Sensors

Probing systems and accessories for bridge CMMs

Operating Instructions

ZEISS

Read first!

– Please read these operating instructions before starting the coordinate measuring machine (CMM).

– For your own safety, please keep all relevant accompanying documents always ready at hand.

The design and delivered components of the CMM, its options, program packages and relevant documentation are subject to change.

This document is subject to modification. We reserve the right to make technical modifications to the CMM and its components.

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Sensors
Operating Instructions
2015-10-06
61211-6081002

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Preface

Information about these operating instructions

These operating instructions describe the probing systems used on bridge CMMs. Please refer to the operating instructions to see which probing system is suitable for the respective CMM.

These operating instructions address operators and users of the coordinate measuring machine.

Terminology

In this document, the terminology for coordinate measuring machines according to EN ISO 10360-1 is used.

Configuration of safety instructions

Safety instructions indicate a personal health hazard. We distinguish three different levels: Danger, warning and caution. All three safety instructions are marked with the same warning symbol. The designation of the safety instruction is shown beside the symbol. The safety instructions used are described below.

Configuration of a safety instruction

A safety instruction may have the following components:

- Warning symbol and designation of the safety instruction (signal word): Danger, warning or caution.
- Source and cause of the danger
- Consequences for the user due to non-observance of the safety instruction
- Required measures to be taken by the user to avoid possible consequences
- A measure may cause an intermediate result.
- At the end of all measures, a final result may be caused.

Personal health hazard

⚠ DANGER

A »danger« indicates an imminent risk to life and limb.
Non-observance of this safety instruction when the described risk occurs causes death or serious injuries.
Example: Electric shock due to high electric voltage.

⚠ WARNING

A »warning« indicates a possible risk to life and limb.
Non-observance of this safety instruction when the described risk occurs may cause death or serious injuries.
Example: Risk of severe crushing of the body caused by heavy loads.

⚠ CAUTION

A »caution« indicates a personal health hazard.

Non-observance of this safety instruction when the described risk occurs may cause slight to moderate injuries.

Example: Risk of minor crushing of the limbs caused by small loads.

Risk of material damage

If there is no personal health hazard, but the CMM or components may get damaged, this is pointed out by the following notice.

This symbol refers to possible damage to the CMM.

Non-observance of this safety instruction when the event occurs may cause damage to the CMM or one of its components.

Example: Collision of the ram with a workpiece.

Marking elements

The texts may be displayed differently in this document. Examples and the meaning of the representation type are described below:

Example	Meaning
not	Words to be emphasized are represented in *italics*. The italicized print is sometimes used to mark a subheading, e.g. *Type of measurement:*
Main switch	Any reference to operator's controls in the text is highlighted typographically.
Tolerance field	Designation of subdomains in software windows.
Cancel	Marking of buttons
RETURN	Keys of the keyboard are represented as small capitals.
"InstallShield Wizard completed"	Software messages
File → Open	Representation of menu items
`Code`	Source code
...\Calypso\opt \om\protform	File and directories
CALYPSO	Product name
ZEISS	Company name
CAUTION! The measuring table must be clean.	Safety instruction embedded in the text.
[1]	Representation of position numbers in texts

Chapter 1

Introduction

This chapter contains:

Intended use

Probing system

The probing system is a high-tech product which may be used only for its intended purpose.

Probing

CMM probing systems are designed for determining the *coordinates* of a workpiece. This is usually achieved via probing, during which the workpiece is probed by a stylus tip. In some cases optical measuring methods are used. The probing system comprises several components, such as the probe holder, probe, and stylus system.

Linear scales

The linear scales are integrated into the machine axes of the CMM and protected by covers. These covers must be attached when the CMM is in operation to prevent improper use.

Probes and probe holders

We can differentiate between two cases:

- Normally, the probe is attached to the ram by means of an adapter. In this case, the probe is also the probe holder.
- On the other hand, there are probe holders which are not probes at the same time. In that case a probe is attached to a probe holder. Such a probe holder can be an articulating probe holder, for example the RDS type.

The stylus system used for probing is inserted into the probe. The probe and stylus system must be handled carefully.

Functions of the probe:

- Holding the stylus system.
- Exact positioning of the stylus system.
- Detecting the stylus system deflection and transmitting the signal to the computer.

  The computer calculates the coordinates of the probed point.

Stylus system

The stylus system consists of several components: Adapter plate, stylus, and stylus system components. One or more styli can be mounted on a stylus system. The stylus tip is located at the end of the stylus.

Functions of the stylus system:

- The adapter plate holds and positions the stylus system exactly in the probe.
- Workpiece probing is carried out by the stylus tip.

Reasonably foreseeable misuse

The probe, the probe holder and the stylus system must not be used for purposes other than their proper use.

Examples:

- The probe must not be used as a support.
- The stylus system must not be used as a lever arm, e.g. to loosen a ring bolt.
- The stylus system must not be used as a hammer.

Notes on the use

Warranty, standards, safety

The probing system is part of the CMM, for which certain standards apply. Furthermore, to operate the CMM, the safety instructions must be observed. See operating instructions for the CMM.

Operating instructions for the CMM

The operating instructions for the CMM include information on the following topics:

- Machine safety
- Standards, regulations and directives
- Warranty
- Safety

Travel movements

There is a risk of injuries during all movements of the CMM. The speed of the travel movements and the travel direction are irrelevant. Travel movements take place in the three CMM axes X, Y, Z and during rotation of the rotary table.

Work on the CMM

⚠ WARNING

Risk of injury during high travel speed movements and rotation of the rotary table axis.

Crushing and cutting of parts of the body.

Risk to the eyes caused by the styli. Styli can hurt the eyes during travel movements if you approach your head close to the workpiece during probing.

✓ Make sure that no travel movements are possible when installing the probing system on the CMM.

- Switch the drives off before setting up the probing system on the CMM.
- Please read the notes in the operating instructions for the CMM.

Setup of the probing system includes:

- Mounting and dismounting of the probe carrier
- Mounting and dismounting of the probe
- Installing and removal of a stylus system.

Disposal

NOTE

Some parts of the probing system contain electronic components and must not be disposed of with domestic waste. Make sure to dispose of the components in question in accordance with the WEEE directive 2002/96/EC or the respective country-specific legislation applicable within the 27 EU states.

Chapter 2

Probing systems

This chapter contains:

Overview

Probing systems - overview

It is differentiated between trigger and measuring probing systems. For the measuring probing systems, a distinction is made between passive and active measuring. There are also optical probing systems:

Probing system		Triggering	Measuring		Optical
			Passive	Active	
ST		×			
ST 3		×			
ST-ATAC	ST 3 with ATAC technology				
DT DynaTouch	Frequently only called DT.			×	
DTS			×		
XDT		×			
VAST XXT	Frequently only called XXT.		×		
VAST XT and VAST XT gold				×	
VAST XTR gold				×	
VAST and VAST gold				×	
HSS				×	
RDS with RST or RST-P	RST-P is an enhancement of the RST	×			
RDS with XDT		×			
RDS with VAST XXT			×		
RDS with TP6		×			
RDS with TP2		×			
RDS with TP20		×			
RDS with TP200		×			
RDS with SP25 or SP25M			×		
RDS with SP600			×		

Probing system		Triggering	Measuring		Optical
			Passive	Active	
RDS with ViScan					×
RDS with DTS					×
RDS with LineScan					×
Renishaw	Combination of an articulating probe holder and a probe, e.g. MIH with TP6	×			

NOTE

Almost all probing systems are contact probing systems. Only RDS with ViScan, RDS with DTS and RDS with LineScan are optical probing systems.

Probing system components and functions

Probing system components

Probe and probe holder at the same time

Probe	ST	ST 3	DT	XDT and VAST XXT	VAST XT	VAST	HSS
Adapter plate	×	×	×	×	×	×	×
Stylus / Stylus system	×	×	×	×	×	×	×

NOTE

The version of the adapter plate depends on the probe.

Probing systems with RDS articulating probe holder

NOTE

In this case, the articulating head is the probe holder.

Contact probing systems:

Articulating probe holder	RDS			
Probe	**RST-P**	**XDT and VAST XXT[1]**	**SP25M**	**SP600**
RDS Adapter plate [2]	×	×	×	×
Optical probe				
Probe	×	×	×	×
Probe extension	o [3]	o	o	o
Adapter plate		×	×	×
Stylus / Stylus system	×	×	×	×

[1] In combination with RDS, only called XXT: RDS/XXT.
[2] The version of the RDS adapter plate depends on the probe.
[3] o: Option

Optical probing systems:

Articulating probe holder	RDS		
Probe	**ViScan**	**DTS**	**LineScan**
RDS Adapter plate [1]		×	
Optical probe	×[2]	×	×

[1] The version of the RDS adapter plate depends on the probe.
[2] Consisting of the basic body of the camera, objective, and lighting fixture.

Probing systems with Renishaw probe holders

There are a non-adjustable probe receptacle and articulating probe holders. A distinction is made between manual and electrical articulating probe holders.

Probe holder versions:

Probe receptacle:	PH6
Articulating probe holder, manual:	MH8, MIH
Articulating probe holder, electrical:	PH50, PH10

The following probes can be mounted to all probe holders: TP6, TP2, TP20, TP200. For more information, please refer to the following table:

Probes:

	TP6	TP2	TP20	TP200
Probe extension	o [1]	o	o	o
Probe module			×	×
Stylus / Stylus system	×	×	×	×

[1] o: Option

Functions of the components

Probing

The *stylus* is used for probing the workpiece. The combination of several styli comprises a stylus system. The stylus system is mounted on an adapter plate. Afterwards, the adapter plate and the stylus system form a single unit.

Holding + securing

The *adapter plate* is used to hold one or more styli and to fasten them to the probe. Proper fastening is ensured by means of a *three-point bearing*. The adapter plate is held by a *magnet* integrated in the adapter plate receptacle of the probe.

A *pin* located on the adapter plate receptacle is mated to a recess on the edge of the adapter plate. The adapter plate must be inserted in the adapter plate receptacle so that the pin fits into this recess.

The RDS adapter plate is used to hold the probe. TheRDS adapter plate is inserted in the articulating probe holder and held by a magnet. The groove in the adapter plate enables correct positioning. The pin in the adapter plate receptacle of the RDS articulating probe holder must engage in this groove.

NOTE

There are RDS adapter plates with different probe connections.

Registration + transmission

The *probe* holds the adapter plate and the mounted styli. Furthermore, the probe registers the deflection of the adapter plate and the stylus during probing. A signal is sent to the computer after each deflection.

