

# MEASURING HEADS

PRE1312(4)



Measuring Heads and Accessories for the  
Best Measurement Results

**Mitutoyo**

# Mitutoyo: Smart Heads for Perfect Coordinate Measuring

## MEASURING HEADS

More and more, industrial quality control requires universal applicability, versatility and automation from measuring technologies. Demands that are successfully met primarily by coordinate measuring machines (CMM) with their enormous range of capabilities. In addition, integrated software solutions provide options for the statistical evaluation of measured data, contour measurements against CAD data as well as the digitisation of free-form surfaces. This opens up a range of applications from measuring small precision turned parts or the calibration of setting masters and measuring devices to the measurement of, for example, entire vehicle bodies. A smart head is an important prerequisite for all of these capabilities.

With over 40,000 systems installed all over the world, Mitutoyo is one of the pioneers and pacesetters in coordinate measuring. Groundbreaking innovative force and enormous versatility are the hallmarks of Mitutoyo's range of products, as are economy and the focus on practical application.

The great variety of intelligent, high-performance measuring heads is an essential part of the CMM line by Mitutoyo. The spectrum of solutions includes touch trigger measuring heads as well as scanning measuring heads with integrated dynamic turning and swivelling systems and vision measuring heads.

Supplemented by a comprehensive range of accessories such as measuring head mounts, measuring head changing systems and probe changing systems. Ideally matched to the exceptional scope of capabilities of Mitutoyo's coordinate measuring machines. Perfectly designed for user-oriented high-quality application.

This brochure offers you an overview over the versatile line of measuring heads for coordinate measuring by Mitutoyo. It will accurately guide you to the optimum solution to your specific measuring task. You will be provided with comprehensive, concise information about model specifications, configurations and the matching accessories.

This provides you with quick, reliable and efficient guidance.

Mitutoyo: It's all in the head

# MEASURING HEADS FOR CMM

## MEASURING HEADS FOR CMM



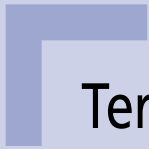
# Content

Page	Designation	Description
8 - 9	Surftest Probe	Surface Roughness Measurements directly on the CMM
10 - 11	Surface Measure	Line Laser Probes
12 - 13	Vision Probe QVP	Vision Probe for CMM
14 - 15	MPP-310Q/MPP-310	High Precision Scanning Probe
16	Special accessories	Special accessories MPP100/MPP-300Q/MPP-300
18 - 19	Micro Probe UMAP CMM	Touch-Trigger Micro Probe for CMM
20 - 21	REVO	5-Axis High-Speed Scanning
22	RCP storage module for REVO	Change for REVO
23	PH20	Rapid and index-free Touch-Trigger Probe
24 - 25	SP80	High Accuracy Scanning Probe for long stylus
26 - 27	SP600Q	Robust Scanning Probe
28 - 31	SP25M	Flexible Scanning Probe System
32 - 33	TP7M/TP7M EP	Robust Touch-Trigger Probe
34 - 35	TP200	Flexible Touch-Trigger Probe Sytem
36 - 37	TP20/TP20NI	Basic Touch-Trigger Probe System
38 - 39	MH20	Flexible Measuring Head for Manual CMMs
40 - 41	MH20i	Indexable Measuring Head for Manual CMMs
42 - 43	Optional Accessories	Optional Accessories for PH20/TP20/MH20/MH20i
44 - 47	PH10 Plus Series	Indexable Probe Holder for CNC CMMs
48	PH6	Fixed Probe Holder
49	PH6M	Fixed Probe Holder
50	PH1	Flexible Probe Holder
51 - 53	MRS	Modular Rack System
54 - 55	ACR3	Autochange Rack ACR3 for Multisensor CMMs
56 - 57	ACR1	Motorised Autochange Rack ACR1 for Multisensor CMMs
58 - 59	Masterballs	For the best Measurement Results

# MEASURING HEADS FOR CMM

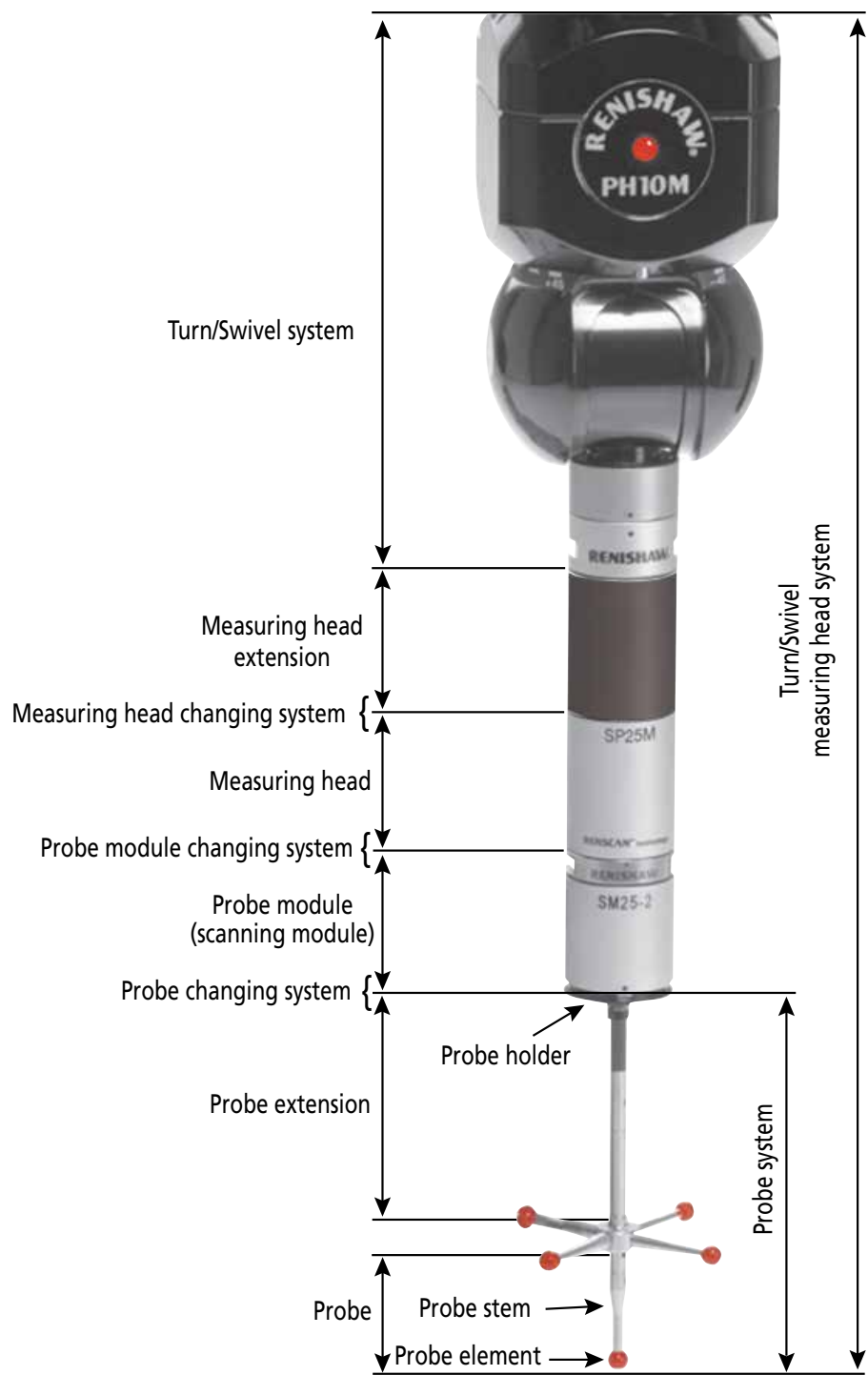
## MEASURING HEADS FOR CMM



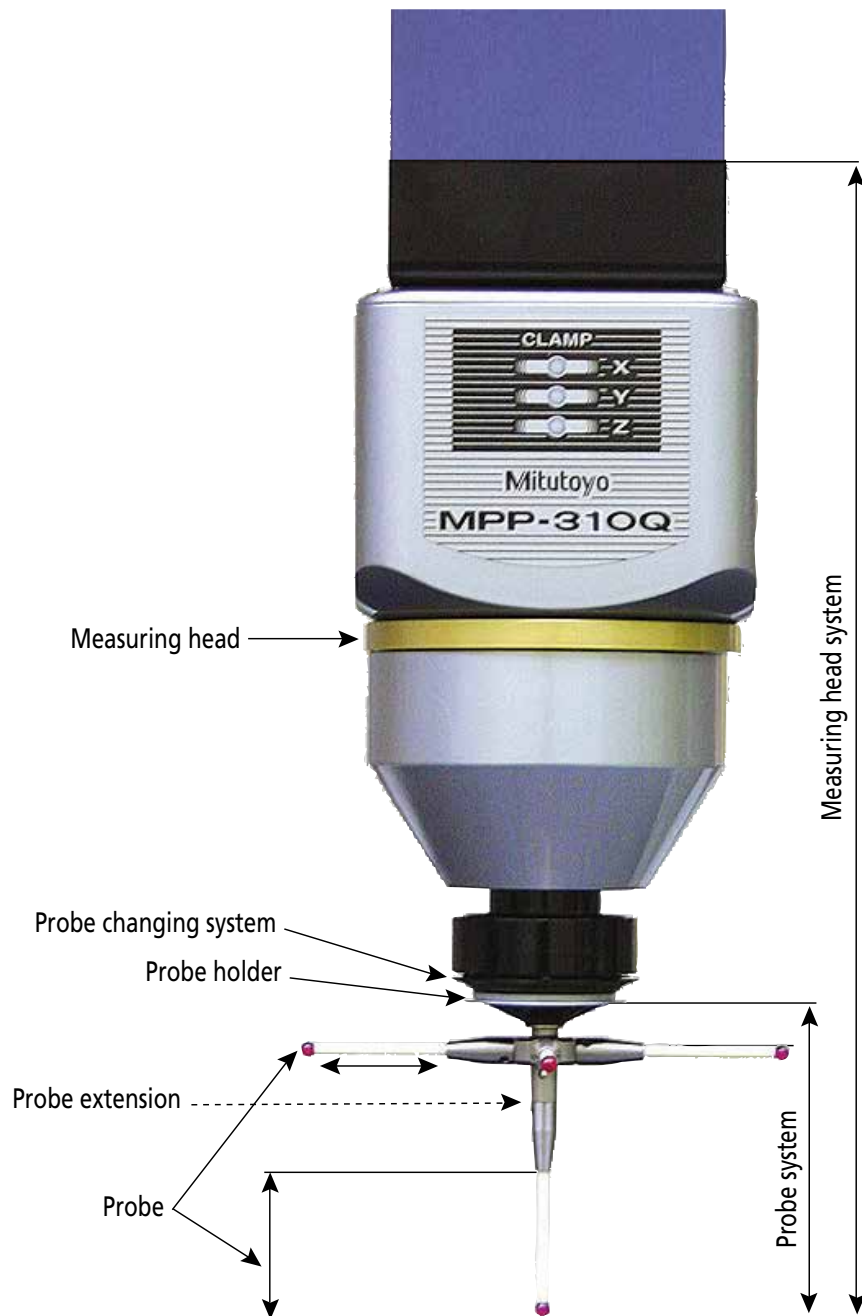


# Terminology

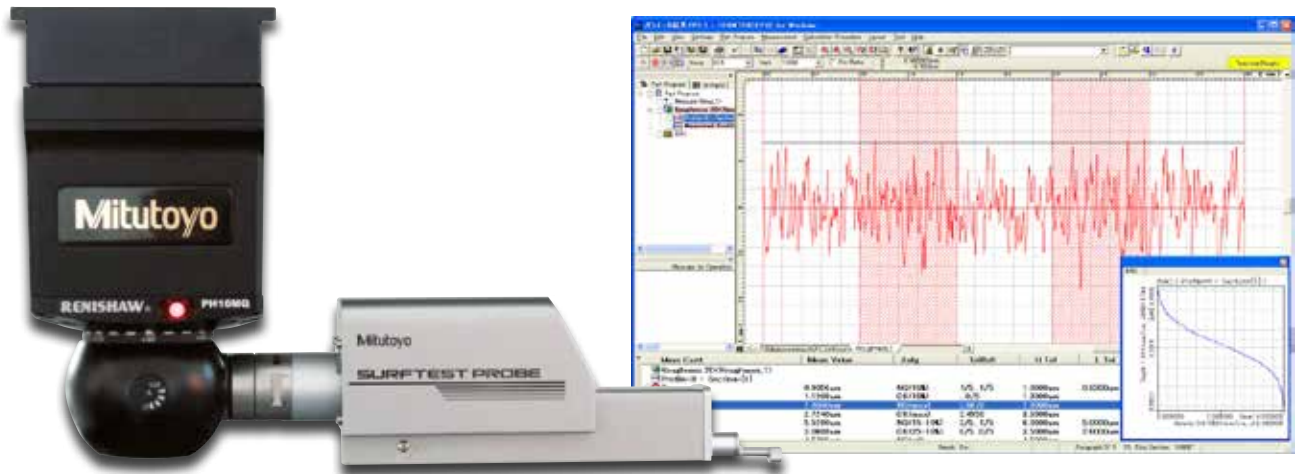
## Designation of components in line with EN ISO 10360-1



# MEASURING HEAD SYSTEMS



# Surface Roughness Measurements Directly on the CMM



## Surface Roughness Measurement Directly on the CMM!

This latest Mitutoyo probe head closes the gap between typical dimensional CMM measurements and surface roughness inspection. Instead of having to take the workpiece to another measuring instrument or using additional portable systems, the SURFTEST Probe adds roughness measurement capability to your CMM and so avoids all the cost and inconvenience of additional systems. It brings the proven technology of the SJ-310 series to the CMM with all its highly capable range of detectors developed for handling specialist applications such as roughness measurement on gears, inside small holes or deep grooves, in addition to simple flat surface measuring tasks.

- Proven technology from Mitutoyo's SJ-310 SurfTest
- Chose from five types of detector for variant applications
- High accuracy – no CMM movement during measurement
- One CNC measurement cycle produces all results
- Graphical and numerical output
- One Measurement report for all GD&T requirements

## Optional Detectors

Mitutoyo offers a wide range of optional detectors for almost any kind of roughness measurements, e.g. inside grooves or even small holes down to diameters of Ø 4 mm.



Standard Detector



Deep Groove Detector



Gear Tip Detector



Small Hole Detector



Extra-small Hole Detector



# SURFTEST PROBE

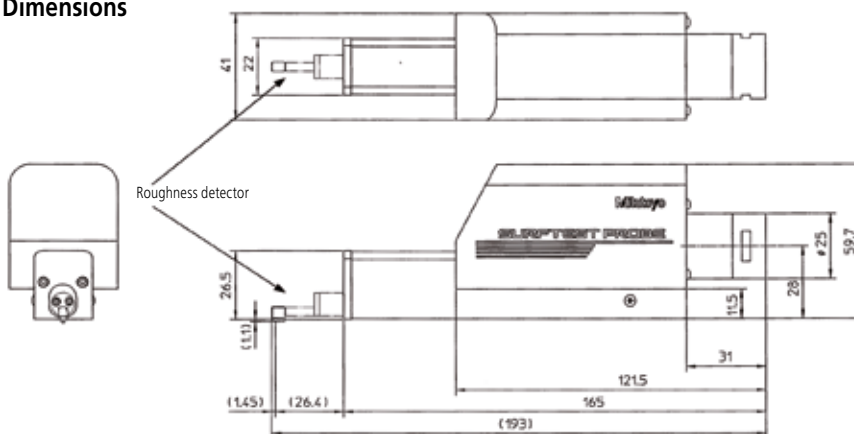
## Specifications

Model	Surftest Probe
Order No.	06AEN891
Length to drive	17.5 mm (the free running distance before and behind measurement is also included)
Driving method <sup>*1</sup>	One reciprocating movement
Tracing speed <sup>*2</sup>	Measurement: 0.25 mm/sec, 0.5 mm/sec, 0.75 mm/sec Return: 1 mm/sec
Probe mount	Renishaw autojoint
Mass	350 g
Range/Resolution	AUTO / Dependent on a measuring range 360 $\mu\text{m}$ / 0.006 $\mu\text{m}$ 100 $\mu\text{m}$ / 0.002 $\mu\text{m}$ 25 $\mu\text{m}$ / 0.0004 $\mu\text{m}$

<sup>\*1</sup>: The drive mechanism in probe performs roughness measurement.

<sup>\*2</sup>: Speed may be unable to be changed depending on conditions.

