

Precision measurement technology

The foundation for high-precision measurements

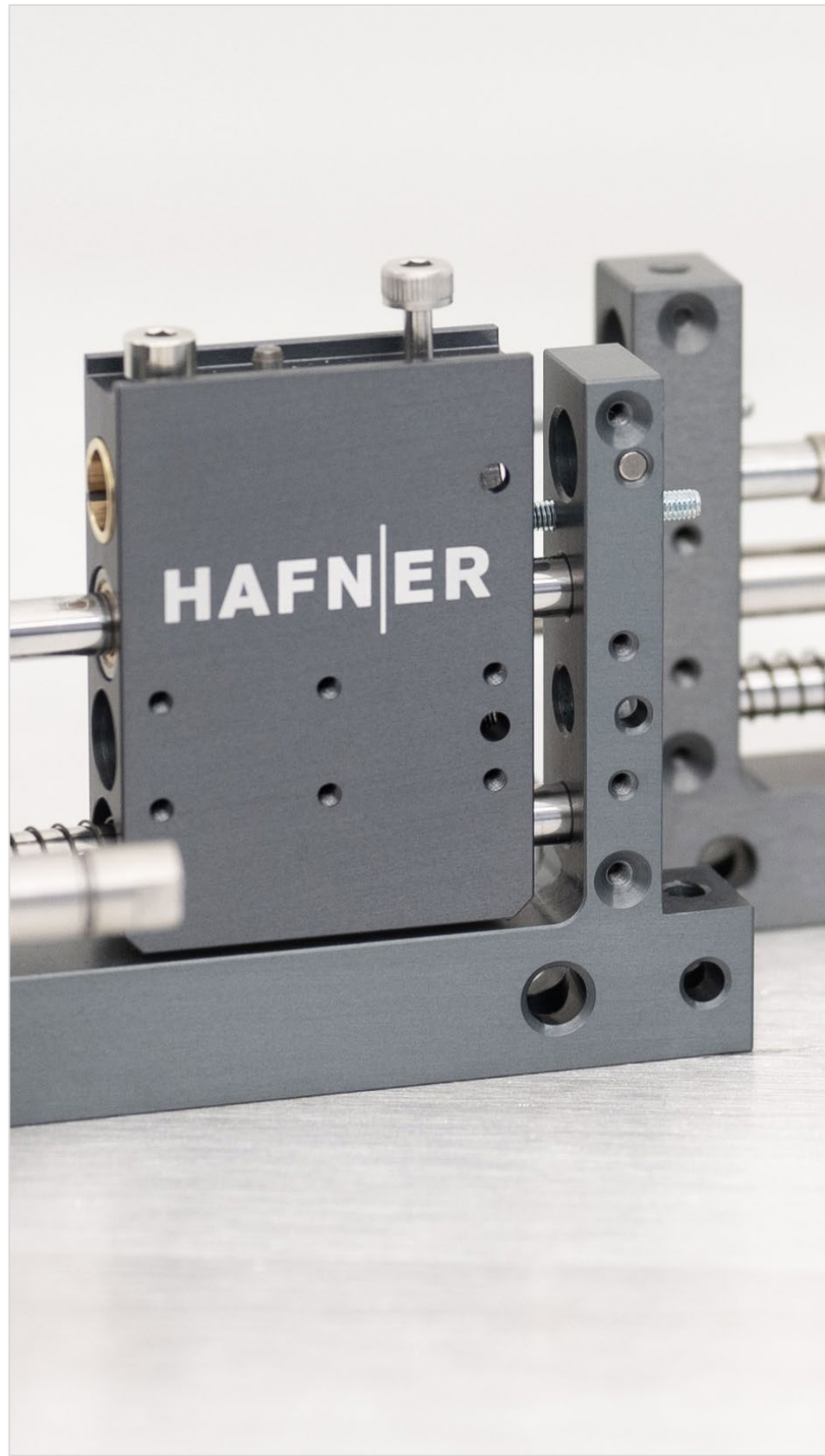
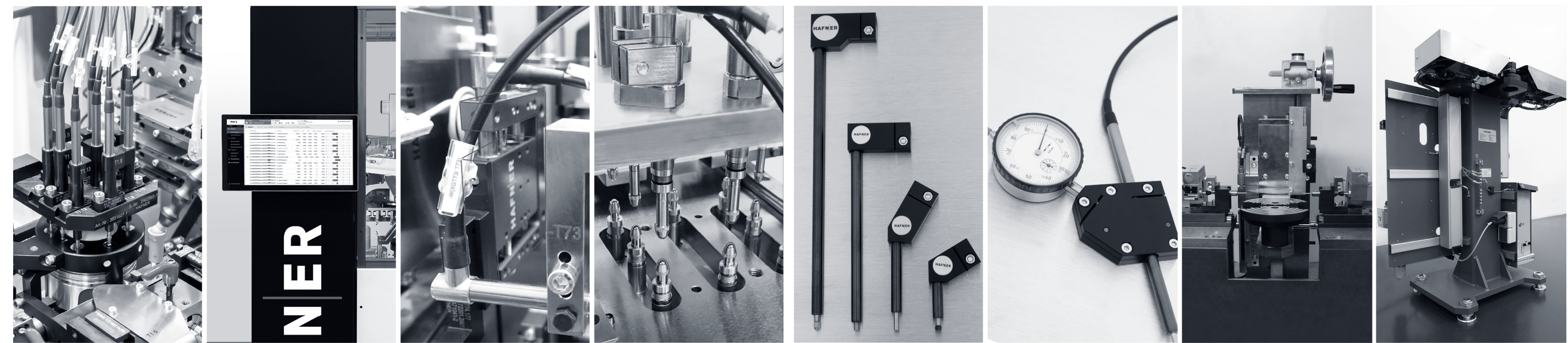


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For accurate measurements

Precision measuring technology we use ourselves

Thousands of satisfied customers trust our customized industrial manufacturing measuring technology solutions. We have decades of experience in developing and manufacturing high-precision components, serving as the foundation for robust and precise measuring machinery.

We offer exclusive precision components and assemblies for customers developing their own measuring applications. These are also made available to system integrators for specialized applications. Our flexible, modular precision systems supplement the IOQ program, facilitating inexpensive and efficient measurements.



Precision components

HAFNER components deliver impressive precision, guaranteeing continuously reliable and repeatable measuring results in thousands of applications. Optimally coordinated precision components can be combined as needed.

- HAFNER slide IOQ 1000
- HAFNER angular head IOQ 2000
- HAFNER multihead IOQ 3000
- HAFNER insert 4000
- HAFNER probe IOQ 5000

Precision kits

Our comprehensive range of precision components makes it possible to combine them to precision kits for technical and economical optimization in any application. We assemble and qualify these, then deliver them according to your specifications. Have a specialized application? We guarantee we can find a solution!

- HAFNER slide kit IOQ 100
- HAFNER angular head kit IOQ 200
- HAFNER multi head kit IOQ 300

Precision systems

We offer flexible, multifunctional precision systems for specific tasks in production-related quality assurance.

- HAFNER vario system IOQ 10
- HAFNER gear system IOQ 20
- HAFNER gear system IOQ 20+
- HAFNER gear system IOQ 25
- HAFNER uni system IOQ 30
- HAFNER axial system IOQ 40

New products

We continuously integrate improvements to our product range, even down to the smallest details.

- Visualization and evaluation with PHIL® measuring software
- Electrical measuring slides

Symbols and definitions

Form, directional, position (location) and running tolerance symbols



Straightness

The tolerance zone is delimited in the measuring plane by 2 parallel straight lines with a distance t .



Flatness

The tolerance zone is delimited by 2 parallel planes with a distance t .



Roundness (circularity)

The tolerance zone is delimited in the measuring plane perpendicular to the axis by 2 concentric circles with a distance t .



Cylindricity (cylinder shape)

The tolerance zone is delimited by 2 coaxial cylinders with a distance t .



Profile of any line, line profile

The tolerance zone is delimited by 2 lines that surround circles of a diameter t whose center lies on a line of a geometrically ideal shape.



Profile of any surface, surface profile

The tolerance zone is delimited by 2 surfaces that surround spheres of a diameter t whose center lies on a surface of a geometrically ideal shape.



Parallelism

The tolerance zone is delimited in the measuring plane by 2 straight lines parallel to the reference with a distance t .



Perpendicularity

The tolerance zone is delimited in the measuring plane by 2 parallel straight lines vertical to the reference with a distance t .



Angularity

The tolerance zone is delimited by 2 parallel planes with a distance t that are tilted to the reference at the specified angle.



Symmetry

The tolerance zone is delimited by 2 planes with a distance t that lie symmetrical to the reference axis or reference plane.



Coaxiality (for axes)

The tolerance zone is delimited by a cylinder with a diameter t whose axis corresponds with the reference axis.



Concentricity (circular "radial" running tolerance)

The tolerance zone is delimited in the measuring plane perpendicular to the axis by 2 concentric circles with a radial distance t whose joint center lies on the reference axis.

Axial run-out (circular "axial" running tolerance)

The tolerance zone is delimited by 2 circles with an axial distance t whose center points lie on the reference axis and that are shifted parallel to the axis of the vertical measuring plane.



Total run (radial)

The tolerance zone is delimited by 2 coaxial cylinders with a radial distance t whose axis corresponds with the reference axis.

Total run (axial)

The tolerance zone is delimited by 2 parallel planes with a distance t that are perpendicular to the reference axis.



Concentricity (for center points)

The tolerance zone is delimited by a circle with a diameter t whose center point corresponds with the reference axis.



Position

If $\emptyset$ is placed before the sign for the tolerance value, the tolerance zone is delimited by a cylinder with a diameter t whose axis lies on the theoretical exact location of the tolerated line.



Distance

The distance describes the linear distance between 2 points, line or surfaces. It serves to ensure defined measurements between elements.



Diameter

The diameter indicates the linear distance between 2 opposing points on a circle or cylinder. It is used to determine the size of circular elements.



HAFNER components deliver impressive precision, guaranteeing continuously reliable and repeatable measuring results in thousands of applications. Optimally coordinated precision components can be combined as needed.

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HAFNER precision components can be used in many different combinations for the following measuring characteristics or applications.

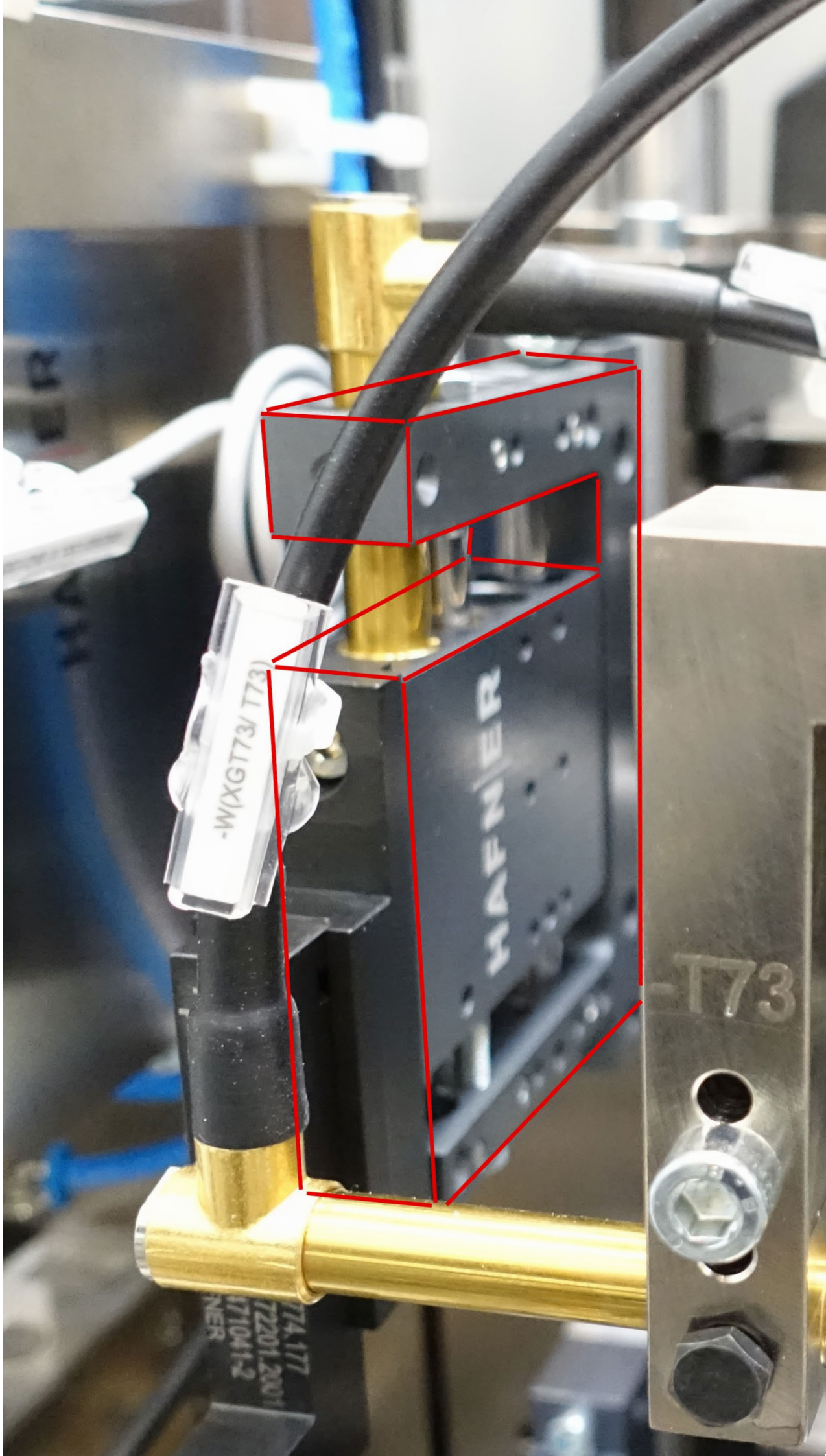
Precision components	Measuring characteristics / application
Measuring slide	Length measurement, interior and exterior measurement, with spring or cylinder force, max. stroke 20 mm
Probe arms	Sensing workpieces, even in difficult to reach areas, bent designs available
Angular heads / screw-in shafts	Deflection or extension of measuring path, for instance in difficult to reach measuring points
Measurement inserts	Direct contact with the workpiece, different sensing geometries or materials
Probe rod extensions	Extension of probe arms or measurement inserts, for instance in deep drill holes
Inductive measuring probes	High-precision length measurement with analog or digital output signal

A uniform connection type must be ensured when combining components like angular heads, screw-in shafts, measurement inserts and probe extensions.

- Version G - connection to the screw fitting via thread M2.5
- Version P - connection to the terminal via flat pin with a diameter of 4.0 mm

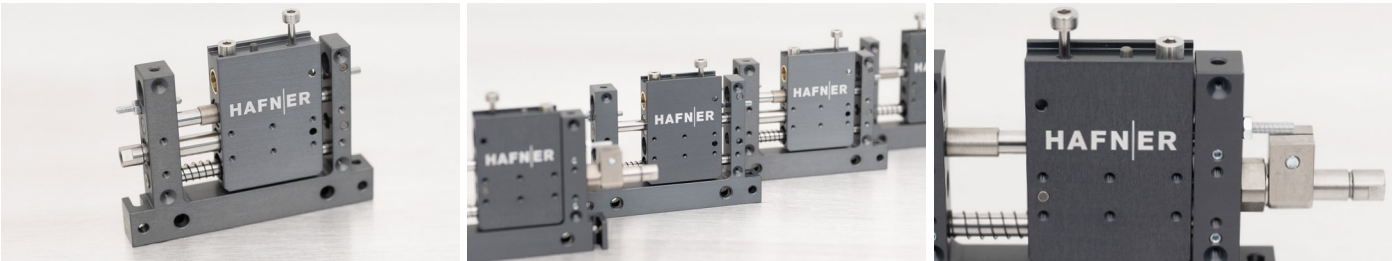
In addition, a uniform stroke must be ensured for angular heads and screw-in shafts, or alternatively:

- Stroke 4 mm
- Stroke 10 mm



HAFNER slide IOQ 1000

High-precision measuring slides. Robust in continuous operation.



HAFNER measuring slides are perfect for continuous industrial operation, extremely robust, can be flexibly installed in all positions and facilitate continuous, high-precision measurements. There are specialized variants for different applications, to optimally handle measuring tasks. A very long, 20 mm stroke makes them suitable for use in difficult installation situations.