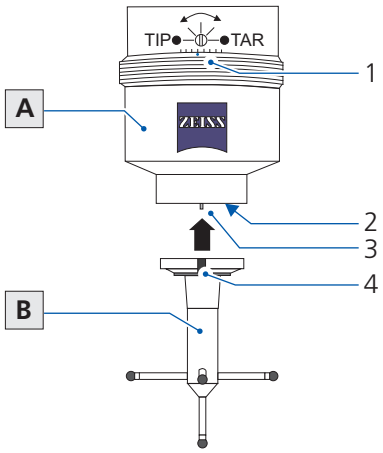
Contact probing systems

ST

Use

The ST probing system is used to probe discrete points. It enables the fast measurement of discrete points. Based on the measuring data, information can be obtained on the distances between two points or two planes.

Components



A STProbe

B Stylus system - adapter plate with star stylus

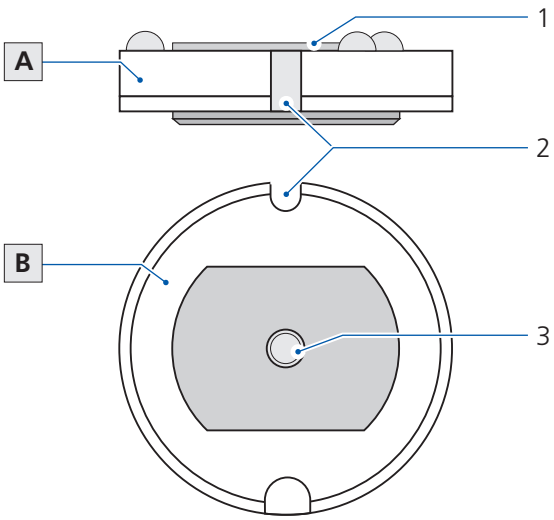
1 Possible adjustments for counterbalancing the stylus system

2 Adapter plate receptacle

3 Pin for positioning the stylus system

4 Recess for positioning the stylus system

Adapter plate



STAdapter plate

A Side view

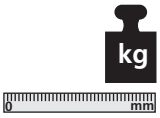
B Bottom view

1 Anchor plate

2 Groove for the pin located in the adapter plate receptacle of the probe. The pin ensures proper positioning of the adapter plate.

3 M5 threaded hole for stylus system components, e.g. styli

Limit values



A maximum weight of 200 g can be suspended from the adapter plate receptacle including the adapter plate. The length of the stylus system including extension must not exceed 200 mm.

Counterbalancing

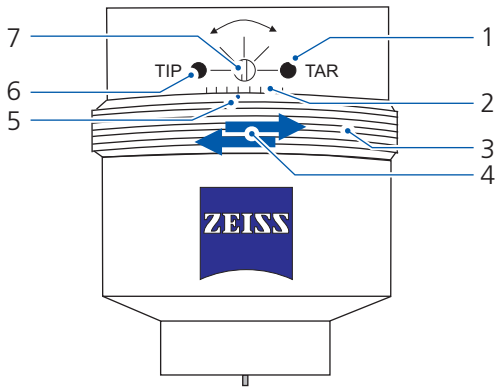
Manual counterbalancing is required for the ST probe. Counterbalancing is only possible if a stylus system has been installed in the adapter plate receptacle.

Definition

Counterbalancing is a method of compensating for the weight of the probe.

Damage to the probe if the adjusting screw is overtightened.
Do not apply force when turning the adjusting ring. The index mark must be located between the left and right graduation marks.

- Only turn the adjusting ring until the mark is below the left or right graduation mark.



Counterbalancing of the ST probe

1 TAR LED for counterbalancing
2 Graduation marks
3 Adjusting ring
4 Directions of rotation of the adjusting ring
5 Mark on the adjusting ring
6 TIP LED for probing
7 Adjusting screw for fine counterbalancing

No counterbalancing if...

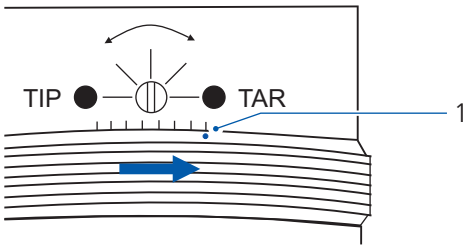
Counterbalancing is *not* required in the following cases:

– If heavy stylus systems are used. The stylus system weight is within the range of the maximum permitted weight.

– If stylus change is performed automatically. This also applies to small and lightweight stylus systems.

Default setting

Measurement with the standard setting is possible in both cases. Turn the adjusting ring clockwise to its right-hand stop. In this case, the LED does not light up.



Default setting for counterbalancing

1 Default setting: Index mark below right graduation mark.

Performing counterbalancing

Conditions

- The stylus system is changed manually.
- A small, lightweight stylus system is used.
- The LED on the probe is on.

1 Turn the adjusting ring counterclockwise until the LED lights up.

2 Turn the adjusting ring clockwise until the LED goes off. Then turn it further by one or two graduation marks.

NOTE

Acceleration of the axes (X, Y, Z) can be reduced for further optimization. See operating instructions for the measuring software.

Fine counterbalancing

Most measurements can be carried out with the adjusting screw in the standard position (slot of the screw is in vertical position). With longer and very thin styli, it may be necessary to use a different position.

Damage to the probe if the adjusting screw is overtightened.

- Turn the screw carefully and do not exert any force.

When should fine counterbalancing be carried out?

– If, while moving the CMM, the TIP LED lights up shortly several times, fine counterbalancing adjustment is set too sensitive. The computer might not be able to record the measured data.

– If the fine counterbalancing is set to the insensitive setting, measurement recording may then be blocked. This may lead to deformation of the stylus shaft or the workpiece.

Adjusting the sensitivity of fine counterbalancing

1 Turn the adjusting ring clockwise to increase sensitivity.

2 Turn the adjusting ring counterclockwise to reduce sensitivity.

NOTE

Sensitivity adjustment needs to corrected until the error no longer occurs.

ST 3

ST 3 probe with star stylus

Use

The ST 3 probing system is used to probe discrete points.

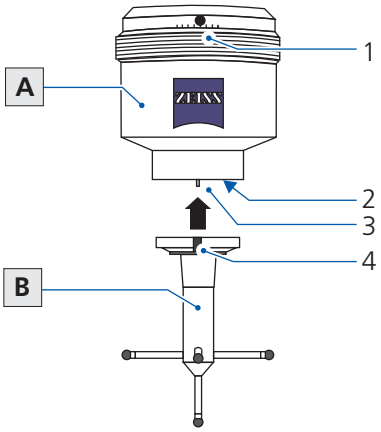
The probe is preferably used in the following cases:

– For measuring large, metallic workpieces.

– If long and heavy stylus systems are used.

Furthermore, it also enables the fast measurement of discrete points. Based on the measuring data, information can be obtained on the distances between two points or two planes.

Components



A ST 3Probe

B Stylus system - adapter plate with star stylus

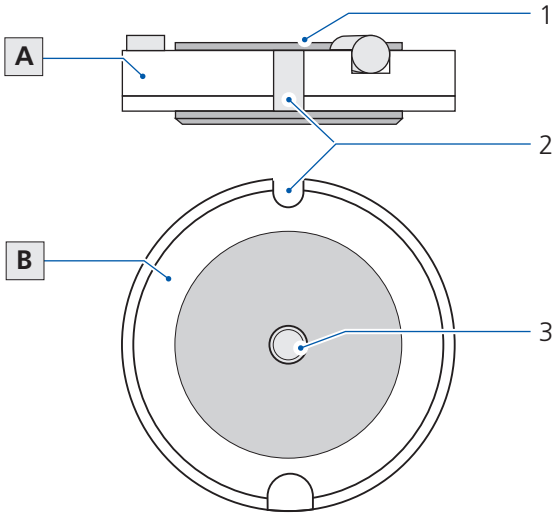
1 Adjusting ring for counterbalancing the stylus system

2 Adapter plate receptacle

3 Pin for positioning the adapter plate

4 Recess for positioning the adapter plate

Adapter plate



ST 3Adapter plate

A Side view

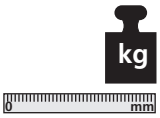
B Bottom view

1 Anchor plate

2 Groove for the pin located in the adapter plate receptacle of the probe. The pin ensures proper positioning of the adapter plate.

3 M5 threaded hole for stylus system components, e.g. styli.

Limit values



A maximum weight of 200 g can be suspended from the adapter plate receptacle including the adapter plate. The length of the stylus system including extension must not exceed 200 mm.

Counterbalancing

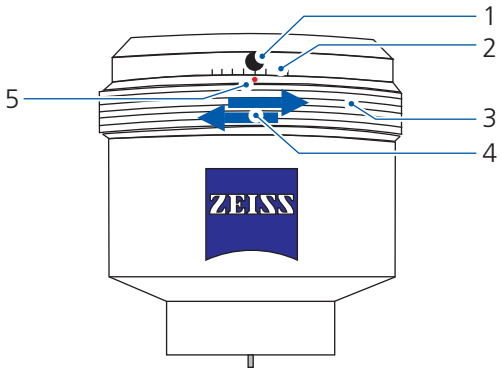
Manual counterbalancing is required for the ST 3 probe. Counterbalancing is only possible if a stylus system has been installed in the adapter plate receptacle.

Definition

Counterbalancing is a method of compensating for the weight of the probe.

Damage to the probe if the adjusting screw is overtightened.
Do not apply force when turning the adjusting ring. The index mark must be located between the left and right graduation marks.

- Only turn the adjusting ring until the mark is below the left or right graduation mark.



Counterbalancing of the ST 3 probe

1 LED

2 Graduation marks

3 Adjusting ring

4 Directions of rotation of the adjusting ring

5 Mark on the adjusting ring

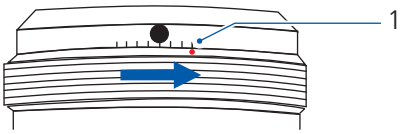
No counterbalancing if...

Counterbalancing is *not* required in the following cases:

- If heavy stylus systems are used. The stylus system weight is within the range of the maximum permitted weight.
- If stylus change is performed automatically. This also applies to small and lightweight stylus systems.

Default setting

Measurement with the standard setting is possible in both cases. Turn the adjusting ring clockwise to its right-hand stop. In this case, the LED does not light up.



1 Default setting: Index mark below right graduation mark.

Performing counterbalancing

Conditions

- The stylus system is changed manually.
- A small, lightweight stylus system is used.
- The LED on the probe is on.

1 Turn the adjusting ring counterclockwise until the LED lights up.

2 Turn the adjusting ring clockwise until the LED goes off. Then turn it further by one or two graduation marks.

NOTE

Acceleration of the axes (X, Y, Z) can be reduced for further optimization. See operating instructions for the measuring software.

XDT

XDTProbe

Use

The XDT probe can be used universally. Only discrete points can be probed. Scanning is not possible. Measurements performed with this system provide information on the dimensions, location, and form of a workpiece.