## Dimensions



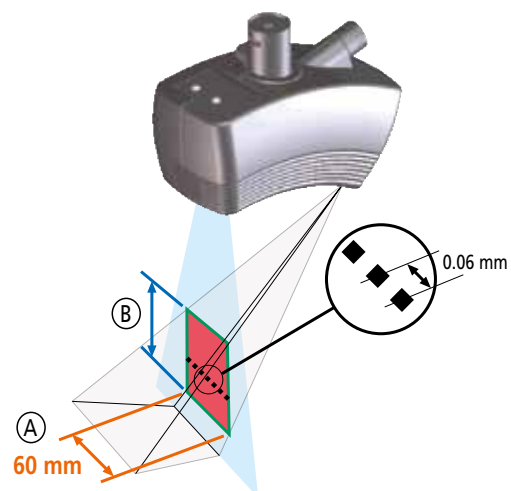
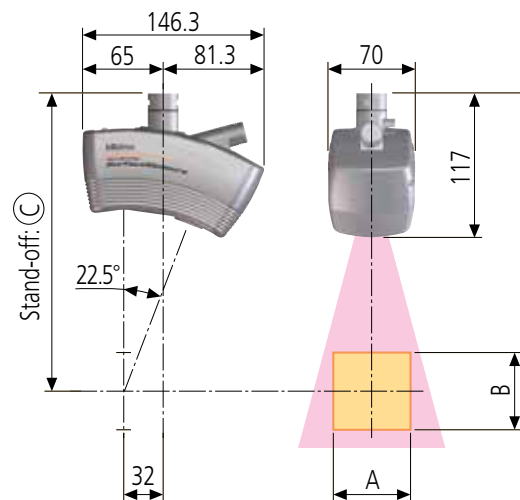
# Line Laser Probes



- › High-precision
- › High-speed non contact measurement
- › Scanning measurement on various surfaces
- › Ideal for inspection, reverse engineering
- › Ideal for free-form inspection and reverse engineering
- › Turn your CMM into multi-sensor device

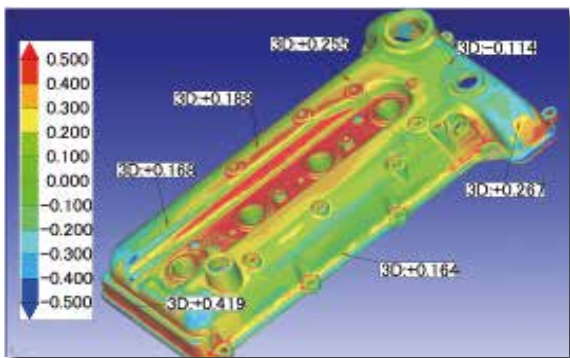
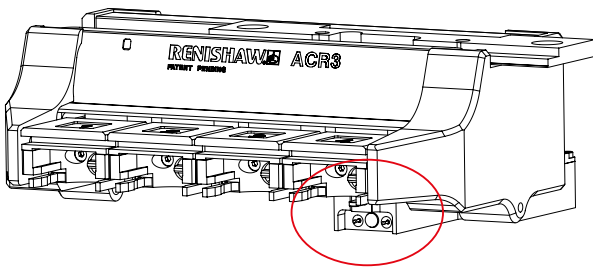
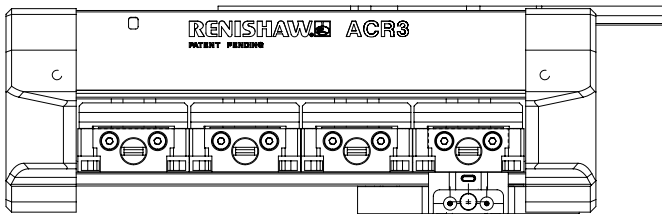
## Specifications

Model	SM 606	SM 610
Oder No.	02AQH100	02AQH250
Scan width [mm] (A)	60	60
Measuring range [mm] (B)	60	100
Stand-off [mm] (C)	240	282
Scanning error [ $\mu\text{m}/1\sigma$ ]	12	15
Laser class	Class 2 [EN / IEC60825-1 (2007)]	
Connection	Auto joint	

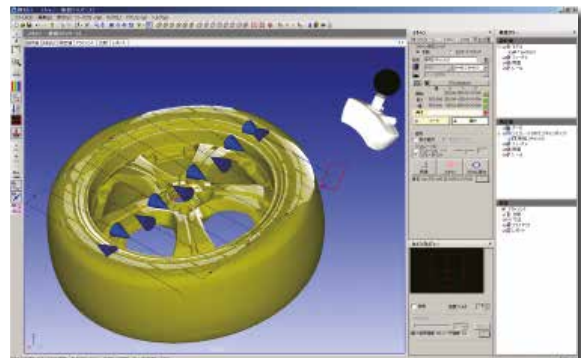


# SURFACE MEASURE

ACR3 Changing rack with power supply  
Order No.: A-5036-0172



Topographic view



Scan path generation on CAD model

# Vision Probe for CMM



## Vision Probe for Coordinate Measuring Machines

The QVP efficiently measures microgeometric forms that cannot be measured using a contact measuring head, together with flexible forms that would easily deform upon application of the measuring force.

Although microscopic measuring methods using a centering microscope mounted on the coordinate measuring machine have been in use since industrial coordinate measuring was still in the nursery stage, they do have the distinct disadvantage that the definition of the positions is dependent on the operator's eye, which in turn can result in measuring errors. The QVP is an optical measuring head designed specifically for coordinate measuring machines. It is based on Mitutoyo's very latest innovative measuring technology and allows automated vision measurement using coordinate measuring machines.



Measurement example: Electronic circuit board



MRS and ACR3 changing system

## Automatic Detection of Work Piece Edges

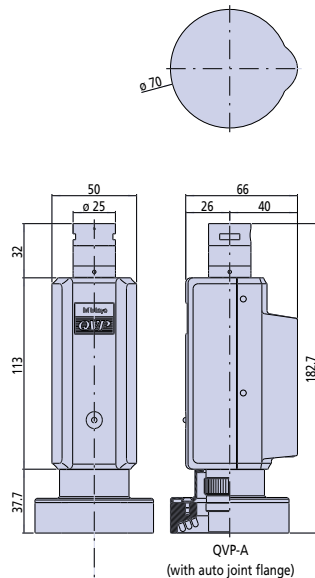
Image processing in connection with coordinate measuring technology means vision measurement: the requisite software functions for identifying work piece contours are the so-called edge detection tools. These are provided by the VISION PAK software supplied with the QVO. VISION PAK is a fully integrated MCOSMOS program module that makes the contact-free measuring points available for geometric evaluation in GEOPAK.

The QVP is fitted with 2 standard high-performance white LED light sources. A coaxial and a ring light source. These can be optimally adjusted in 100 stages by the software to the relevant measuring tasks and stored for serial measurements. The QVP-A can be replaced automatically, e.g., with contact measuring heads, on a CNC coordinate measuring machine using a measuring head changing system (ACR1/ACR3), thus turning the coordinate measuring machine into a so-called multi-sensor measuring device.

## Specifications

Model	QVP-A					
Order No.	359-051-5D					
QVP main unit	CCD camera		1/3" / <b>8.46 mm</b> (S/W)			
	Optical magnification		0.375X			
	Lighting function	Coaxia light	White LED light source (integrated): Power loss max. 5 W			
		Ring light	White LED light source: Power loss max. 10 W			
	Weight		QVP-A: 310 g, ≒ QVP-S: 385 g			
	Optical magnification		0.375X	1.125X	1.375X	3.75X
	Visible area (mm)		9.6 x 12.8	3.2 x 4.3	1.9 x 2.6	1 x 1.3
Working distance (mm)		61	77	61	51	
Objective lens	Magnification		1 x (optional)	3 x (standard)	5 x (optional)	10 x (optional)
	Numerical aperture (N.A.)		0.03	0.09	0.13	0.21
	Depth of field (μm) ±		306	34	16.3	6.2
	Weight		100 g	55 g	75 g	125 g
	Order No.		375-036-2		375-034-1	375-039
QVP I/F BOX	Mains voltage		AC 100 - 240 V			
	Frequency		50/60 Hz			
	Power consumption		45 W			
	Weight		3800 g			

## Dimensions



## Optional Accessories

Objective lens ML 1X Order No.: 375-036-2  
Objective lens ML 5X Order No.: 375-034-1  
Objective lens ML 10X Order No.: 375-039



## Calibration Guide

This calibration standard is used to define the mismatch data of the vision measuring head to the contact measuring head.

Order No.: 02AQC310



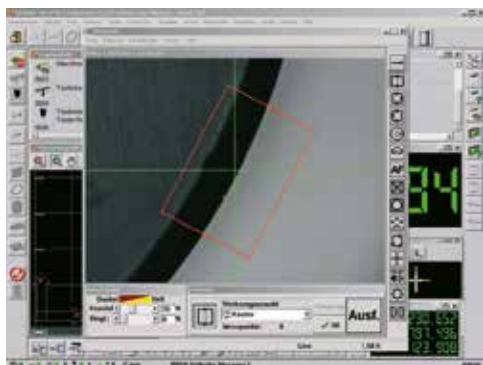
## Calibration Standard

For determining the size of a pixel.

Order No.: 02AKN020



## VISIONPAK Software for Controlling the Vision Measuring Head



### Automatic brightness tool

Controls the brightness setting during repeat mode.



### Dual range contrast tool

Automatically controls the light setting to achieve the best possible contrast at an edge.



### Point tool

Detection of a single point on the edge at which the arrow is pointing.



### Manual tool

Detection of any position clicked on with the mouse.



### Box tool

Multi-point measurements on a line on an edge within the box.



### Gravity tool

Detection of the center of gravity of any form.



### Circular tool

Multi-point measurement on a circular edge. As is also the case with the box tool, the circular tool can also capture data adjusted for burrs and dust.



### Edge tracking tool

Edge detection by automatically tracing an unknown geometry by simply entering the start point and measurement interval.



# High Precision Scanning Probe



## High-Precision Scanning

The MPP-310Q/310 is a multifunctional measuring head for CNC coordinate measuring machines. It not only performs continuous contact scanning measurements at  $V_2 \leq 0.3 \mu\text{m}$ , it also allows highly precise point measurements and self-centering measurements.

Combined with the MRT320 turntable, high-precision measurements can also be performed on rotationally symmetrical work pieces (e.g. elevating spindles, camshafts, crankshafts, gear wheels).

## Omni-Directional Scanning

The MPP-310Q/310 is equipped with high-precision scales with a resolution of  $0.01 \mu\text{m}$  for each direction (X-, Y- and Z-axis). The air bearings on all axes ensure smooth running of the probes at minimal measuring force. The software-controlled axis clamps are particularly beneficial when scanning slanted or arched surfaces. Clamping the axis at right angles to the direction of measurement eliminates unwanted deflections of the probe system and reduces measurement errors enormously.



MPP-310Q during ring test measurement of large gear standard on a LEGEX 9106.

## Low Measuring Force

The MPP-310Q/310 allows contact forces of  $0.03 \text{ N}$  or higher, which is especially useful when measuring sensitive work pieces or using very small probes.

## Rapid Scan

Two different scanning methods are available for scanning measurements. One method automatically scans an unknown geometry; the other measures a known geometry based on a previously defined contour. Known geometries can be scanned at measuring speeds of up to  $120 \text{ mm/s}$ .

## Accessories/Special Accessories

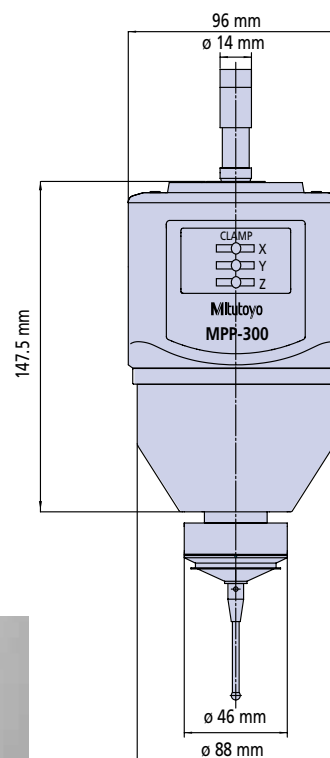
SCR6 probe changing system.

# MPP-310Q/MPP-310

## Specifications

Model	MPP-310Q
Code No.	02AQG160
Measuring range	$\pm 1$ mm (x, y, z)
Resolution	0.01 $\mu$ m
Max. permissible contact deviation	$MPE_p \leq 0.45$ mm (LEGEX500/700/900: using $\phi 4 \times 18$ mm probes)
Max. permissible scanning contact deviation	$MPE_{THP} \leq 1.4$ mm (LEGEX500/700/900: using $\phi 4 \times 18$ mm probes)
Spring rate	0.2 N/mm
Max. length of probe system	200 mm (all directions)
Max. weight of probe system	75 g
Probe mounting thread	M4
Max. measuring speed	120 mm/s (when scanning a known geometry)
Air flow rate	30 NL/min
Compatible models	CNC (LEGEX 500/700/900/1200 series)
Automatic probe changing system	SCR6 (optional)

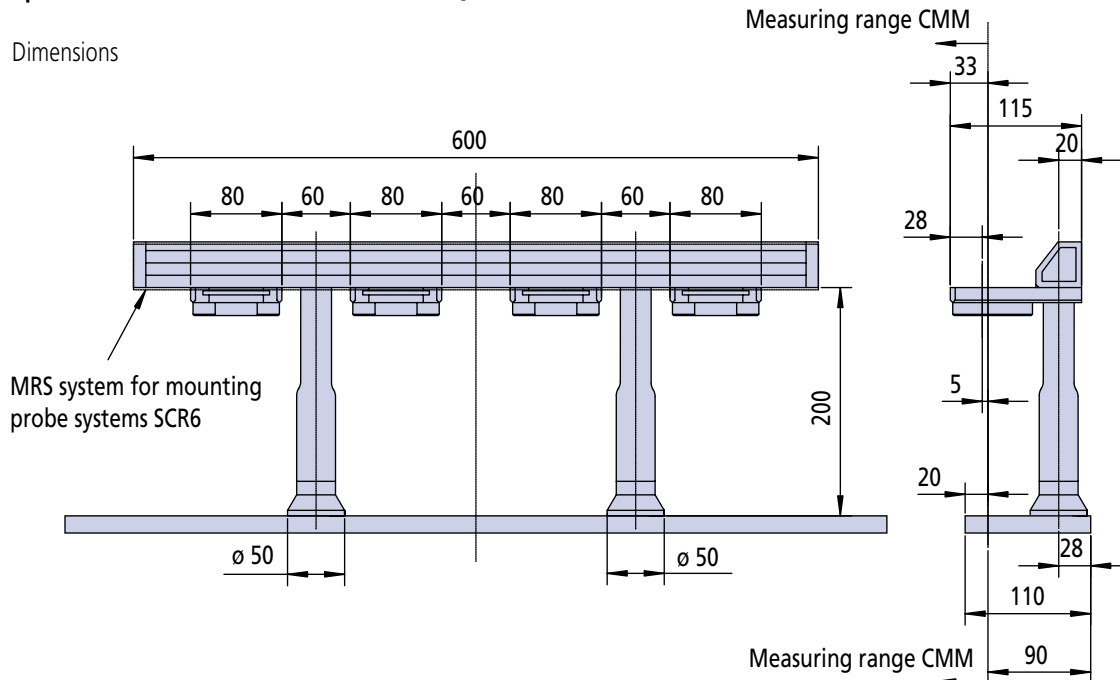
## Dimensions



# Special Accessories for MPP-310Q/MPP-310

## Special Accessories for MPP 100/MPP-300Q/MPP-300

Dimensions



### MPP-300Q Set

Order No.: 06ABU500

- 1 x SCR6 probe changing system
- 4 x probe system mounts
- 3 x probe mounts
- 1 x adapter plate
- 3 x  $\varnothing 4 \times 20$  mm probes
- 3 x M4 adapters
- 1 x  $\varnothing 10$  reference ball for recalibration





# Touch-Trigger Micro Probe for CMM

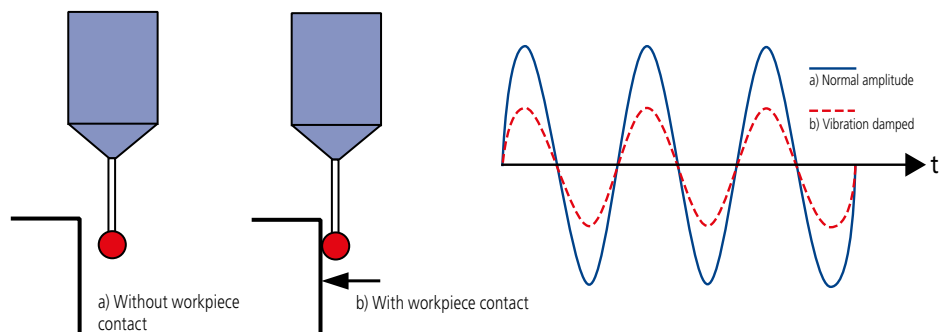


## The Probe System for Measuring 3D Micro Geometries

Especially designed for full 3D measurements of micro geometries, the UMAP CMM probe system can be connected to a standard CMM via its auto joint connection. On an indexable probe head, it can even be articulated in various positions.

## Small Tip Diameters and Extremely Low Measuring Forces

Extremely low contact forces of  $1\mu\text{N}$  (that's the gravity force of  $10\mu\text{g}$ !!) allow you to detect geometries on sensitive surfaces without any damage or bending. These features are achieved by a unique measurement principle: the probe is forced to swing in its resonance frequency. As soon as the tip gets in contact with the workpiece, the amplitude of the swinging probe is being damped - this is the trigger signal for taking the measuring point. With this principle, the probe has the same sensitivity in any probing direction.

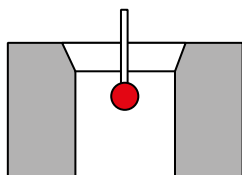


## Vision Systems Only Detect in 2D

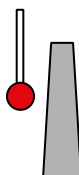
For detecting micro geometries, mostly vision systems are being used. They provide quick results without contact to the surface - but can only provide results in 2D!

As you can see in the following pictures, the UMAP probe system gives you results in 3D for many important features of your workpieces.

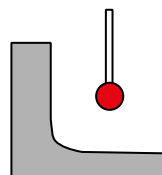
The UMAP measuring head offers the following advantages compared with image processing measuring systems for the following examples of measuring tasks:



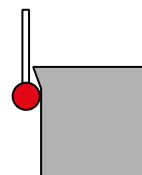
Chamfered bore



Tapered component

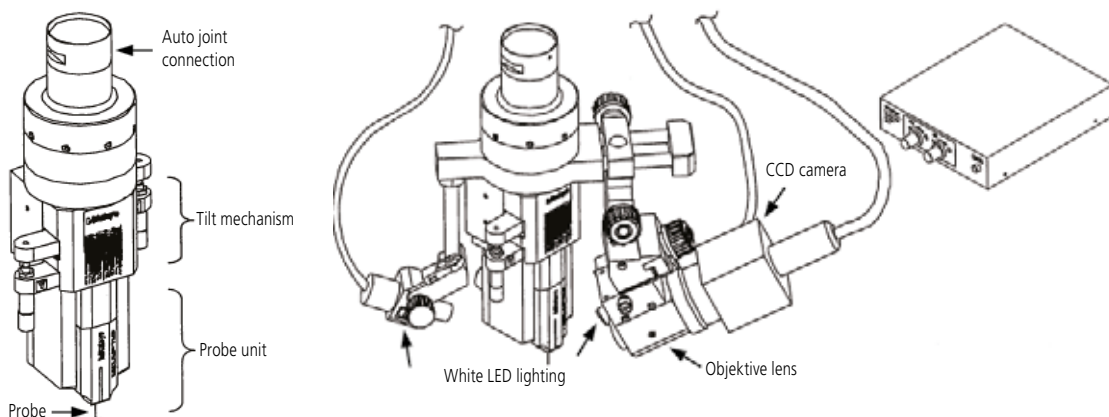
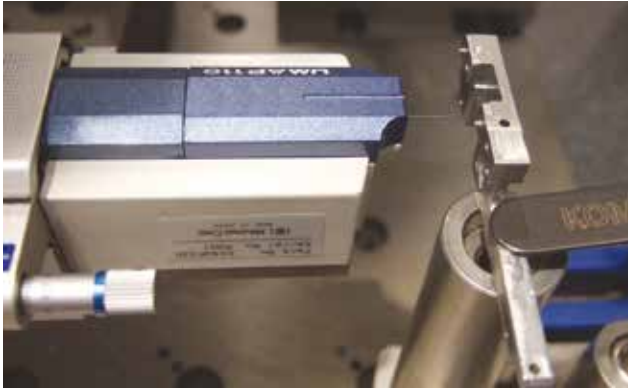