General overview for exterior and interior measurements			
Measurements	Pneumatic spring force / lift	Spring-actuated cylinder force / lift	Spring force / no lift
Measuring slides for exterior measurements	✓	✓	✓
Measuring slides for interior measurements	✓	✓	✓

Product features

- Flexible measuring arm design thanks to stable ball bearing slides
- Large lift for measuring arm (up to 20 mm) without overpressure on the inductive probe
- Adjustable stops limit the stroke
- Measuring force either with cylinder force (4 bar = 7 N) or spring force (standard 1 N, the spring force can be increased or reduced via adjusted springs from the optional spring packet)
- Repeat precision between 0.1 and 0.4 µm depending on the sensing geometry.
- The clamping shaft diameter for the measured value transducer is Ø 8H7
- Protection of the inductive measuring probes
- Flexible use in any installation position
- Measuring slides can be fastened conventionally via fitting bores and screws
- Different mounting options for hard to reach areas
- Always connect the measuring probe and pneumatic hose on the same side even in case of different measuring directions

The measurement transducer (such as an inductive probe) is clamped either in the movable center part (for exterior measurements) or in the bridge of the U-shaped exterior part of the measuring slide (for interior measurements).

Scope of delivery

- Measuring slide
- Attachment screws for all attachments and fastening components
- Connection nipple and pneumatic hose

Specialized versions and optional accessories

- Probe arms
- Measurement inserts
- Inductive measuring probe
- Spring packet with different spring forces

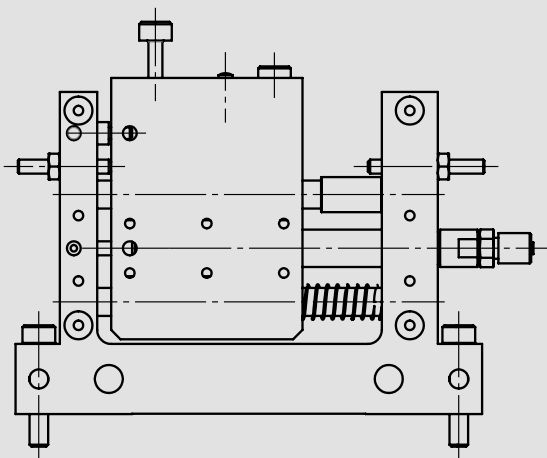
On request, we can deliver completely pre-assembled measuring slides including probe arms, measuring inserts and inductive measurement probes. (Page 33 HAFNER slide kit IOQ 1000)

Exterior measurement with spring force

Item number 152831.1

Product features

- Measure with spring force ($F = 1\text{ N}$)
- Lift via pneumatic cylinder (4 bar = 7 N) with horizontal installation
- Accessories for pneumatic connection: 2 M5 screw fittings, 1 m flexible hose
- Measuring probe clear during lift



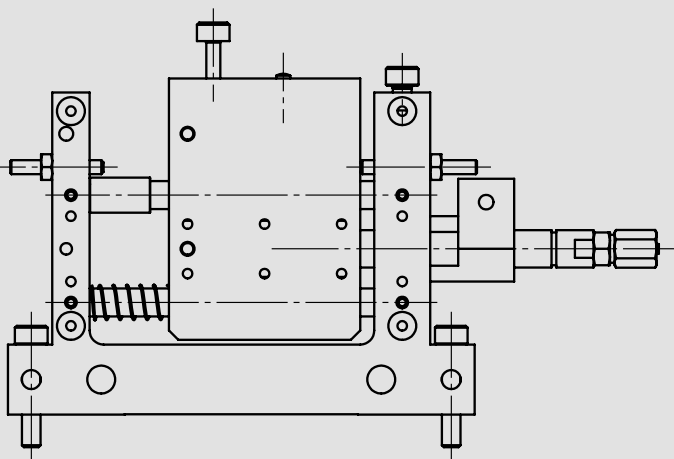
Measuring slides shown in measuring position.

Interior measurement with spring force

Item number 152832.1

Product features

- Measure with spring force ($F = 1\text{ N}$)
- Lift via pneumatic cylinder (4 bar = 7 N) with horizontal installation
- Accessories for pneumatic connection: 2 M5 screw fittings, 1 m flexible hose
- Measuring probe clear during lift



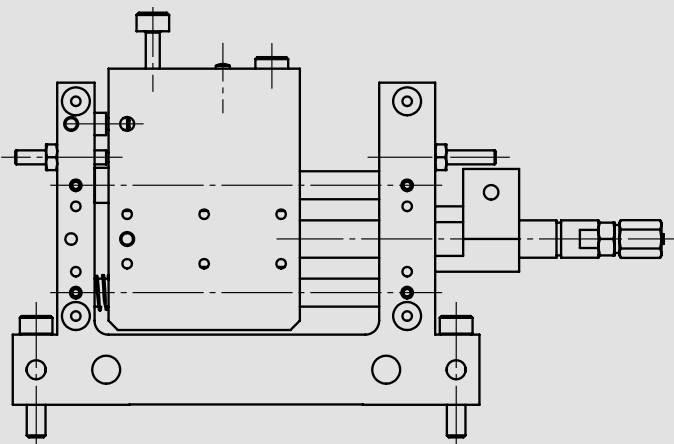
Measuring slides shown in measuring position.

Exterior measurement with pneumatic

Item number 152833.1

Product features

- Lift with spring force ($F = 1\text{ N}$)
- Measurement with pneumatic (4 bar = 7 N) with horizontal installation
- Accessories for pneumatic connection: 2 M5 screw fittings, 1 m flexible hose
- Measuring probe clear during lift



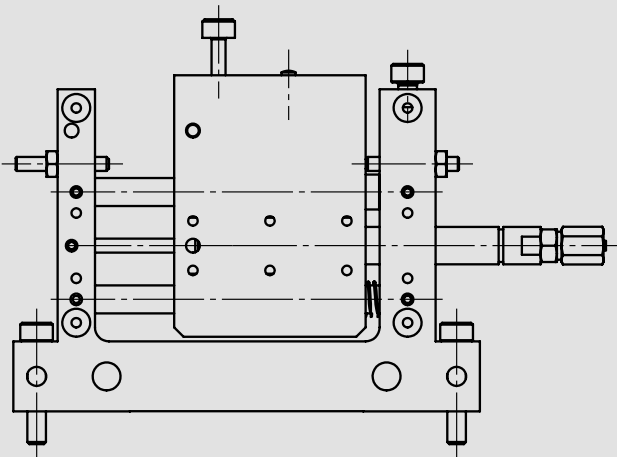
Measuring slides shown in measuring position.

Interior measurement with pneumatic

Item number 152834.1

Product features

- Lift with spring force ($F = 1\text{ N}$)
- Measurement with pneumatic (4 bar = 7 N) with horizontal installation
- Accessories for pneumatic connection: 2 M5 screw fittings, 1 m flexible hose
- Measuring probe clear during lift



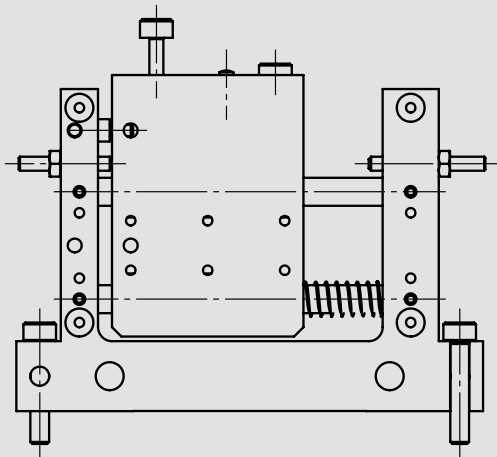
Measuring slides shown in measuring position.

Exterior measurement with spring force without return stroke

Item number 152835.1

Product features

- Measure with spring force only ($F = 1\text{ N}$)
- No return stroke (without pneumatic cylinder)
- Workpiece applied to measuring slide



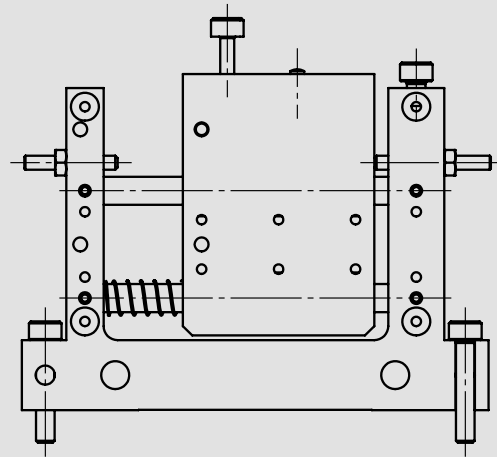
Measuring slides shown in measuring position.

Interior measurement with spring force without return stroke

Item number 152836.1

Product features

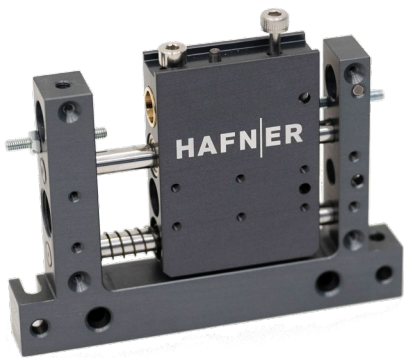
- Measure with spring force only ($F = 1\text{ N}$)
- No return stroke (without pneumatic cylinder)
- Workpiece applied to measuring slide



Measuring slides shown in measuring position.

Example applications

Measuring slides for exterior measurements



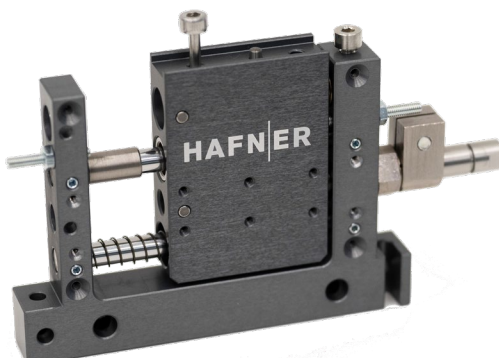
Measuring slides for exterior measurements		
Type	Operating principle	Item no.:
AF 20 P	Measure with spring force / pneumatic lift	152831.1
AP 20 F	Measure with pneumatic / lift with spring force	152833.1
AF 20	Measure with spring force / without return stroke	152835.1

Additional information

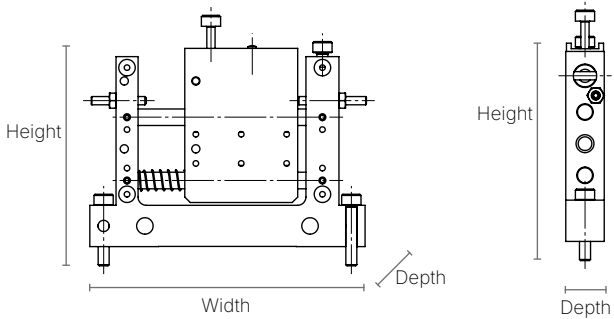
Abbe's principle: the path on the test object to be measured and the comparison path on the measuring standard in the measurement direction must be arranged flush with one another.

Dimensions of all measuring slides	
Width	100 mm
Height	72 mm
Depth	14 mm

Measuring slides for interior measurements



Measuring slides for interior measurements		
Type	Operating principle	Item no.:
IF 20 P	Measure with spring force / pneumatic lift	152832.1
IP 20 F	Measure with pneumatic / lift with spring force	152834.1
IF 20	Measure with spring force / without return stroke	152836.1



Probe arm for measuring slides

Probe arms with M2.5 thread

For item numbers see table

Product features

- Designed for HAFNER measuring slides Series 1528
- With M2.5 thread for standard inserts
- Angling possible thanks to rigid design, non-rotating
- Symmetrical design of the attachment to the measuring slide allows for the angled component to be mounted in 4 directions

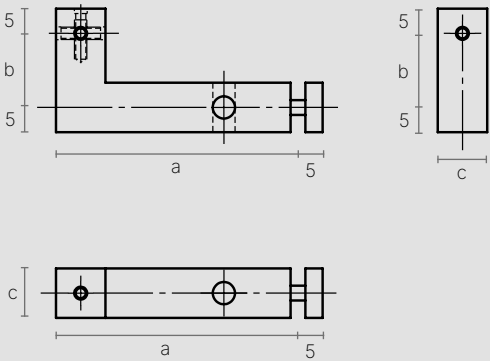
Probe arms with edge

For item numbers see table

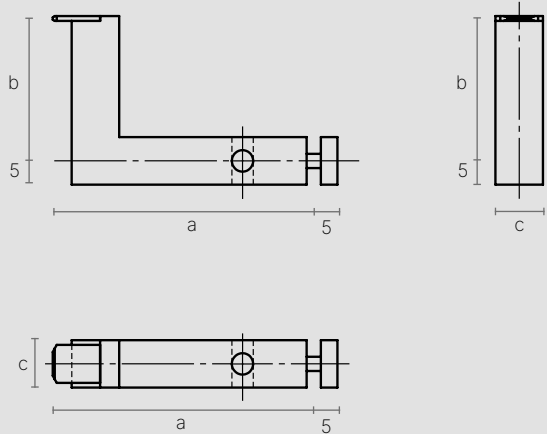
Product features

- Designed for HAFNER measuring slides series 1528
- With carbide measuring edge
- Angling possible thanks to rigid design non-rotating
- Symmetrical design of the attachment to the measuring slide allows for the angled component to be mounted in 4 directions

Probe arm with M2.5 thread inserts



Probe arm with edge



Item numbers for probe arms

Probe arms with M2.5 thread

		Length (a)						
Height (b)	mm	39	49	59	69	mm	Width (c)	
	0	162001.2	162002.2	162003.2	162004.2	10		
	15	162201.2	162202.2	162203.2	162204.2	10		
	30	162301.2	162302.2	162303.2	162304.2	10		

Probe arm with edge

		Length (a)							
		mm	45	55	65	75	85	mm	
Height (b)	0	162031.2	162032.2	162033.2	162034.2	162035.2	10	Width (c)	
	4.5	162131.2	162132.2	162133.2	162134.2	162135.2	10		
	15	162231.2	162232.2	162233.2	162234.2	10			
	30	162331.2	162332.2	162333.2	162334.2	10			

Applications

The fastening dimensions of the probe arms are designed for series 1528 HAFNER measuring slides. They are positioned by a guide fit and alignment pin. They are fastened with an M4 screw. The length increment is 10 mm. The path of the measuring slide is approx. 20 mm. This means that you can set any intermediate dimension. There are straight probe arms and probe arms angled by 15 or 30 mm. This allows for a minimum distance of approx. 1.5 mm between 2 measuring planes. We are able to manufacture workpiece-specific specialized probe arms quickly and inexpensively.



NEW: HAFNER eSlide® IOQ 1100e

Measuring slide. Electrical. Variable.



Technical data	
Cycle time	0.3 sec
Measuring force	1 N (horizontal)
Repeat precision	0.1 - 0.4 µm
Dimensions L x H x W	222 x 24 x 82 mm
Stroke	14 mm

Interior measurement version Item number.: 80019544
Exterior measurement version Item number.: 80019545

Advantages

- Sensor-controlled variable end position (home position)
- Different actuation alternatives can be implemented by the customer
- Simple actuation via IO module

The eSlide® combines the advantages of electrical linear drives with HAFNER measuring slides, which are the standard for high-precision, reproducible measuring results no matter the measuring task:

- Large measuring arm outreach and large lift
- Repeat precision 0.1 - 0.4 µm

Equipment variants, scope of delivery and accessories

The HAFNER eSlide IOQ 1100e is available for interior and exterior measurements, consisting of:

- Measuring slide with eSlide add-on kit
- Attachment screws for all attachments and fastening components
- 2 m connection cable for motor actuation
- Fastened via fitting bores and screws

Optional accessories

- Probe arms
- Measurement inserts
- Inductive measuring probe

On request, we can also deliver completely pre-assembled measuring slides including probe arms, measuring inserts and inductive measurement probes.



HAFNER angular head IOQ 2000

High-precision deflectors. For all lengths and positions.



HAFNER extension and deflection heads offer a highly flexible platform for extending, bridging or deflecting the area between the measurement point and measurement transducer attachment (such as a dial gauge, inductive probe), in order to solve a range of measurement tasks.

A movement of the probe rod is transferred to the measurement transducer in the deflection head via the high-precision deflection element. This ensures exact, error-free transmission of sensed values to the measurement transducer.