Characteristics

- Automatic stylus system change
- Low deviation caused by the measuring system
- Robustness

Use

The XDT probe can be used in two ways:

- In combination with the RDS articulating probe holder.

  Combination with the RDS allows probing in almost any position. This is ensured by means of two rotary axes. The angular positions in both axes can be changed in steps of 2.5°. ➢ *See [⇨ 2-39]*

- As a probe on a rigid adapter.

  The adapter is attached to the ram. The second option is not possible for all CMMs.

System requirements

To perform measurements using the XDT probe, the following requirements must be met:

	XDT with TL3
Measuring software:	from CALYPSO 4.10.02
Firmware:	from 22.09

Only TL3 adapter plates can be used with the XDT probe. The plate designation is: »ZSH-28-B-0-M3ZSH-28-B-REF-TL3-M3ZSH-28-B-75-M3«.

Design

Standard

The XDT probing system comprises:

- XDT TL3 probe for stylus lengths from 30 to 150 mm
- Two adapter plates:

  - ZSH-28-B-0-M3
  - ZSH-28-B-REF-TL3-M3 (for master stylus)
- Master stylus (ThermoFit):

  Length: 30 mm.

  Diameter of the stylus tip: 5 mm.
- Stylus (ThermoFit):

  Length: 50 mm.

  Diameter of the stylus tip: 3 mm.
- Installation kit

  The installation kit consists of a pin wrench 5 × 1.2 and a probe key to screw on styli.

Option

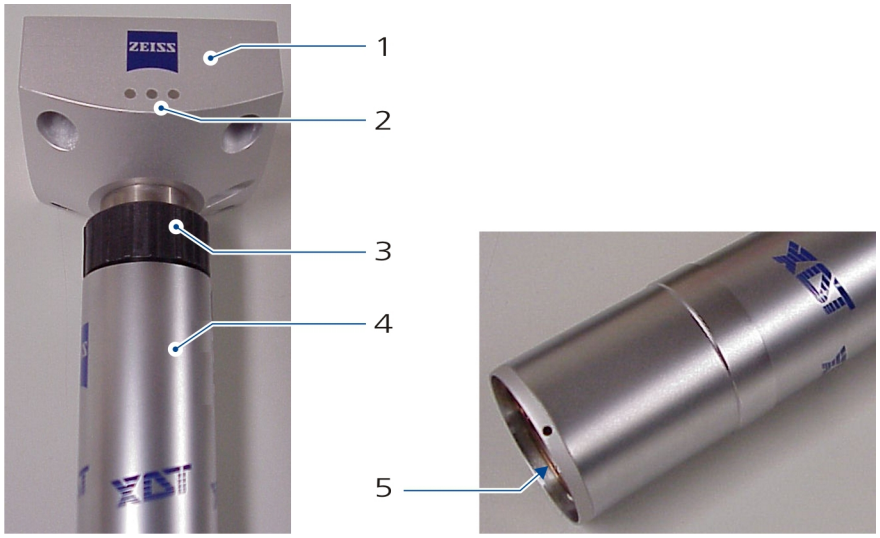
Further optional components are:

RDS-XXTAdapter plate	Only in combination with the RDS articulating probe holder
VAST XXTChanger rack	One unit with three positions for the adapter plate. The unit is mounted to the profile rail of a changer rack.
Stylus kit	There are three different stylus system kits.

NOTE

For conversions of a CMM, you may require additional conversion parts. Moreover, the system requirements must be met.

Components



1 Adapter; attached to ram

2 LED; 3 pieces
Left: LED for probe. The LED is permanently on if the probe is connected to the adapter.
Center: System clock pulse LED
Right: Power LED. The LED is permanently on.

3 Knurled nut for screwing to adapter

4 Probe

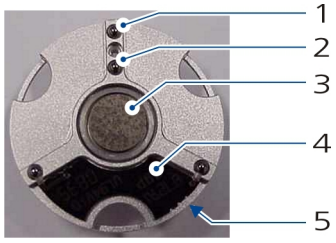
5 Adapter plate receptacle

Adapter plate

The adapter plate is held magnetically and can be installed manually or automatically. The three outer spheres on the adapter plate serve for adjustment of the correct position in the adapter plate receptacle. The correct fit of these spheres is monitored electronically. The fourth sphere serves for mechanical coding of the adapter plate type.

Marking

Laterally on the adapter plate, there are black marks at a distance of 120°. The marks are in the form of one, two, or three dots. They serve for better orientation when installing the adapter plate.



TL3Adapter plate

1 Outer spheres serve for monitoring the correct position of the adapter plate in the adapter plate receptacle.
2 The inner sphere serves for mechanical coding
3 Magnet
4 Chip for identification of the adapter plate
5 Lateral mark on the adapter plate; for orientation

NOTE

Only adapter plates of the »ZSH-28-B« type may be used on the probe.

NOTE

Proper fit of the adapter plate must be checked. Carefully try to rotate the adapter plate. If you feel a slight resistance, the adapter plate fits properly in the receptacle of the probe.

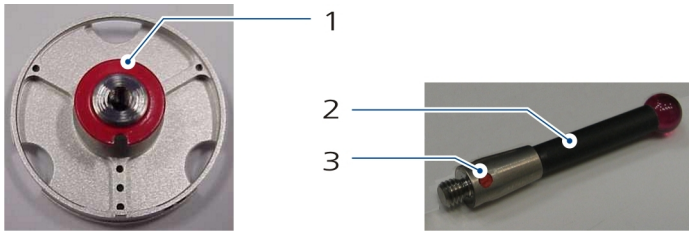
Adapter plate for master stylus

NOTE

The adapter plate for the master stylus is identified by a red ring; the master stylus by a red dot. The XDTTL3 adapter plate for the master stylus has the following designation: »ZSH-28-B-REF-TL3«.

- Use this adapter plate exclusively for the master stylus.

  Use both the adapter plate and the master stylus only for qualification of the reference sphere (reference measurement).



Adapter plate with master stylus

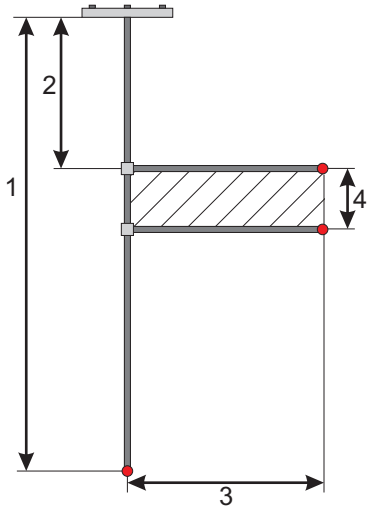
1 Red ring on the adapter plate for master stylus
2 Master stylus for TL3
3 Red dot for identification of the master stylus.

Limit values

The following values must not be exceeded:

Limit values for TL3:

Probe extension (between RDS adapter plate and XDT probe)	100 mm
Stylus system weight, max. (incl. adapter plate)	15 g
Total length of the stylus	30 mm - 150 mm



Conditions for lateral styli with the TL3

1 Stylus length: max. 150 mm
2 Distance from the adapter plate: min. 50 mm
3 Projection: max. 65 mm
4 Recommended range for lateral stylus: 50 - 70 mm

Maximum deflection at the stylus tip

The maximum deflections depend on the length and weight of the stylus system as well as on the probe orientation. If the stylus sags in the Z direction at lateral orientation, the deflection in the -Z direction is reduced and increases in the +Z direction. Additionally, the maximum deflections in the other directions change.

Deflection with a stylus length of 150 mm:

X, Y axis:	±3 mm
Z axis:	±3 mm

NOTE

Only the styli belonging to the respective stylus kit may be used. If longer or heavier styli are used, measurement errors may occur.

VAST XXT

VAST XXTProbe

Use

The VAST XXT probe can be used universally. It is possible to probe discrete points or perform scanning. Measurements performed with this system provide information on the dimensions, location, and form of a workpiece.

Characteristics

- Scanning
- Automatic stylus system change
- Low deviation caused by the measuring system
- Robustness
- Different probe variants are available depending on the stylus length and application

Measuring soft workpieces

The VAST XXT probe is particularly suitable for measuring soft workpieces. Due to the low measuring force, deformations on the workpiece and thus incorrect measurements are avoided.

Use

The VAST XXT probe can be used in two ways:

– In combination with the RDS articulating probe holder.

  Combination with the RDS allows probing in almost any position. This is ensured by means of two rotary axes. The angular positions in both axes can be changed in steps of 2.5°. ➤ *See [⇨ 2-41]*

– As a probe on a rigid adapter.

  The adapter is attached to the ram. The second option is not possible for all CMMs.

System requirements

To perform measurements using the VAST XXT probe, the following requirements must be met:

	TL1, TL2	TL3
Measuring software:	CALYPSO 4.4 and higher	from CALYPSO 4.8.06
Firmware:	from 19.03	from 20.12

Design versions

The VAST XXT probe is available in three design versions. Each version is supplied with specific accessories:

Design versions:

Version 1 for stylus lengths from 30 to 125 mm:	– VAST XXT TL1Probe – TL1Adapter plate – Master stylus (ThermoFit): Length: 30 mm; diameter of the stylus tip: 5 mm
Version 2 for stylus lengths from 125 to 250 mm:	– VAST XXT TL2Probe – TL2 adapter plate (with basic extension 75 mm) – Master stylus (ThermoFit): Length: 50 mm; diameter of the stylus tip: 5 mm

Version 3 for stylus lengths from 30 to 150 mm:	– VAST XXT TL3Probe – TL3Adapter plate – Master stylus (ThermoFit): Length: 30 mm; diameter of the stylus tip: 5 mm

All versions are supplied with an additional adapter plate, an additional stylus and an installation kit. The installation kit consists of a pin wrench 5 × 1.2 and a probe key to screw on styli.

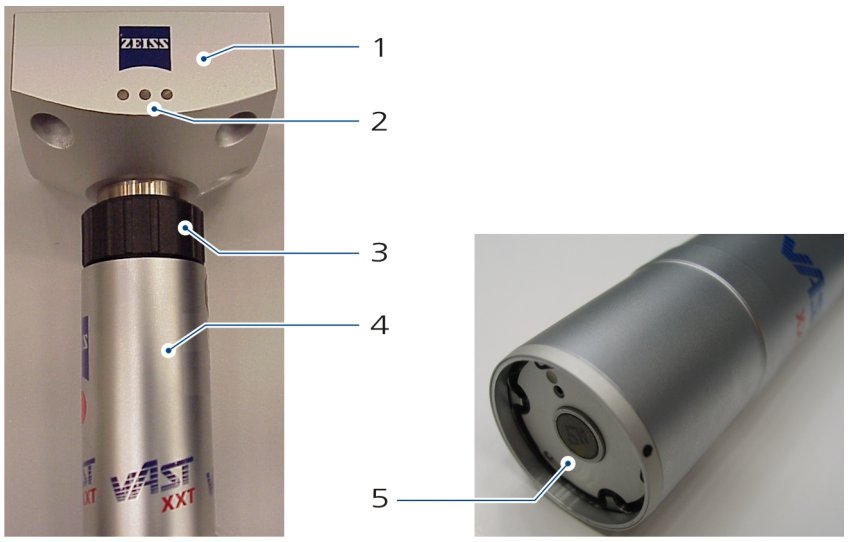
Further components are:

RDS-XXTAdapter plate	Only in combination with the RDS articulating probe holder.
VAST XXT changer rack	One unit with three holders for adapter plates. The unit is mounted to the profile rail of a changer rack.
Stylus kit	There are three different stylus system kits.