Radius



Upset edge

# UMAP CMM



**Version 1:**  
Standard

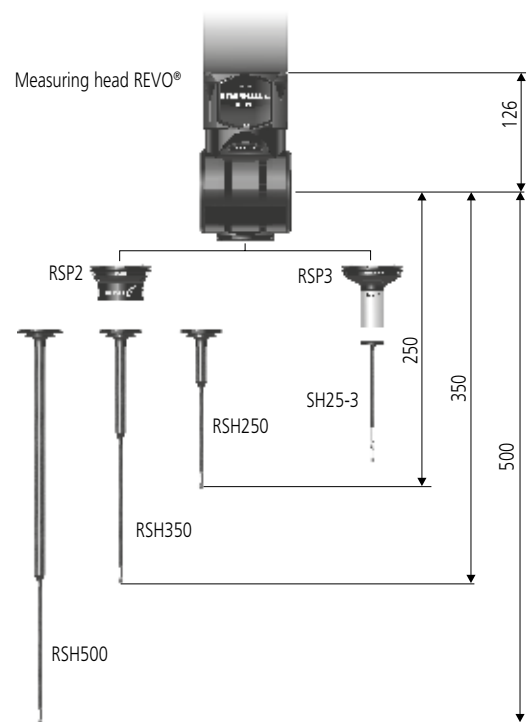
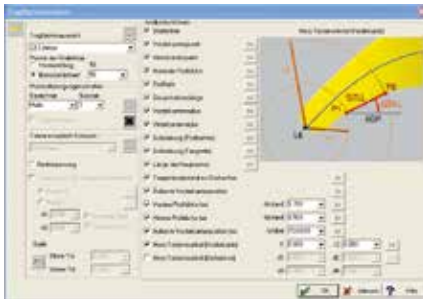
**Version 2:**  
Incl. observation system with on-board camera system with LED lighting (factory option)

	UMAP 110	UMAP 130
Diameter	100 µm	300 µm
Shaft diameter	80 µm	200 µm
Effective length	10 mm	16 mm
Measuring speed	1 - 50 µm/s	
Contact force	1 µN	10 µN
Ambient temperature	20°C +/-1°; Gradient < 1K/8h	
Humidity	55% +/-5%; Gradient < 2%/8h	

# 5-Axis High-Speed Scanning



- Dynamic measurement
- Consistent measuring force thanks to actively controlled probe deflection
- 5-axis scan measurements on CMMs
- Measuring speeds up to 500 mm/s
- Probe system lengths up to 500 mm
- High precision air bearings
- Infinitely positionable for enhanced flexibility (swivel range - 5° to + 120°, infinitely rotatable 0° - 360° – unlimited)



## Specifications

Resolution, angle measuring system		0.08 angle seconds
Measuring system		Laser
Permissible operating temperature		+ 15°C to + 30° C
Change of position	A-axis	-5° to + 120° C, infinite
	B-axis	360° continuous
Bearing		High precision air bearing in both axes, driven by brushless engines
Air supply (upstream of filter)		ISO8537.1 Class 4; at 6 bar - 6.5 bar
Air supply (downstream of filter)		ISO8537.1 Class 2; 5 bar
Measuring speed		max. 500 mm/s
Weight (excl. probe module and cable)		1.75 kg
Measuring head mount		Bolted with adapter directly on to the sleeve
Compatible models		CNC coordinate measuring machines with Renishaw UCC2 Controller, supported by MCOSMOS software, version V 3.1 or higher
Automatic changing system (optional)		MRS / RCP storage modules for changing RSP2 / RSP3 probe modules and probe system holders

## REVO standard set

### Order No.: A-3060-0002

1 x REVO measuring head (A-3060-0040)  
 1 x RSP2 2-D scanning module (A-3060-0020)  
 1 x RSH250 250 mm probe holder (A-3061-1910)  
 1 x RSH350 350 mm probe holder (A-3061-1911)  
 1 x RSP3 3-D scanning module (A-3060-0030)  
 1 x SH25-3 probe holder (A-2237-1303)  
 1 x probe RBK = 6 mm, L = 10 mm (A-5000-4156)  
 1 x MRS600 mounting set (A-4192-0002)  
 4 x RCP storage modules (A-3061-0100)  
 1 x calibration ball D = 45 mm (A-3060-0310)

## REVO starter set

### Order No.: A-3060-0003

1 x REVO measuring head (A-3060-0040)  
 1 x RSP2 2-D scanning module (A-3060-0020)  
 1 x RSH250 250 mm probe holder  
 1 x probe RBK = 6 mm, L = 10 mm (A-5000-4156)  
 1 x calibration ball D = 45 mm (A-3060-0310)

## REVO change set 1

### Order No.: A-3060-0011

1 x MRS600 mounting set (A-4192-0002)  
 1 x FCR25 change system (A-2237-1401)  
 4 x RCP storage modules (A-3061-0100)  
 2 x MRS pillars (L = 62.50 mm) (A-4192-0061)  
 1 x MRS600 set of adjusting plates (A-4192-0002)

## REVO 2D scanning module

### Order No.: A-3060-0020

1 x RSP2 2-D scanning module for using RSH250, RSH350 and RSH500

## REVO 3D scanning module

### Order No.: A-3060-0030

1 x RSP3 3-D scanning module for using a type SH25-3 probe holder (A-2237-1303) (not included)

## REVO measuring head

### Order No.: A-3060-0040

1 x REVO measuring head

## Revo calibration ball set

### Order No.: A-3061-0310

1 x REVO steel calibration ball with a diameter of 50 mm, incl. mounting material

## RSH250 REVO probe holder

### Order No.: A-3061-1910

1 x RSH250 REVO probe holder, L = 250 mm swivel range, for RSP2 2-D scanning module, M2 probe connecting thread

## RSH350 REVO probe holder

### Order No.: A-3061-1911

1 x RSH350 REVO probe holder, L = 350 mm swivel range, for RSP2 2-D scanning module, M2 probe connecting thread

## RSH500 REVO probe holder

### Order No.: A-3060-0021

1 x RSH500 REVO probe holder, L = 500 mm swivel range, for RSP2 2-D scanning module, M2 probe connecting thread

## RCP REVO storage module

### Order No.: A-3061-0100

1 x RCP REVO storage module  
 (for mounting RSP2, RSP3 scanning modules and/or RSH250, RSH350 or RSH 500 probe holders, mounted on an MRS system)

## RCP TC REVO storage module

### Order No.: A-3061-0303

1 x RCP TC REVO storage module  
 (for mounting RSP2, RSP3 scanning modules, mounted on an MRS system)

## RCP TC REVO storage module set

### Order No.: A-3061-0300

2 x RCP TC REVO storage module  
 1 x power pack for supplying voltage to max. 4 storage modules  
 (for mounting RSP2, RSP3 scanning modules, mounted on an MRS system)

Further information on REVO storage modules can be found on page 22.

# RCP Storage Module for REVO®

## RCP REVO storage module

**Order No.: A-3061-0100**

1 x RCP REVO storage module  
(for mounting RSP2, RSP3 scanning modules and/or RSH250, RSH350 or RSH 500 probe holders, mounted on an MRS system)



RCP TC REVO storage models are identical to RCP REVO storage modules but with an additional voltage supply for the measuring systems of the REVO RSP 2 or RSP 3 scanning modules. This voltage supply guarantees the consistent operating temperature of the measuring systems; idle times following scanning module changes during measuring processes can therefore be avoided.

## RCP TC REVO storage module

**Order No.: A-3061-0303**

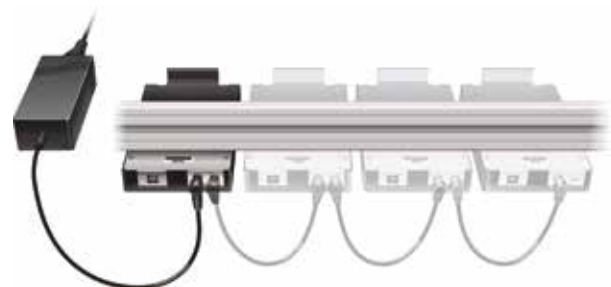
1 x RCP TC REVO storage module  
(for mounting RSP2, RSP3 scanning modules, mounted on an MRS system)



## RCP TC REVO storage module set

**Order No.: A-3061-0300**

2 x RCP TC REVO storage module  
1 x power pack for supplying voltage to max. 4 storage modules  
(for mounting RSP2, RSP3 scanning modules, mounted on an MRS system)



Mounting RCP TC storage modules on the MRS system:  
Max. 4 RCT TC change systems can be operated on one power pack.



# PH20



## Rapid and Index-free Touch-Trigger Probe

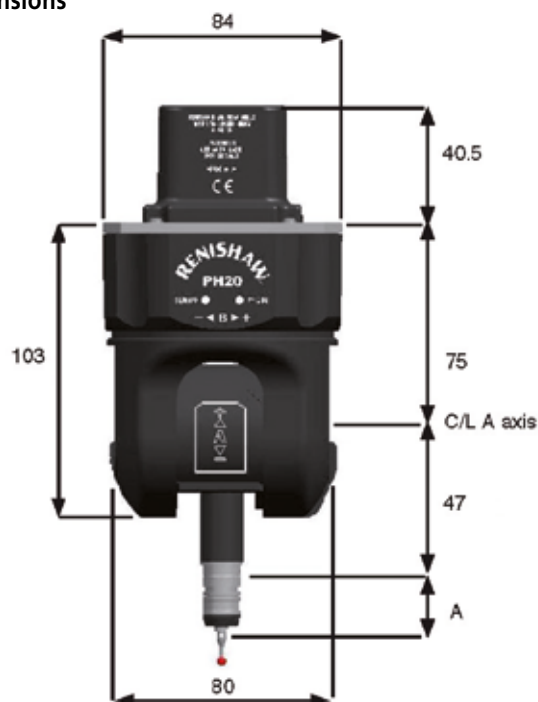
- Head touch for improved repeatability
- Feature-based calibration for improved accuracy
- Probe change with TP20 modules
- Allowing subsequent measurement at any head angle
- Full support in MCOSMOS

## Specifications

Weight (excluding module and cables)	810 g		
Temperature range	15 °C to 35 °C		
Operating storage	-25 °C to 70 °C		
Maximum movement speed	3 revs/s (1281 mm/s with standard module & 10 mm stylus)		
Maximum head touch speed	50 mm/s		
Rotation angles A-axis / B-axis	-115° to 115°		
Angular resolution	0.4 µ Radians		
Bearings	Mechanical		
Change rack system	MCR20 NI and MCR20		
Joystick	Multifunction MCUIlite-2		
ISO 10360-5 (2001) typical performance std force module with 12 x 4 mm stylus on a CMM with ISO 10360-2 (2002) specification of 0.48 + L/1000*	Size	CMM TOUCH	HEAD TOUCH
	Form	0.0006 mm	0.0002 mm
	Location	0.0026 mm	0.0024 mm
		0.0013 mm	0.0009 mm

\* specified with a TP7

## Dimensions



Please find additional accessories on page 42!

# High Accuracy Scanning Probe for Long Styli



## Multifunctional Scanning Measuring Head Compatible Even with Very Long Probe Systems

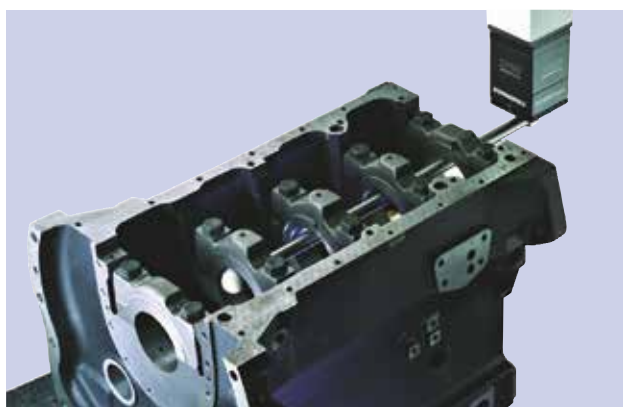
The SP80 scanning measuring head is specially designed for long probe systems with high levels of measurement accuracy and a max. length of 500 mm (measured in vertical and horizontal direction). The multifunctional measuring head for CNC coordinate measuring machines allows not only scanning measurements but also high-precision point measurements and self-centering measurements.

## Rapid Scan

Two different scanning methods are available for scanning measurements. One method automatically scans an unknown geometry; the other measures a known geometry based on a previously defined contour. Known geometries can be scanned at measuring speeds of up to 120 mm/s.

## Accessories

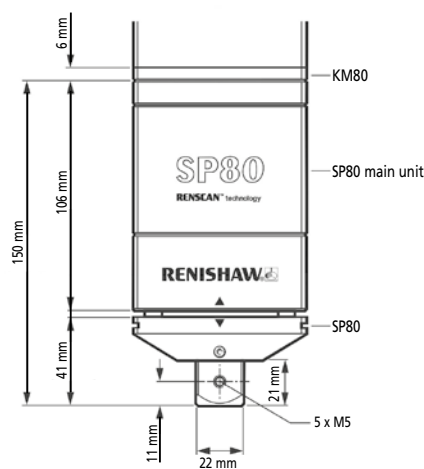
MRS/SCP80 probe changing system.



## Specifications

Measuring range	± 2.5 mm (x, y, z)
Resolution	0.02 µm
Max. permissible contact deviation	MPE <sub>p</sub> ≤ 0.6 µm (Legex 500/700/900); ≤ 1.7 µm (Crysta Apex C 700/900)
Max. permissible scanning contact deviation	MPE <sub>THP</sub> ≤ 1.4 µm (Legex 500/700/900); ≤ 2.0 µm (Crysta Apex C 700/900)
Spring rate	1.8 N/mm
Max. length of probe system	500 mm
Max. weight of probe system	500 g
Probe mounting thread	M5
Max. measuring speed	120 mm/s (when scanning a known geometry)
Compatible models	CNC coordinate measuring machines Legex (x=500 or higher); Crysta Apex C (x=700 or higher)
Automatic probe changing system	MRS/SCP 80 (optional)

## Dimensions





## SP80 set 1

**Order No.: A-2238-0700**

- 1 x SP80 analog measuring head
- 1 x SH80 probe holder (A-2238-0705)
- 1 x PL157 adapter cable (A-1016-7132)
- 1 x KM80 change adapter (A-2238-0703)

## SP80 set 2

**Order No.: A-2238-0733**

- 1 x SP80 analog measuring head
- 1 x SH80 probe holder (A-2238-0705)
- 1 x PL157 adapter cable (A-1016-7132)
- 1 x KM80 change adapter (A-2238-0703)
- 4 x SCP80 storage module (A-2238-0706)
- 1 x MRS600 – mounting set (A-4192-0002)

## SP80 set 3

**Order No.: A-2238-0735**

- 1 x SP80 analog measuring head
- 3 x SH80 probe holder (A-2238-0705)
- 1 x PL157 adapter cable (A-1016-7132)
- 1 x KM80 change adapter (A-2238-0703)
- 3 x SCP80 storage module (A-2238-0706)
- 1 x MRS600 – mounting set (A-4192-0002)

## SP80 set 4

**Order No.: A-2238-0736**

- 1 x SP80 analog measuring head
- 4 x SH80 probe holder (A-2238-0705)
- 1 x PL157 adapter cable (A-1016-7132)
- 1 x KM80 change adapter (A-2238-0703)
- 4 x SCP80 storage module (A-2238-0706)
- 1 x MRS600 – mounting set (A-4192-0002)

## SP80 set 5

**Order No.: A-2238-0737**

- 1 x SP80 analog measuring head
- 5 x SH80 probe holder (A-2238-0705)
- 1 x PL157 adapter cable (A-1016-7132)
- 1 x KM80 change adapter (A-2238-0703)
- 5 x SCP80 storage module (A-2238-0706)
- 1 x MRS1000 – mounting set (A-4192-0003)

## SH80 probe holder

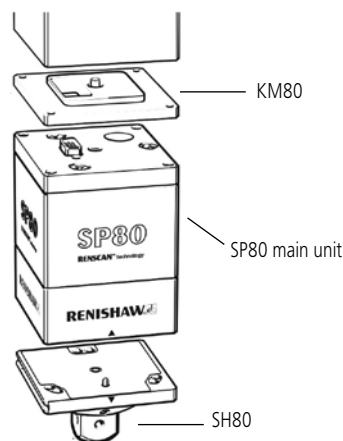
**Order No.: A-2238-0705**

with M5 probe system mount (cube)

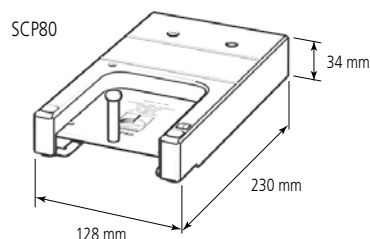
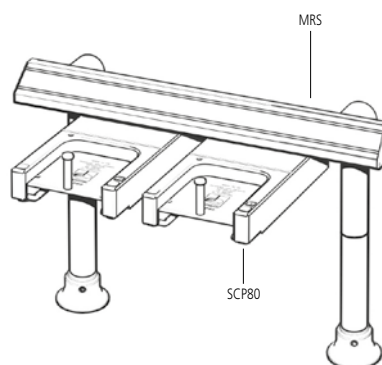
## SCP80 storage module

**Order No.: A-2238-0706**

for storing an SH80 probe holder in conjunction with an MRS mounting set, see page 54 et seqq.



Automatic probe changing system



# Robust Scanning Probe



## SP600Q: Technical specifications

Functions	Rapid scanning, digitalisation and single point measurements	
Directions of measurement	In $\pm X$ , $\pm Y$ , $\pm Z$	
Measuring range	$\pm 1$ mm (X, Y, Z)	
Resolution	0.1 $\mu\text{m}$	
Spring rate	1.2 N/mm nominal (X, Y, Z)	
Probe system (G4 connecting thread)	Length	Max. 200 mm, max. 300 mm with extended probe holder module
	Weight	Max. 20 g
Weight	300 g	
Compatible models	Crysta Apex C 500 series	
Anchorage	Directly mounted on the CMM sleeve	
Change system	SCR600 or SCP600 with MRS	

## Multi-functional Scanning Measuring Head with Direct Sleeve Fastening

The SP600Q is a very reliable analog measuring head. It is ideal for scanning profiles and tiny surface details. Large volumes of data can be quickly recorded by the SP600Q for measuring or digitalisation purposes.

The measuring head has a measuring range of  $\pm 1$  mm in all three axes (X, Y and Z). The SH600EXT probe holder can be used to mount probe systems up to a length of 300 mm.

The self-centering properties of the measuring probe are excellent ( $< 5 \mu\text{m}$ ) when the probe is not touching the work piece. This minor deviation is irrelevant for the measuring accuracy; it does, however, enable scanning with small probe deflections and low contact forces – which is crucial when scanning small geometries and surface details. The detachable probe holder is fixed magnetically and enables automatic changes of probe systems. The dynamic properties are excellent thanks to its low weight, superb structural rigidity and friction-free viscous damping. The compact design with direct sleeve fastening is particularly useful on CMMs with small measuring ranges.