General overview of available types					
	0°	30°	45°	60°	90°
Deflection heads stroke 4 mm					
Insertion depth 33 mm	✓	✓	✓	✓	✓
Insertion depth 23 mm	✓	✓	✓	✓	✓
Deflection heads stroke 10 mm					
Insertion depth 33 mm	✓	✓	✓	✓	✓

Product features

- Extension and deflection heads with 4 mm stroke with max. deflection error of 5 µm or 10 mm with maximum 8 µm
- Any installation possible thanks to extension heads with 0° or deflection heads with 30°, 45°, 60° or 90°
- Can be used for any measurement transducer, such as a dial gauge, inductive probe
- Insertion depth 23 mm with 4 mm stroke or 33 mm with 10 mm stroke
- Mounting bore M8 × 0.75
- Screw-in shaft versions D = Pressure , Z = Tension and F = Boot
- The probe rod of the screw-in shafts is available either with a thread M2.5 (G) or flat (P)

Special version

- Multi-way measuring heads
- Measured value transmission optionally to 2 or 3 different measuring probes or measured value displays
- Version with 4 mm or 10 mm stroke

Scope of delivery

- Angular head
- Optional screw-in shafts with a large range of lengths

Extension and deflection heads from the 1123 and 1124 series - 4mm stroke and 1125 series - 10 mm stroke

Product feature

- Deflection angle 0° (extension)

Product feature

- Deflection angle 30°

Product feature

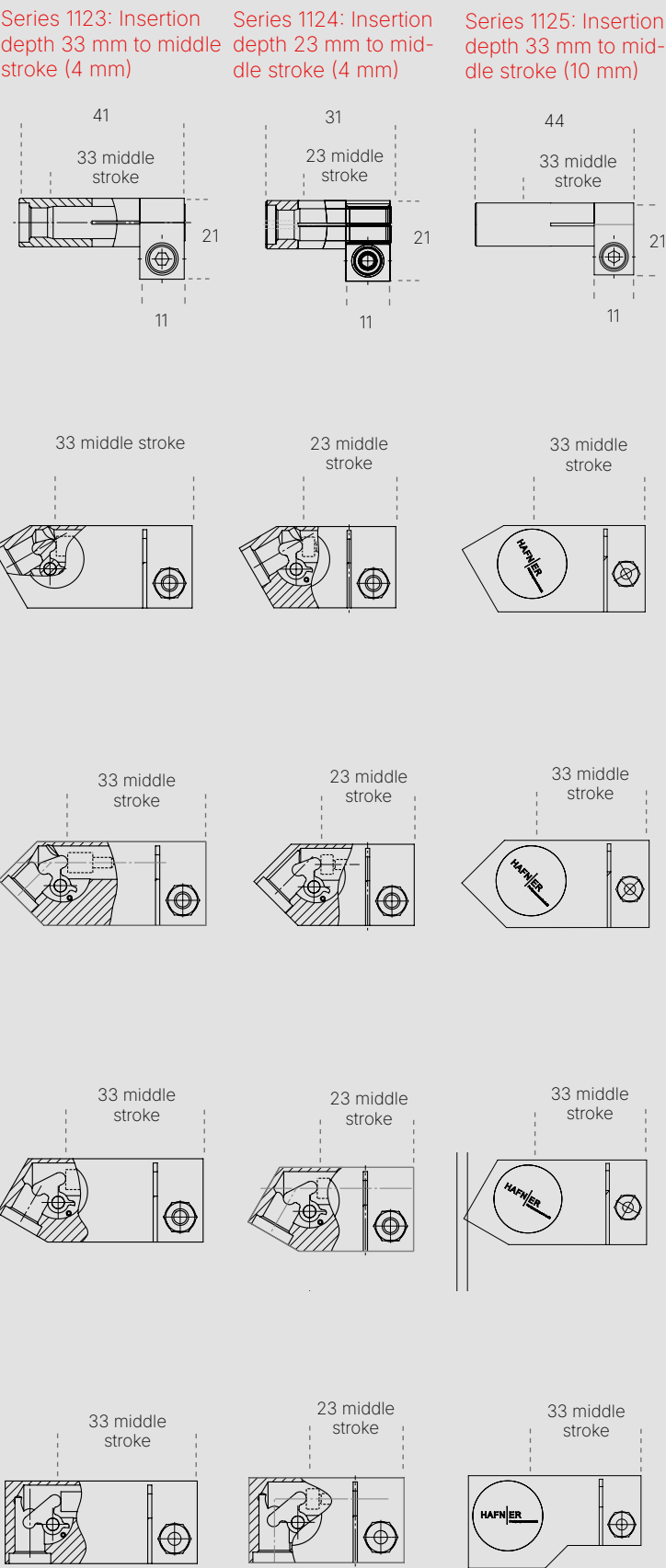
- Deflection angle 45°

Product feature

- Deflection angle 60°

Product feature

- Deflection angle 90°



Item number selection for series 1123 and 1224 deflection heads complete with screw-in shaft

Item number structure

The item number can be used to determine the item type and version. Item numbers always follow a uniform structure. The following examples outline the meanings of the numbers and letters. There is a table of versions at the end of the page.



Version with boot: additional designation "F", example order: 1123 05 P 025 F (except for shaft length 15 mm.)

Versions

Example item number:

1123	05	G	175	D
Type	Deflection angle	Version	Shaft length L	
1123	Deflection heads stroke 4 mm, Insertion depth 33 mm to middle stroke (long version)	01 0°	G M2.5 thread	015 15
		02 30°	P flat pin Ø4 mm	025 25
		03 45°		050 50
1124	Deflection heads stroke 4 mm, Insertion depth 23 mm to middle stroke (short version)	04 60°		075 75
		05 90°		100 100
				125 125
1125	Deflection heads stroke 10 mm, Insertion depth 33 mm to middle stroke			150 150
				175 175
				200 200

Other versions

- D Pressure
 - Z Tension
 - F Boot
- (individually or as an addition to D or Z)

We also offer associated holders for dial gauges and screw-in shafts for series 1127, 1128 and 1125, stroke 10mm.

HAFNER multihead IOQ 3000
Multi-way measuring heads

Multifunctional measured value transmission to 2 or 3 different measured value displays or measured value transmission via measuring probe

2-way measurement head

With 2 dial gauge clamp holders (0° and 45° to the measuring axis)

Item number 113201

Product features

- Stroke 4 mm
- Insertion depth 32 mm middle stroke

Item number 1132 02

Product features

- Stroke 10 mm
- Insertion depth 35 mm middle stroke

3-way measurement head

With 3 dial gauge clamp holders (0° and symmetrical, additionally right and left 2 × 45° outputs)

Item number 113301

Product features

- Stroke 4 mm
- Insertion depth 32 mm middle stroke

Item number 113302

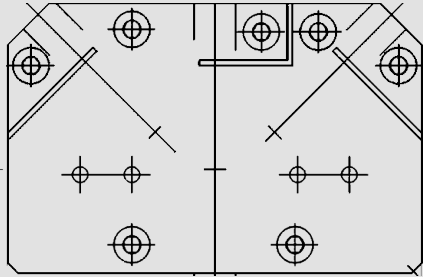
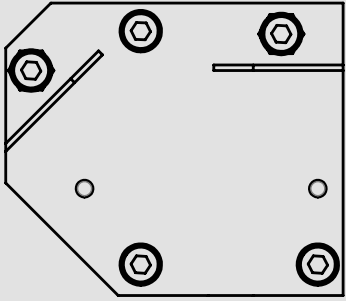
Product features

- Stroke 10 mm
- Insertion depth 35 mm middle stroke

Dimensions	2-way measure- ment head	3-way measure- ment head
Width	60 mm	80 mm
Height	52 mm	52 mm
Depth	12 mm	12 mm

For example applications see pages 38 and 39.

CAD data in various formats is available at [My-HAFNER](#)



Drawings not to scale

Screw-in shafts



Screw-in shafts product features

- Measurement path transmission with shaft lengths between 15 and 200 mm
- Available in version G with M2.5 thread for different measurement inserts and version P with Ø 4 mm flat pin for direct sensing on the workpiece or via a clamping probe
- Probe rod of the screw-in shafts with non-rotating feature
- Standard spring force approx. 1 N with horizontal installation
- With M8 thread x 0.75

Scope of delivery

- Screw-in shaft

Screw-in shafts options

- Additional spring force version D for measurement force reinforcement via pressure
- Additional spring force version Z for lift force reinforcement via tension
- Additional boot version F to avoid contamination

Screw-in shafts for deflectors

Item numbers 1127G and 1128G

Product features

- Version G with M2.5 thread
- Alternative stroke 4 mm or 10 mm
- Probe rod of the screw-in shafts is non-rotating

Item numbers 1127P and 1128P

Product features

- Flat in version P
- Alternative stroke 4 mm or 10 mm
- Probe rod of the screw-in shafts is non-rotating

Item numbers 1127P / G and 1128P / G

Product features

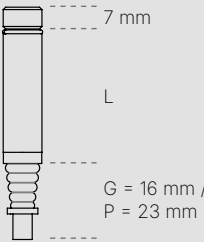
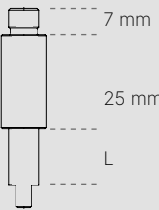
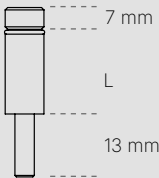
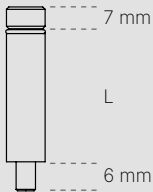
- Alternative version G with M2.5 thread or version P flat
- Additional version D with spring force for pressure or Z with spring force for tension
- Alternative stroke 4 mm or 10 mm
- Probe rod of the screw-in shafts is non-rotating

Item numbers 1127G015F and 1128G025F

Product features

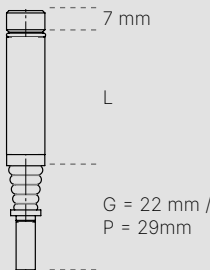
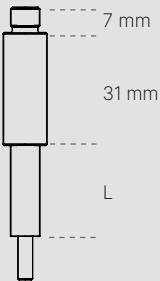
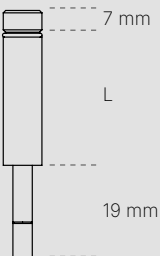
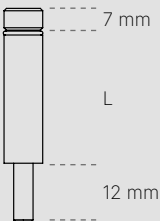
- There is an optional version F with boot for all screw-in shafts (Except for 15 mm length)
- Spring force with horizontal installation approx. 1 N

Series 1127 stroke 4 mm



Suitable for extension and deflection heads in series 1123 and 1124.

Series 1128 stroke 10 mm

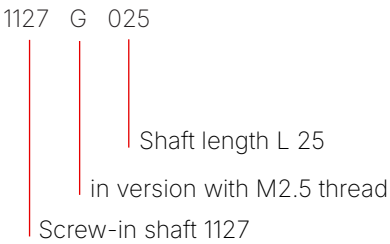


Suitable for extension and deflection heads in series 1125.

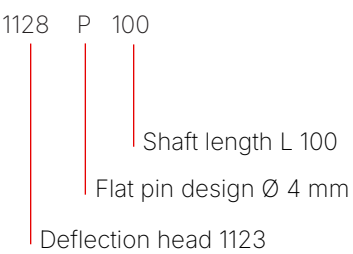
Item number selection for series 1127 and 1128 screw-in shafts

Item number structure

The item number can be used to determine the item type and version. Item numbers always follow a uniform structure. The following examples outline the meanings of the numbers and letters. There is a table of versions at the end of the page.



Could look as follows:



Could look as follows:



Version with boot bears the additional designation "F" (shaft length L=15 not available)

Versions

Example item number:

1128		P	100	D
Type		Version	Shaft length L	
1127	Screw-in shafts stroke 4 mm	G M2.5 thread	015	15***
1128	Screw-in shafts stroke 10 mm	P flat pin Ø 4 mm	025	25
			050	50
			075	75
			100	100
			125	125
			150	150
			175	175
			200	200

Other versions:

- D Pressure*
- Z Tension**
- F Boot (individually or as an addition to D or Z)

* Screw-in shafts with spring force for pressure (1127 D) or tension (1127 Z), spring force with horizontal installation approx. 1 N.
** Screw-in shafts with spring force for pressure (1128 D) or tension (1128 Z), spring force with horizontal installation approx. 1 N.
*** Shaft length L = 15 for series 1128 not possible



HAFNER insert IOQ 4000

High-precision measurement inserts. Measuring point optimized.



These measuring inserts are suitable for screw-in attachment (M2.5 thread) in dial gauges, precision indicators, screw-in shafts or inductive measuring probes, or for clamping onto version P screw-in shafts. Item numbers bearing the designation "H" stand for carbide probe elements.

Scope of delivery

- Measuring inserts M2.5 with probe geometry - surface / line / point or for clamping on flat pin Ø 4 mm
- Measuring inserts with carbide and line / point probe geometry
- Optional probe extension from 10 to 100 mm

General overview of available types				
Contact geometry	M2.5	Clamp	Hardened steel	Carbide
Surface	✓	—	✓	✓
Line	✓	—	✓	✓
Point	✓	—	✓	(✓)
Offset	✓	—	—	✓
Line				
Center	—	✓	—	✓
Flat	—	✓	—	✓
Drum	—	✓	—	✓
Angled	—	✓	—	✓
Tip middle	—	✓	—	✓
Tip flat	—	✓	—	✓

The dial gauge holders are suitable for precision indicators and dial gauges, measurement extensions, angular heads and inductive probes with a shaft diameter of 8 mm (special lengths upon request).

Clamping elements for measuring probes with a shaft diameter of 8 mm (other lengths upon request)

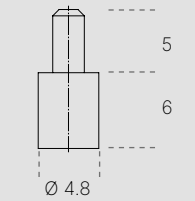
M2.5 measuring insert

Suitable for screwing into components with version G as well as into dial gauges, precision indicators or inductive measuring probes. Item numbers containing the designation “H” stand for carbide measuring inserts.

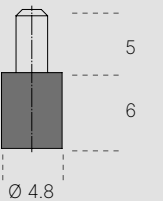
Probe geometry - surface

Item numbers 1130030 and 1130030H

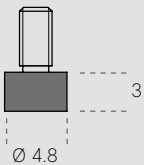
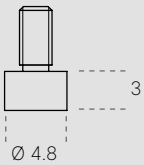
Standard



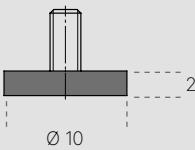
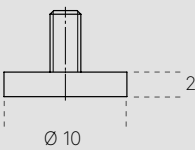
Carbide



Item numbers 1130031 and 1130031H



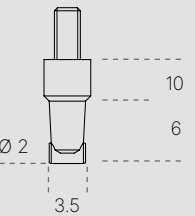
Item numbers 1130032 and 1130032H



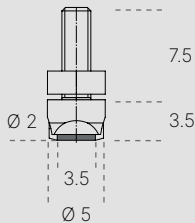
Probe geometry - Line

Item number 1130040H

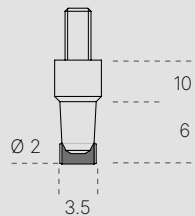
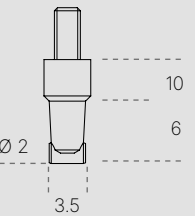
Standard



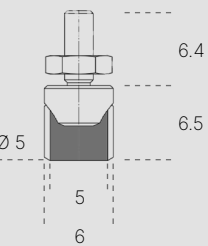
Carbide



Item numbers 1130041 and 1130041H



Item number 1130042H



Probe geometry - Point

Item numbers 1130050 and 1130050H

Item number 1130051

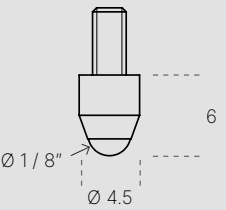
Item numbers 1130052 and 1130052H

Item number 1130055

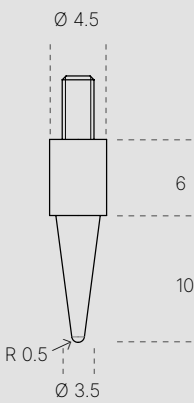
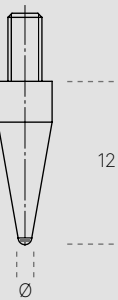
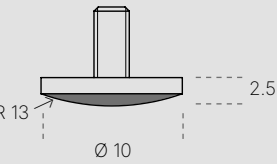
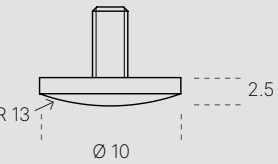
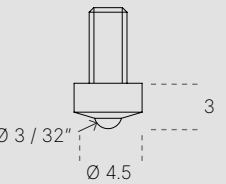
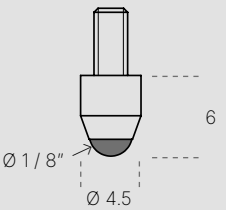
Ø	Item no.:	Attachment
1	11300551	H
2	11300552	H
3	11300553	H
4	11300554	H
5	11300555	H
6	11300556	H

Item number 1130056

Standard



Carbide



Item number 1130057

L	Attachment
16	113005716
26	113005726
36	113005736
46	113005746

Item number 1131100

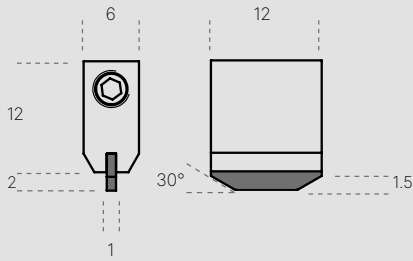
A	L	Attachment
5	4	113110004
5	8	113110008
5	12	113110012
5	16	113110016
10	8	113111008
10	12	113111012
10	16	113111016
15	8	113112008
15	12	113112012
15	16	113112016

Scope of delivery with M2.5 countersunk screw.