NOTE

For conversions of a CMM, you may require additional conversion parts. Moreover, the system requirements must be met.

Components



1 Adapter; attached to ram

2 LED; 3 pieces
Left: LED for probe. The LED is permanently on if the probe is connected to the adapter.
Center: System clock pulse LED
Right: Power LED. The LED is permanently on.

3 Knurled nut for screwing to adapter

4 probeVAST XXT

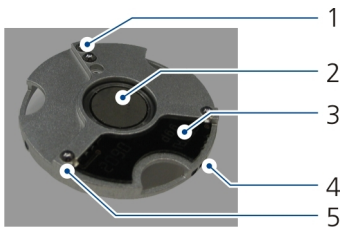
5 Adapter plate receptacle

Adapter plate

The adapter plate is held magnetically and can be installed manually or automatically. The three outer spheres on the adapter plate serve for adjustment of the correct position in the adapter plate receptacle. The correct fit of these spheres is monitored electronically. The fourth sphere serves for mechanical coding of the adapter plate type.

Marking

Laterally on the adapter plate, there are black marks at a distance of 120°. The marks are in the form of one, two, or three dots. They serve for better orientation when installing the adapter plate. A special adapter plate is provided for each design version.



Adapter plateTL1

1 The inner sphere servers for mechanically coding the various adapter plates The illustration shows a TL1 adapter plate.
On the TL2 adapter plate, the inner sphere is even closer to the magnet.

2 Magnet

3 Chip for identification of the adapter plate

4 Lateral mark on the adapter plate; for orientation

5 Outer spheres serve for monitoring the correct position of the adapter plate in the adapter plate receptacle.

NOTE

The arrangement of the pair of spheres is different for TL1 and TL2. This prevents accidental insertion of a wrong adapter plate into the probe.

NOTE

The correct fit of the adapter plate must be checked. Try to twist the adapter plate carefully. If you feel a slight resistance, the adapter plate fits properly in the receptacle of the probe.

NOTE

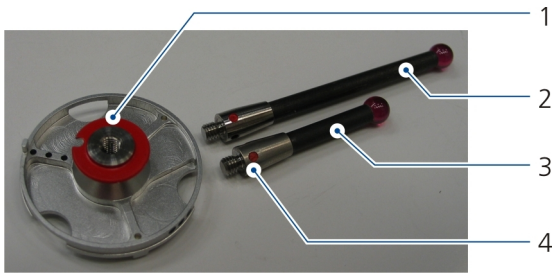
The 18-pole VAST XXT probe requires an adapter plate with ID chip. Adapter plates without ID chip are no longer supported.

Adapter plate for master stylus

NOTE

The adapter plate for the master stylus is identified by a red ring; the master stylus by a red dot.

- Use this adapter plate exclusively for the master stylus.
- Use both the adapter plate and the master stylus only for qualification of the reference sphere (reference measurement).



TL1Adapter plate

1 Red ring on the adapter plate for master stylus
2 Master stylus for TL2
3 Master stylus for TL1
4 Red dot for identification of the master stylus.

Adapter plateTL2

The illustration shows a TL1 adapter plate. The TL2 adapter plate has a permanently attached extension.

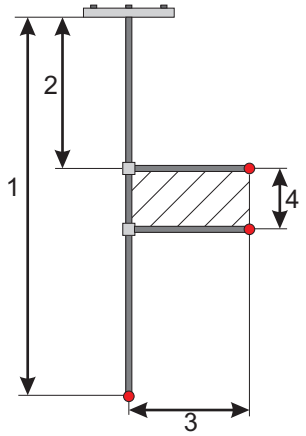
Limit values

The following values must not be exceeded:

Probe extension (between RDS-XXT adapter plate and VAST XXT probe)	TL1, TL2, TL3	100 mm
Stylus system weight, max. (incl. adapter plate)	TL1 and TL2	10 g

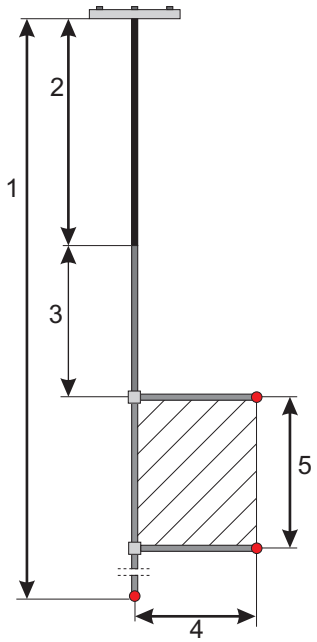
	TL3	15 g
Total length of the stylus	TL1	30 mm - 125 mm
	TL2	125 mm - 250 mm
	TL3	30 mm - 150 mm

Conditions for lateral styli



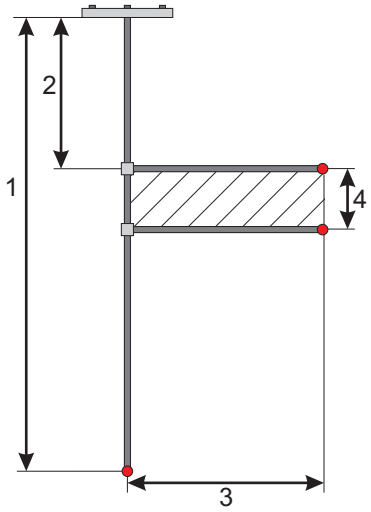
Conditions for lateral styli with the TL1

1 Stylus length: max. 125 mm
2 Distance from the adapter plate: min. 50 mm
3 Projection: max. 40 mm
4 Recommended range for lateral stylus: 50 - 70 mm



Conditions for lateral styli with the TL2

1 Stylus length: max. 250 mm
2 Fixed extension: 75 mm
3 Distance from the adapter plate extension: min. 50 mm
4 Projection: max. 40 mm
5 Recommended range for lateral stylus: 125 - 175 mm



Conditions for lateral styli with the TL3

1 Stylus length: max. 150 mm
2 Distance from the adapter plate: min. 50 mm
3 Projection: max. 65 mm
4 Recommended range for lateral stylus: 50 - 70 mm

Maximum deflection at the stylus tip

The maximum deflections depend on the length and weight of the stylus system as well as on the probe orientation. If the stylus sags in the Z direction at lateral orientation, the deflection in the -Z direction is reduced and increases in the +Z direction. Additionally, the maximum deflections in the other directions change.

TL1	Deflection with a stylus length of 125 mm:	
	X,Y axis:	±3,5 mm
	Z axis:	±2,8 mm
TL2	Deflection with a stylus length of 250 mm:	
	X, Y axis:	±3 mm
	Z axis:	±3 mm
TL3	Deflection with a stylus length of 150 mm:	
	X, Y axis:	

Z axis:

NOTE

Only the styli belonging to the respective stylus kit may be used. If longer or heavier styli are used, measurement errors may occur.

DT DynaTouch and VAST XT

DT DynaTouch Probe

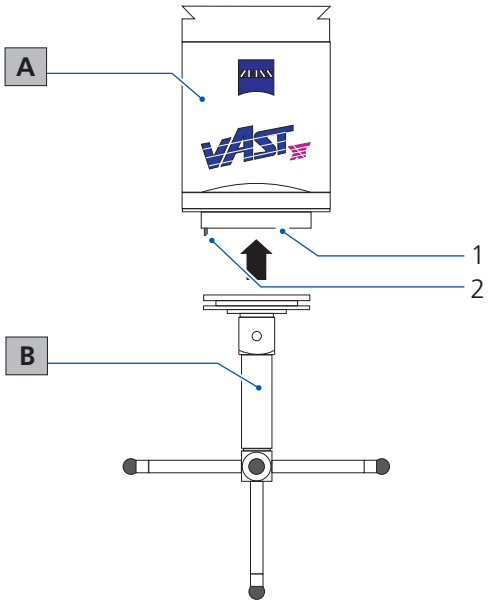
VAST XT Probe

VAST XT gold probe

Use

DT DynaTouch	The DT DynaTouch probing system is used to probe discrete points. Measurements performed with this system provide information on the dimensions and position of a workpiece. Special applications: – In case of adverse ambient conditions: E.g. vibrations (floor vibrations and sound). – If high accuracy is required. – If high repeatability is required. – If long and heavy stylus systems are used.
VAST XT	The VAST XT probe can be used universally. In comparison to the DT DynaTouch probing system, this probe also allows multipoint measurements and scanning. Measurements performed with this system provide information on the dimensions, location, and form of a workpiece.
VAST XT gold	The VAST XT gold probe is an enhancement of the VAST XT.

Components



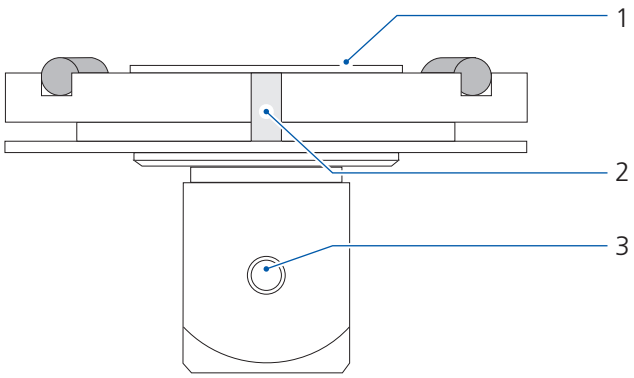
A VAST XT probe (alternatively DT DynaTouch or VAST XT gold)

B Stylus system with adapter plate

1 Adapter plate receptacle
2 Pin for positioning the stylus system

Adapter plate

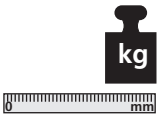
The VAST adapter plate is provided with a distributor with five threaded holes used for mounting stylus system components. The size of the connection thread is M5.



VAST adapter plate

1 Anchor plate
2 Groove for the pin located in the adapter plate receptacle of the probe. The pin ensures proper positioning of the adapter plate.
3 M5 threaded hole for stylus system components, e.g. styli.