SCR600 change system

# SP600Q

## SP600Q measuring head Order No.: A-2098-0890

1 x SP600Q measuring head

1 x  $\varnothing 8 \times 50$  mm probe with ceramic shaft and ruby ball

1 x SH600 STD probe holder (RA2098-0284)

## SCP600 storage module Order No.: A-2098-0933

1 x SCP600 storage module (for mounting on the MRS system)

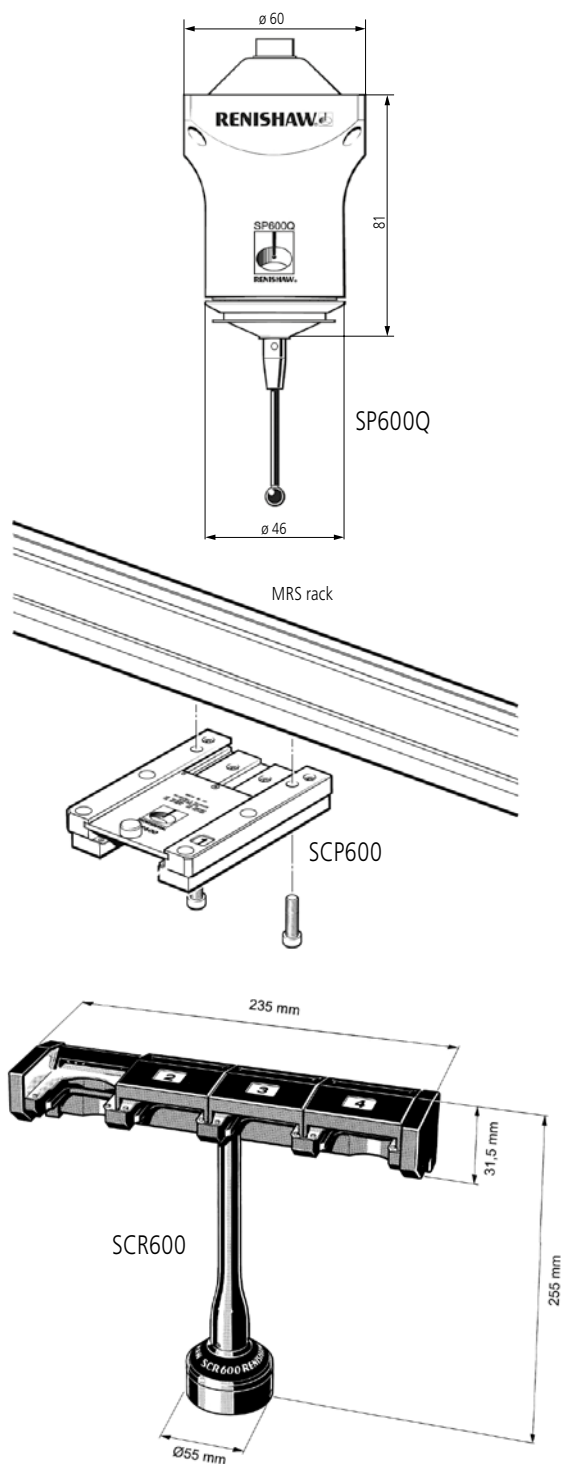
## SCR600 changing system Order No.: A-2098-0255

1 x SCR699 changing system

2 x SH600 STD probe holders (RA2098-0284)

## SH600 EXT probe holder Order No.: A-2098-1036

1 x SH600 EXT probe holder with increased magnetic force for probe system lengths up to 300 mm



# Flexible Scanning Probe System SP25M



## Multifunctional, Compactly Designed Scanning Measuring Head

The SP25M is a compact, high-precision measuring head with an outer diameter of 25 mm. The multifunctional measuring head for CNC coordinate measuring machines allows not only scanning measurements but also high-precision point measurements and self-centering measurements.

## Rapid Scan

Two different scanning methods are available for scanning measurements. One method automatically scans an unknown geometry; the other measures a known geometry based on a previously defined contour. Known geometries can be scanned at measuring speeds of up to 120 mm/s.

## Extremely Flexible

The SP25M measuring head is extremely flexible. In addition to its superb measuring accuracy at very low contact forces, the SP25M can be used with probe systems ranging in length from 20 mm (SP25-1) up to 400 mm (SP25-4). The measuring head can be used on both fixed (PH6M) and turn/swivel measuring head mounts (PH10M/PH10MQ). Both the entire measuring head, the scanning modules (SM25-1 to SM25-4) and the relevant probe systems can be automatically changed on the SP25M using the relevant changing systems (ACR1/ ACR3; FCR25). Thus allowing the automation of even complex measuring processes.

## Accessories

MRS/FCR25 probe module changer/probe changing system.



Measurement example: carbody parts



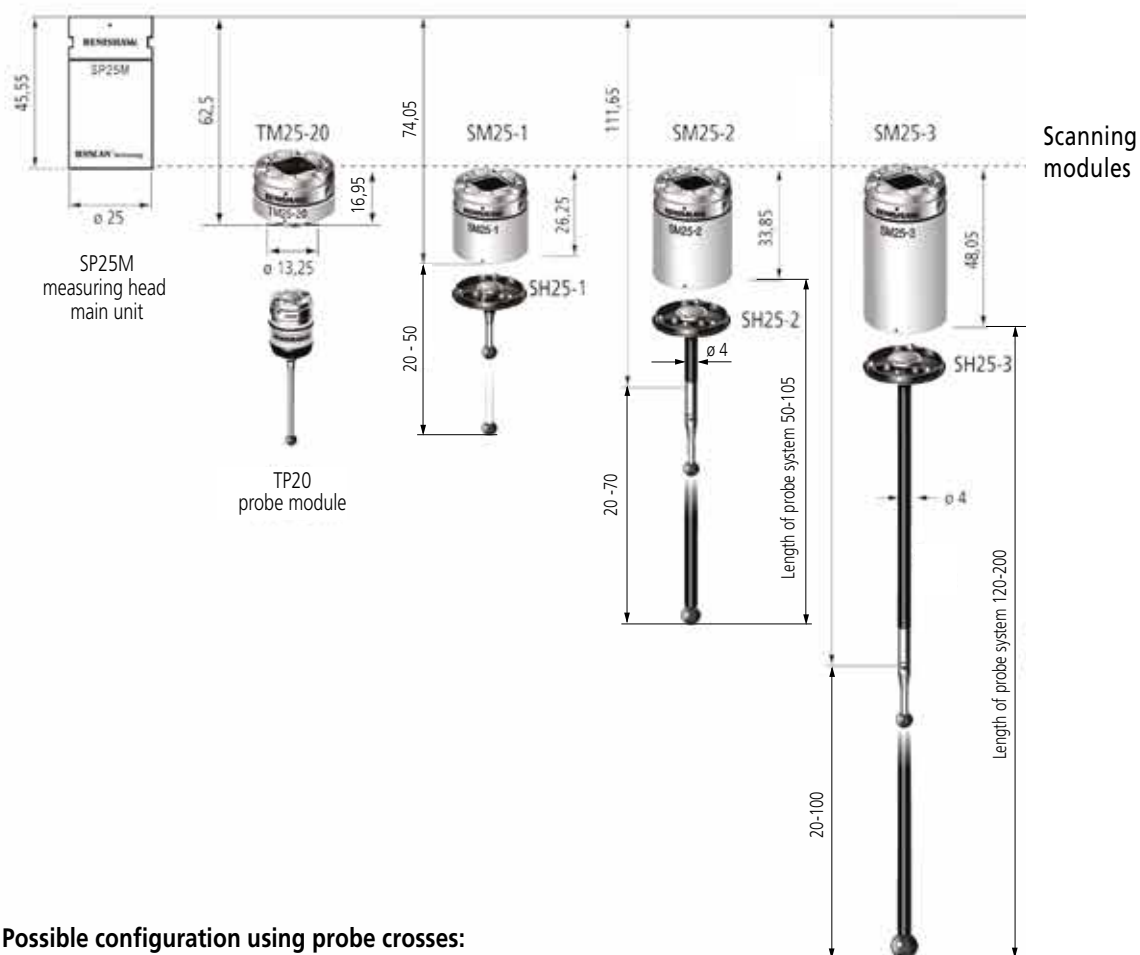
Measurement examples: cylinder head

## Technical specifications SP25M

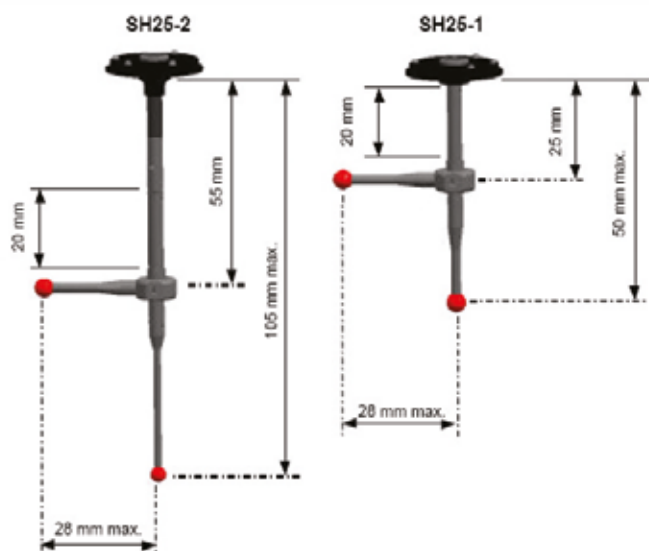
Measuring range	± 0,5 mm (x, y, z)
Resolution	< 0.1 µm
Max. permissible scanning contact deviation	MPEP ≤ 0.6 µm (Legex 500/700/900); ≤ 1.7 µm (Crysta Apex C 500/700/900)
Max. permissible scanning contact deviation	MPE <sub>THP</sub> ≤ 1.6 µm (Legex 322), 1.4 µm (Legex 500, 700, 900); ≤ 2.3 µm (Crysta Apex C 500, 700, 900)
Spring rate	0.2 N/mm – 0.6 N/mm
Overrun	± 2.0 mm (XY) 1.7 mm (Z) + /1.2 mm Z-
Length of probe system	400 mm (when using SM25-4/SH25-4)
Probe mounting thread	M3
Max. measuring speed	120 mm/s
Measuring head mount	Auto joint
Compatible models	CNC coordinate measuring machines
Automatic stylus changer	MRS/FCR25 (max. 8 x FCR25, installed in the same direction)

# SP25M

## Dimensions



## Possible configuration using probe crosses:



# SP25M Sets

## SP25M set 1

### Order No.: A-2237-1001

Set 1 SP25M measuring head scanning set 1 A-2237-1001  
Basic system for scanning at a probe system length of 20 mm – 50 mm.

The set comprises the following components:

- 1 x SP25M measuring head
- 1 x SM25-1 scanning module
- 2 x SH25-1 probe holders

**incl. Mitutoyo components** incl. control software, connecting cable, interface

## SP25M set 2

### Order No.: A-2237-1002

Set 2 SP25M measuring head scanning set 2 A-2237-1002  
Basic system for scanning at a probe system length of 50 mm – 105 mm.

The set comprises the following components:

- 1 x SP25M measuring head
- 1 x SM25-2 scanning module
- 2 x SH25-2 probe holders

**incl. Mitutoyo components** incl. control software, connecting cable, interface

## SP25M set 3

### Order No.: A-2237-1003

Set 3 SP25M measuring head scanning set 3 A-2237-1003  
Basic system scanning at a probe system length of 120 mm – 200 mm.

The set comprises the following components:

- 1 x SP25M measuring head
- 1 x SM25-3 scanning module
- 2 x SH25-3 probe holders

**incl. Mitutoyo components** incl. control software, connecting cable, interface

## SP25M set 4 for MCOSMOS V 3.0 or higher

### Order No.: A-2237-1004

SM25-4 scanning module set for A-2237-1004  
Probe system lengths 220 mm - 400 mm

The set comprises the following components:

- 1 x SM25 scanning module
- 2 x SH25-4 probe holders

## SP25M complete set

### Order No.: A-2237-1015

SP25M complete set for scanning and conventional contact using a TP20 probe module.

The set comprises the following components:

- SP25M measuring head scanning set 1 (A-2237-1001)
- SM25-2 scanning module set (A-2237-1102)
- SM25-3 scanning module set (A-2237-1103)
- TM25-20 TP20 module adapter (A-2237-1200)

**incl. Mitutoyo components** incl. control software, connecting cable, interface

## SM25-1 scanning module set

### Order No.: A-2237-1101

SM25-1 scanning module set for A-2237-1101  
Probe system lengths 20 mm – 50 mm

The set comprises the following components:

- 1 x SM25-1 scanning module
- 2 x SH25-1 probe holders

## SM25-2 scanning module set

### Order No.: A-2237-1102

SM25-2 scanning module set for A-2237-1102  
Probe system lengths 50 mm – 105 mm

The set comprises the following components:

- 1 x SM25-2 scanning module
- 2 x SH25-2 probe holders

## SM25-3 scanning module set

### Order No.: A-2237-1103

SM25-3 scanning module set for A-2237-1103  
Probe system lengths 120 mm – 200 mm

The set comprises the following components:

- 1 x SM25-3 scanning module
- 2 x SH25-3 probe holders

## SM25-4 scanning module set MCOSMOS V 3.0 or higher

### Order No.: A-2237-1104

SM25-4 "complete" scanning module set for A-2237-1104  
Probe system lengths 220 mm - 400 mm.

The set comprises the following components:

- 1 x SM25 scanning module
- 2 x SH25-4 probe holders
- 1 x TE M3 D10R L200 EAL200 D4C/F (A-5003-7054)
- 1 x TE M3 D10R L150 EAL150 D4C/F (A-5003-7055)
- 1 x TE M3 D10R L100 EAL100 D4C/F (A-5003-7056)
- 1 x TE M3 D10R L75 EAL75 D4C/F (A-5003-7057)
- 1 x TE M3 D5R L50 EAL50 D2.5CE (A-5003-0069)
- 1 x TE M3 D5R L21 EAL21 D2.5SS (A-5000-7630)



## TM25-20 module adapter MCOSMOS V 2.4 or higher

**Order No.: A-2237-1200**

TM25-20 module adapter for using a TP20 probe module combined with the SP25M measuring head without TP20 probe modules.

## TM25-20 module adapter

**Order No.: A-2237-1201**

TM25-20 module adapter for using a TP20 probe module combined with the SP25M measuring head incl. two TP20 probe modules (SF) with standard contact force.

## SH25-1 probe holder

**Order No.: A-2237-1301**

SH25-1 probe holder for scanning module SM25-1, probe system length 20 mm – 50 mm

## SH25-2 probe holder

**Order No.: A-2237-1302**

SH25-2 probe holder for scanning module SM25-2, probe system length 50 mm – 105 mm

## SH25-3 probe holder

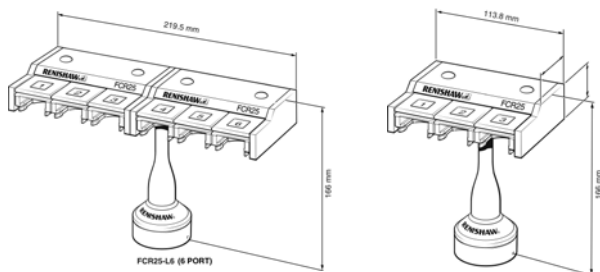
**Order No.: A-2237-1303**

SH25-3 probe holder for scanning module SM25-3, probe system length 120 mm – 200 mm

## SH25-4 probe holder MCOSMOS V 3.0 or higher

**Order No.: A-2237-1304**

SH25-4 probe holder for scanning module SM25-4, probe system length 220 mm – 400 mm



FCR25-L6

FCR25-L3

## FCR25 flexible changing system

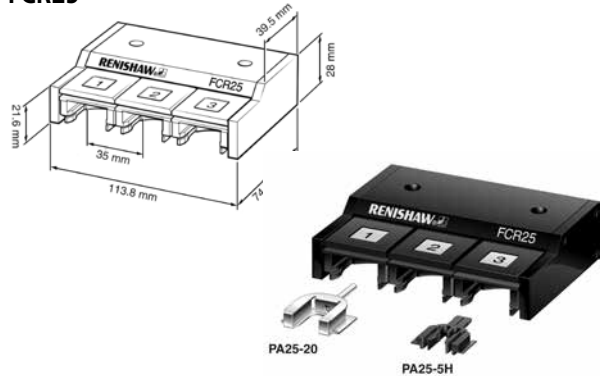
**Order No.: A-2237-1401**

FCR25 flexible changing system with 3 storage slots for scanning modules SM25-1, SM25-2, SM25-3, SM25-4 and module adapter TM25-20.

The enclosed adapters PA25-SH, PA25-20 (3 of each) can be used to store the probe holders SH25-1, SH25-2, SH25-3, SH25-4 or TP20 probe modules.

(The MRS mounting set is not included in delivery, please order separately, see page 54 et seqq MRS)

## FCR25



FCR25 mounted on the MRS modular mounting system (54 et seqq).

# Robust Touch-Trigger Probe



## High-Precision Contact Touch-Trigger Measuring Head

The TP7M series is a high-precision, contact touch trigger measuring head with a max. repeat accuracy of  $2\sigma \leq 0.25 \mu\text{m}$ .

## Flexibility

The measuring head is superbly flexible as it can be used in all possible directions of the turn/swivel head (PH10M).

Measurements at greater immersion depths can also be performed using PEM extensions.

The TP7MEP measuring head can be automatically replaced with other systems using an optional ACR changing system.

## Compatible with Long Probe Systems

Even long probe systems of up to 180 mm can be mounted on the TP7M \* (Fig. 3). Combined with the max. permissible extension (Fig. 2) of 200 mm for the PH10M/PH10MQ turn/swivel head, a max. measuring range of 380 mm can be achieved.

\* when using a carbon fiber extension,  $\leq 150 \text{ mm}$  in the case of steel.