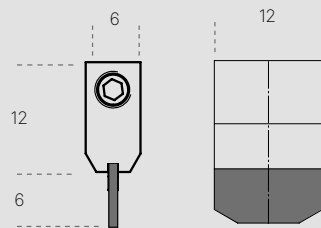
Carbide measurement inserts

Suitable for clamping onto probe extensions or screw-in shafts with Ø 4 mm - version P

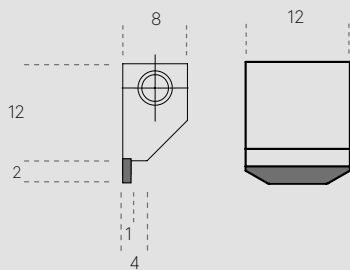
Item number 1131500



Item number 1131501



Item number 1131510



Item number 1131511

Item number 1131520

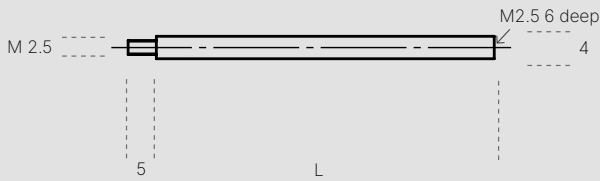
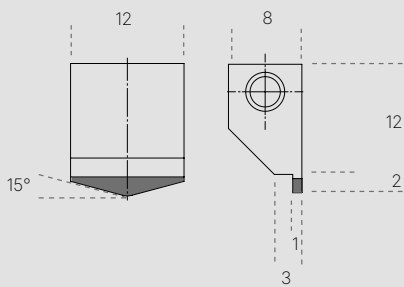
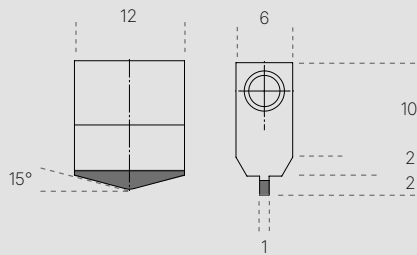
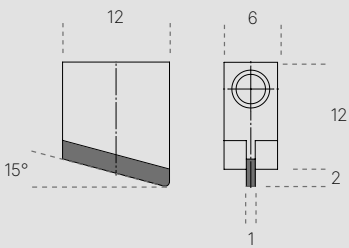
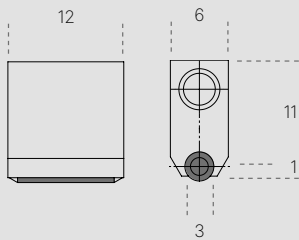
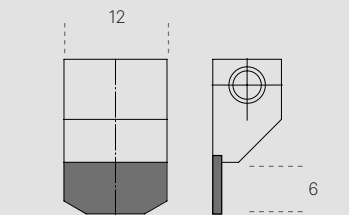
Item number 1131530

Item number 1131540

Item number 1131543

Probe rod extensions with M2.5 thread

Length	Attachment
10	113100110
15	113100115
20	113100120
30	113100130
40	113100140
50	113100150
60	113100160
70	113100170
80	113100180
90	113100190
100	1131001100





HAFNER probe IOQ 5000

Measuring probe for millions of measurements. Reproducible.



Inductive HAFNER measuring probes are based on a proven inductive measurement process with mechanical contact. A coil system energized with alternating voltage generates an AC output voltage that changes depending on the position of a soft magnetic core.

This movement, for instance via a measuring pin, changes the inductance and generates a signal that is amplified and displayed.

- Highest precision: thanks to the unique assignment of measured variables (position of the measuring pin) to the measurement signal (displayed measured value), you always receive precise results
- Reliability: the previous measured value is reliably displayed, even after a power interruption like switching off the device or a power outage
- Display options: the analog measurement signal can be displayed directly via a voltmeter or digitally converted to be shown on a numerical display

Product features

- Depending on the version and stroke, the linearity error, corresponding to the maximum deviation of the non-linear characteristic curve (sensor signal) from the linear nominal characteristic curve (mechanical position of the measuring pin) is 0.3 - 0.9 %
- Depending on the measuring probe, the scatter of the output signal with mechanically precise repeat positioning is 0.01 - 0.05 μm
- Standard measuring ranges $\pm 2 \text{ mm}$ or $\pm 5 \text{ mm}$ other ranges available on request
- Variants with radial or axial cable outlet
- Pressurized if needed

Scope of delivery

- Inductive measuring probe
- 2 m connection cable

Optional

- Pneumatic feed either with
 - Boot or
 - Air gap seal

Inductive measuring probes

Product features

- Versions: all measuring probes alternatively available with axial or radial cable outlet
- Mech. service life > 10 million cycles
- Backlash 1° over the entire stroke
- Temperature range -10 to +65 °C storage and operation
- Any installation position
- Probe element: 3 mm carbide sphere, M2.5 thread, exchangeable
- Boot: Viton
- Clamping shaft: 8h6 (DIN No. 7182)
- Cable: in PUR, length 2 m
- Plug 5-pin 240° (DIN No. 453220)
- No lift
- Sensitivity 7.3 ± 0.15 mV / (V*mm) on R = 2 kOhm (± 0.1 %)
- Carrier frequency 13 kHz ± 5 %
- Feed 3V ± 0.5 % RMS
- Switching: half bridge
- Repair capability: can be repaired and disassembled

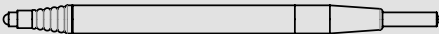
The measuring probes are alternatively available as short stroke or long stroke measuring probes.

Additional product features of short stroke measuring probe

- Total stroke 4.6 mm
- Measuring stroke ± 2 mm
- Forward stroke adjustable
- Mounting: Ball guide
- Measuring force: 0.63 N ± 20 % on electrical zero point values from 0.25 N to 4 N as option
- Repeated dispersion 0.01 µm
- Linearity error 0.3 % in the range ± 1,000 µm (20 °C ± 1 °C)

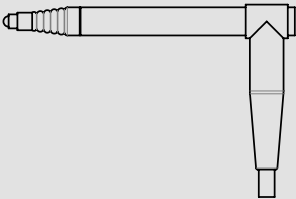
Item number 410010.028

Measuring probe IOQ 5101 F



Item number 410010.029

Measuring probe IOQ 5102 F

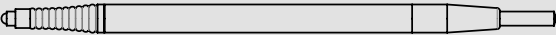


Additional product features of long stroke measuring probe

- Total stroke 10.6 mm
- Measuring stroke ± 5 mm
- Measuring force: 1 N ± 15 % on electrical zero point 1.6 N as option
- Repeated dispersion 0.05 µm
- Linearity error 0.9 % in the range ± 5,000 µm (20 °C ± 1 °C)

Item number 410010.043

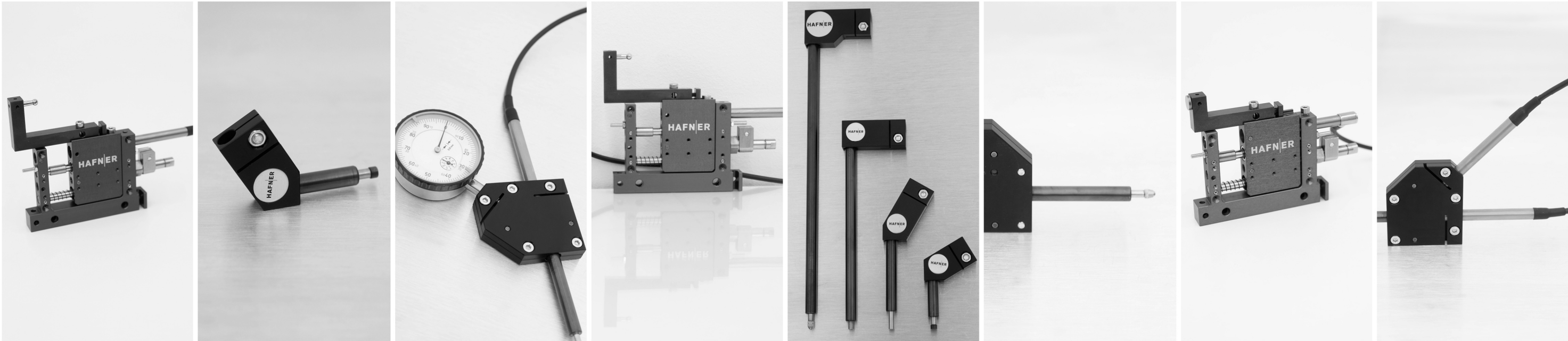
Measuring probe IOQ 5501 F



Item number 410010.044

Measuring probe IOQ 5502 F

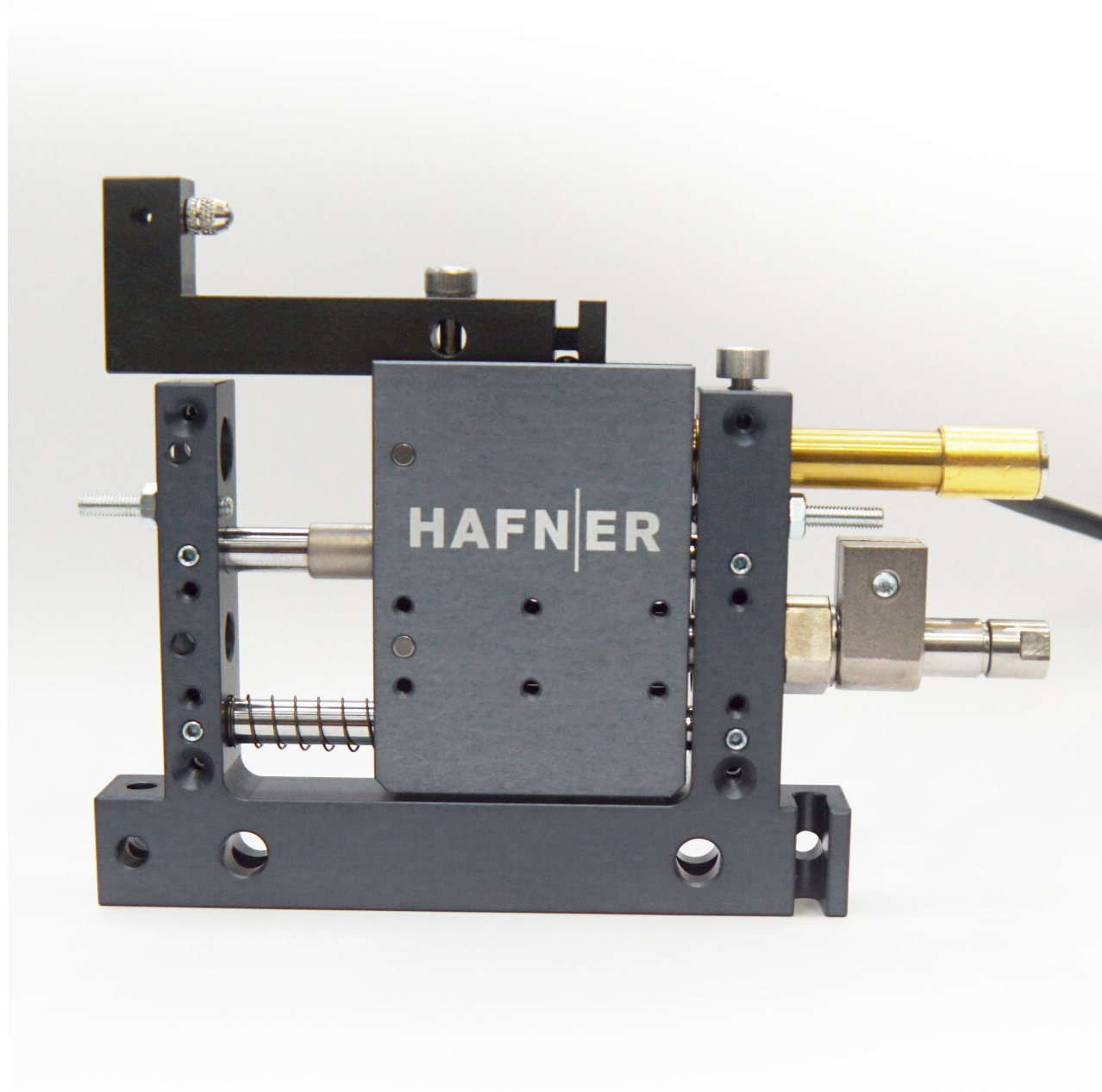




Our comprehensive range of precision kits makes it possible to combine precision kits for technical and economical optimization in any application. We assemble and qualify these, then deliver them according to your specifications. Have a specialized application? We guarantee we can find a solution!

HAFNER slide kit IOQ 100	38
HAFNER angular head kit IOQ 200	42
HAFNER multi head kit IOQ 300	46

Precision assembly	Measuring characteristics / application
Measuring slide HAFNER slide kit IOQ 1000	Length measurement, interior and exterior measurement, with spring or cylinder force, max. stroke 20 mm
Deflector HAFNER angular head kit IOQ 200	Deflection or extension of measuring path, for instance in difficult to reach measuring points
Multi-way measuring head HAFNER multi head kit IOQ 300	Multifunctional measured value transmission to 2 or 3 different measured value displays or measured value transmission via measuring probe



HAFNER slide kit IOQ 100

Measuring slide precision kits



Based on our wide range of products, we assemble economical, plug-and-play measuring slides technically optimized for your application.

Product overview

- High-precision measuring slides, a solid mechanical foundation for precise, repeatable measuring results
- Smart probe arm system, rigid versions, flexible dimensional integration thanks to symmetrical design
- Over 25 measuring insert variants with multiple alternative versions, extremely low-wear thanks to optimal material selection
- High-precision inductive measuring probes
- Suitable for exterior and interior measurements

The measurement transducer (such as an inductive probe) is clamped either in the movable center part (for exterior measurements) or in the bridge of the U-shaped exterior part of the measuring slide (for interior measurements).

The workpiece is contacted using a probe arm fastened to the measuring slide. The measurement transducer (probe or dial gauge) is applied either to the lateral pin in the bridge of the U-shaped exterior part (for exterior measurements) or the lateral pin in the movable center part of the measuring slide (for interior measurements).

We deliver the slide kit precision assembly fully assembled and qualified according to your specifications. Have a specialized application? We guarantee we have a solution.

Scope of delivery

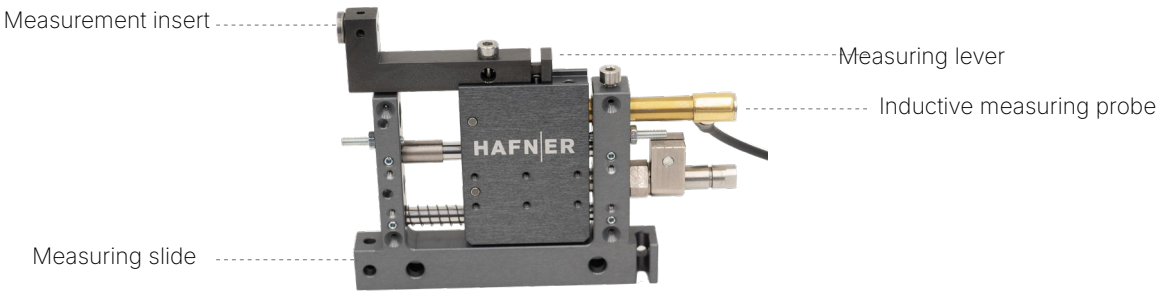
Fully pre-assembled and tested:

- Measuring slide
- Attachment screws for all attachments and fastening components
- Connection nipple and pneumatic hose
- Measuring lever
- Measurement insert
- Measuring probe

Product selection HAFNER slide kit IOQ 100

Versions

To order the complete HAFNER slide kit measuring slide, you can specify the combination of components using the item number selection table. Your HAFNER slide kit measuring slide will be assembled according to your specifications and qualified through a system check.