Limit values



A maximum weight of 500 g can be suspended from the adapter plate receptacle including the adapter plate. The length of the stylus system including extension must not exceed 500 mm.

Torque

The maximum torque of the stylus system allowed is 0.3 Nm. Torque calculation: ➤ *See [⇨ 3-13]*

VAST XTR

VAST XTR gold Probe

Use

The VAST XTR gold probe is an actively measuring scanning probe.

The most important distinctive feature of the VAST XTR gold is the integrated rotational axis. The stylus system can thus be rotated in angular steps of 15° in the Z axis. This enables positioning a stylus at the correct angle to the workpiece. In some cases, the rotary table is therefore not required.

The VAST XTR gold probe supports the VAST navigator and VAST performance options.

System requirements

Currently, the VAST XTR gold probe can be used for the ACCURA II and PRISMO coordinate measuring machines. Use on other CMMs is planned.

To perform measurements using the probe, the following requirements must be met:

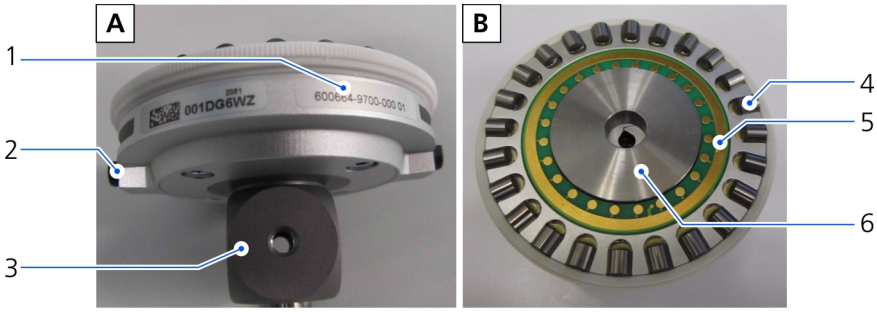
Measuring software:	from CALYPSO 5.2.14
Firmware:	from 26.12

Components

1 Dovetail adapter for mounting to the ram
2 Probe
3 Adapter plate receptacle
4 Rotational axis with pin for securing the adapter plate

Adapter plate

To use the rotation function on the VAST XTR gold probe, a special adapter plate is needed. The designation is: »ZSH-70-R-24« (Order number: 600664-9700-000).



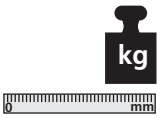
A Front view
B Top view

1 Order no.
2 Push-buttons for installing and removing the adapter plate (2 buttons)
3 Cube for mounting styli
4 Anchor plate for fastening to the adapter plate receptacle of the probe
5 Contacts for identifying the adapter plate
6 Cylinder rollers

NOTE

The »ZCR 70« holder is required for storage in the changer rack. The VAST holder is not allowed.

Limit values



A maximum weight of 500 g can be suspended from the adapter plate receptacle including the adapter plate. The length of the stylus system including extension must not exceed 350 mm.

Torque

The maximum torque of the stylus system allowed is 0,15 Nm. Torque calculation: ➢ *See [⇨ 3-13]*

To achieve better reproducibility during stylus change, the stylus system should be balanced more precisely.

VAST gold

VAST gold probe with star stylus

Use

The VAST gold probe is an actively measuring scanning probe. The probe can be used universally. Measurements performed with this system provide information on the dimensions, location, and form of a workpiece.

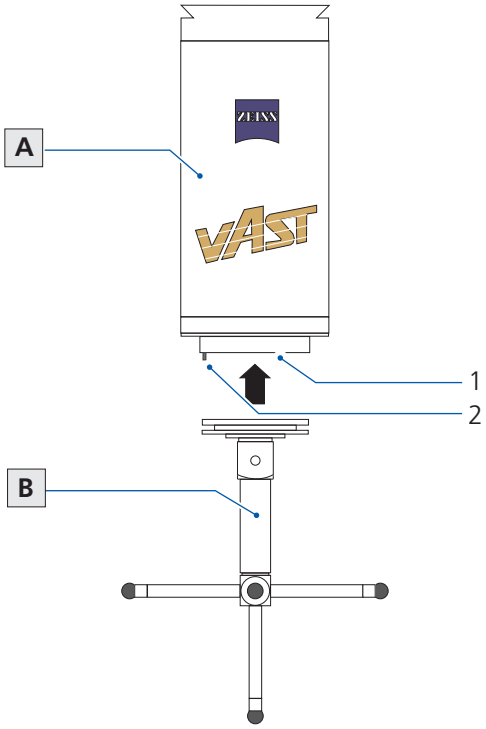
Special applications:

– In case of adverse ambient conditions: E.g. vibrations (floor vibrations and sound).
– For measuring many measuring points – multipoint measurement, scanning.
– If high accuracy is required.
– If long and heavy stylus systems are used.

Special styli

In addition to conventional styli, a temperature probe may be used. The temperature probe is used to measure the workpiece temperature.

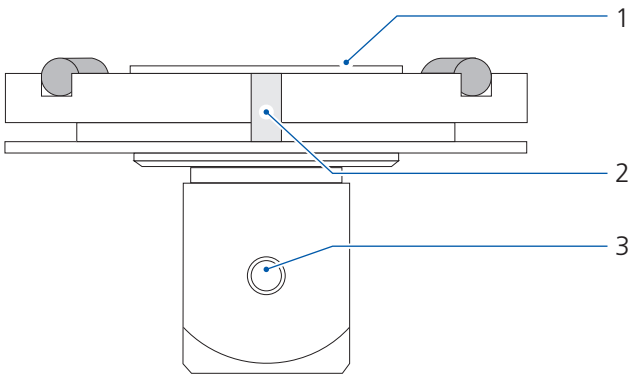
Components



A VAST gold Probe
B Stylus system with adapter plate
1 Adapter plate receptacle
2 Pin for positioning the adapter plate

Adapter plate

The VAST adapter plate is provided with a distributor with five threaded holes used for mounting stylus system components. The size of the connection thread is M5.



VASTAdapter plate

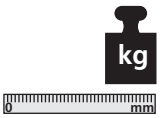
1 Anchor plate

2 Groove for the pin located in the adapter plate receptacle of the probe. The pin ensures proper positioning of the adapter plate.

3 M5 threaded hole for stylus system components, e.g. styli

Limit values

The limit values for weight, length and torque of a stylus system must be considered when assembling or mounting the stylus system.



A maximum weight of 800 g can be suspended from the adapter plate receptacle including the adapter plate. The length of a stylus system must not exceed 800 mm.

Torque

The torque depends on the weight of the stylus system:

Weight of the stylus	K_M
800 g	0,1 Nm
450 g	0,3 Nm

Torque calculation: ➢ *See [⇨ 3-13]*.

Temperature probeRST-T (option)

Use

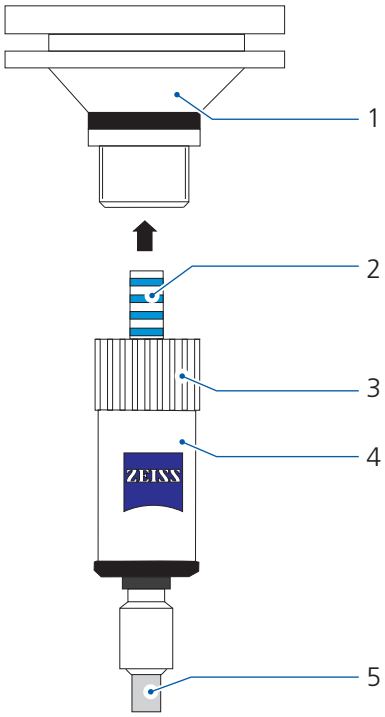
The RST-T temperature probe is used to measure the temperature of the workpiece surface and of the surrounding air. Both measurements can also be carried out in an automatic run. Temperature monitoring is thus possible throughout the entire measurement.

NOTE

The VAST probing system is required for the operation of a temperature probe.

Further information is given elsewhere. ➤ *See [⇨ 2-78]* and ➤ *see [⇨ 2-79]*.

Components



1 Adapter plate
2 Connector
3 Knurled nut for screwing to adapter plate
4 Temperature probe
5 Temperature sensor

HSS

probeHSS

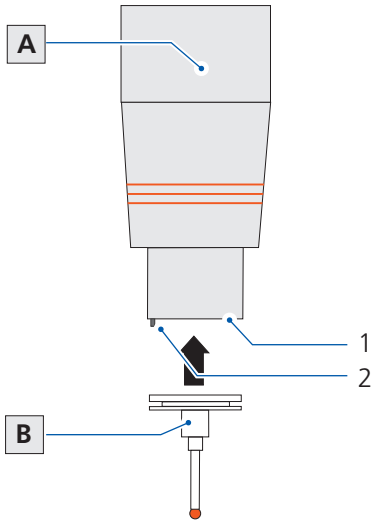
Use

The HSS probe can be used universally. Measurements performed with this system provide information on the dimensions, location, and form of a workpiece.

Special applications:

– For measuring many measuring points - multipoint measurement, scanning.
– If high accuracy is required.
– If long, heavy styli are used.

Components



A HSS Probe

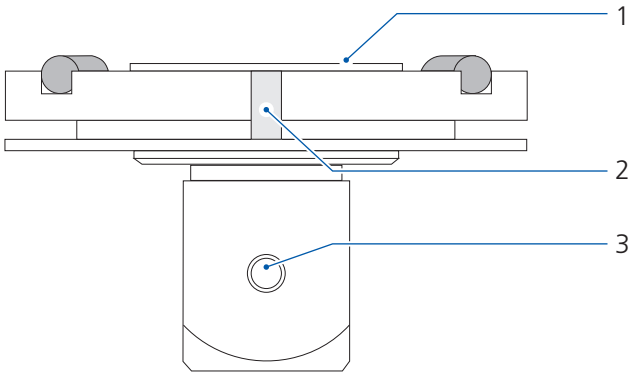
B Stylus system - adapter plate and stylus

1 Adapter plate receptacle

2 Pin for positioning the stylus system

Adapter plate

The VAST adapter plate is provided with a distributor with five threaded holes used for mounting stylus system components. The size of the connection thread is M5.



VASTAdapter plate

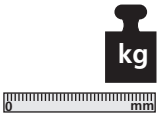
1 Anchor plate

2 Groove for the pin located in the adapter plate receptacle of the probe. The pin ensures proper positioning of the adapter plate.

3 M5 threaded hole for stylus system components, e.g. styli.

Limit values

The limit values for weight, length and torque of a stylus system must be considered when assembling or mounting the stylus system.



A maximum weight of 600 g can be suspended from the adapter plate receptacle including the adapter plate. The length of the stylus including extension must not exceed 600 mm.