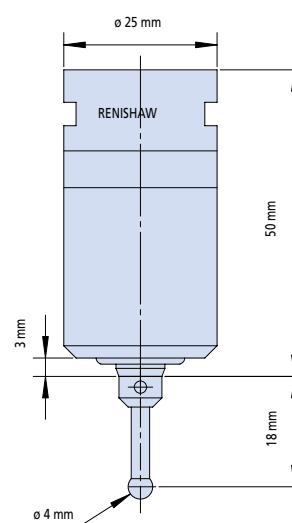


## Technical specifications TP7M/TPM EP

Direction of measurement	$\pm X, \pm Y, + Z$	
Repeat accuracy ( $2\sigma$ )	$0.25 \mu\text{m} \text{ } 1^*$	
3-D accuracy	$< 0.6 \mu\text{m}$ (TP7M EP only)	
Measuring force	XY	$0.02 \text{ N } 1^*$
	Z	$0.15 \text{ N } 1^*$
Measuring speed	max. 30 mm/s	
Overrun	XY	$\pm 16^\circ$
	Z	$\pm 5 \text{ mm}$
Requisite force needed to trigger an overrun signal	XY	$0.49 \text{ N } 1^*$
	Z	$2.94 \text{ N } 1^*$
Length of probe system	150 mm	
Probe system mounting	M4	
Weight	85 g	
Service life	$> 10,000,000$ contact probes	
Measuring head mount	auto joint	
Compatible models	TP7M CNC coordinate measuring machines TP7M EP CNC coordinate measuring machines (Legex)	

$1^*$  probe  $\varnothing 4 \times 50 \text{ mm}$ , measuring speed 30 mm/s

## Dimensions





## TP7M set

**Order No.: R-TP7ME**

1 x TP7M high-precision 6-way measuring head A-1073-0121

1 x PI7-2 interface A-1073-0030

## TP7M measuring head

**Order No.: R-TP7MS**

1 x TP7M measuring head A-1073-0121

## TP7M EP high-precision measuring head

**Order No.: R-TP7M EP**

Contact, touch trigger measuring head

1 x TP7MEP measuring head A-1073-0261

## Styli Kit M4

Part No.	Contents	Description	ø S mm	L mm
<b>K651383</b>				
		Wooden box		
	1x Part No. K651184	Stylus ceramic-ruby M4	8	100
	1x Part No. K651182	Stylus ceramic-ruby M4	8	50
	1x Part No. K651216	Adaptor ceramic M4/M3	7	100
	1x Part No. K651215	Adaptor ceramic M4/M3	7	75
	1x Part No. K651214	Adaptor ceramic M4/M3	7	50
	1x Part No. K651204	Extension ceramic M4	7	50
	1x Part No. K651203	Extension ceramic M4	7	30
	1x Part No. K651170	Adaptor M3/M2	4	5
	1x Part No. K651208	Adaptor M4/M3	7	9
	2x Part No. K650346	Pin spanner	1.7	49
	2x Part No. K651223	Pin spanner	1.2	23
	1x Part No. K651058	5-way stylus holder M2	7	7.5
	1x Part No. K651169	5-way stylus holder M3	10	13
	1x Part No. K651206	5-way stylus holder M4	15	18
	1x Part No. K651186	Stylus steel-ruby M4	1	19.5
	4x Part No. K651187	Stylus steel-ruby M4	2	19
	1x Part No. K651188	Stylus steel-ruby M4	4	18



**Ask for the STYLI AND ACCESSORIES brochure!**

Get concise information about Mitutoyo's manifold probe elements.

# Flexible Touch-Trigger Probe System TP200



## High-Precision, Compactly Designed Contact Measuring Head

This contact measuring head has a very small outer diameter of just 13.5 mm, enabling it to efficiently measure complex work pieces or in confined spaces. Fitted with a suitable extension, it can easily reach deeper areas.

## Automatic Probe System Change

The automatic probe changing system is used when a measurement requires more than just one change in probe direction (e.g., the normal probe needs to be replaced with a probe of a different diameter or special shape) – it enables fully automated measurement without having to interrupt the measuring process. As such, it can easily perform even complex measuring tasks requiring the widest range of different probe systems.



Measurement example: Engine block



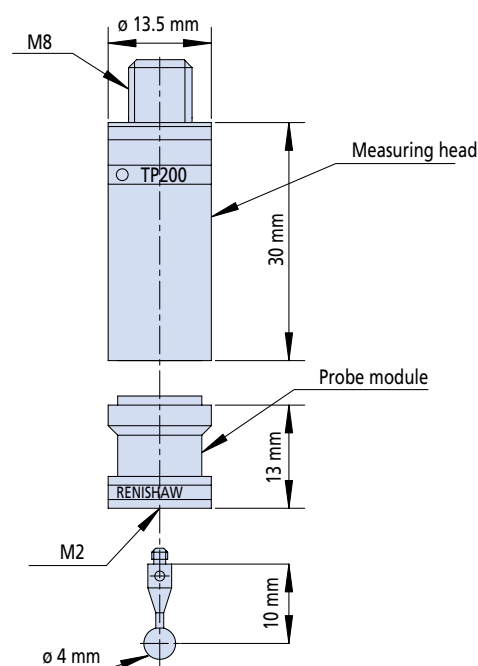
SCR 200 change system

## Technical Specifications TP200

Direction of measurement		$\pm X, \pm Y, + Z$
Repeat accuracy ( $2\sigma$ )		Max. $0.4 \mu\text{m}^*1$
3-D accuracy		Max. $1 \mu\text{m}^*1$
Measuring force	XY	$0.02 \text{ N } 1^* \text{ SF/LF}$
	Z	$0.07 \text{ N } 1^* \text{ SF/LF}$
Overrun	XY	$XY \pm 14^\circ$
	Z	$\pm 4.5 \text{ mm SF module, } + 3 \text{ mm LF module}$
Requisite force needed to trigger an overrun signal	XY	Max. $0.4 \text{ N}$ , SF module Max. $0.15 \text{ N}$ , LF module
	Z	Max. $4.9 \text{ N}$ , SF module Max. $1.6 \text{ N}$ , LF module
Length of probe system	SF module	50 mm (steel), 100 mm (carbon fiber)
	LF module	20 mm (steel), 50 mm (carbon fiber)
Max. weight of probe system		8 g SF module, 3 g LF module
Probe system mounting		M2
Weight		22 g
Service life		> 10,000,000 contact probes
Mount		M8 connections
Compatible models		CNC coordinate measuring machines
Repeat accuracy of the probe module		SCR 200; storage of up to 6 probe modules
Probe changing system (optional)		All probes with a diameter < 1 mm must be used with the low contact force module (LF). Repeatability positioning accuracy: min. $1.0 \mu\text{m}$ using the automatic module changer and 50 mm probe * min. $2.0 \mu\text{m}$ using manual module change and probe

1\* probe  $\varnothing 3 \times 50 \text{ mm}$

## Dimensions



# TP200

## TP200 set

**Order No.: R-TP200**

- 1 x PI200 interface A-1207-0050
- 1 x SCR200 probe module changer incl. 3 probe modules (SF) A-1207-0030
- 1 x PL63S 5 meter connecting cable to SCR200 A-1016-7630
- 1 x TP200 measuring head with SF probe module A 1207-0005
- 4 x probe modules (SF)

## TP200S

**Order No.: R-TP200S**

- 1 x PI200 interface A-1207-0050
- 1 x PL63S 5 meter connecting cable to SCR200 A-1016-7630
- 1 x TP200 measuring head with probe module (SF) A-1207-0005

## TP200 measuring head

**Order No.: A-1207-0005**

- 1 x TP200 measuring head A-1207-0005

## SCR200 probe module changer

**Order No.: A-1207-0260**

- SCR200 cassette without probe modules A-1207-0260

## SCR200 probe module changer

**Order No.: A-1207-0030**

- SCR200 with 6 storage slots, A-1207-0030 incl. 3 probe modules (SF)



## Accessories

### Standard probe module

**Order No.: A-1207-0010**

- 1 x probe module (SF) A-1207-0010

### Low force probe module

**Order No.: A-1207-0011**

- 1 x Low force probe module (LF) A-1207-0011

### Cleaning kit

**Order No.: A-1085-0016**

- Cleaning kit for TP200/ TP20 A-1085-0016

# Basic Touch-Trigger Probe System



## Compactly Designed Contact Measuring Head

This contact measuring head has a very small outer diameter of just 13 mm, enabling it to efficiently measure complex work pieces or in confined spaces. Fitted with a suitable probe extension, it can easily reach deeper areas.

## Automatic Probe System Change with MCR20 Changing System

The automatic probe changing system is used when a measurement requires more than just one change in probe direction (e.g., a probe with a different diameter or special shape) – it enables fully automated measurement without having to interrupt the measuring process. In addition, the probe changing system allows the rapid and flexible replacement of inserted probes, thus enabling finished parts of different shapes to be measured fully automatically.



TP20 with measuring head extension



MCR20 changing system



Measurement example: Transmission cover

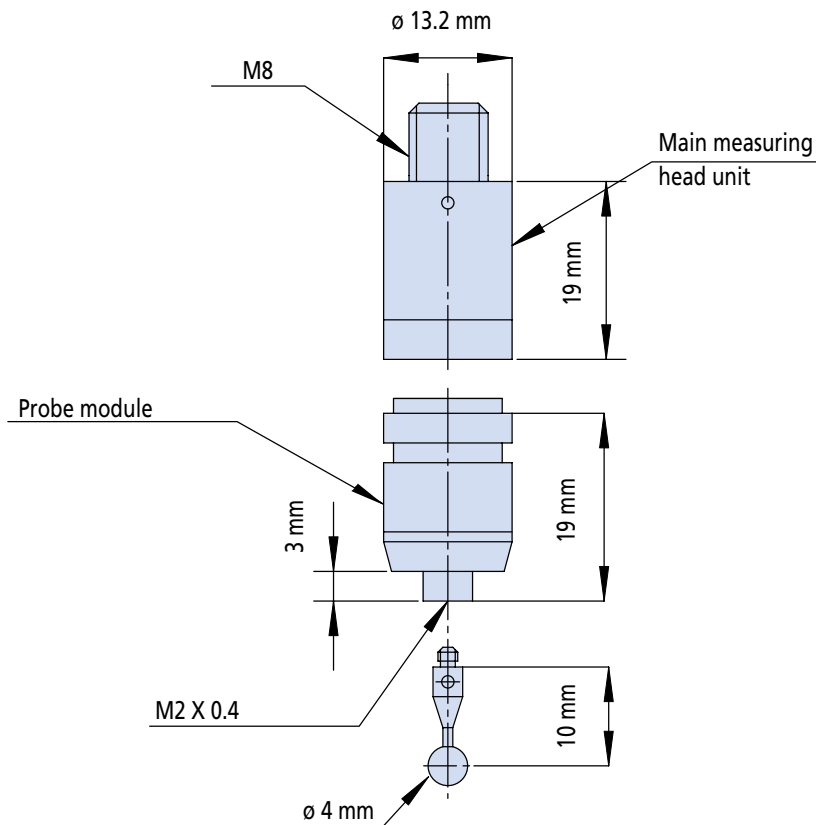
## Technical specifications TP20/TP20NI

Direction of measurement	$\pm X, \pm Y, + Z$	
Repeat accuracy ( $2\sigma$ )	Max. 0.35 $\mu\text{m}$ (at $L=10\text{ mm}$ , SF module)	
3-D accuracy	Max. 1 $\mu\text{m}$ (at $L=10\text{ mm}$ , SF module)	
	Max. 4 $\mu\text{m}$ (at $L=50\text{ mm}$ , SF module)	
Measuring force	XY	0.08 N with 10 mm probe SF module, 0.1 N with 25 mm probe MF module, 0.1 N with 50 mm probe EF module
	Z	0.75 N SF module, 1.9 N MF module, 3.2 N probe EF module
Overrun	XY	$\pm 14^\circ$
	Z	+ 4.0 mm SF module, + 3.7 mm MF module, + 2.4 mm EF module
Requisite force needed to trigger an overrun signal	XY	0.2 – 0.3 N SF module, 0.2 – 0.4 N MF module, 0.2 – 0.5 N EF module
	Z	3.5 N SF module, 7 N MF module, 10 N EF module
Length of probe system	50 mm SF module, 60 mm MF module, 60 mm EF module	
Probe system mounting	M2	
Weight	22 g (probe body: 13 g, (probe module: 9 g)	
Service life	> 1,000,000 contact probes	
Mount	M 8 connecting thread	
Compatible models	Manual/CNC coordinate measuring machines	
Probe changing system (optional)	MCR20; storage of up to 6 probe modules	
Repeat accuracy of the probe module	Repeatable positioning accuracy: max. 1.0 $\mu\text{m}$ (with automatic module change) when using the 10 mm probe, *max. 2.0 $\mu\text{m}$ with manual module change when using the 10 mm probe	

L = Length of probe system

# TP20/TP20NI

## Dimensions



### TP20 touch trigger measuring head set

#### Order No.: R-TP20

Measuring head and 2 probe modules, 1 x SF, 1 x MF contact force

incl. tool kit and cleaning kit

### TP20NI touch trigger measuring head set

#### Order No.: R-TP20NI

without magnetic switch, for performing measuring tasks in the range of magnetic fields, consisting of:

1 TP20NI measuring head and 2 probe modules

1 x SF 1 x MF incl. tool kit and cleaning kit

# Flexible Measuring Head for Manual CMMs



## Contact Measuring Head, Manual Turn/Swivel

This contact measuring head has a very small outer diameter of just 13.2 mm, enabling it to efficiently measure complex work pieces or to reach parts of work pieces in confined spaces. Further probe modules with optional 50 mm or 70 mm extension are also available (see optional accessories, page 12/13).

## Simple Change of Position

The alignment of the probe can be manually adjusted in any direction by simply loosening the button on the right hand side, positioning the probe as required, and subsequently tightening the button again. A hexagon wrench or other tools are not needed to adjust the position. The positions are not repeatable (indexable).



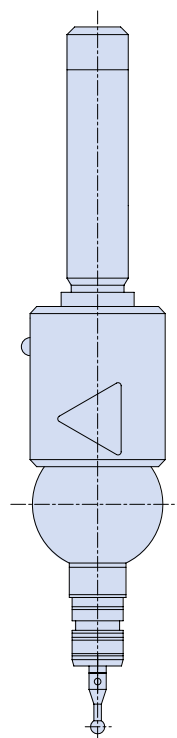
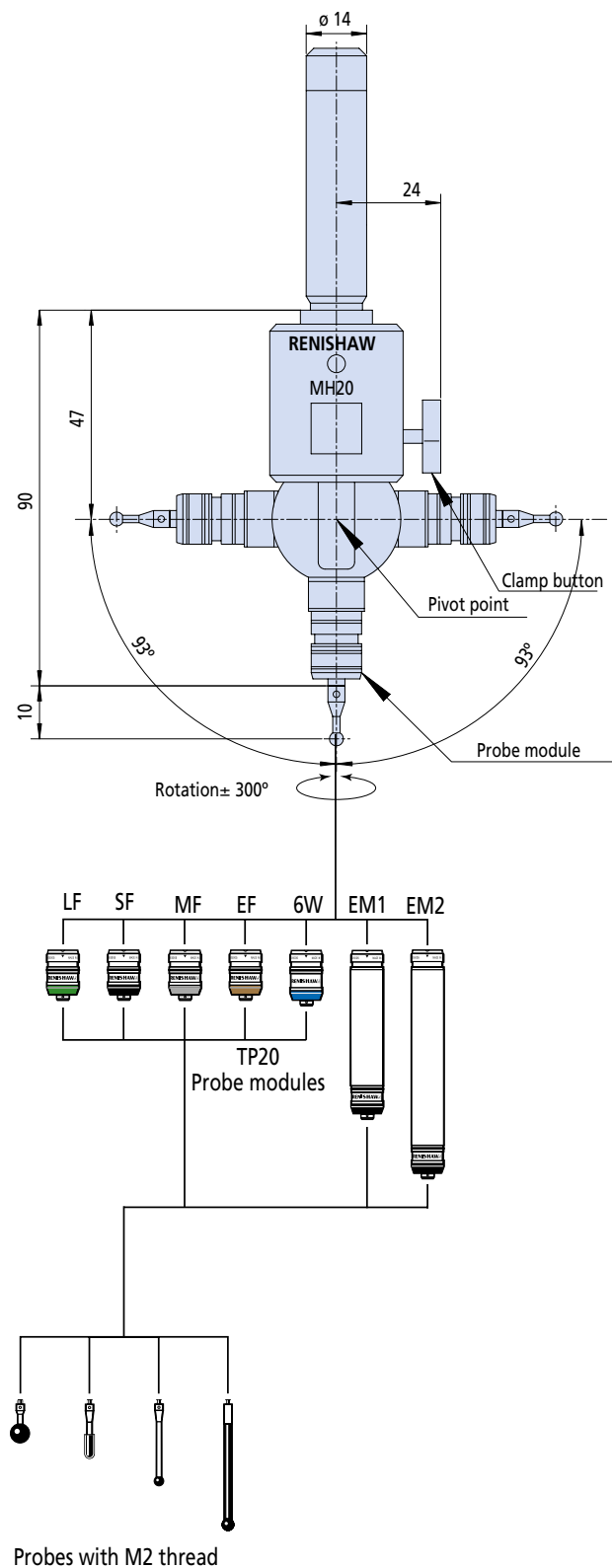
## Technical Specifications MH20

Direction of measurement	$\pm X, \pm Y, + Z$	
Change of position	Manually, on the A-axis (vertical): $\pm 93^\circ$ , and the B-axis (horizontal): in any direction within a range of $\pm 300^\circ$	
Repeat accuracy ( $2\sigma$ )	Min. $0.35 \mu\text{m}$	
3-D accuracy	Max. $1 \mu\text{m}$ (at $L=10 \text{ mm}$ , SF module)	
	Max. $4 \mu\text{m}$ (at $L=50 \text{ mm}$ , SF module)	
Measuring force	XY	0.08 N with 10 mm probe SF module, 0.1 N with 25 mm probe MF module, 0.1 N with 50 mm probe EF module
	Z	0.75 N SF module, 1.9 N MF module, 3.2 N probe EF module
Overrun	XY	$\pm 14^\circ$
	Z	+ 4.0 mm SF module, + 3.7 mm MF module, + 2.4 mm EF module
Requisite force needed to trigger an overrun signal	XY	0.2 – 0.3 N SF module, 0.2 – 0.4 N MF module, 0.2 – 0.5 N EF module
	Z	3.5 N SF module, 7 N MF module, 10 N EF module
Length of probe system	50 mm SF module, 60 mm MF module, 60 mm EF module	
Probe system mounting	M2	
Weight	100 g (without stem)	
Service life	> 1,000,000 contact probes	
Mount	M8 connecting thread	
Compatible models	Manual/CNC coordinate measuring machines	
Probe changing system (optional)	MCR20; storage of up to 6 probe modules	
Repeat accuracy of the probe module	Repeatable positioning accuracy: max. $1.0 \mu\text{m}$ (with automatic module change) when using the 10 mm probe, *max. $2.0 \mu\text{m}$ with manual module change when using the 10 mm probe	

L = Length of probe system

# MH20

## Dimensions



### MH20 measuring head set Order No.: R-MH20

MH20 turn/swivel system with integrated TP20 measuring head (main unit), 1 probe module TP20 (SF)

# Indexable Measuring Head for Manual CMMs



## Contact Measuring Head, Manual Turn/Swivel

This contact measuring head has a very small outer diameter of just 13.2 mm, enabling it to efficiently measure complex work pieces or to reach parts of work pieces in confined spaces. Further probe modules with optional 50 mm or 70 mm extension are also available.

## 168 Repeatable Measuring Head Positions

The measuring head on the MH20i can be both manually positioned (probe alignment) or turned and/or swiveled into 168 different repeatable positions. Storing the requisite positions before commencing the measurement of complex 3-D shapes requiring repeated changes in probe direction can eliminate the need to recalibrate following each change of position and thus significantly improve overall measuring performance.



