}$$

Id No. 5355031

$$\text{MPE}_{E1} = (0.1+L/2,000) \mu\text{m}$$

Id No. 5355032

Application ranges:

ULM 520 S

external up to 520 mm, internal up to 365 mm

with air bearing units

Id No. 5355033

ULM 1000 S

external up to 1,025 mm, internal up to 870 mm
with air bearing units

Id No. 5355034

ULM 1400 S (on request)

external up to 1,440 mm,
internal up to 1,285 mm
with air bearing units

ULM 1700 S (on request)

external up to 1,740 mm,
internal up to 1,605 mm
with air bearing units

Application ranges:

ULM 800 L

external up to 830 mm, internal up to 670 mm

with air bearing units

Id No. 5355029

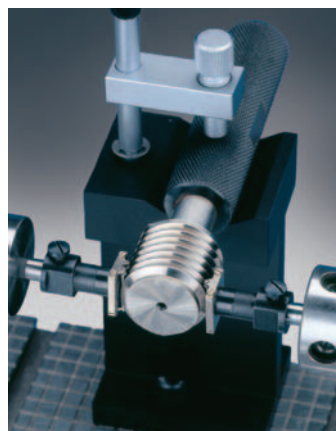
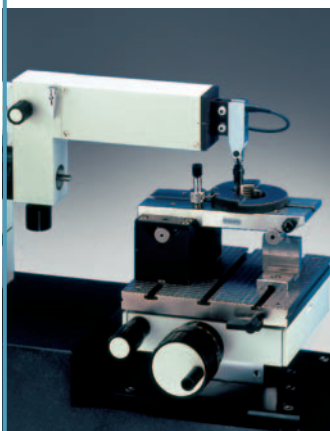
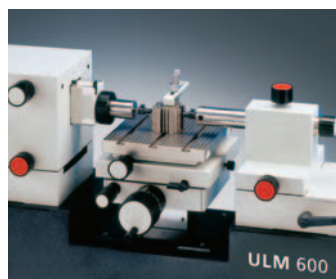
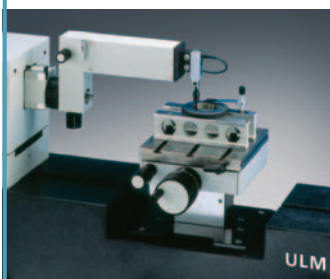
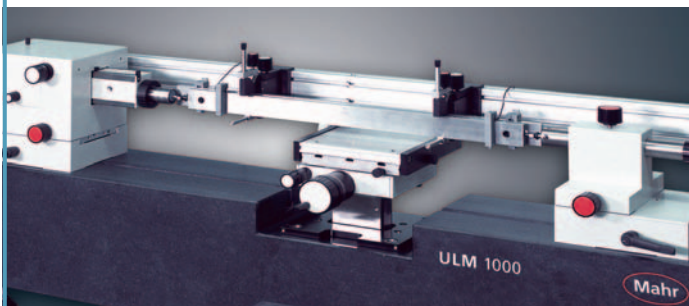
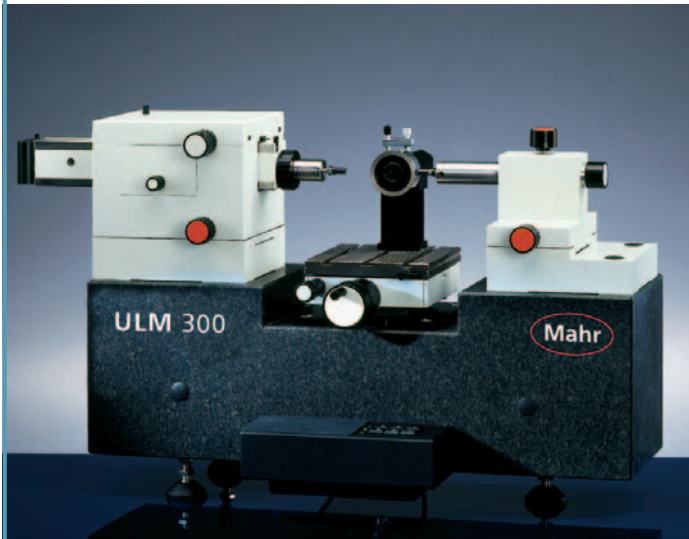
ULM 1500 L

external up to 1,620 mm,
internal up to 1,465 mm
with air bearing units

Id No. 5355030

Precimar ULM 300 / 600 / 1000 / 1500

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 Heidenhain reflected light 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 3 speeds