Step 1 - Select the measuring slide depending on the measurement direction:

- Exterior measurement → measurement direction away from the measuring slide, for instance for exterior diameter
- Interior measurement → measurement direction towards the measuring slide, for instance for interior diameter, interior bore hole

Step 2 - Select the operating principle

- Measure with spring force and pneumatic lift, for instance spring force is often chosen when a defined, constant measuring force is required.
- Measure with cylinder force, spring actuated lift, for instance pneumatic cylinder force if the measuring slide is automated or with vertical operating principle.
- Measure with spring force without lift, for instance for double-sided contacting of a shaft or diameter measurement

Step 3 - Select the probe arm

- Geometry depending on the installation situation of the measuring slide, accessibility of the measurement point and the distance
- Alternatively, the variant for measuring inserts for M2.5 threaded inserts or direct contacting via edge

Example combination:

- Measuring slide with interior measurement, measure with spring force and pneumatic lift, item number 152832.1
- Probe arm with 39 mm length and 0 mm height, item number 162001.2
- Surface measuring insert with 2 mm diameter and 6 mm height and carbide design, item number 1130041 H
- Measuring probe with large measuring range ± 5 mm and axial connection, item number 410010.044

Step 4 - Select the measuring insert based on the workpiece geometry

- Flat: ball probe or flat probe surfaces, for instance length measurements
- Round: Point with ball or conical tip probe geometry
- Internal contours: Probe geometry point for needle or tip geometries
- External contours: Probe geometry sphere, cylinder or line

Step 5 - Select the measuring insert material

- Standard design for soft and sensitive surfaces
- Carbide version for hardened materials

Step 6 - Select the measuring probe

- Measuring range depending on available space, tolerances, and required repeat precision
- Horizontal or vertical cable connection depending on the installation situation

Measuring slide (for details see page. 8 et seq.)

152831.1	Exterior measurement, measure with spring force and pneumatic lift
152833.1	Exterior measurement, measure with cylinder force and lift with spring force
152835.1	Exterior measurement with spring force, without lift
152832.1	Interior measurement, measure with spring force and pneumatic lift
152834.1	Interior measurement, measure with cylinder force and lift with spring force
152836.1	Interior measurement with spring force, without lift

Probe arms (for details, see page. 14 et seq.)

162001.2	L 39 mm / H 0 mm	162031.2	L 45 mm / H 0 mm	162034.2	L 75 mm / H 0 mm
162201.2	L 39 mm / H 15 mm	162131.2	L 45 mm / H 4.5 mm	162134.2	L 75 mm / H 4.5 mm
162301.2	L 39 mm / H 30 mm	162231.2	L 45 mm / H 15 mm	162234.2	L 75 mm / H 15 mm
		162331.2	L 45 mm / H 30 mm	162334.2	L 75 mm / H 30 mm
162002.2	L 49 mm / H 0 mm	162032.2	L 55 mm / H 0 mm	162035.2	L 85 mm / H 0 mm
162202.2	L 49 mm / H 15 mm	162132.2	L 55 mm / H 4.5 mm	162135.2	L 85 mm / H 4.5 mm
162302.2	L 49 mm / H 30 mm	162232.2	L 55 mm / H 15 mm		
		162332.2	L 55 mm / H 30 mm		
162003.2	L 59 mm / H 0 mm	162033.2	L 65 mm / H 0 mm		
162203.2	L 59 mm / H 15 mm	162133.2	L 65 mm / H 4.5 mm		
162303.2	L 59 mm / H 30 mm	162233.2	L 65 mm / H 15 mm		
		162333.2	L 65 mm / H 30 mm		
162004.2	L 69 mm / H 0 mm				
162204.2	L 69 mm / H 15 mm				
162304.2	L 69 mm / H 30 mm				

Probe element (for details see page. 26 et seq.)

Surface		Point		11300556	Ø 6 mm, H = 12 mm
1130030	Ø 4.8 mm, H = 6 mm	1130050	Ø 4.5 mm, H = 6 mm	11300556H	Ø 6 mm, H = 12 mm
1130030H	Ø 4.8 mm, H = 6 mm	1130050H	Ø 4.5 mm, H = 6 mm		
1130031	Ø 4.8 mm, H = 3 mm	1130051	Ø 4.5 mm, H = 3 mm	11305716	Ø 1.5 mm, L = 16 mm
1130031H	Ø 4.8 mm, H = 3 mm	1130052	Ø 4.8 mm, H = 2.5 mm	11305726	Ø 1.5 mm, L = 26 mm
1130032	Ø 10 mm, H = 2 mm	1130052H	Ø 4.8 mm, H = 2.5 mm	11305736	Ø 1.5 mm, L = 36 mm
1130032H	Ø 10 mm, H = 2 mm	1130056	Ø 3.5 mm, H = 16 mm	11305746	Ø 1.5 mm, L = 46 mm
		11300551	Ø 1 mm, H = 12 mm		
Line		11300551H	Ø 1 mm, H = 12 mm	113110004	Ø 2 mm, L = 4 mm
1130040H	Ø 5 mm, H = 3.5 mm	11300552	Ø 2 mm, H = 12 mm	113110008	Ø 2 mm, L = 8 mm
1130041	Ø 2 mm, H = 10 mm	11300552H	Ø 2 mm, H = 12 mm	113110012	Ø 2 mm, L = 12 mm
1130041H	Ø 2 mm, H = 10 mm	11300553	Ø 3 mm, H = 12 mm	113110016	Ø 2 mm, L = 16 mm
1130042	Ø 5 mm, H = 6.5 mm	11300553H	Ø 3 mm, H = 12 mm	113111008	Ø 2 mm, L = 8 mm
		11300554	Ø 4 mm, H = 12 mm	113111012	Ø 2 mm, L = 12 mm
		11300554H	Ø 4 mm, H = 12 mm	113111016	Ø 2 mm, L = 16 mm
		11300555	Ø 5 mm, H = 12 mm	113112008	Ø 2 mm, L = 8 mm
		11300555H	Ø 5 mm, H = 12 mm	113112012	Ø 2 mm, L = 12 mm
				113112016	Ø 2 mm, L = 16 mm

Inductive measuring probe (for details see page. 34 et seq.)

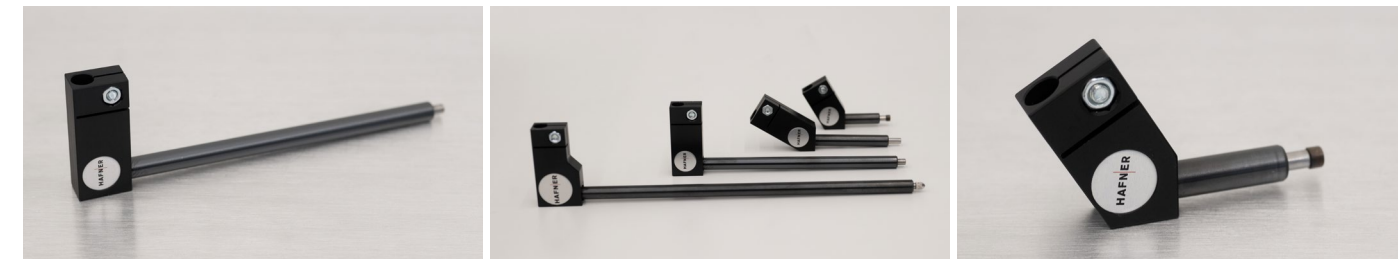
410010.028	Measuring probe with axial cable outlet
410010.029	Measuring probe with radial cable outlet
410010.043	Measuring probe with axial cable outlet
410010.044	Measuring probe with radial cable outlet

Overall designation HAFNER slide kit IOQ 100 - xxx / If you frequently use a specific HAFNER slide, we would also be happy to create a specific, abbreviated item number to quickly filter out this combination from the many available options.



HAFNER angular head kit IOQ 200

Deflector precision kits. For all positions.



Based on our wide range of products, we assemble economical, plug-and-play deflectors technically optimized for your application. We deliver the angular head kit IOQ 200 precision assembly fully assembled and qualified according to your specifications. Have a specialized application? We guarantee we have a solution. It is possible to select the deflector and screw-in shaft item numbers.

Scope of delivery

The HAFNER angular head kit IOQ 2000 is delivered completely pre-assembled and tested, consisting of:

- Deflector
- Screw-in shaft
- Optional: Measuring insert and inductive measuring probe

Product overview

- High-precision deflectors, the solid mechanical basis for flexible use in difficult installation situations from 0° to 90° deflection
- Smart screw-in shaft system with flat design or modular for different measuring inserts, flexible contact pressure or lift force

Function

The movable probe rod integrated in the screw-in shaft is applied to the workpiece. A movement of the probe rod (4 or 10 mm stroke) is transferred to the measurement transducer in the deflection head via a deflection element. When ordering, please ensure that the deflection or extension head and screw-in shaft have the same stroke (4 or 10 mm).

Product selection HAFNER angular head kit IOQ 200

Versions

To order the complete deflector angular kit, you can specify the combination of components using the item number selection table. Your angular head deflector will be assembled according to your specifications and qualified through a system check.



Step 1 - Select the angular head

- Installation situation depending on the effective direction (extend or deflect by xx°)
- Select stroke and insertion depth depending on the measuring task

Step 2 - Select the screw-in shaft

- Shaft length depending on the distance to the measurement point, version with thread or flat depending on the selected measuring probe
- With reinforcing spring force D to increase the measuring force or Z for the lift force via tension, depending on the measuring task
- Option to select a boot in case of contamination risk

Example combination:

- Measuring slide with interior measurement, measure with spring force and pneumatic lift, item number 152832.1
- Screw-in shaft, stroke 4 mm with M2.5 thread version with length 125, item number 1127G125
- Surface measuring insert with 5 mm diameter and 6 mm height and carbide design, item number 1130042
- Measuring probe with large measuring range ± 5 mm and axial connection, item number 410010.044

Step 3 - Select the measuring insert based on the workpiece geometry

- Flat: ball probe or flat probe surfaces, for instance length measurements
- Round: Point with ball or conical tip probe geometry
- Internal contours: Probe geometry point for needle or tip geometries
- External contours: Probe geometry sphere, cylinder or line

Step 4 - Select the measuring insert material

- Standard design for soft and sensitive surfaces
- Carbide version for hardened materials

Screw-in shaft (for details see page. 23 et seq.)

Type	Version	Shaft length L
1127 Screw-in shafts stroke 4 mm	G Thread M2.5	015 15 mm
1128 Screw-in shafts stroke 10 mm	P flat	025 25 mm
		050 50 mm
	Other versions	075 75 mm
	D Pressure	100 100 mm
	Z Tension	125 125 mm
	F Boot	150 150 mm
	(Individually or as an addition to D or Z)	175 175 mm
		200 200 mm

Deflector (for details, see page. 18 et seq.)

Type	Deflection angle	Version	Shaft length L
1123 Deflection heads stroke 4 mm, Insertion depth 33 mm to middle stroke (long version)	01 0°	G Thread M2.5	015 15 mm
	02 30°	P flat pin Ø 4 mm	025 25 mm
	03 45°		050 50 mm
1124 Deflection heads stroke 4 mm, Insertion depth 23 mm to middle stroke (short version)	04 60°	Other versions	075 75 mm
	05 90°	F Boot	100 100 mm
		D Pressure	125 125 mm
1125 Deflection heads stroke 10 mm, Insertion depth 33 mm to middle stroke		Z Tension	150 150 mm
			175 175 mm
			200 200 mm

Probe element (for details see page. 26 et seq.)

Surface	Point		
1130030 Ø 4.8 mm, H = 6 mm	1130050 Ø 4.5 mm, H = 6 mm	11300556 Ø 6 mm, H = 12 mm	
1130030H Ø 4.8 mm, H = 6 mm	1130050H Ø 4.5 mm, H = 6 mm	11300556H Ø 6 mm, H = 12 mm	
1130031 Ø 4.8 mm, H = 3 mm	1130051 Ø 4.5 mm, H = 3 mm	11305716 Ø 1.5 mm, L = 16 mm	
1130031H Ø 4.8 mm, H = 3 mm	1130052 Ø 4.8 mm, H = 2.5 mm	11305726 Ø 1.5 mm, L = 26 mm	
1130032 Ø 10 mm, H = 2 mm	1130052H Ø 4.8 mm, H = 2.5 mm	11305736 Ø 1.5 mm, L = 36 mm	
1130032H Ø 10 mm, H = 2 mm	1130056 Ø 3.5 mm, H = 16 mm	11305746 Ø 1.5 mm, L = 46 mm	
	11300551 Ø 1 mm, H = 12 mm		
	11300551H Ø 1 mm, H = 12 mm	113110004 Ø 2 mm, L = 4 mm	
1130040H Ø 5 mm, H = 3.5 mm	11300552 Ø 2 mm, H = 12 mm	113110008 Ø 2 mm, L = 8 mm	
1130041 Ø 2 mm, H = 10 mm	11300552H Ø 2 mm, H = 12 mm	113110012 Ø 2 mm, L = 12 mm	
1130041H Ø 2 mm, H = 10 mm	11300553 Ø 3 mm, H = 12 mm	113110016 Ø 2 mm, L = 16 mm	
1130042 Ø 5 mm, H = 6.5 mm	11300553H Ø 3 mm, H = 12 mm	113111008 Ø 2 mm, L = 8 mm	
	11300554 Ø 4 mm, H = 12 mm	113111012 Ø 2 mm, L = 12 mm	
	11300554H Ø 4 mm, H = 12 mm	113111016 Ø 2 mm, L = 16 mm	
	11300555 Ø 5 mm, H = 12 mm	113112008 Ø 2 mm, L = 8 mm	
	11300555H Ø 5 mm, H = 12 mm	113112012 Ø 2 mm, L = 12 mm	
		113112016 Ø 2 mm, L = 16 mm	

Inductive measuring probe (for details see page. 34 et seq.)

410010.028	Measuring probe with axial cable outlet
410010.029	Measuring probe with radial cable outlet
410010.043	Measuring probe with axial cable outlet
410010.044	Measuring probe with radial cable outlet

Overall designation HAFNER angular head kit IOQ 200 - xxx / If you frequently use a specific HAFNER angular head, we would also be happy to create a specific, abbreviated item number to quickly filter out this combination from the many available options.



HAFNER multi head kit IOQ 300

One measurement point. Many options:



Discover our customized plug-and-play 2 or 3-way measurement heads, perfectly tailored to your unique requirements.

We deliver the multi head kit IOQ 300 fully assembled and qualified according to your specifications. Have a specialized application? We guarantee we have the right solution.

Product overview

- High-precision 2- or 3-way measurement heads, the solid mechanical basis for flexible use in multiple displays or evaluating measurement points
- Modular screw-in shaft system, with flat design or modular for different measuring inserts, flexible contact pressure or lift force
- High-precision inductive measuring probes

Function

The movable probe rod integrated in the screw-in shaft is applied to the workpiece. A movement of the probe rod (4 or 10 mm stroke) is transferred to the measured value display or measurement transducer via a high-precision multifunctional deflection element in the deflection head.

Achieve your goals:

- Specify target / measurement task
- Select individual items for measuring head, screw-in shaft, measuring insert, dial gauge and inductive measuring probe

Scope of delivery

The HAFNER multi head kit IOQ 300 is delivered completely pre-assembled and tested, consisting of:

- 2- or 3-way measurement head
- Screw-in shaft
- Optional measuring insert
- Optional dial gauge or inductive measuring probe

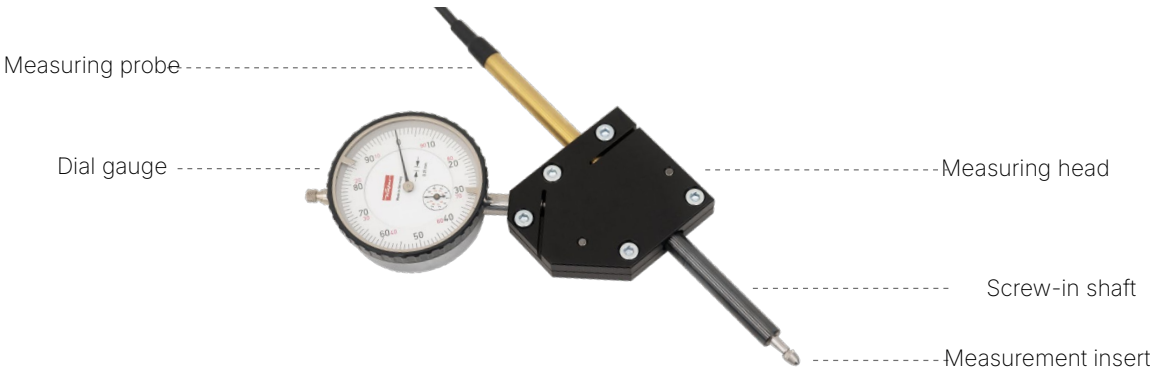
Example applications

- Measuring computer and dial gauge combined display
- Double measuring probe for multiple assessments of one measurement point
- Digital retrofitting
- Automatic workpiece detection
- Expand the measuring range

Product selection HAFNER multi head kit IOQ 300

Versions

To order the complete dial gauge multi head kit, you can specify the combination of components using the item number selection table. Your multi head kit dial gauges will be assembled according to your specifications and qualified through a system check.