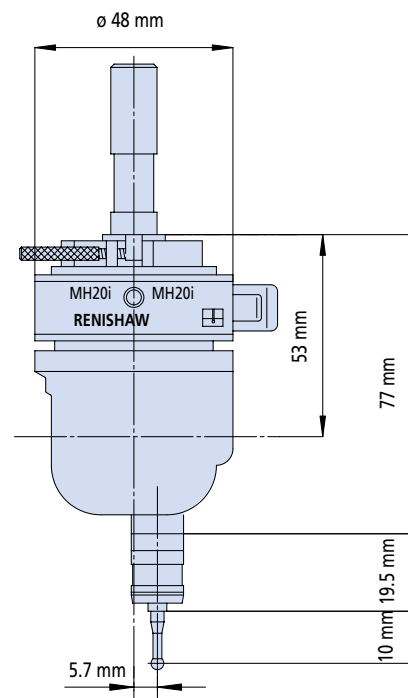
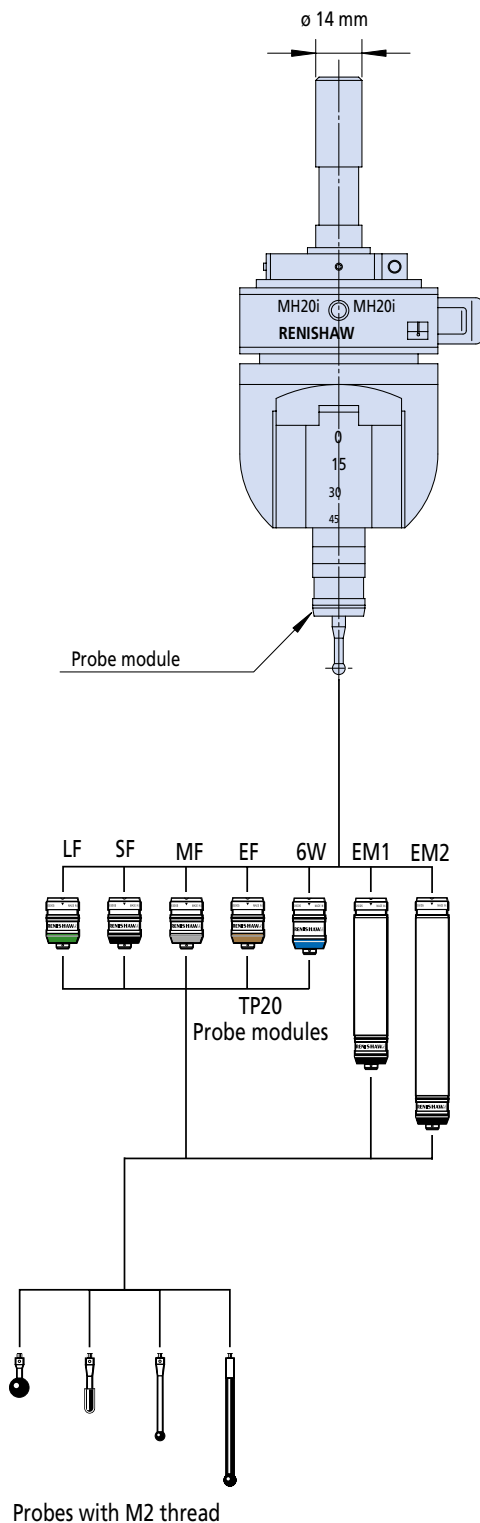
## Technical Specifications MH20i

Direction of measurement	$\pm X, \pm Y, + Z$	
Change of position	Manually, on the A axis (vertical): 0-90° (in 15° increments), and the B axis (horizontal): $\pm 180^\circ$ (in 15° increments)	
Repeatable positioning accuracy	$2\sigma \leq 1.5 \mu\text{m}$ (L=10 mm, SF module)	
Repeat accuracy ( $2\sigma$ )	Min. 0.35 $\mu\text{m}$	
3-D accuracy	Max. 1 $\mu\text{m}$ (at L=10 mm, SF module)	
	Max. 4 $\mu\text{m}$ (at L=50 mm, SF module)	
Measuring force	XY	0.08 N with 10-mm probe SF module, 0.1 N with 25 mm probe MF module, 0.1 N with 50 mm probe EF module
	Z	0.75 N SF module, 1.9 N MF module, 3.2 N probe EF module
Overrun	XY	$\pm 14^\circ$
	Z	+ 4.0 mm SF module, + 3.7 mm MF module, + 2.4 mm EF module
Requisite force needed to trigger an overrun signal	XY	0.2 – 0.3 N SF module, 0.2 – 0.4 N MF module, 0.2 – 0.5 N EF module
	Z	3.5 N SF module, 7 N MF module, 10 N EF module
Length of probe system	50 mm SF module, 60 mm MF module, 60 mm EF module	
Probe system mounting	M2	
Weight	250 g	
Service life	> 1,000,000 contact probes	
Mount	M8 connecting thread	
Compatible models	Manual/CNC coordinate measuring machines	
Probe changing system (optional)	MCR20; storage of up to 6 probe modules	
Repeat accuracy of the probe module	Repeatable positioning accuracy: max. 1.0 $\mu\text{m}$ (with automatic module change) when using the 10 mm probe, *max. 2.0 $\mu\text{m}$ with manual module change when using the 10 mm probe	

L = Length of probe system



## Dimensions



**MH20i measuring head set**  
**Order No.: R-MH20i**

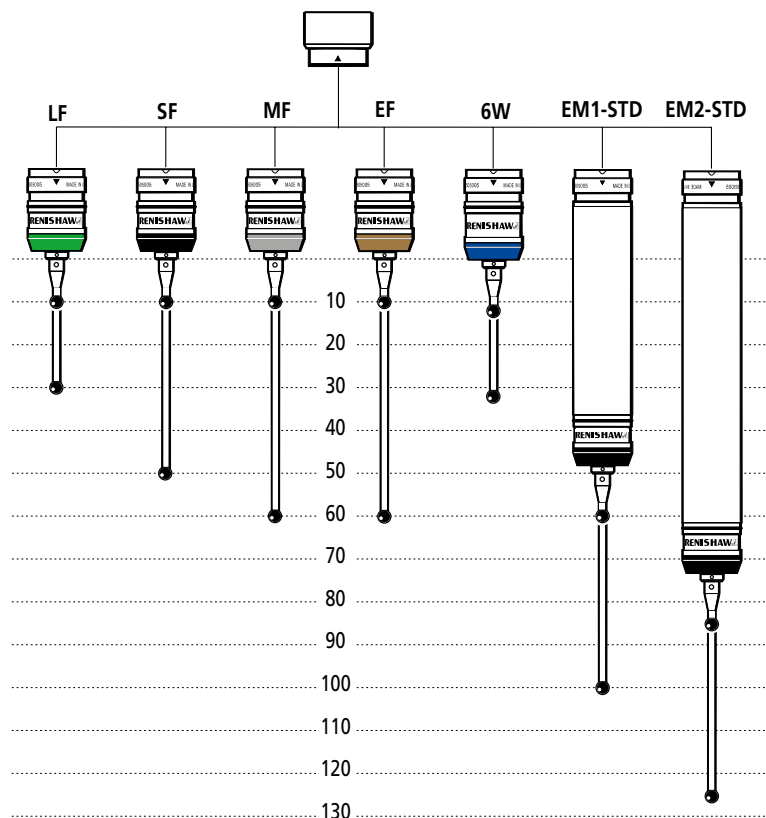
MH20 turn/swivel system with integrated TP20 measuring head (main unit), 1 probe module TP20 (SF)

# Optional Accessories for PH20/TP20/MH20/MH20i

## Probe Modules

- LF – Probe module with low contact force
- SF – Probe module with standard contact force
- MF – Probe module with medium contact force
- EF – Probe module with high contact force
- 6W – 6-way probe module
- EM1-STD – Probe module with standard contact force and 50 mm extension
- EM2-STD – Probe module with standard contact force and 75 mm extension

Probe lengths of TP20 probe modules



## Specifications

	Probe length	Contact force		Deflection force if probe overruns*			Max. probe overrun			Repeat accuracy in one direction (max. 2σ)*	2-D contact certainty on XY plane*
		XY	Z	XY	+Z	-Z	XY	+ Z mm	- Z mm		
LF	10	0.005 N	0.65 N	0.09 N	1.15 N	–	± 14°	3.1	–	0.35 μm	± 0.8 μm
SF	10	0.08 N	0.75 N	0.2 – 0.3 N	3.5 N	–	± 14°	4.0	–	0.35 μm	± 0.6 μm
MF	25	0.1 N	1.9 N	0.2 – 0.4 N	7.0 N	–	± 14°	3.7	–	0.50 μm	± 1.0 μm
EF	50	0.1 N	3.2 N	0.2 – 0.5 N	10.0 N	–	± 14°	2.4	–	0.65 μm	± 2.0 μm
6W	10	0.14 N	1.6 N	0.25 N	2.5 N	9.0 N	± 14°	4.5	1.5	0.80 μm	± 1.5 μm
EM1 STD	10	0.08 N	0.75 N	0.2 – 0.3 N	3.5 N	–	± 14°	4.0	–	0.35 μm	± 0.8 μm
EM2 STD	10	0.08 N	0.75 N	0.2 – 0.3 N	3.5 N	–	± 14°	4.0	–	0.35 μm	± 0.8 μm

\* The data were collected under the following test conditions: see column probe length, contact speed 8 mm/s

# OPTIONAL ACCESSORIES

## TP20 measuring head Order No.: A-1371-0284

without probe module A-1371-0284

TP20 mount with change kinematics,

tool kit, cleaning kit and storage box

## Probe module TP20 (LF) Order No.: A-1371-0392

with reduced contact force (green) A-1371-0392

## Probe module for TP20 (SF) Order No.: A-1371-0270

with standard contact force (black) A-1371-0270

## Probe module for TP20 (MF) Order No.: A-1371-0271

with medium contact force (gray) A-1371-0271

## Probe module for TP20 (EF) Order No.: A-1371-0272

with high contact force (light brown) A-1371-0272

## Probe module for TP20 (6W) Order No.: A-1371-0419

6-way probe module (blue) A-1371-0419

## Extended probe module EM1 Order No.: A-1371-0430

L = 70 mm A-1371-0430

## Extended probe module EM2 Order No.: A-1371-0431

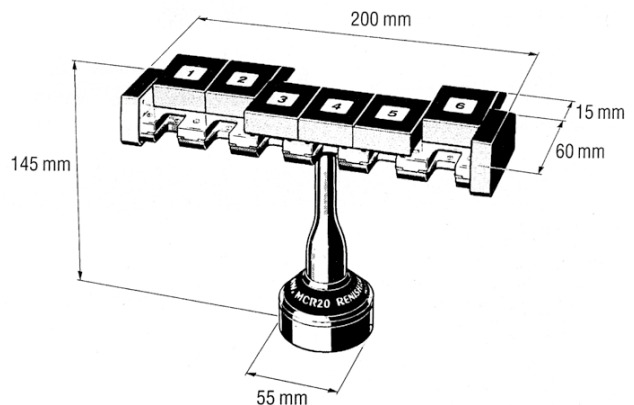
L = 95 mm A-1371-0431

## Probe module set Order No.: A-1371-0432

EM1 and EM2 A-1371-0432

## MCR20 probe changing system Order No.: A-1371-0163

MCR20 cassette with 6 storage slots A-1371-0163 without probe modules



## MSR1 Order No.: A-1371-0347

Manual stand for TP20 probe modules



# Indexable Probe Holder for CNC CMMs

## Automatic Change of Probe Position for Enhanced Measuring Performance

This servo powered turn/swivel system automatically controls the direction of the measuring head. (Positions are changed by simple manual entry of the angle on the operating box supplied, using the dedicated software or by calling up the positions from the memory, if these have been stored in advance in the memory for automatic position changes.)

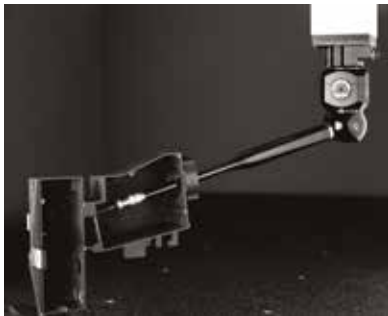
The following constellation is generally needed to measure a multi-shaped subject with one probe without automatic change of position: A star probe or several probes have to be mounted in order to measure the surface with the vertical and the side with the horizontal probe. But if the geometry of the work piece is complex, the route to the target position may be blocked by the probes that are not being used colliding with the work piece. Measuring tasks that require an angled probe are frequently equally problematic if a change of position is not possible. Moreover, the use of automatic position change significantly shortens the measuring time compared with automatic probe changing systems, allowing real time savings when performing measurements with coordinate measuring machines.

## Highly Accurate Positioning with 720 Probe Positions

The PH10M/PH10MQ can be moved to max. 720 different angle positions. Since the probe, moreover, offers a repeat positioning accuracy of  $2\sigma \leq 0,5\text{ }\mu\text{m}$ , there is no need for time-consuming recalibration when performing measurements requiring repeated adjustment to the same position.

## Use of Different Measuring Heads

The widest range of measuring heads can be used in the turn/swivel system – including contact measuring heads, scanning measuring heads, optical measuring heads, laser measuring heads and heads for measuring thread lengths, etc. These measuring heads can, moreover, be quickly and reliably changed with the help of the measuring head changing system (ACR1/ACR3) (optional) – enabling you to measure a wide range of different subjects fully automatically.



PH10MQ



PH10M

## Technical Specifications PH10T/PH10M/PH10MQ

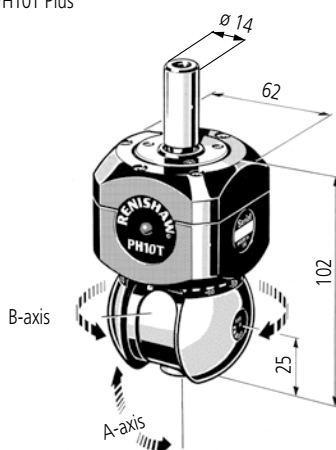
Change of position	Horizontal direction (B-axis)	$\pm 180^\circ$ (in $7.5^\circ$ increments, 48 positions)
	Vertical direction (A-axis)	$0 - 105^\circ$ (in $7.5^\circ$ increments, 15 positions)
Repeatable positioning accuracy	$2\sigma \leq 0.5\text{ }\mu\text{m}$ ; at a swivel radius of 70 mm (PH10M/PH10MQ) at a swivel radius of 48 mm (PH10T)	
Max. torque	0.45 Nm	
Total number of positions	720	
Compatible measuring heads*	MTP2000, TP7M, TP200, TP20, TP2-5W, QVP, SP25, SP600XE, MPP-10	
Extension	PEM1, PEM2, PEM3, PAA1, PAA2, PAA3 PAA+PFCF1, PAA1+PFCF2 and PAA1+PFCF3 can each be used in combination	
Weight	PH10M 645 g; PH10MQ 730 g	
Compatible models	CNC coordinate measuring machines	

\* PH10T measuring heads with M8 connecting thread only

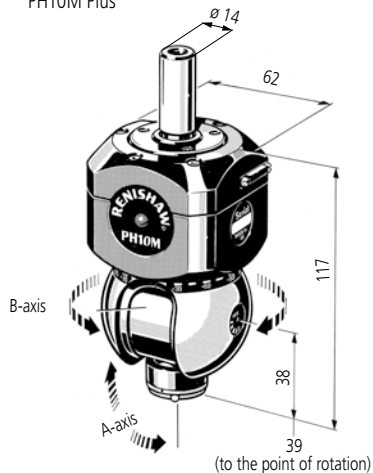
# PH10 PLUS SERIES

## Dimensions

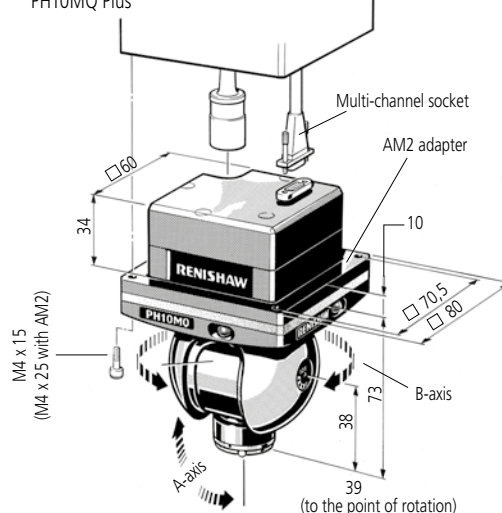
PH10T Plus



PH10M Plus



PH10MQ Plus



### PH10M set

#### Order No.: R-PH10ME Plus

- 1 x PH10M Plus turn/swivel head (MS9 mount) A-5863-1000
- 1 x HCU1 manual control A-1345-0220
- 1 x PHC10-2 RS232 control unit A-1368-0100
- 1 x PAA1 adapter L=30 mm A-1051-0417

### PH10T set

#### Order No.: R-PH10TE Plus

- 1 x PH10T Plus turn/swivel head (MS9 mount) A-5863-2000
- 1 x PHC10-2 RS232 control unit A-1368-0100
- 1 x HCU1 manual control A-1345-0220