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

Features

- Excellent measuring accuracy
- 100% compliance with Abbe comparator principle
- Online temperature measurement with 2 to 4 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
- 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

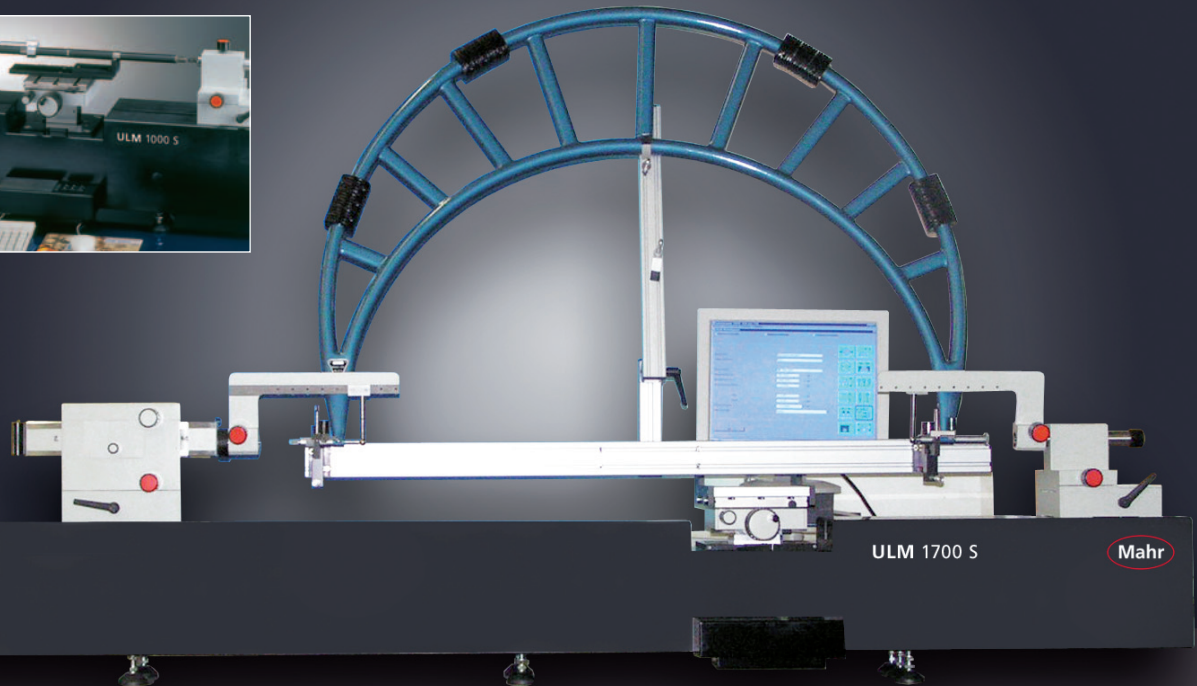
Details on metrological accessories are available on request.

Versions

ULM 300
ULM 600
ULM 1000
ULM 1500

Precimar ULM 520 S / 1000 S / 1400 S / 1700 S

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 Heidenhain reflected light 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 3 speeds