Torque

The maximum torque of the stylus system allowed is 0,2 Nm. Torque calculation: ➤ *See [⇨ 3-15]*

Contact probing systems with articulating probe holder

RDS with RST-P

Use

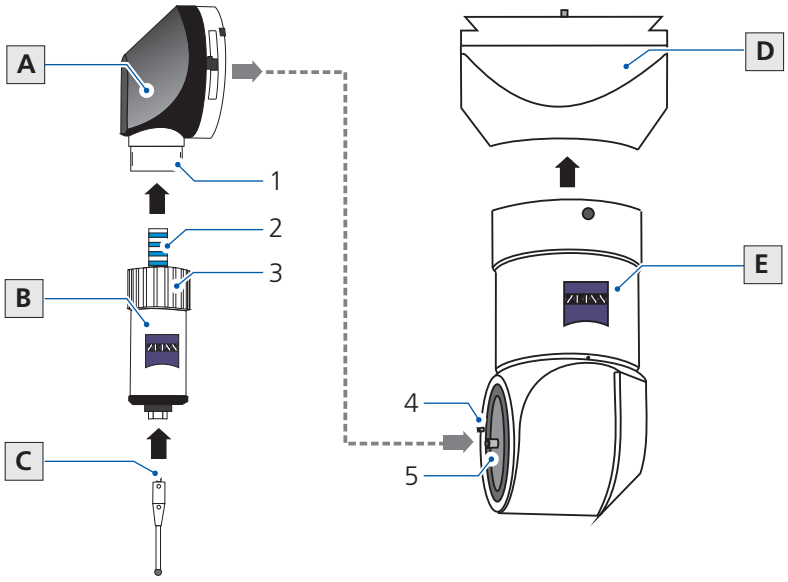
Discrete points are probed with trigger probes on the RDS articulating probe holder. Probing is possible in almost any position. This is ensured by means of two rotary axes. The angular positions in both axes can be changed in steps of 2.5°.

Special applications

- Probing of hard-to-access locations on the workpiece.
- Fast probing.
- Reduction of the number of styli: If many different stylus systems would be necessary for another probing system.

Components

The RDS/RST probing system is a combination of the incremental RDS articulating probe holder and the RST probe or RST-P probe (also RST gold). The articulating head is the probe holder.



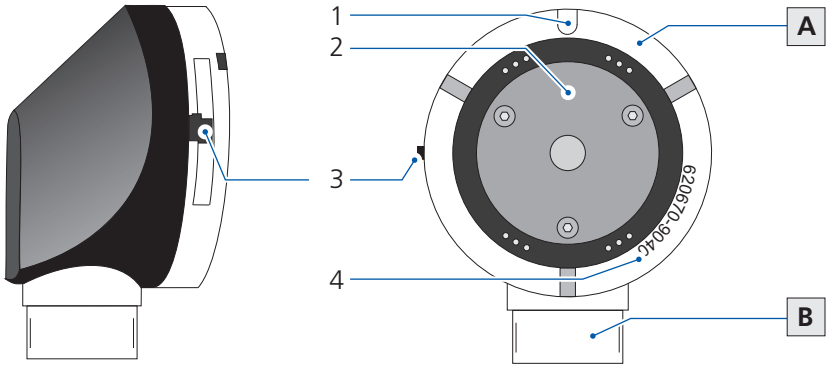
A Adapter plate
B RST probe or RST-P probe
C Stylus with extension
D Adapter for CMM with a 85 mm (width) ram
E RDS articulating probe holder

1 Connection thread for probe
2 Connector
3 Knurled nut for screwing to adapter plate
4 Pin for positioning the adapter plate
5 Adapter plate receptacle

NOTE

Self-centering probing is not possible for all CMMs. On some CMMs, the RDS articulating probe holder is mounted directly to the ram.

Adapter plate



RDS adapter plate for RST or RST-P

A Connection to the RDS articulating probe holder

B Connection of the probe or extension of the probe

1 Groove for positioning the adapter plate in the adapter plate receptacle of the articulating probe holder

2 Anchor plate

3 Push-button for releasing the adapter plate from the articulating probe holder

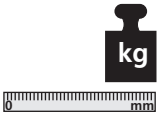
4 Order number of adapter plate

The RST or RST-P probe is attached to the RDS adapter plate. You may put an extension between probe and adapter plate.

NOTE

There are RDS adapter plates with different probe connections.

Limit values



A maximum weight of 10 g can be suspended from the RST andRST-P probes. The length of the stylus system including extension must not exceed 90 mm.

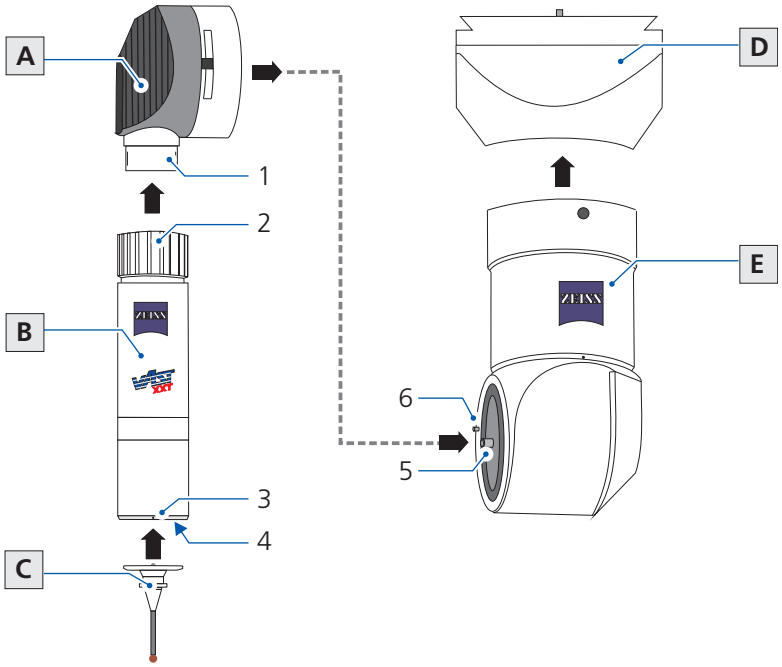
RDS with XDT

XDT Probe

Components

The RDS/XDT probing system is a combination of the incremental RDS articulating probe holder and the XDT probe. The articulating head is the probe holder.

Further information on the XDT probe is to be found elsewhere. ➢ *See [⇨ 2-13]*



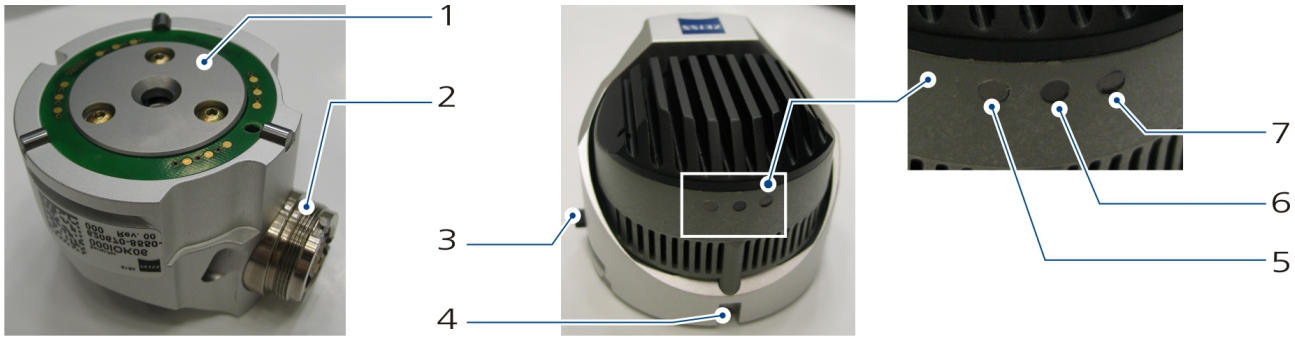
A RDS-XXTAdapter plate
B XDT Probe
C TL3 adapter plate; M3 thread for stylus
D Adapter for CMM with a 85 mm (width) ram
E RDS articulating probe holder

1 Connection thread for probe
2 Knurled nut for screwing to adapter plate
3 Mark for positioning the adapter plate
4 XDT adapter plate receptacle
5 RDS adapter plate receptacle
6 Pin for positioning the RDS-XXT adapter plate

Information on the adapter plate, its receptacle and the master stylus can be found elsewhere. ➤ *See [⇨ 2-16]*

Adapter plate

The XDT probe is attached to the RDS-XXT adapter plate. You may put an extension between probe and adapter plate.



RDS-XXTAdapter plate

1 Connection for RDS adapter plate receptacle
2 Connection for probe or probe extension
3 Push-button for releasing the adapter plate from the articulating probe holder
4 Groove for positioning the adapter plate in the adapter plate receptacle of the articulating probe holder
5 Power LED. The LED is permanently on.
6 System clock pulse LED
7 LED for probe. The LED is permanently on if the probe has been installed in the RDS-XXT adapter plate.

NOTE

When inserting the adapter plate for the first time into the RDS adapter plate receptacle, the LED in the RDS may be flashing (above the ZEISS logo). The flashing of the LED indicates that the adapter plate firmware is being updated. The LED may flash for several minutes.

Limit values

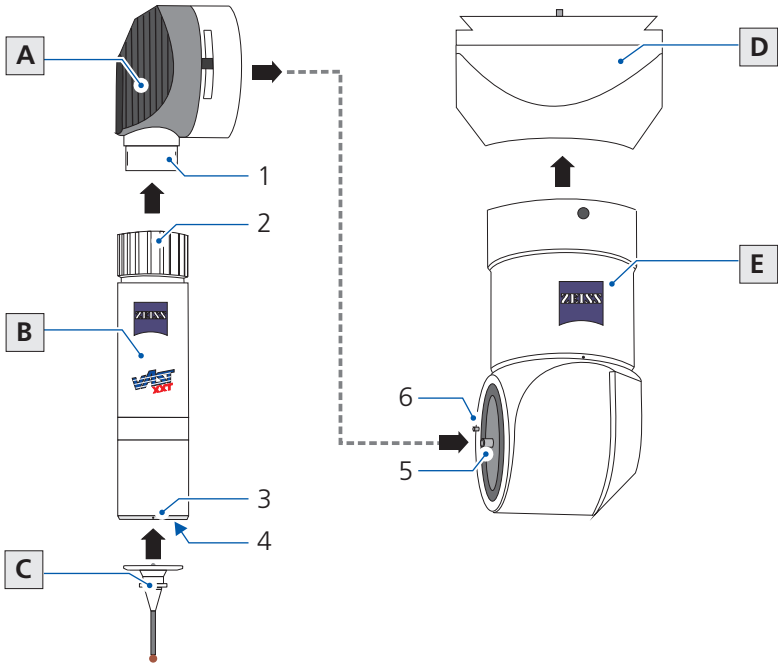
When using the XDT probe, certain limit values must not be exceeded. Further information is to be found elsewhere. ➤ *See [⇨ 2-17]*

RDS with VAST XXT

Components

The RDS/XXT probing system is a combination of the incremental RDS articulating probe holder and the VAST XXT probe. The articulating head is the probe holder.