### PH10MQ set

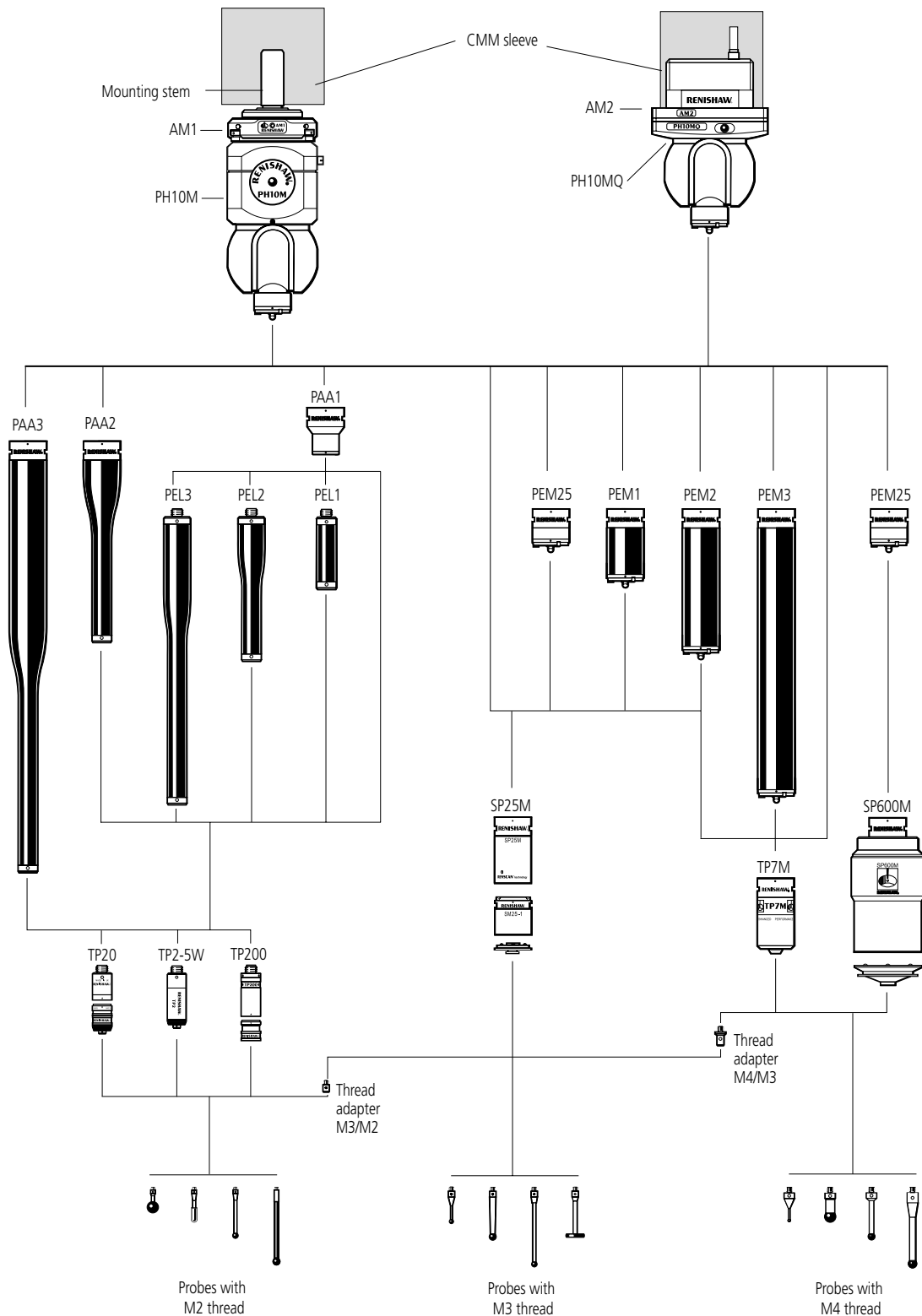
#### Order No.: R-PH10MQME Plus

- 1 x PH10MQ Plus turn/swivel head A-5863-1000
- 1 x HCU1 manual control A-1345-0220
- 1 x PHC10-2 RS232 control unit A-1368-0100
- 1 x PAA1 adapter L=30 mm A-1051-0417

## Extensions

Designation	Order no.	Material	
R-PEL1	A-1047-3484	Carbon fiber	
R-PEL2	A-1047-3485	Carbon fiber	
R-PEL3	A-1047-3486	Carbon fiber	
R-PEL4	A-1034-3487	Carbon fiber	

# Configuration Overview of PH10 Plus Series



# PH10 PLUS SERIES

## PH10 PLUS SERIES





# Fixed Probe Holder PH6



## PH6 – Rigid Measuring Head Mount

The PH6 is a compact, rigid measuring head mount with integrated cable connection and M8 connecting thread. A cylindrical stem is used to mount it on the coordinate measuring machine.

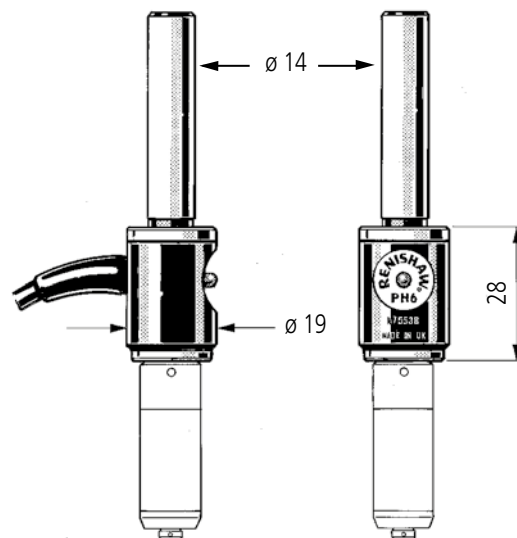
## Technical Specifications PH6

Status display	1 LED
Cable connection	Integrated spiral cable on the side
Measuring head connection	M8 thread
Compatibility	All Renishaw measuring heads with M8 connecting thread
Weight	48 g
Compatible models	Manual and CNC coordinate measuring machines

### PH6 Measuring head mount Order No.: RA-1046-7221

PH6 measuring head mount MS9/5POL.BUCHSE A-1046-7221  
PL1 head cable 0.25-0.7 meter 5 PIN-DIN A-1016-0004

## Dimensions



# Fixed Probe Holder PH6M



## PH6 M – Rigid Measuring Head Mount with Automatic Change Function

The PH6M is a rigid measuring head mount with automatic change function (auto joint mount). A cylindrical stem is used to mount it on the coordinate measuring machine.

The auto joint mount allows the PH6M to automatically change various measuring heads on CNC coordinate measuring machines while ensuring high levels of position reproducibility. The integrated multi-channel system ensures compatibility even with optical and other measuring heads.

## Technical Specifications PH6M

Status display	1 LED
Cable connection	15 pin Micro D connecting socket on the side
Measuring head connection	Auto joint mount
Reproduktionsbarkeit der Position (2 $\sigma$ )	L = 1 $\mu\text{m}$ (at a distance of 50 mm)
Compatibility	Extensions and measuring heads with auto joint mount, all measuring heads with M8 connection thread if a PAA1 adapter is used.
Weight	160 g
Compatible models	Manual and CNC coordinate measuring machines

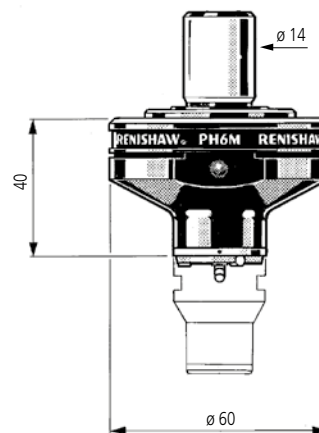
### PH6M Measuring head mount

#### Order No.: R-PH6M

PH6M A-1074-0039

PAA1 adapter L = 30 mm A-1051-0417

## Dimensions



# Flexible Probe Holder PH1



## Manual Turn/Swivel System

For use with TP200, TP20 and TP2-5W measuring heads.

## Simple Change of Position

The operator can manually change the alignment of the probe to any direction, the positions cannot be indexed.

## Extension

The turn/swivel system permits the use of measuring head extensions up to 200 mm in length.



## Technical Specifications PH1

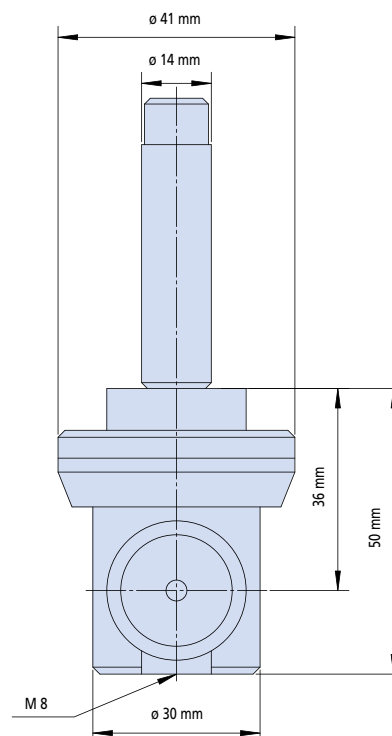
Change of position	Horizontal direction (B axis)	360° (in 15° increments) Continual (infinitely variable) positioning possible if the head is turned together with the ø 14 mm stem unit
	Vertical direction (A axis)	± 115° (infinitely variable)
Compatible measuring heads	TP200, TP20, TP2-5w	
Extension	PECF1, PECF2, PECF3	
Compatible models	Manual coordinate measuring machines	

### PH1

Order No.: R-PH1

Measuring head mount A-1049-6135

## Dimensions



# Modular Rack System MRS

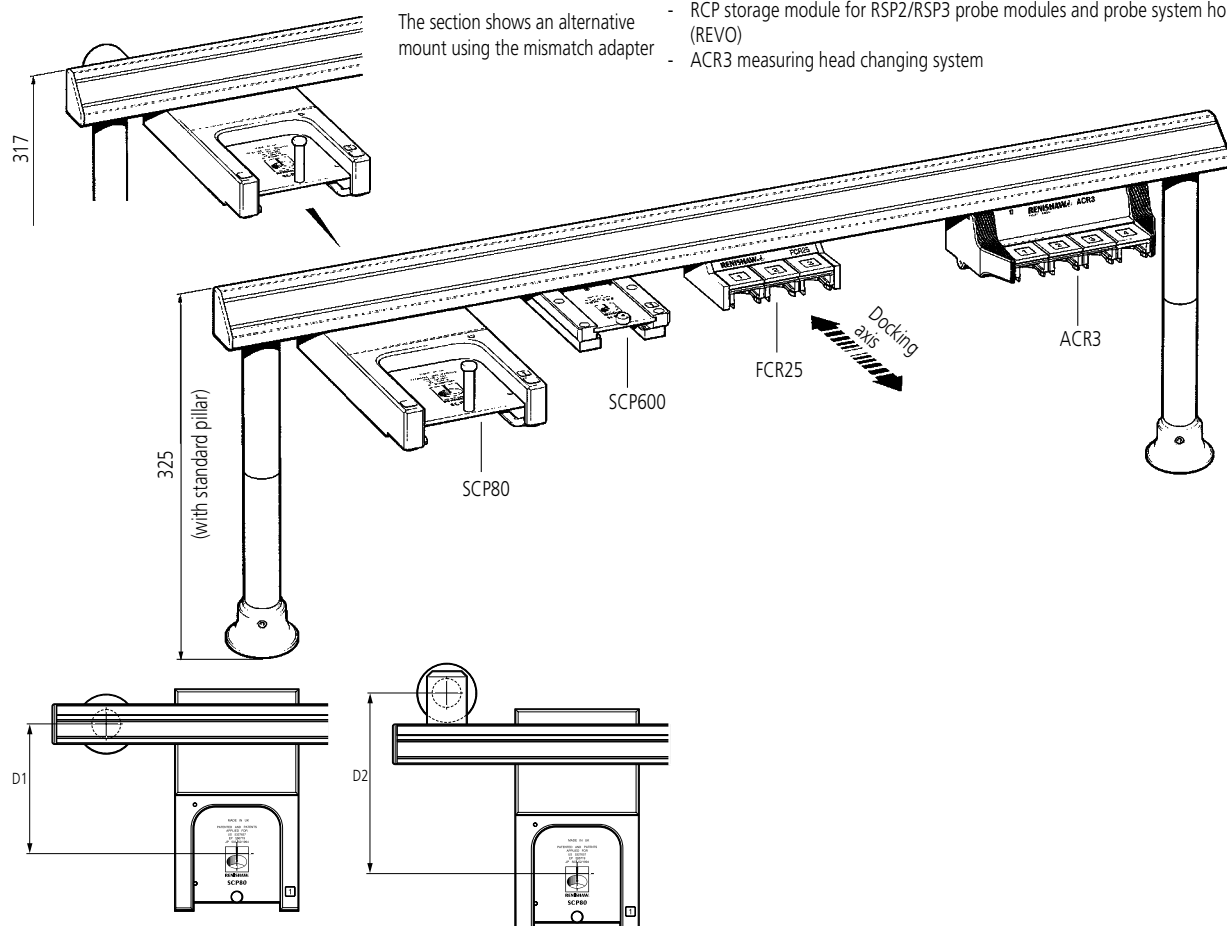
The MRS modular mounting system is the ideal basis for combining various Renishaw changing and storage systems. It is comprised of the MRS bar, which is available in lengths of 400, 600 and 1000 mm, and two pillars.

Additional pillars can be used to raise the height of the MRS bar above the CMM table, thus enabling the use of long probe systems and extensions. A standard pillar is 125 mm high (4 pillars are supplied with each set). Additional pillars are optionally available to raise the height to 500 mm maximum. Additional 125 mm pillars are also available. Two pillars of the MRS mounting system are bolted onto the CMM table.

We recommend the use of reinforced MRS pillars with  $\varnothing 60$  mm and a length of 350 mm when using large, heavy probe configurations (e.g. several SPC80 on one 1000 mm MRS bar). These special pillars are mounted beneath the standard pillars and bolted to the CMM table.

The MRS is compatible with the following changing systems and storage modules:

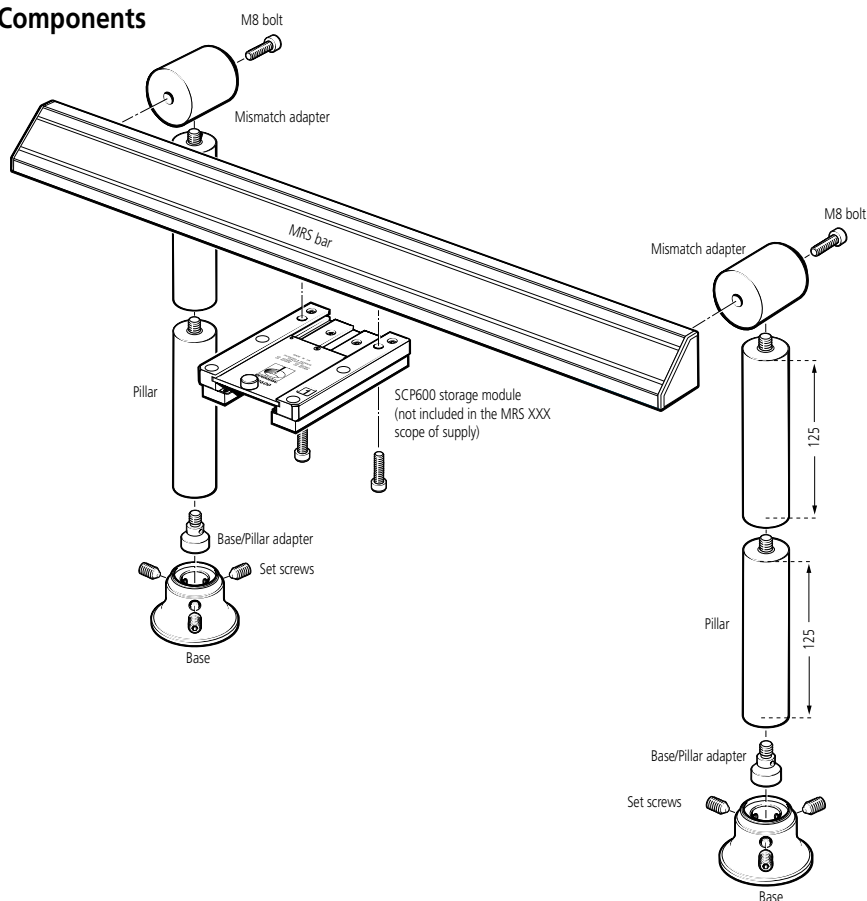
- FCR25 changing system for SP25M with three storage slots
- SCP80 storage module for SH80 probe system holder
- SCP600 storage module for probe system holders (MPP100, MPP300, SP600)
- RCP storage module for RSP2/RSP3 probe modules and probe system holders (REVO)
- ACR3 measuring head changing system



		D1	D2
Distance measuring head storage point to center pillar	FCR25	41	94
	ACR3	56	109
	SCP600	69.2	122.2
	SCP80	134	187

# MRS Modular Rack System

## MRS System Components



### MRS400

**Order No.: A-4192-0001**

MRS400 mounting set for changing systems:

400 mm profiled bar, 4 support pillars, each 125 mm long, 2 angle adapters for back mounting, 2 table adapters and installation material.

### MRS600

**Order No.: A-4192-0002**

MRS600 mounting set, identical to MRS400 except:

600 mm profiled bar, 4 support pillars, each 125 mm long, 2 angle adapters for back mounting, 2 table adapters and installation material.

### MRS1000

**Order No.: A-4192-0003**

MRS1000 mounting set, identical to MRS400 except:

1000 mm profiled bar, 4 support pillars, each 125 mm long, 2 angle adapters for back mounting, 2 table adapters and installation material.

## Maximum Changing Stations that can be Mounted on the MRS



ACR3-4	ACR3-8	FCR25	SCP600	SCP80
1	0	0	0	0
0	0	2	0	0
0	0	0	4	0
0	0	0	0	2



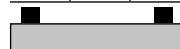
ACR3-4	ACR3-8	FCR25	SCP600	SCP80
1	0	0	0	0
0	1	0	0	0
1	0	2	0	0
0	0	4	0	0
1	0	0	3	0
0	0	0	6	0
0	0	0	0	4



ACR3-4	ACR3-8	FCR25	SCP600	SCP80
1	0	5	0	0
0	1	4	0	0
0	0	8	0	0
1	0	0	7	0
0	0	0	11	0
0	0	0	0	7



ACR3-4	ACR3-8	FCR25	SCP600	SCP80
1	0	1	0	0
0	0	3	0	0
0	0	0	4	0
0	0	0	0	3



ACR3-4	ACR3-8	FCR25	SCP600	SCP80
1	0	2	0	0
0	1	1	0	0
1	0	2	0	0
1	0	0	3	0
0	0	5	0	0
0	0	0	7	0
0	0	0	0	4



ACR3-4	ACR3-8	FCR25	SCP600	SCP80
1	0	6	0	0
0	1	4	0	0
0	0	8	0	0
1	0	0	8	0
0	0	0	11	0
0	0	0	0	7

# MRS MODULAR RACK SYSTEM

## MRS MODULAR RACK SYSTEM

### MRS High-performance Pillars

The optional high-performance pillars must be used if you intend to store several SCP80 with heavy or vertical probe configurations that are 190 mm or longer in order to improve stability and raise the height of the MRS bar sufficiently. These sets are offered separately to ensure they match the number of pillars used. The high-performance pillars are 330 mm long and are mounted between the CMM table and the standard MRS pillars.

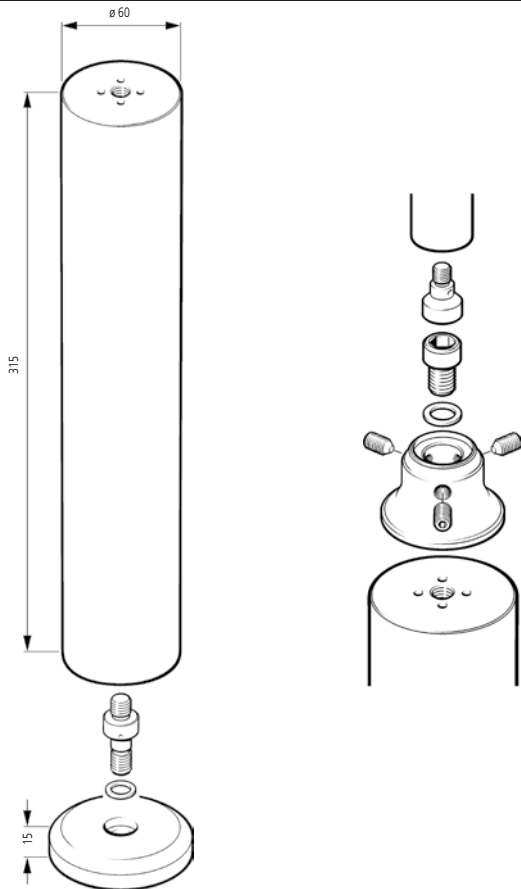
### MRS Set of High-performance Pillars

The set of high-performance pillars can be used to improve the stability of the MRS modular mounting system when using particularly heavy or particularly long (Z direction) probe system configurations. As each set of high-performance pillars consists of 1 pillar, 1 each M8 / M10 stud bolt, and 1 base plate, at least two sets are needed for an MRS system.