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

Features

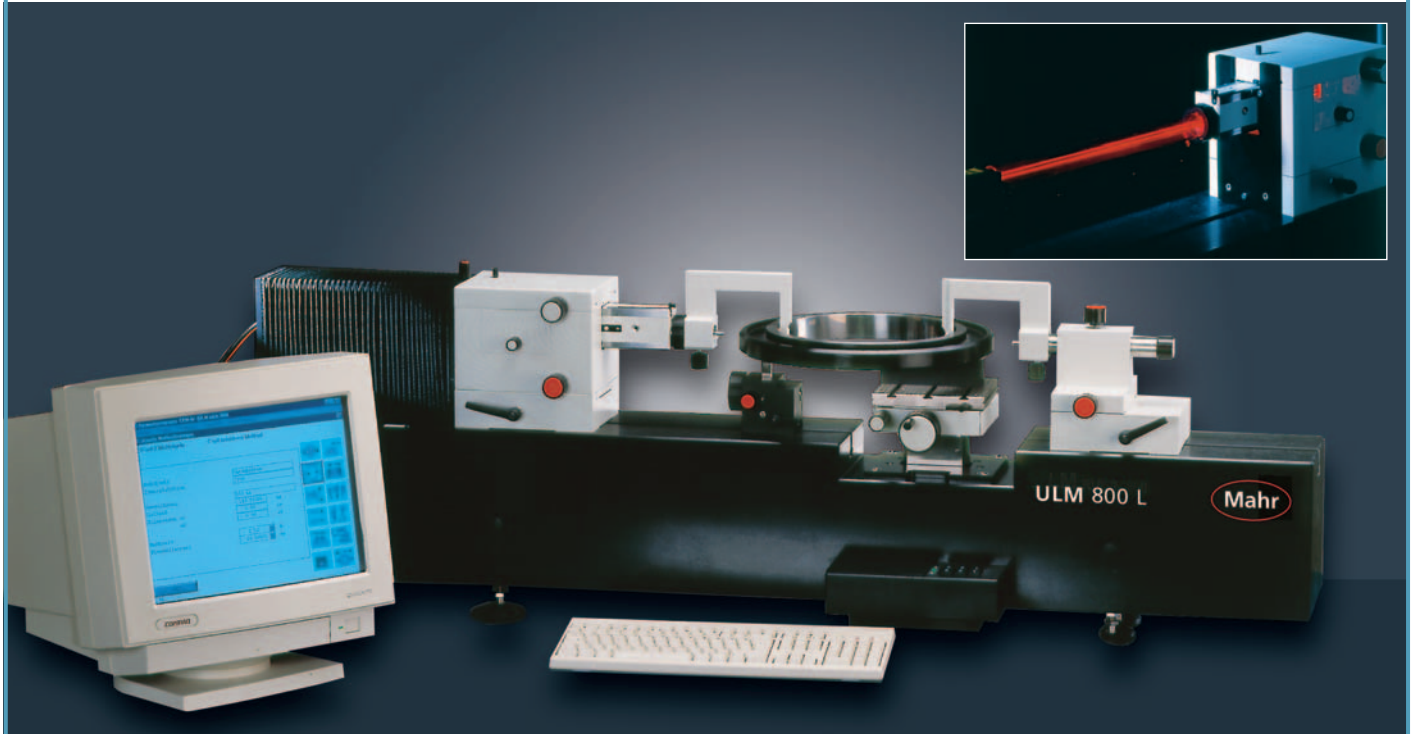
- Combined measuring instrument for very high-precision measurements in the range up to 100 mm (4 in) and standard-precision measurements over the entire range of movement of the measuring element and counter-bearing. X measured value formed from the measuring systems of the measuring element and the 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
ULM 1000 S
ULM 1400 S (on request)
ULM 1700 S (on request)

Precimar ULM 800 L / 1500 L

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 Heidenhain reflected light 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 3 speeds