Further information on the VAST XXT probe is to be found elsewhere. ➤ *See [⇨ 2-19]*



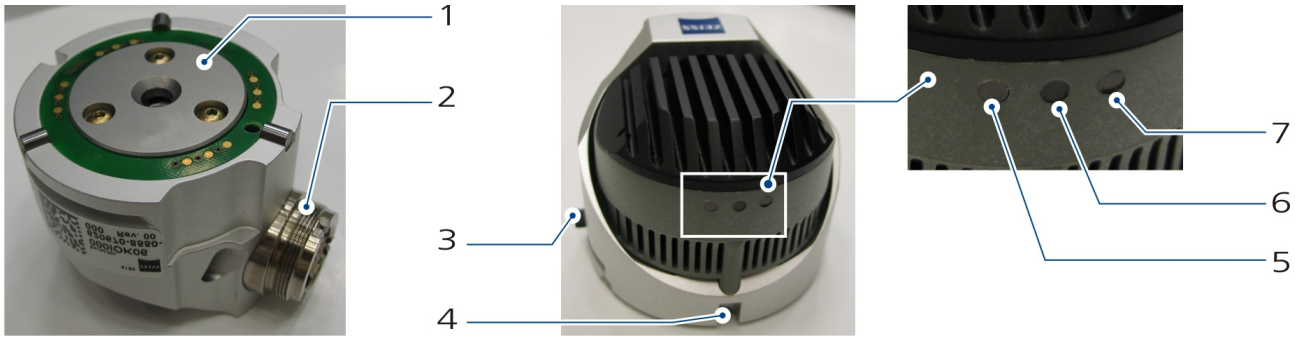
A RDS-XXTAdapter plate
B VAST XXT Probe
C TL1 adapter plate; M3 thread for stylus
D Adapter for CMM with a 85 mm (width) ram
E RDS articulating probe holder

1 Connection thread for probe
2 Knurled nut for screwing to adapter plate
3 Mark for positioning the adapter plate
4 VAST XXT adapter plate receptacle
5 RDS adapter plate receptacle
6 Pin for positioning the RDS-XXT adapter plate

Information on the VAST XXT probe with respect to the adapter plate and master stylus can be found elsewhere. ➤ *See [⇨ 2-21]*

Adapter plate

The VAST XXT probe is attached to the RDS-XXT adapter plate. You may put an extension between probe and adapter plate.



RDS-XXTAdapter plate

1 Connection for RDS adapter plate receptacle
2 Connection for probe or probe extension
3 Push-button for releasing the adapter plate from the articulating probe holder
4 Groove for positioning the adapter plate in the adapter plate receptacle of the articulating probe holder
5 Power LED. The LED is permanently on.
6 System clock pulse LED
7 LED for probe. The LED is permanently on if the probe has been installed in the RDS-XXT adapter plate.

NOTE

When inserting the adapter plate for the first time into the RDS adapter plate receptacle, the LED in the RDS may be flashing (above the ZEISS logo). The flashing of the LED indicates that the adapter plate firmware is being updated. The LED may flash for several minutes.

Limit values

When using the VAST XXT probe, certain limit values must not be exceeded. Further information is to be found elsewhere. ➤ *See [⇨ 2-23]*

RDS with Renishaw probes

RDS with trigger probes

Use

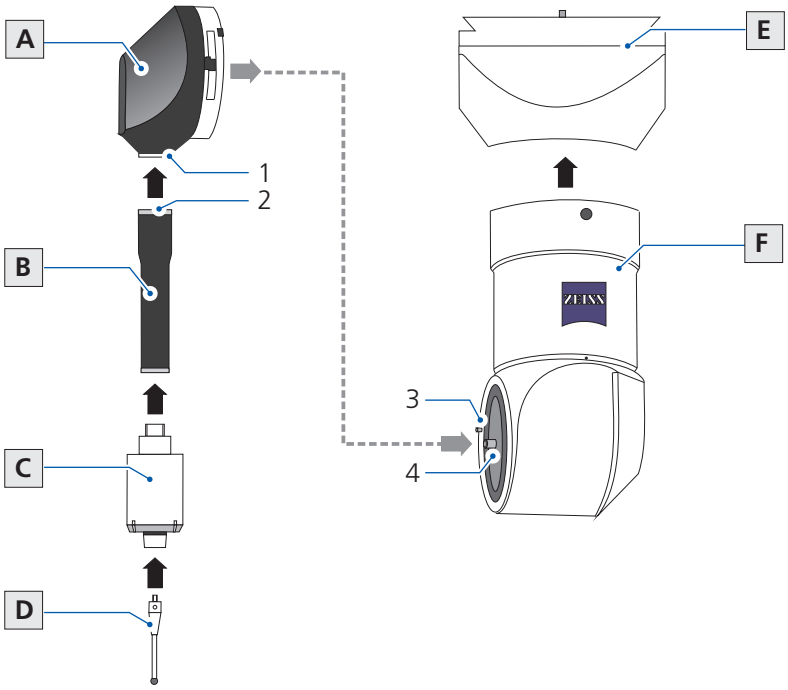
Discrete points are probed with trigger probes on the RDS articulating probe holder. Probing is possible in almost any position. This is ensured by means of two rotary axes. The angular positions in both axes can be changed in steps of 2.5°.

Special features:

- Probing of hard-to-access locations on the workpiece.
- Fast probing.
- Reduction of the number of styli: If many different stylus systems would be necessary for another probing system.

Components

The RDS/Renishaw probing system is a combination of the incremental RDS articulating probe holder and a Renishaw probe. There are different probes: e.g. TP6.

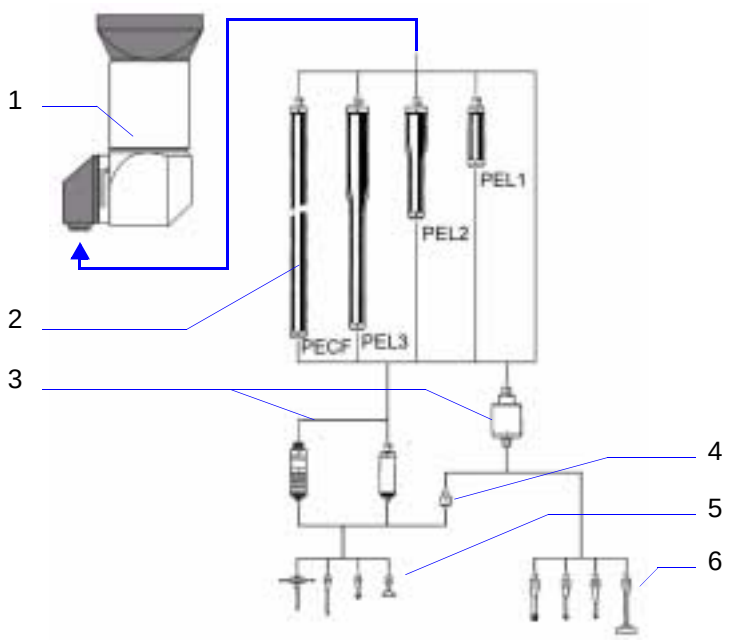


A RDS adapter plate for Renishaw
B Extension for Renishaw probes
C Renishaw Probe TP6
D Stylus
E Adapter
F RDS articulating probe holder

1 Connection for the Renishaw probe
2 Connection thread
3 Pin for positioning the adapter plate
4 Adapter plate receptacle

NOTE

Self-centering probing is not possible for all CMMs. On some CMMs, the RDS articulating probe holder is mounted directly to the ram.

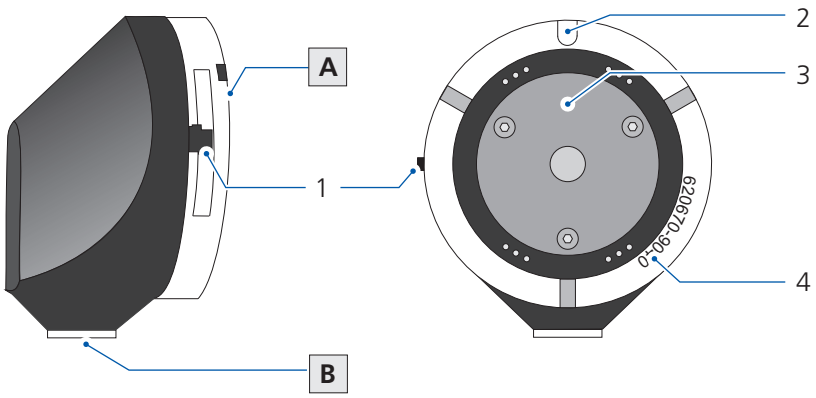


Possible combinations:

1 RDS articulating probe holder, equipped with adapter and adapter plate
2 Extensions
3 RenishawProbes
4 SA3 (M3/M2 adapter)
5 Stylus with M2 thread
6 Stylus with M3 thread

Adapter plate

The Renishaw probe or an extension is attached to the RDS adapter plate. In the second case, the probe is attached to the extension.



RDS adapter plate for Renishaw probes and extensions

A Connection to the RDS articulating probe holder

B Connection of the Renishaw probe

1 Push-button for releasing the adapter plate from the articulating probe holder

2 Groove for positioning the adapter plate in the adapter plate receptacle of the articulating probe holder

3 Anchor plate

4 Order number of the adapter plate

Limit values

The limit values for Renishaw probes can be found in the accompanying Renishaw brochures.

NOTE

Only use the delivered stylus in order to reach the maximum probe accuracy possible.

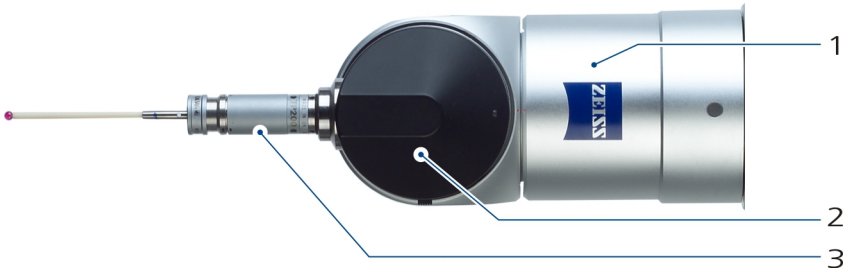
RDS with TP200

Components:

– RDS adapter plate for TP200

– TP200 Probe

– PI200 interface



1 RDS articulating probe holder
2 RDS adapter plate for TP200
3 TP200 probe with probe module

Information on TP200: ➤ *See [⇨ 2-54]*

Information on mounting the TP200: ➤ *See [⇨ 2-56]*

RDS with measuring probes

RDS with SP25M

Use

Discrete-point probing and scanning are possible using the SP25M probe. Probing is possible in almost any position. This is ensured thanks to the two rotary axes of the RDS articulating probe holder. The angular positions in both axes can be changed in steps of 2.5°.