#### MRS pillar set

Order No.: A-4192-0020

1 x pillar L=315 mm, D=60 mm,  
1 x double-sided stud bolt and  
1 x base plate



\* Two stud bolts (one each M8 and M10 thread) are supplied to enable the pillars to be mounted on different CMM tables.

### MRS Adjustable Base Plates

The adjustable base plates (optional) can be used to place the MRS in different positions on the CMM table. This allows for the largest possible working area. The adjustable base plates can be used with both standard and high-performance pillars. They are fitted with bores at four stages – 25/50/75/100 mm - for alignment purposes.

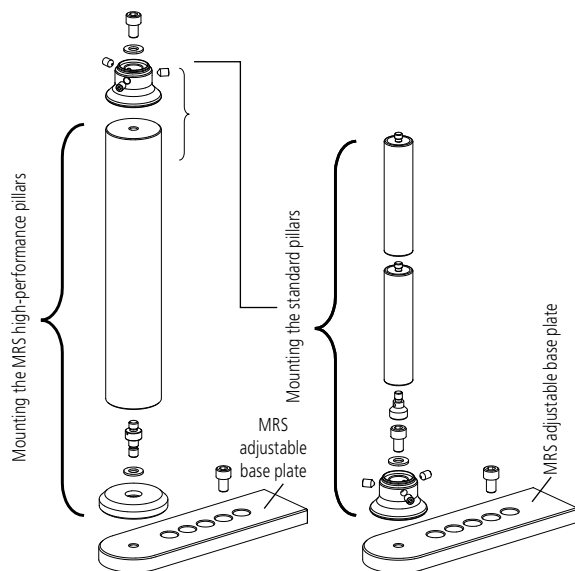
### MRS Set of Base Plates

The adjustable base plates are optional accessories for best possible alignment and positioning of the MRS mounting system on the CMM table. The set of base plates contains 2 base plates and is compatible with both standard and high-performance pillars.

#### MRS set of base plates

Order No.: A-4192-0702

2 base plates, each adjustable  
in increments of 25 mm, 50 mm,  
75 mm and 100 mm.



Arranging the adjustable MRS base plates with standard or high-performance pillars

# Autochange Rack ACR3 for Multisensor CMMs



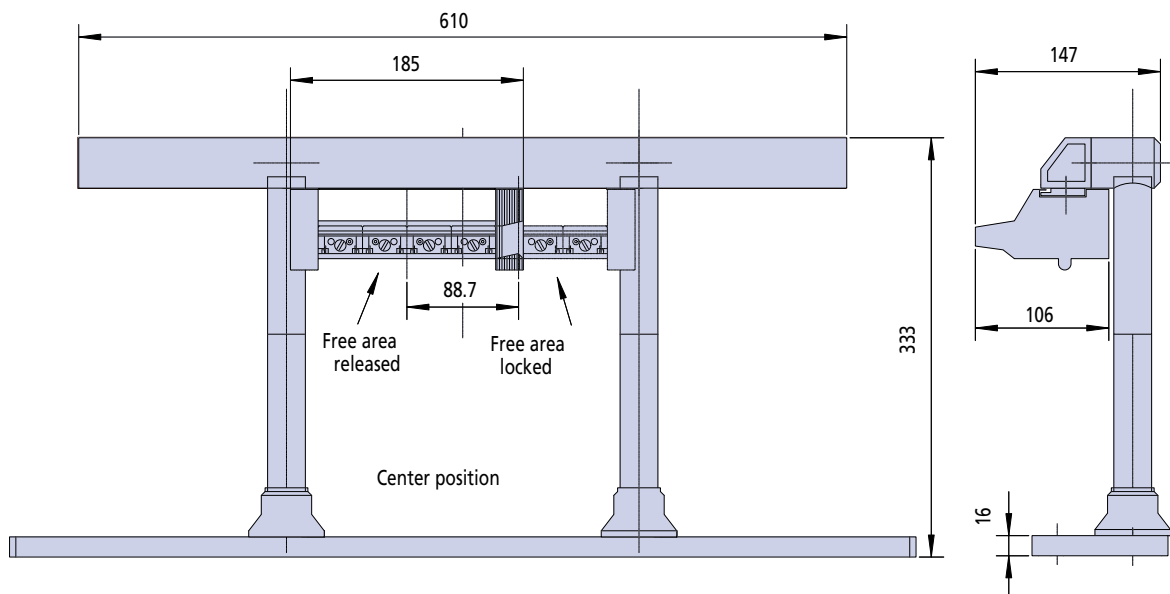
## Multi-sensor Technology Through Automatic Change of Measuring Heads

The ACR3 is an automatic measuring head changing system that is used in combination with the PH10M/PH10MQ/PH6M turn/swivel systems. It enables the user to perform automatic measurements if the measuring head currently in use does not permit an automatic change of probe system but the diameter or length of the probe has to be occasionally altered and contact and contact-free measuring heads have to be inserted as necessary.

## Simplified Structure

The structure of the ACR3 is simple and designed for a long service life. This is achieved by means of an innovative mechanism through which the drive unit of the coordinate measuring machine automatically changes the probes itself.

## Dimensions





# ACR3

## ACR3-4

**Order No.: A-5036-0005**

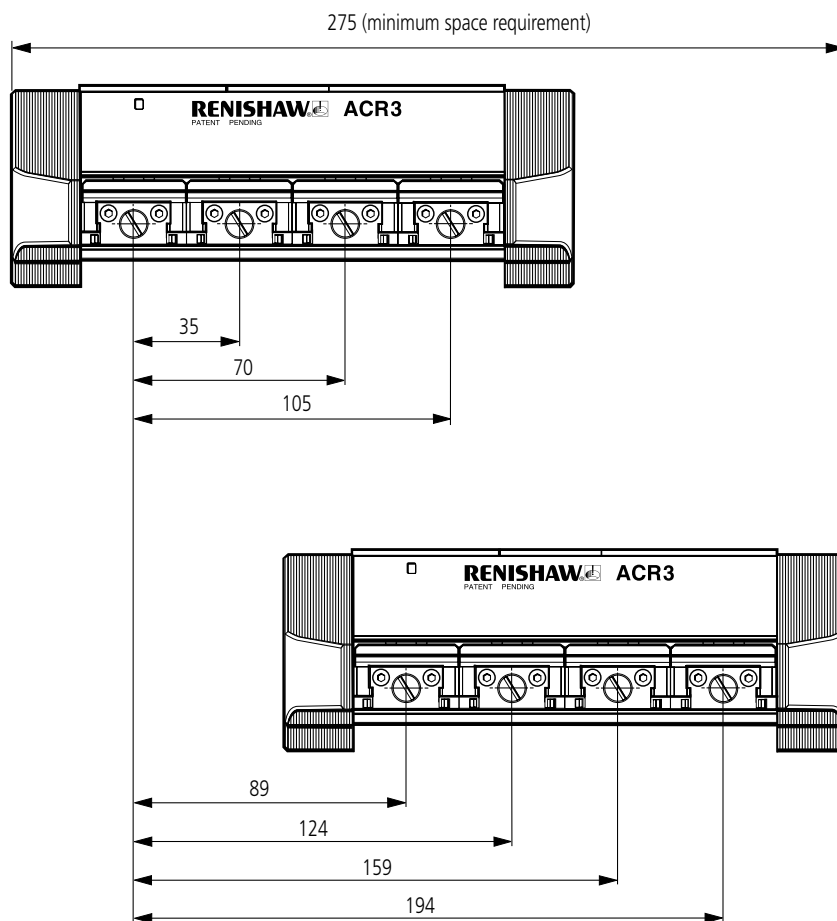
ACR3-4 measuring head changing system with 4 storage slots for extensions and/or measuring heads with auto joint mount for installation on an MRS mounting set.

## ACR3-8

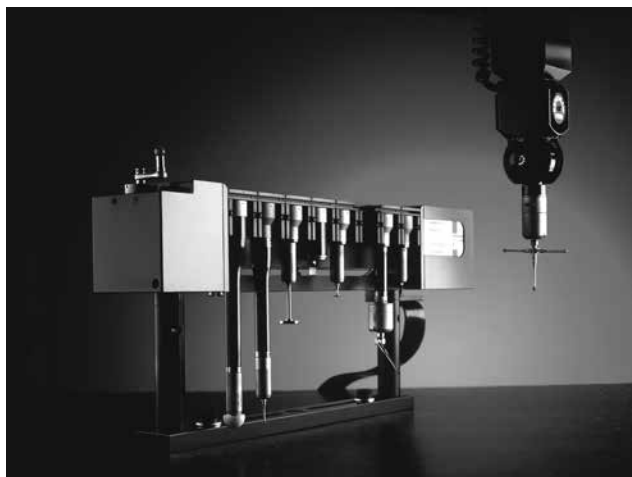
**Order No.: A-5036-0500**

ACR3-8 measuring head changing system with 8 storage slots

### Dimensions



# Motorised Autochange Rack ACR1 for Multisensor CMMs



## Automatic Measuring Head Changing System

The ACR1 is an automatic measuring head changing system with eight storage slots. Mounted in the workspace of the coordinate measuring machine, it automatically replaces the widest range of measuring heads and extensions with auto joint mount. It can be used in combination with other changing systems (e.g. probe module changing systems).

The servo powered clamp and release mechanisms of the auto joint mount keeps bending moments away from the coordinate measuring machine's sleeve, which also makes it possible to automatically change combinations of extensions. Since the ACR1 can also be used vertically, it is particularly flexible.

## Technical Specifications ACR1

Data transfer	ACC2-2 controller, serial RS232C connection
Compatibility	Measuring heads and extensions with auto joint mount
Weight	3.85 kg
Compatible models	CNC coordinate measuring machines

### ACR1 set

**Order No.: R-ACR1-SP600M**

ACR1 special measuring head changing system **A1051-1300**

ACC2-2 control unit A-1520-0101

Installation kit for horizontal mounting A-1051-0441

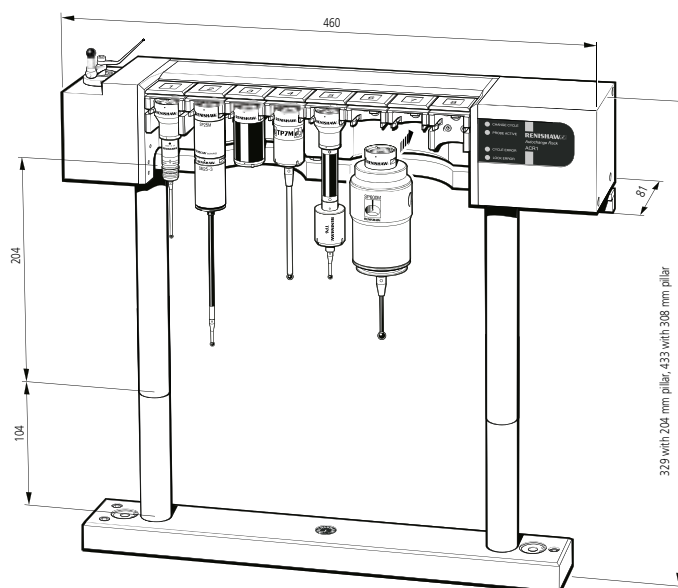
PL19 5 meter cable ACR1 - ACC2 A-1051-0199

PL37 connecting cable PHC9-ACC2 7 PIN-DIN A-1054-0003

AM1 adapter for PH10M,MIH und PH6M A-1026-0320

PHC10-PI200 connecting set A-1018-0126

## Dimensions



# ACR1

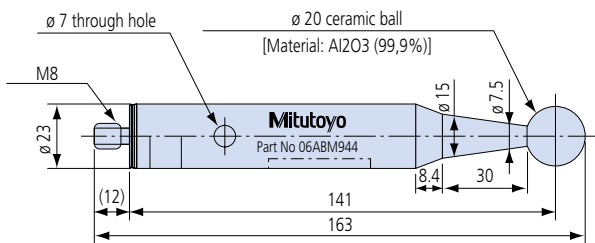


# For the Best Measurement Results



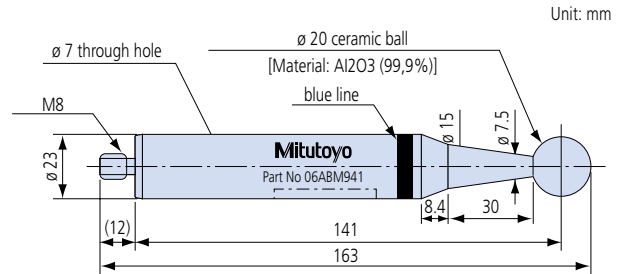
**Standard ceramic ball 20 mm**  
Order No. 06ABM944

- Ball sphericity: 0.13  $\mu\text{m}$
- Measuring tolerance of ball diameter:  $20 \pm 0.01 \text{ mm}$



**High precision ceramic ball 20 mm**  
Order No. 06ABM941

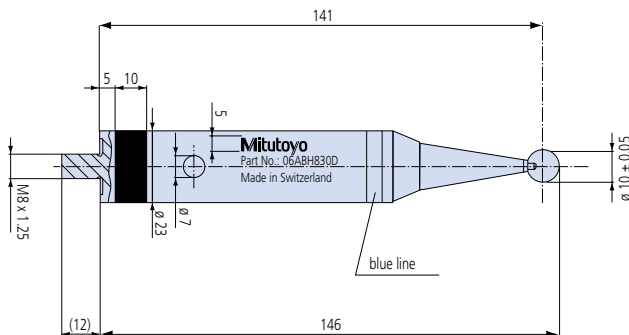
- Ball sphericity: 0.08  $\mu\text{m}$
- Measuring tolerance of ball diameter:  $20 \pm 0.02 \text{ mm}$



Unit: mm

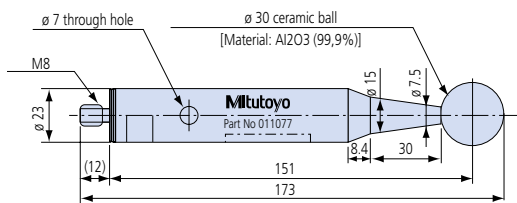
**Ceramic ball 10 mm**  
Order No. 06ABH830D

- Ball sphericity: 0.08  $\mu\text{m}$
- Measuring tolerance of ball diameter:  $10 \pm 0.05 \text{ mm}$



**Ceramic ball 30 mm**  
Order No. 011077

- Ball sphericity: 0.13  $\mu\text{m}$
- Measuring tolerance of ball diameter:  $30 \pm 0.05 \text{ mm}$



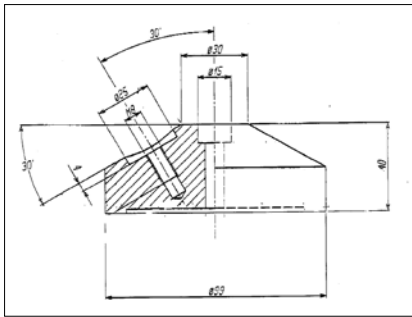
# MASTERBALLS

## A blue cylindrical robot with a smiling face, a single eye, and a small antenna. It is positioned in the center of the slide.

Technical drawings of a mechanical assembly in three views: isometric, front view, and side view.

- Isometric View:** Shows a base with a vertical hole and a tilted hole. The vertical hole has a diameter of 20. The tilted hole has a diameter of 14.1. The distance from the base to the top of the tilted hole is 90.5.
- Front View:** Shows a base with a vertical hole and a small rectangular feature. The vertical hole has a diameter of 20. The distance from the base to the top of the vertical hole is 191.
- Side View:** Shows a base with a vertical hole and a small rectangular feature. The vertical hole has a diameter of 32. The distance from the base to the top of the vertical hole is 191.

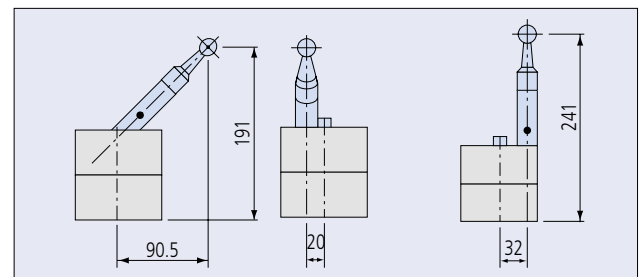
Unit: mm



**Order No.: 06AAC565D**

Order No.	Diameter	Material	
06ABH830D	10 mm	Ruby	Incl. works certificate
06ABM941D	20 mm	Ceramic	Incl. METAS certificate (Lexeg)
06ABM944D	20 mm	Ceramic	Incl. works certificate

Spacer plate for stand



59

Coordinate measuring machines from Mitutoyo give you the cutting edge in terms of experience and competency of one of the world's leading specialists for production measurement technology. You can gain access to the knowledge assimilated over decades for performing the tasks of tomorrow. The standards of quality and performance and the level of progressiveness are unequalled.



**Ask for our general brochure "Coordinate Measuring Machines".**

It provides you with a compact overview of the wide diversity offered by next-generation CMM technology developed by Mitutoyo.



**Ask for the STYLI AND ACCESSORIES brochure!**

Get concise information about Mitutoyo's manifold probe elements.

Coordinate Measuring Machines	
Vision Measuring Systems	
Form Measurement	
Optical Measuring	
Sensor Systems	
Test Equipment and Seismometers	
Digital Scale and DRO Systems	
Small Tool Instruments and Data Management	

Mitutoyo Europe GmbH  
Borsigstr. 8-10  
41469 Neuss  
T +49 (0)21 37-102-0  
F +49 (0)21 37-102-351  
info@mitutoyo.eu  
www.mitutoyo.eu

**Note:** MITUTOYO, LEGEX, MCOSMOS and SURFTEST are either registered trademarks or trademarks of Mitutoyo Corp. in Japan and/or other countries/regions. RENISHAW, REVO and Renscan are registered trademarks of Renishaw plc. Other product, company and brand names mentioned herein are for identification purposes only and may be the trademarks of their respective holders. Product illustrations are without obligation. Product descriptions, in particular any and all technical specifications, are only binding when explicitly agreed upon.

**Mitutoyo**