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

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
ULM 1500 L

ULM, ULM S, ULM L Series

Equipment		ULM				ULM S				ULM L	
		300	600	1000	1500	520	1000	1400	1700	800	1500
Base unit	Base	•	•	•	•	•	•	•	•	•	•
	Testpiece table with digital Z measuring system and analog Y micrometer	•	•	•	•	•	•	•	•	•	•
	Abbe measuring element	•	•	•	•	•	•	•	•	•*	•*
	Counter-bearing	•	•	•	•	•	•	•	•	•	•
	Measuring system interface card	•	•	•	•	•	•**	•**	•**	•**	••
	Air bearing carriage	–	•	•	•	•	•	•	•	•	•
	Compressed air service unit	–	•	•	•	•	•	•	•	•	•
	Base-type measuring system	–	–	–	–	•	•	•	•	–	–
	Laser measuring system	–	–	–	–	–	–	–	–	•	•
	Software (basic version)	•	•	•	•	•	•	•	•	•	•
	ALMEMO temperature meas. instr.	o/•	•	•	•	•	•	•	•	•	•
Standard accessories	Anvils with ball zone*	•	•	•	•	•	•	•	•	•	•
	Calipers, 90/45**)	•	•	•	•	•	•	•	•	•	•
	Holder for open temp. sensor***	•	•	•	•	•	•	•	•	•	••
	Spring clips	•	•	•	•	•	•	•	•	•	•
	PC with Windows XP multilingual	•	•	•	•	•	•	•	•	•	••
	Parallel bases 60/20	•	•	•	•	•	•	•	•	•	•
	Support table	–	(o)	o	o	(o)	o	o	o	o	•
Accessories optional general	Equipment table	o	o	o	o	o	o	o	o	o	o
	Testpiece table with digital Z measuring system and digital Y micrometer	o	o	o	o	o	o	o	o	o	o
	Tilting table	o	o	o	o	o	o	o	o	o	o
	Single-axis floating table	o	o	o	o	o	o	o	o	o	o
	Turntable	o	o	o	o	o	o	o	o	o	o
	Floating table with air bearings, large	–	o	o	o	o	o	o	o	o	o
	Center support 200/220	o	o	o	o	o	o	o	o	o	o
	Center support 105/150	o	o	o	o	o	o	o	o	o	o
	Adjustable center support 85/330	o	o	o	o	o	o	o	o	o	o
	Clamping plate	o	o	o	o	o	o	o	o	o	o
	Double V support	o	o	o	o	o	o	o	o	o	o
	Universal mount	–	o	o	o	o	o	o	o	o	o
	Vibration damping base	o	o	o	o	o	o	o	o	o	o
	Spacer, short	o	o	o	o	o	o	o	o	o	o
	Calipers, insertion depth 5, 14, 32 and 60 mm	o	o	o	o	o	o	o	o	o	o
	Setting gages	o	o	o	o	o	o	o	o	o	o
	Universal calipers	o	o	o	o	o	o	o	o	o	o
	Blocks raising measuring axis	o	o	o	o	o	o	o	o	–	–
	Three-jaw hand-operated chuck	o	o	o	o	o	o	o	o	o	o
	Angle setting table	o	o	o	o	o	o	o	o	o	o
	Parallel blocks with threaded bores	o	o	o	o	o	o	o	o	o	o
	Setting ring, 200 mm	–	o	o	o	o	o	o	o	o	o
	Anvils with plane faces or narrow edges	o	o	o	o	o	o	o	o	o	o
Parallel bases 40/20	o	o	o	o	o	o	o	o	o	o	
Universal double V support	o	o	o	o	o	o	o	o	o	o	
Work-holding clamps, 60 and 105 mm	o	o	o	o	o	o	o	o	o	o	
Measurement-task specific	Set A External thread (d2)	o	o	o	o	o	o	o	o	o	o
	Set B Internal thread (D2)	o	o	o	o	o	o	o	o	o	o
	Set C Internal thread (D2)	o	o	o	o	o	o	o	o	o	o
	Set D Lead/pitch (P/T)	–	o	o	o	o	o	o	o	o	o
	Set E1 Dial indicators, dial comparators, lever-type test indicators	o	o	o	o	o	o	o	o	o	o
	Set E2 External micrometers	o	o	o	o	o	o	o	o	o	o
	Set E3 Two-point internal measuring instr.	–	o	o	o	–	–	–	–	o	o
	Set E3 Inside micrometers	o	o	o	o	o	o	o	o	o	o
	Set G Internal thread (D2)	o	o	o	o	o	o	o	o	o	o
	Set H Internal thread (D2)	–	o	o	o	o	o	o	o	o	o
	Set I Internal measurement (D)	o	o	o	o	o	o	o	o	o	o
	Set K Taper/taper thread	o	o	o	o	o	o	o	o	o	o
	Set L Taper	o	o	o	o	o	o	o	o	o	o
Set Z Gear (MdK)	o	o	o	o	o	o	o	o	o	o	