Step 1 - Select multi-way measuring head

- Alternatively with 2 or 3 measured value displays or transmissions
- Select stroke and insertion depth depending on the measuring task

Step 2 - Select the screw-in shaft

- Shaft length depending on the distance to the measurement point
- Version with thread or flat depending on the selected measuring insert
- With reinforcing spring force D to increase the measuring force or Z for the lift force via tension, depending on the measuring task
- Option to select a boot in case of contamination risk

Step 3 - Select the measuring insert based on the workpiece geometry

- Flat: ball probe or flat probe surfaces, for instance length measurements
- Round: Point with ball or conical tip probe geometry
- Internal contours: Probe geometry point for needle or tip geometries
- External contours: Probe geometry sphere, cylinder or line

Step 4 - Select the measuring insert material

- Standard design for soft and sensitive Surfaces
- Carbide version for hardened materials

Step 5 - Select the measuring probe or displays

- Measuring range depending on available space, tolerances, and required repeat precision
- Horizontal or vertical cable connection depending on the installation situation
- Select the dial gauge

Example combination:

- Measuring head with 2 dial gauge clamp holders, 4 mm stroke with 32 mm insertion depth middle stroke, item number 113201
- Screw-in shaft, stroke 4 mm with M2.5 thread version with length 125, item number 1127G125
- Surface measuring insert with 2 mm diameter, 6 mm height and carbide design, item number 1130041 H
- Measuring probe with large measuring range ± 5 mm and axial connection, item number 410010.044
- Dial gauge

Measuring head (for details, see page. 22 et seq.)

113201	2-way measuring head, 4 mm stroke
113202	2-way measuring head, 10 mm stroke
113301	3-way measuring head, 4 mm stroke
113302	3-way measuring head, 10 mm stroke

Screw-in shaft (for details see page. 23 et seq.)

Type	Version	Shaft length L
1127	Screw-in shafts stroke 4 mm	G Thread M2.5
1128	Screw-in shafts stroke 10 mm	P flat
Other versions		
D	Pressure	015 15 mm
Z	Tension	025 25 mm
F	Boot	050 50 mm
	(Individually or as an addition to D or Z)	075 75 mm
		100 100 mm
		125 125 mm
		150 150 mm
		175 175 mm
		200 200 mm

Probe element (for details see page. 26 et seq.)

Surface		Point		11300556	Ø 6 mm, H = 12 mm
1130030	Ø 4.8 mm, H = 6 mm	1130050	Ø 4.5 mm, H = 6 mm	11300556H	Ø 6 mm, H = 12 mm
1130030H	Ø 4.8 mm, H = 6 mm	1130050H	Ø 4.5 mm, H = 6 mm		
1130031	Ø 4.8 mm, H = 3 mm	1130051	Ø 4.5 mm, H = 3 mm	11305716	Ø 1.5 mm, L = 16 mm
1130031H	Ø 4.8 mm, H = 3 mm	1130052	Ø 4.8 mm, H = 2.5 mm	11305726	Ø 1.5 mm, L = 26 mm
1130032	Ø 10 mm, H = 2 mm	1130052H	Ø 4.8 mm, H = 2.5 mm	11305736	Ø 1.5 mm, L = 36 mm
1130032H	Ø 10 mm, H = 2 mm	1130056	Ø 3.5 mm, H = 16 mm	11305746	Ø 1.5 mm, L = 46 mm
Line		11300551	Ø 1 mm, H = 12 mm		
1130040H	Ø 5 mm, H = 3.5 mm	11300551H	Ø 1 mm, H = 12 mm	113110004	Ø 2 mm, L = 4 mm
1130041	Ø 2 mm, H = 10 mm	11300552	Ø 2 mm, H = 12 mm	113110008	Ø 2 mm, L = 8 mm
1130041H	Ø 2 mm, H = 10 mm	11300552H	Ø 2 mm, H = 12 mm	113110012	Ø 2 mm, L = 12 mm
1130042	Ø 5 mm, H = 6.5 mm	11300553	Ø 3 mm, H = 12 mm	113110016	Ø 2 mm, L = 16 mm
		11300553H	Ø 3 mm, H = 12 mm	113111008	Ø 2 mm, L = 8 mm
		11300554	Ø 4 mm, H = 12 mm	113111012	Ø 2 mm, L = 12 mm
		11300554H	Ø 4 mm, H = 12 mm	113111016	Ø 2 mm, L = 16 mm
		11300555	Ø 5 mm, H = 12 mm	113112008	Ø 2 mm, L = 8 mm
		11300555H	Ø 5 mm, H = 12 mm	113112012	Ø 2 mm, L = 12 mm
				113112016	Ø 2 mm, L = 16 mm

Inductive measuring probe (for details see page. 34 et seq.)

410010.028	Measuring probe with axial cable outlet
410010.029	Measuring probe with radial cable outlet
410010.043	Measuring probe with axial cable outlet
410010.044	Measuring probe with radial cable outlet

Overall designation HAFNER multi head kit IOQ 300 - xxx / If you frequently use a specific HAFNER multi head, we would also be happy to create a specific, abbreviated item number to quickly filter out this combination from the many available options.

Measuring computer and dial gauge combined display

A measuring device is connected to a measuring computer and equipped with inductive probes. Dial gauges should also be used to read out values. Now, you can set a dial gauge and inductive probe on one measurement point. This is an advantage in particular in dynamic measurements. Run-out measurements are displayed as minimum and/or maximum on the computer. Now, the 2-way measurement head can be used to monitor the measurement process over the entire rotation. In addition, measurements can be continued even in case of a power outage or computer fault.

Double measuring probe

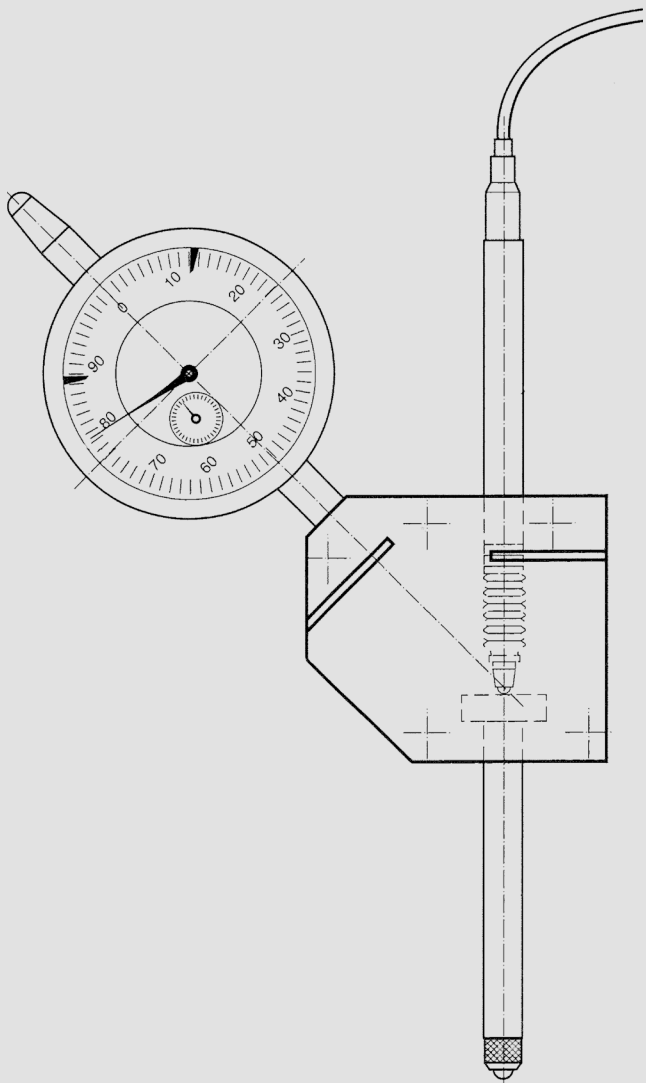
One measurement signal is required on 2 gauging cylinders that cannot be electronically linked. In this case, it is possible to precisely contact one measurement point with 2 inductive probes, without electrically connecting the probes.

Retrofitting

An older measuring device with a dial gauge needs to be retrofitted with electronic evaluation. With the 2-way measurement head, the worker can read their dial gauges as usual. Further analysis can be completed, for instance, in a monitoring room with a screen.

Automatic workpiece detection

One measuring device is used for multiple workpiece types that differ in one contact point. A proximity switch (proximity initiator) can now be inserted in the second Ø8 mm clamp holder, which for instance activates the associated measurement program in the computer.



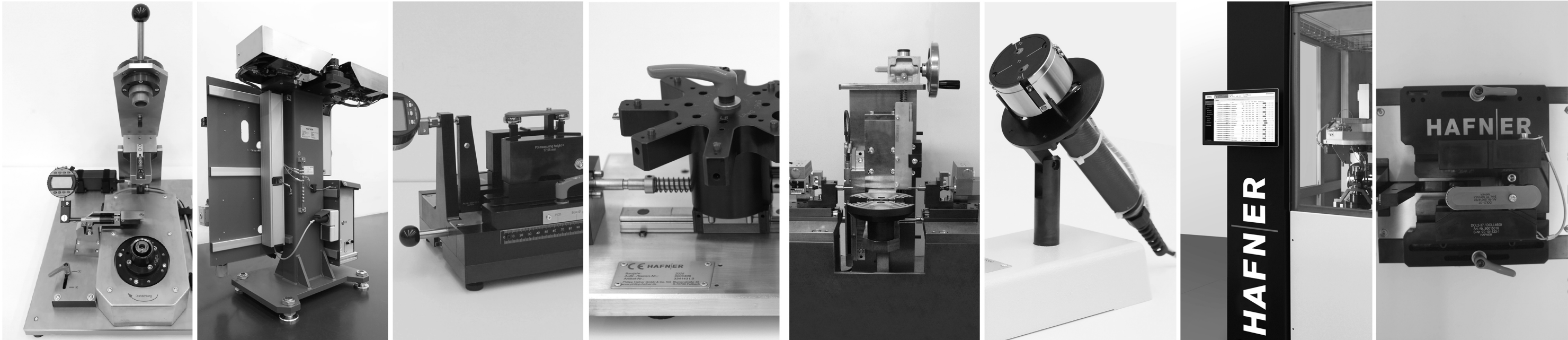
Drawings not to scale

Expanding the measuring range

In case of very large measuring ranges, or if different workpiece types need to be measured in one measuring device, this may often exceed the measuring range of an inductive probe. The 3-way measurement head offers the option of activating another program in the measuring computer depending on which encoder is pressed, and thereby expanding the measurement range.

Additional information

Information on the boot designs is available upon request. This series is suitable for dial gauges and inductive probes with a common shaft diameter of 8 mm. The measurement heads are inserted when a measuring result or measuring signal is required 2 or 3 times.



We offer flexible, multifunctional precision systems for specific tasks in production-related quality assurance.

HAFNER vario system IOQ 10	54
HAFNER gear system IOQ 20	58
HAFNER gear system IOQ 20+	60
HAFNER gear system IOQ 25	62
HAFNER uni system IOQ 30	64
HAFNER axial system IOQ 40	66
Visualization and evaluation with PHIL [®] measuring software	68

Precision system	Measuring characteristics		Workpieces
HAFNER vario system IOQ 10		Interior and exterior diameter	Rotationally symmetrical parts, kingpin, joint, hub, rings, stator housing
HAFNER gear system IOQ 20	 	Interior and exterior gearing	Gears
HAFNER gear system IOQ 20+	 	Interior and exterior gearing	Gears
HAFNER gear system IOQ 25		Double sphere dimension Tip circle / root circle	Gears
HAFNER uni system IOQ 30		Diameter	Shafts, other axially symmetrical workpieces or workpieces that can be centered
HAFNER axial system IOQ 40		Axial run-outs	Disc carriers, driving plates



HAFNER vario system IOQ 10

Robust universal measuring device for exterior and interior measurements



HAFNER vario system IOQ 10, the perfect measuring device for quick and precise control measurements in production. It stands out thanks to its simple operation and excellent flexibility, and can be converted to different workpieces in just minutes.

Product features

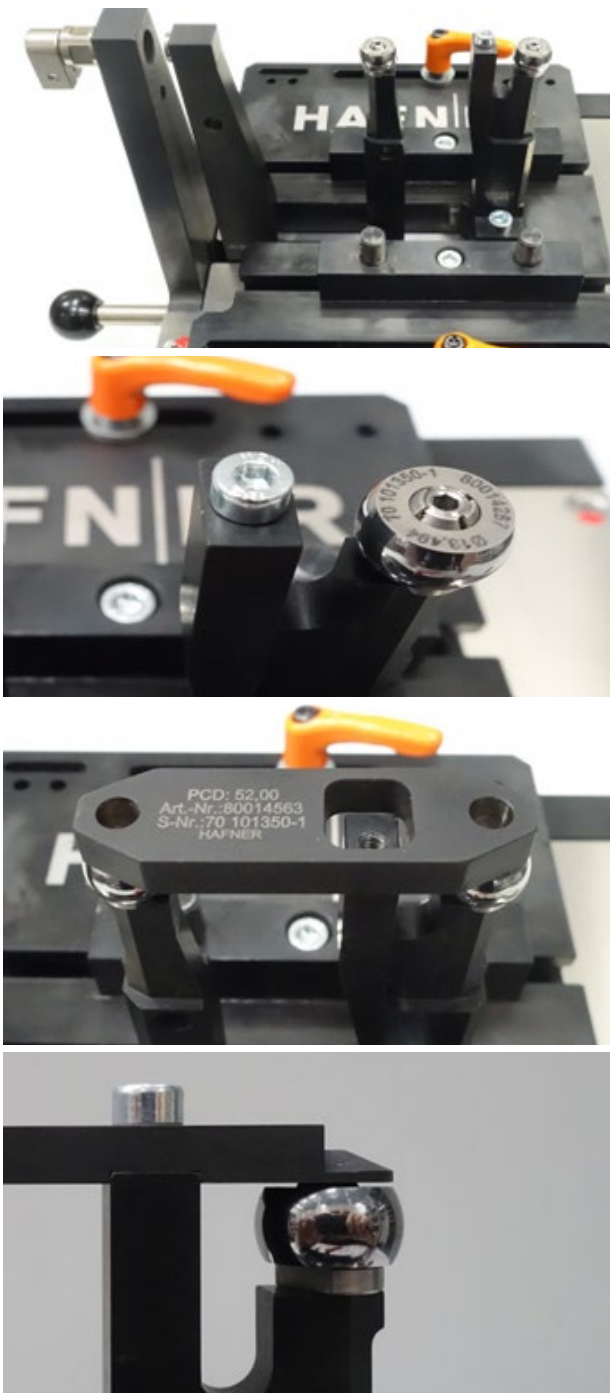
- In general, reproducibility is 0.1 - 0.5 μm depending on the specific device and workpiece, and in some cases 1.0 μm
- Robust equipment made of nitriding steel for durability and resistance in the production environment
- Little to no maintenance required thanks to a simple design and a solid and robust construction
- Easy to learn operation for less experienced users
- Flexible for measuring a wide range of measurement characteristics

Scope of delivery HAFNER vario system IOQ 10

- Base device with integrated high-end measuring slides
- Flexible clamping concept for workpiece-specific positioning
- Protected carbide elements
- Easy-fit exchangeable parts for quick conversion

Optional accessories

- Additional Easy-fit exchangeable sets for a wide range of workpieces
- Modular selections for measurement data display from the dial gauge (analog or digital) to measurement data recording and evaluation via HAFNER measuring computer with PHIL®



Wide range of workpieces

HAFNER vario system is suitable for an extremely wide range of workpiece dimensions. That means one device can be used for multiple production series executed either in parallel or sequentially, with randomized measurement samples.

Measurement area		Min	Max
PCD	mm	40	95
Cage track diameter	mm	60	120
Height to middle of measuring spheres	mm	5	30
Measuring sphere diameter	mm	15	24

The highest precision

Measurement area		Min	Max
Reproducibility	µm	0.1	0.5

Diverse applications

For use with a wide range of workpieces:

- Kingpins
- Cylinder liners
- Hinge blocks
- Stator housings
- Hubs
- Bushings
- Rings

Easily adjust the HAFNER vario system to your workpieces. This allows you to cover a range of workpieces with different dimensions with just one device.

Compact and robust

HAFNER vario system is the perfect device for precise measurements of workpieces with narrow tolerances in production, allowing workers to conduct self-checks.