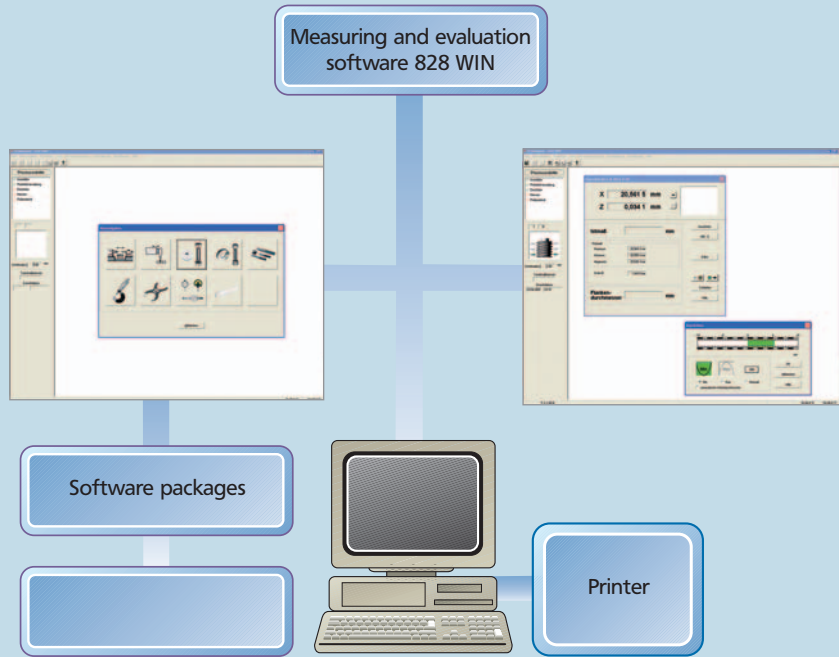
* With laser measuring system ** 2 pieces • Basic equipment () Not recommended
 *** For ULM instrument with $MPE_{E1} (0.1+L/2,000 \mu m) L$ in mm o Optional – Not possible

ULM Software Components for Precision Measurements and Gage Monitoring

Evaluation software

- Measuring functions for reversing point detection and dynamic recording of measured values
- Linear and non-linear measuring system correction
- Correction of contacting errors when measuring threads
- Generation of measuring result records
- ASCII and RS 232 interface for data exchange
- Microsoft® Windows™ 2000/XP

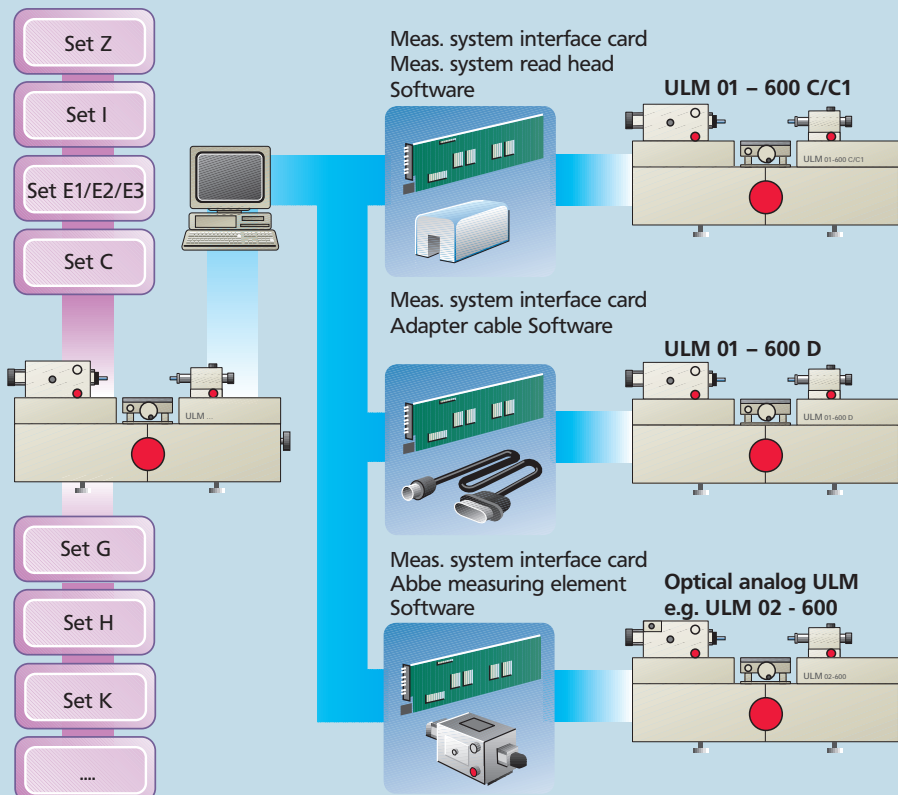
All software packages are available in several languages.