Dimensions		
Base plate width	mm	240
Overall width	mm	385
Depth	mm	210
Height	mm	190
Weight	kg	30

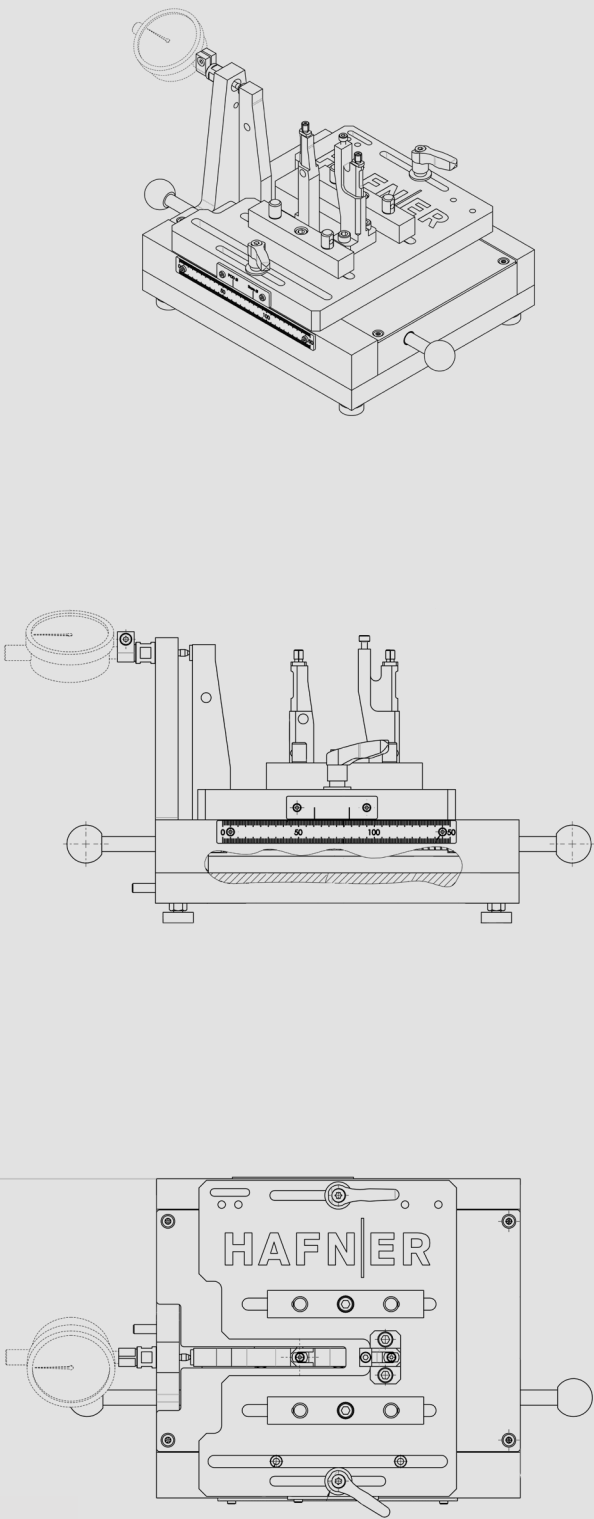
Highlight

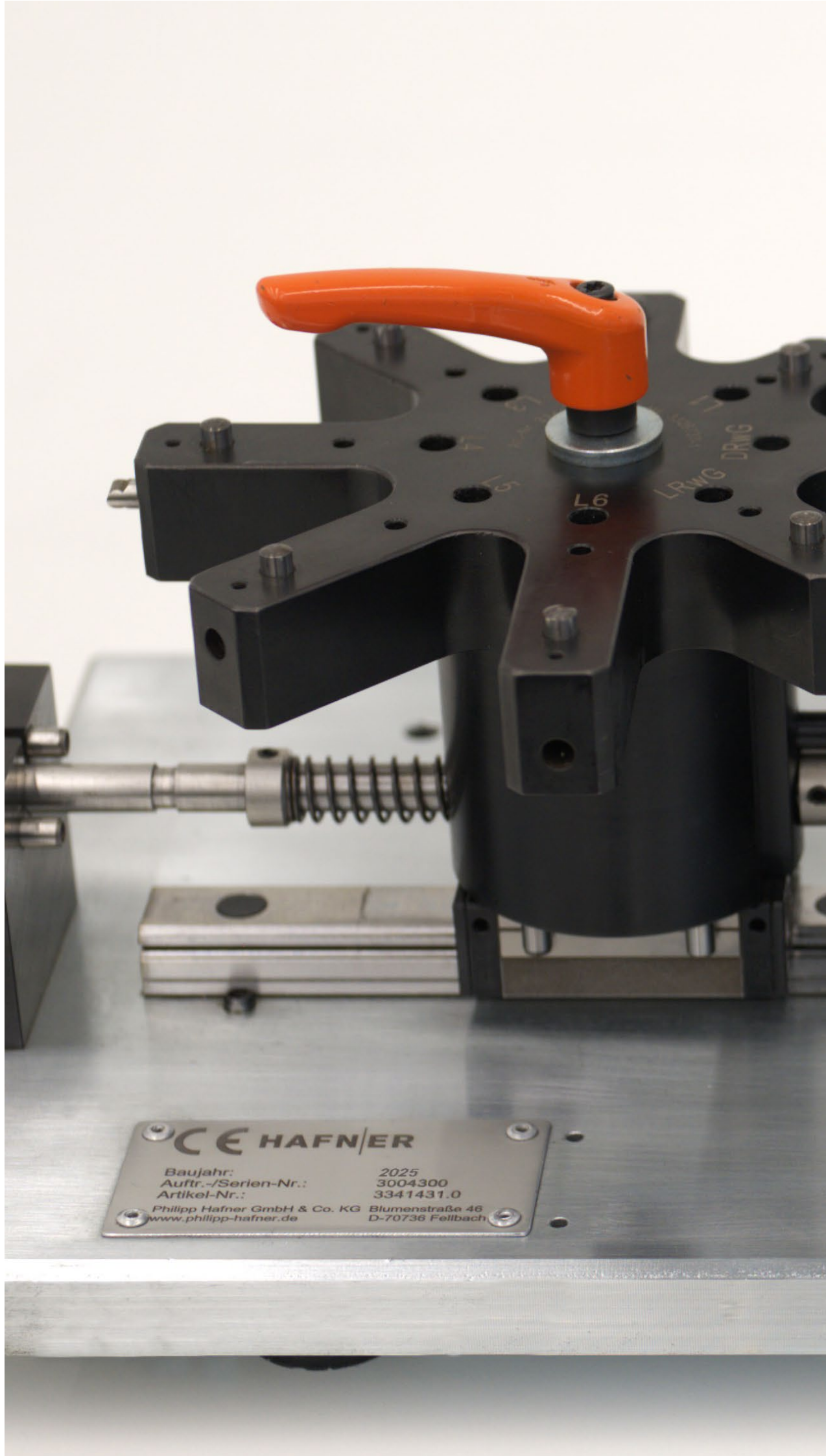
A HAFNER High-end measuring slide is used here, the most precise measuring slide HAFNER offers. Extremely robust and with a wide range of applications, for millions of reproducible measurements.

Measurement technology expansion options

Different requirements for measurement data display, recording, and evaluation can be implemented:

- Analog dial gauge
- Digital dial gauge
- Measuring probe to transmit data for adjustment, HAFNER measuring computer with HAFNER measuring software PHIL®





HAFNER gear system IOQ 20

For interior and exterior gearing



HAFNER gear system IOQ 20, the perfect measuring device for measuring gears (straight, angled gearing) with measured data recording via inductive measuring probe. Evaluation via HAFNER measuring computer. The measurement device consists of one fixed and one movable measuring plate, as well as a workpiece support with initial stop. The workpiece is aligned using the movable measuring plate. The measuring plate consists of up to 8 probe arms. Spheres or rollers are used as the measuring insert. The diametric double sphere dimension is determined; an additional measuring insert can be used to measure the concentricity of the exterior gearing to the bore hole wall of the center bore hole.

Further information

- Capability variables: The scatter is <1 µm with up to 20 repeat measurements
- Workpiece feed: workpieces are inserted manually
- Required connections: power supply for HAFNER measuring computer: 230V AC

Wide range of applications

In addition to the flexibility of the individual measuring plates, any number of different workpieces can be measured by converting to another measuring plate equipped with workpiece-specific probe arms and measuring inserts. This allows the device to be used for a wide range of different gears.

Workpiece data	
Max. interior diameter*	65 mm
Max. Ø double sphere dimension*	148 mm
Cycle time	
Measurement double sphere dimension	< 10 s
Measurement double sphere dimension + concentricity (measurement at 3 points)	< 30 s
Conversion time	< 5 Min

* longer upon request

Conversion

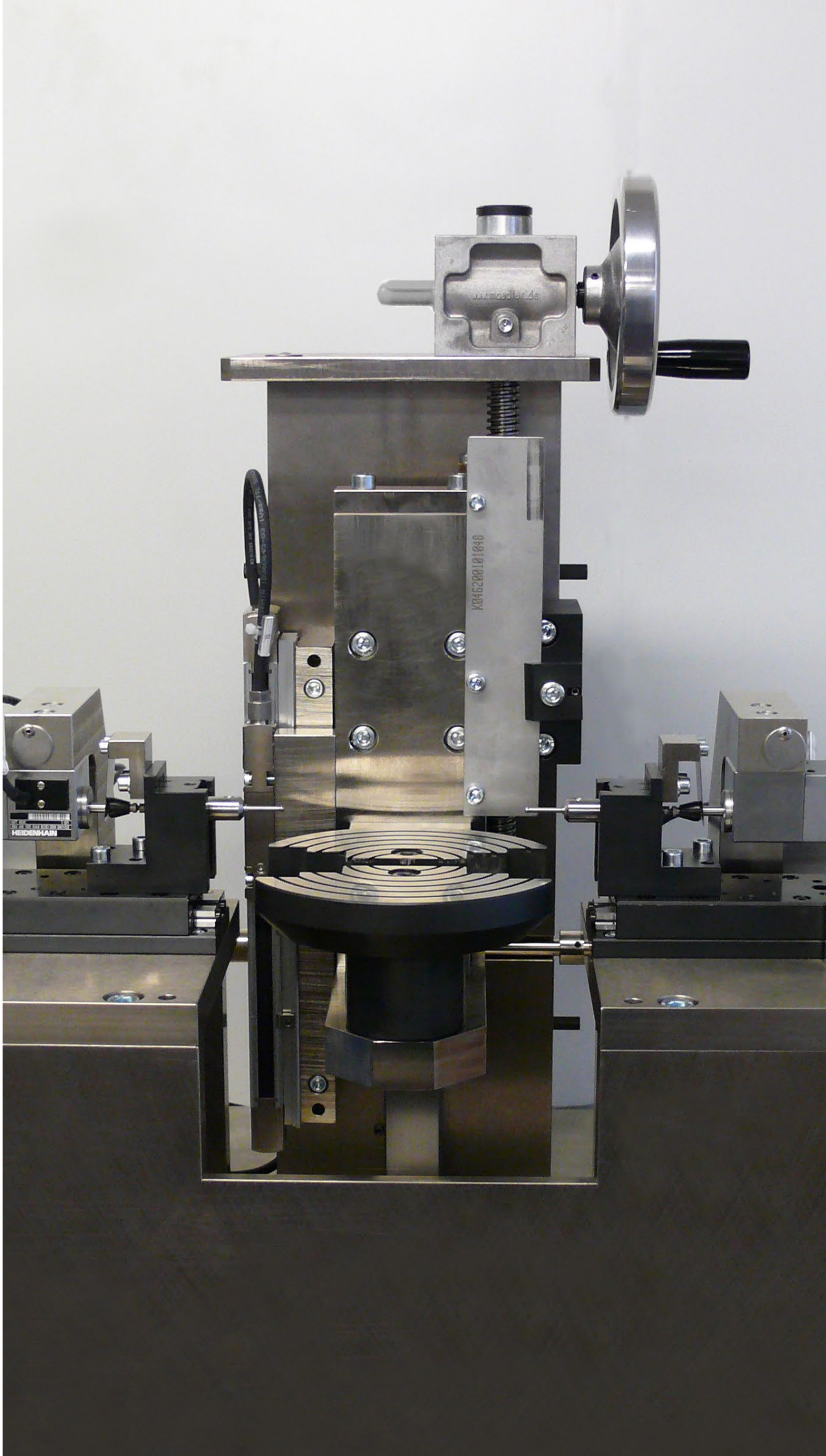
Simple conversion for each measuring plate is possible with up to 8 different probe arms, with no probe setting required.

Dimensions

Length	550 mm
Width	250 mm
Height	200 mm
Weight	45 kg

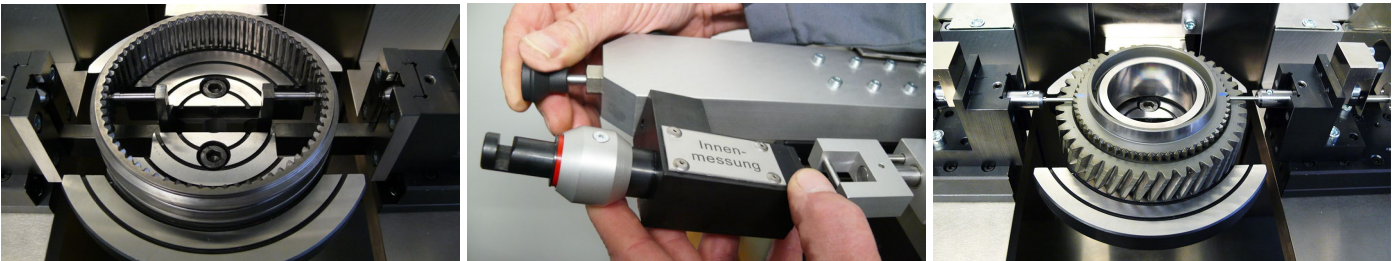
Accessories

- Workpiece-specific probe arms and measuring inserts
- Setting master or measured workpiece



HAFNER gear system IOQ 20+

For interior and exterior gearing



HAFNER gear system IOQ 20+, the perfect measuring device for measuring gears with internal or external gearing (straight, angled gearing). Measurement data is recorded via a digital long stroke measuring probe. A measuring computer / display device is used for analysis. The height and diameter of the measuring device can be adjusted via handwheels. The operator manually places the workpiece on the workpiece support plate of the measuring device. The workpiece is aligned visually using orientation rings.

Conversion

Depending on the workpiece / gearing type, the measuring device may need to be converted, the sphere holder may need to be exchanged (for exterior measurement), or the comb (for interior measurements) and sphere measuring inserts may need to be exchanged. It is not necessary to adjust the measuring probe.

Workpiece data	
Exterior diameter	160 mm
Interior diameter	
min.	20 mm
max.	120 mm
Max. height adjustment	150 mm
Conversion time	< 2 min

Dimensions

Length	600 mm
Width	900 mm
Height	600 mm
Weight	around 200 kg

Further information

- Cycle time: double sphere dimension measurement ≤ 10 s
- Capability variables: The scatter is $<1.0 \mu\text{m}$ with up to 20 repeat measurements
- Workpiece feed: workpieces are inserted manually
- Conversion time: approx. 2 min.
- Required connections: Power supply for measuring computer: 230 V AC (as needed), special voltages upon request

Accessories

- Workpiece-specific probe arms and measuring inserts
- Setting master or measured workpiece



HAFNER gear system IOQ 25

Measurement double sphere dimension, tip circle, root circle for internal gearing



The configuration dimensions of the measuring device are adjusted to the specific workpiece geometry, so as to ensure it can measure the workpiece.

In addition to static measurement of the diametric double sphere dimension, the measuring device can also be used for static measurement of the tip circle diameter. Root circle measurement is also available as an option.

The measuring device is designed as a plug gauge, and consists of a stable device holder and tripod, workpiece-specific sphere inserts, depth stop and robust precision measuring probes. Also available without tripod, this version is manually guided. Setting ring can be delivered as an option.

Precise, flexible and robust

- The robust design allows for use for SPC measurement in production
- The diametric double sphere dimension and root circle can be measured without conversion or at the same time
- Measuring data display from the dial gauge (analog or digital) to measured data recording and evaluation via HAFNER measuring computer with HAFNER measuring computer PHIL®
- Versions are available as a hard plug gauge, with tripod or balancer depending on the usage requirements

Options

- Alternatively available with stable device holder and tripod or a balancer
- Carbide version
- Adjustment ring

Wide range of applications

The device is designed according to the workpiece-specific parameters for the diametric double sphere dimension MdK min / MdK max as well as the tip circle diameter dk. Optional static measurement of root circle.

Workpiece data	Example workpiece mm	Workpiece range mm	
		From	To
Diametric double sphere dimension between	75.6	30	140
MdK min	+0.030	-	-
Mdk max	-0.030	-	-
Measuring sphere diameter	4.5	2	6
Measurement plane	15.0	5	40
Tip circle diameter	80	-	-
Tolerance	+0.020	-	-
	-0.020	-	-



HAFNER uni system IOQ 30

Process-integrated automatic diameter measurement



HAFNER uni system IOQ 30, the perfect measuring device for high-precision, fully-automated, process-integrated diameter measurement - either as a post-process or SPC measurement. It is suitable for workpieces that are axially symmetrical or can be centered. Measuring results can be processed directly in the processing machine, via a HAFNER measuring computer with HAFNER measuring software PHIL®.

The measuring device consists of a measuring slide and incremental systems. Optionally, the workpiece can be positioned depending on the task and inserted automatically or manually into the workpiece mount of the measuring device. The measuring probe is applied to the workpiece, so the measurement is started automatically.

Measurements

- Conversion via any number of different mounts
- Evaluation in customer-supplied control architecture, alternatively evaluation via in-house HAFNER measuring computer with HAFNER measuring software PHIL®
- Cable outlet optionally on left or right side
- Optionally equipped with protective cover / rugged environmental conditions
- Wall attachment via threaded bolt or base frame (see image)

Capability variables

In the base version, the Ø tolerance is 11 µm. In the HG version, the Ø tolerance is 6 µm.

Dimensions

Length	800 mm
Width	400 mm
Height (with base frame)	1200 mm



HAFNER axial system IOQ 40

Quick. Motorized. Flexible.



HAFNER axial system IOQ 40, the perfect measuring device for measuring the axial run-outs of disc-shaped workpieces (disc carriers, driving plates). Measuring data display from the dial gauge (analog or digital) to measured data recording and evaluation via HAFNER measuring computer with HAFNER measuring computer PHIL®.

The measuring device consists of a workpiece mount with integrated motor and start-stop controller, workpiece fixation via manual swivel arm, measuring technology equipment with measuring probe and measured value transmission, as well as optional display or evaluation.

Axial run-out is determined by the probe element, which is installed in a protected manner to avoid damage.

Capability variable

Axial run-out is determined with a tolerance of 0.25 µm. The base is formed via a 3-point support in the axial direction.

Measurement duration

Manual loading and fixation of workpieces takes approx. 5 seconds. The actual measurement for a complete, motorized 360° measurement cycle takes a max. of 10 seconds. After the measurement is completed, all elements are moved to home position for subsequent manual removal.

Flexible

Adjustment to the workpiece-specific diameter can be carried out as a fixed value; alternatively, adjustment to different diameters is possible with the same type of workpiece mount.

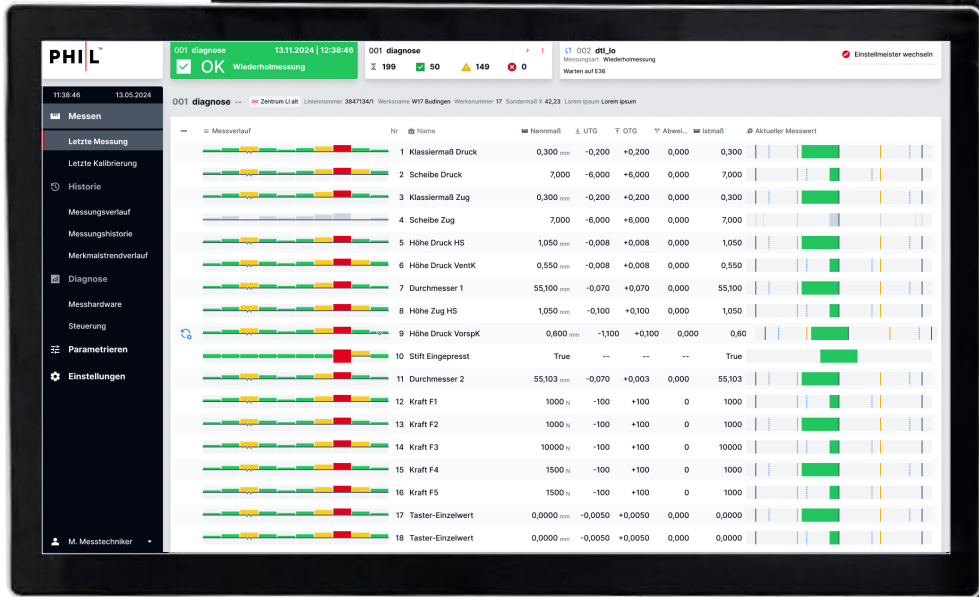
Workpiece applications

The HAFNER axial system IOQ 40 is suitable for a wide range of disc-shaped workpieces:

- Disc carriers
- Driving plates

Dimensions

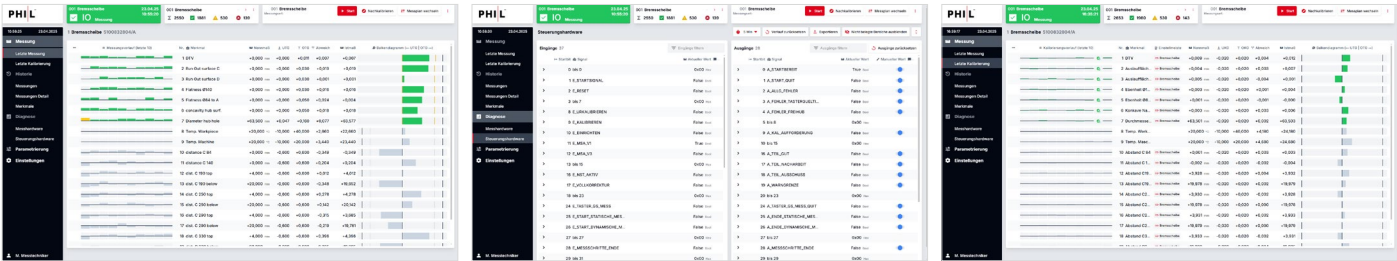
Length	450 mm
Width	450 mm
Depth	280 mm



HAFNER

Visualization and evaluation

Simple or complex. The right option for every application.



The product range can be used to select anything from simple and cost-effective displays to real-time data recording and evaluation for visualizing and evaluating measurement data of precision components and precision kits, including archiving for statistical process controlling, which is also used in the High-end measurement technology.

Dial gauges

Precision for every measurement - our analog and digital dial gauges offer the simplest, most direct display option. High-quality processing, combined with state-of-the-art technology. Ideal for processional applications where precision counts.

HAFNER Pad with PHIL® measuring software

The HAFNER Pad offers the simplest, most direct option for evaluating measured data from precision systems. With state-of-the-art technology and intuitive operation, it delivers precise and reliable measurements in any situation. Perfect for mobile use and rapid results.

The measuring software is pre-installed in combination with one of the precision systems for the workpieces defined in the order.

HAFNER measuring computer with PHIL® measuring software

The HAFNER measuring computer offers the highest precision and reliability for displaying measured values. A robust design and powerful technology makes it ideal for challenging industrial applications. Rely on precise measurements and durable stability

The PHIL® measuring software is pre-installed in combination with one of the precision systems for the workpieces defined in the order.



We design and manufacture customer-specific, durable and precise solutions in production measurement technology. These range from simple manual measuring stations to fully-automated measuring machines for individual workpieces, work-piece families, or complex systems. Our machines are optimally aligned to our customers' profile of requirements. They are equipped with state-of-the-art HAFNER measuring software.

Specialized measuring machines

- Core competence: tactile or non-contact measuring technology for these workpiece groups
- Additional functions like labeling, crack testing, sorting, layer thickness measurement, checking grinding patterns, wear marking (laser) and surface detection for cavities and imperfections

Other focal areas

- Optical and pneumatic measuring technology
- Assembly measuring technology / functional testing
- Classification for gear, axis and steering assemblies

The most state-of-the-art measuring software on the market **PHIL**

- Developed by measuring machine experts
- Based on web technologies
- Future-proof thanks to the use of modern standards
- Open for all common communication protocols and interfaces
- Intuitive operation
- Continuous live display of your measurement data
- Live-tracking of measurement and control hardware

Standardized measurement components

- Precision components
- Precision kits
- Precision systems

Our range of services

- Consulting and planning support for new investments and updates
- Training and commissioning
- Start-up support
- Maintenance and service

Axis and steering parts

- Steering box
- Steering nut
- Steering pinion
- Wheel flange
- Wheel carrier
- Strut
- Rack

Gear parts

- Axle housing
- Bevel drive gear
- Differential housing
- CVT gear parts
- Gearbox housing
- Shift fork
- Switching groups
- Sliding collar
- Synchronizer ring
- Shaft
- Gears

Brake disc

- Brake disc
- Brake disc chamber
- Brake drum
- Hard-coated brake disc

Constant velocity joint

- Joint housing
- Ball cage
- Ball hub

Wheels / rims

- Aluminum rim
- Rim ring
- Wheel disc
- Steel wheel

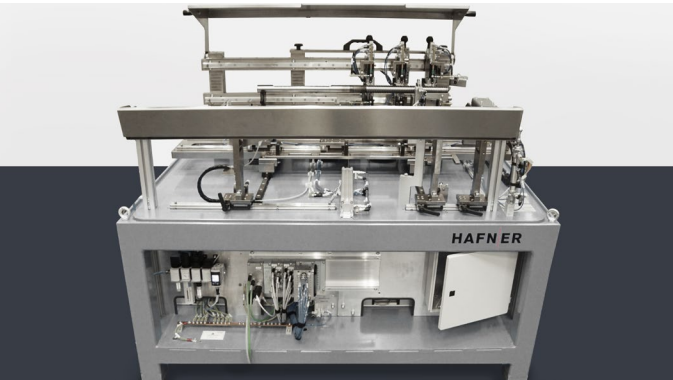
E-mobility

- Differential housing
- Bevel gear
- Rotor shaft
- Stator housings
- Gears

Motor and motor add-on components

- Piston
- Bearing housing (turbo)
- Camshaft
- Connecting rod
- Turbine casing
- Compressor wheel
- Cylinder crankcase

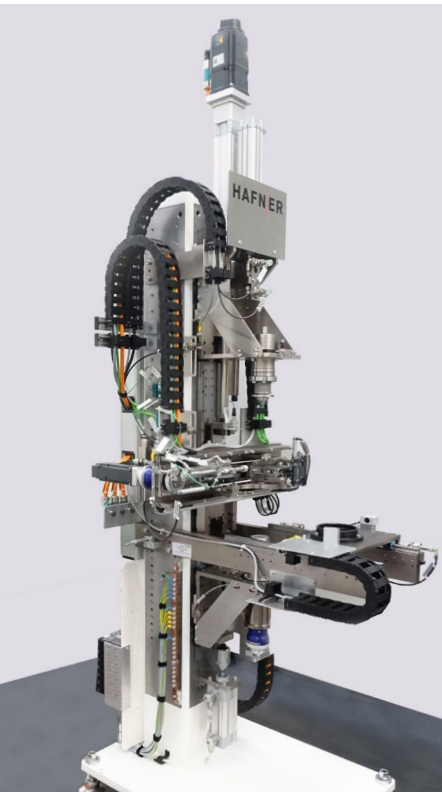
Specialized measuring machines



The post-process measuring machine for racks conducts tactile and dynamic measurements of the diameter of the ball screw track and thread pitch.



The measuring device for kingpins conducts tactile and static diameter measurements (double sphere dimension, pitch circle, gearing) and angle divisions.



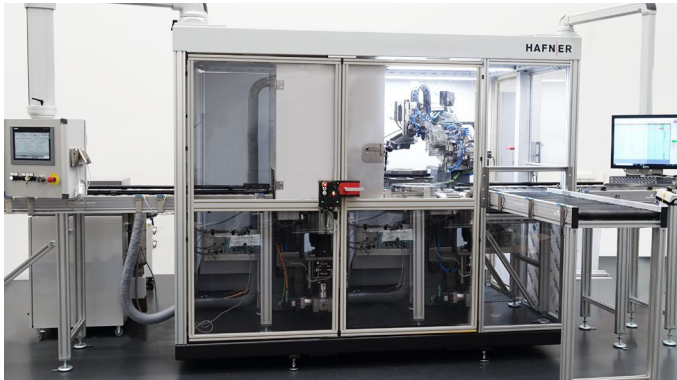
Vertical ShaftControl offers high flexibility for precisely checking all rotationally symmetrical workpieces. It is available in different versions, and can be optimally adjusted to custom requirements.



The vertical GearControl is designed for gears and flat, disc-shaped components with a hole, and combines precise measuring technology with excellent flexibility for a wide range of workpieces.



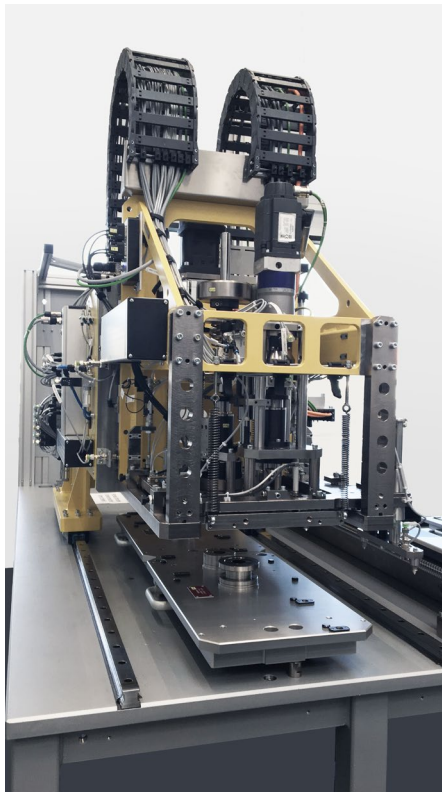
The ShaftControl Extended in the XXL version offers complete flexibility for complex measuring tasks on large workpieces. It facilitates high-precision length measurements, for instance of recesses, thanks to integrated axis compensation.



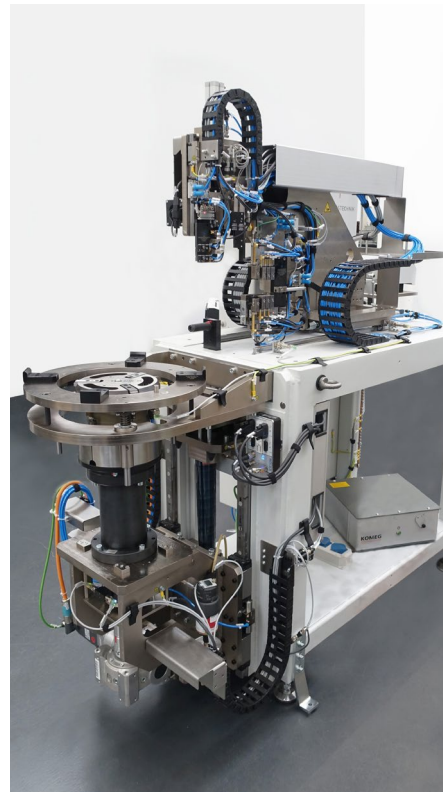
The measurement and testing machine for truck brake discs allows for 100% controlling, detects even the smallest errors, and precisely measures diameters, lengths and dimensional tolerances.



The measuring device for differential cases conducts tactile determinations of diameter, length, form and position tolerances, as well as axial run-outs. Both static and dynamic.



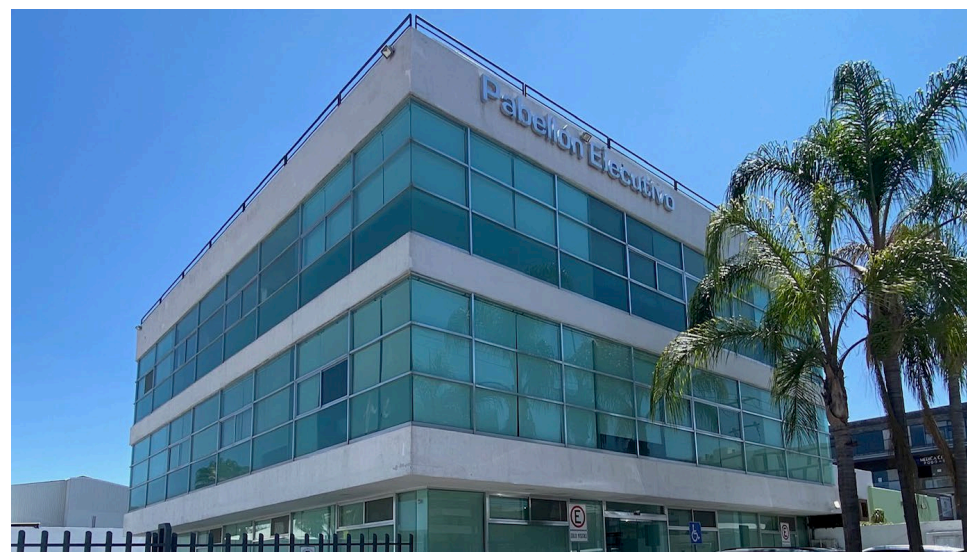
The solution for E-gears measures adjusting washers and sealing profiles, as well as the thickness of washers and sealing profiles on gears and housings, including adjusting washer magazine.



The Modular brake disc measuring machine is suitable for different workpiece types, and allows for post-process monitoring of brake discs and drums after individual process steps.



The brake disc measuring device can be integrated into production lines with cycle times of up to < 10 seconds for end-of-line measurements.



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