OULM. Update Options for Older ULM Models

We offer users of older models of the universal length measuring instrument the opportunity to upgrade to a state-of-the-art system without going through a great deal of effort/expense.

Further update option:
 Replace the bases of the following models:
 ULM 02-600; ULM 01-600 D;
 ULM 01-600 C; ULM 01-600 C1;
 ULM 600.2; ULM 600
 with a granite base
 (on request).



ULM 300 / 600 / 1000 / 1500 und ULM 800 L / 1500 L. Technical Data

Measuring ranges		ULM 300	ULM 600 / 1000 / 1500	ULM 800 L / 1500 L
External measurement	Direct	0 to 100	0 to 1000	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	1 μm	1 μm
Instr. system	Length measuring deviation MPE_{E1} Reproducibility	** $\leq (0.1+L/2,000) \mu\text{m}$ or $\leq (0.3+L/1,500) \mu\text{m}$ 0.05 μm or 0.1 μm	$\leq (0.1+L/2,000) \mu\text{m}$ 0.05 μm
Travel speed	Object table adjustment Measuring spindle	0.015 mm/s; 0.3 mm/s; 6 mm/s (0 to 250) mm/s	0.015 mm/s; 0.3 mm/s; 6 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, Instrument weight Testpiece weight	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
	in kg	110	160 / 215 / 280	220 / 325
	for testpiece table for support table	25 kg -	25 kg 10 kg	25 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		-	$\leq 4 \text{ l/min}$ at 3 bar	$\leq 4 \text{ l/min}$ at 3 bar
Humidity		-	$\leq 60\%$	$\leq 60\%$
Ambient temperature for operational readiness		+15 °C to +35 °C		+15 °C to +35 °C

* $\leq (0.3 + L/500) \mu\text{m}$ possible as an option for ULM

ULM 520 S / 1000 S / 1500 S / 1700 S. Technical Data

Measuring ranges		ULM 520 S	ULM 1000 S	ULM 1400 S	ULM 1700 S
External measurement	Direct	0 to 520	0 to 1,025	0 to 1,440	0 to 1,740
	Difference	0 to 520	0 to 1,025	0 to 1,440	0 to 1,740
Internal meas.		0.5 to 365	0.5 to 870	0.5 to 1,285	0.5 to 1,585
Taper measurement	External	0 to 520	0 to 1,025	0 to 1,440	0 to 1,740
	Internal	4 to 365	4 to 870	4 to 1,285	4 to 1,585
Cylindrical thread	External d2 (P=0.2 to 6)	0.8 to 200*	0.8 to 200*	0.8 to 200*	0.8 to 200*
	Internal D2 (P=0,45 .to 6)	2.6 to 195	2.6 to 615	2.6 to 995	2.6 to 1.295
	Lead (P/T)	(0,35) 1.0 to 5.5 (6,5)	(0,35) 1.0 to 5.5 (6,5)	(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	2.6 to 85	2.6 to 85
	Internal D2	2.6 to 165**	2.6 to 165**	2.6 to 165**	2.6 to 165**
Gear	External MdK	7 to 510	7 to 1,015	7 to 1,430	7 to 1,730
	Internal MdK	20 to 370	20 to 875	20 to 1,290	20 to 1,590
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	5 to 1,160	5 to 1,460
		up to 100	up to 100	up to 100	up to 100
		0 to 520	0 to 1,025	0 to 1,440	0 to 1,740

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	0.1 µm
Length meas. system Z-axis	Resolution	1 µm
Instr. system	Length measuring deviation	With ABBE measuring element only: $MPE_{E1} = (0.1 + L/2,000) \mu\text{m}$ With base measuring system: $MPE_{E1} = (0.6 + L/1,000) \mu\text{m}$
	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 dimensions	L x W x H	1,080 x 380 x 480	1,500 x 380 x 480	2,000 x 380 x 480	2,300 x 380 x 480
Instrument weight in kg		160	215	280	325
Testpiece weight	for testpiece table	25 kg	25 kg	25 kg	25 kg
	for support table	10 kg	10 kg	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			