Special feature: Combination of the scanning option and the variable adjustability provided by the articulating probe holder. A further feature are the variable stylus lengths.

System requirements

To perform measurements using the SP25M probe, the following requirements must be met:

System requirements for SP25M

Measuring software:	CALYPSO 4.2
Firmware:	18.06
Probe holder:	RDS

Components

The RDS/SP25M probing system is a combination of the incremental RDS articulating probe holder, the SP25M probe, a scanning module, and an SP25M adapter plate. The articulating head is the probe holder.

Design versions:

Version 1 for stylus lengths from 50 to 105 mm:	– SP25M Probe – SM25-2 scanning module – SH25-2 adapter plates (2 plates) – Master stylus 20 mm

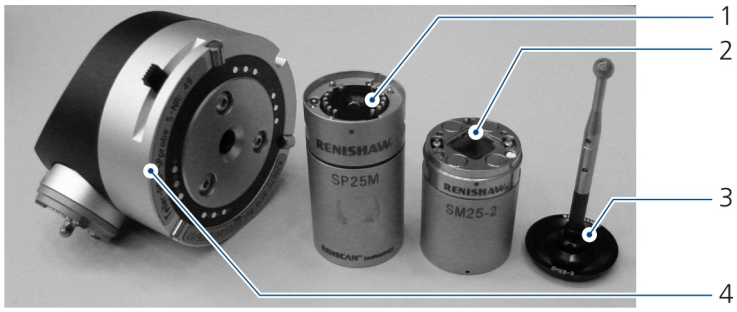
Version 2 for stylus lengths from 120 to 200 mm:	– SP25M Probe – SM25-3 scanning module – SH25-3 adapter plates (2 plates) – Master stylus 20 mm

Additional components:

RDS adapter plate for the SP series	
FCR25 changer rack	3 holders for scanning modules and adapter plates. An adapter is needed for storing the adapter plates.
Stylus kit	There is a special stylus kit for each design version.

NOTE

For conversions of a CMM, you may require additional conversion parts. Moreover, the system requirements must be met.



Components for SP25M

1 RDS adapter plate
2 SP25M Probe
3 SM25-2 scanning module
4 SH25-2 adapter plate with stylus; M3 thread

There are different scanning modules. In turn, for each scanning module there is a special adapter plate.

RDSAdapter plate

When inserting the RDS adapter plate for the first time into the RDS adapter plate receptacle, the LED in the RDS adapter plate (above the ZEISS logo) may be flashing. The flashing of the LED indicates that the adapter plate firmware is being updated. The LED may flash for several minutes.

SH25Adapter plate

For each scanning module there is a special adapter plate. The adapter plate is held magnetically and can be installed manually or automatically. The orientation is determined by means of a sphere.

Limit values

NOTE

Only the styli belonging to the respective stylus kit may be used. If longer or heavier styli are used, measurement errors may occur.

Lateral styli

Lateral styli are only allowed for the SM25-2 scanning module.

Conditions for lateral styli with the SM25-2:

Distance from the end of the adapter plate extension:	min. 20 mm
Projection:	max. 28 mm
Total length in the Z axis:	max. 105 mm

NOTE

The SP25M is a Renishaw product. Separate operating instructions are provided for this. These are stored on the CD included in the delivery. File name: »H-1000-5104-01-A (Draft V1) SP25M FCR25 AC3 - IIUG.pdf«.

- Please read the information given in the SP25M operating instructions.

RDS with SP600

Use

Discrete-point probing and scanning are possible using the SP600 probe. Probing is possible in almost any position. This is ensured thanks to the two rotary axes of the RDS articulating probe holder. The angular position in both axes can be changed in steps of 2.5°

Special feature: Combination of the scanning option and the variable adjustability provided by the articulating probe holder.

System requirements

To perform measurements using the SP600 probe, the following requirements must be met:

System requirements for SP600

Measuring software:	CALYPSO 4.0
Firmware:	16
Probe holder:	RDS

Components

The RDS/SP600 probing system is a combination of the incremental RDS articulating probe holder and the SP600 probe. The articulating head is the probe holder.

1 RDS articulating probe holder
2 RDSAdapter plate
3 SP600 Probe

4 Stylus with M4 thread

NOTE

The SP600 probe and the RDS adapter plate form a unit. The probe and adapter plate must *not* be separated.

A test seal is located at the connection point between the probe and the adapter plate. This test seal must neither be removed nor damaged.

RDSAdapter plate

When inserting the RDS adapter plate for the first time into the RDS adapter plate receptacle, the LED in the RDS adapter plate (above the ZEISS logo) may be flashing. The flashing of the LED indicates that the adapter plate firmware is being updated. The LED may flash for several minutes.

SP600 adapter plate

The adapter plate is held magnetically and can be installed manually or automatically. The adapter plate position is determined by a pin located in the adapter plate receptacle.

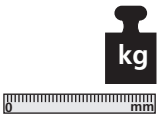
SP600 probe with adapter plate

1 Adapter plate receptacle
2 Magnet
3 Pin for proper positioning of the adapter plate
4 Adapter plate
5 Recess for the pin in the adapter plate receptacle

NOTE

For long styli, a special adapter plate containing a stronger magnet is available from Renishaw. This adapter plate must be used when the permissible holding force is exceeded.

Limit values



The maximum permissible stylus weight, including adapter plate, is 20 g. The maximum permissible stylus length is 200 mm.

For more information, please refer to the separate SP600 brochure. This brochure comes packed with the probe.

NOTE

Longer styli are permitted according to the separate brochure. Nevertheless, the above value for the maximum permissible stylus length should not be exceeded. Otherwise, inaccurate measurements may occur.

Renishaw probing systems

Use

Trigger probes are used to probe single points.

Special applications:

- Probing with small, short styli
- Probing with low probing forces
- Probing of soft materials, e.g. plastics.

Articulating probe holders additionally allow probing of hardly accessible areas on the workpiece.

Options

Renishaw probing systems:

Component	Type
Receptacle for probe	PH1, PH6
Articulating probe holders	MH8, MIH, PH10, PH50
Probe	TP6, TP2, TP20 or TP200 (only in combination with CALYPSO or U-SOFT)
Extension	PEL 1, PEL 2, PEL 3 (lengths: 50, 100, and 200 mm)

Component	Type
Changer rack	MCR20 for TP20 and SCR200 for TP200

Examples:

Rigid probe receptacle	Articulating probe holder
Clamping device on the ram with PH1 probe receptacle and TP6 probe	MIH articulating probe holder with probe extension and TP6 probe
	

Mounting of the stylus system

On Renishaw trigger probes, the stylus system is normally screwed directly into the probe.

Limit values

The limit values for Renishaw probes can be found in the accompanying Renishaw brochures.

NOTE

Only use the delivered stylus in order to reach the maximum probe accuracy possible.

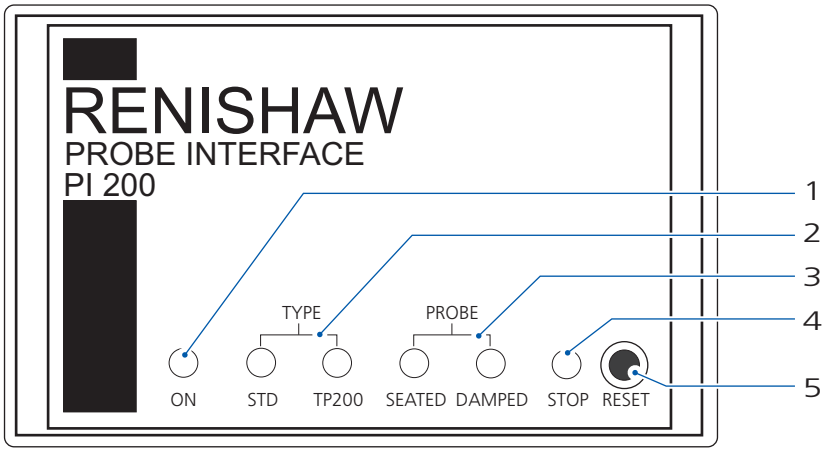
TP200 probe

Damage to strain sensors.
The TP200 probe is provided with strain sensors. These are sensitive to shocks and may easily be damaged.

- Handle the TP200 probe with care.

NOTE
The PI200 interface is required for the TP200 probe.

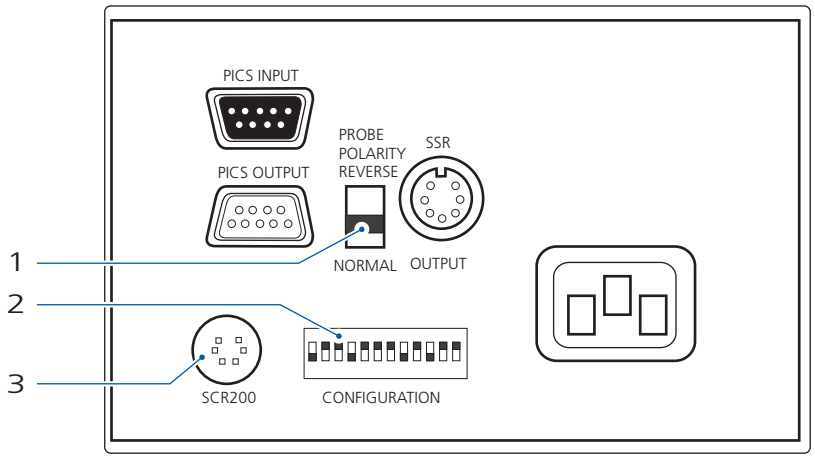
PI200 Interface



Front side of the PI200

1 Power supply «ON»
2 Display of the selected probe; «STD» = standard, e.g. TP2, TP6
3 Status display of the probe; «SEATED»: LED is on = probe ready
4 «PICS-STOP» activated
5 Various functions, e.g. switching off an alarm sound

NOTE
For more information, please refer to the separate PI200 interface brochure.



Rear side of the PI200

1 Polarity switch
2 Configuration switch
3 Connection for the SCR200 changer rack

Configuration switch

To use the TP200 for the measurement, the PI200 interface must be configured correctly. Since different versions of the PI200 interface exist, the configuration switches may have different positions.

– Write down the switch positions when installing the PI200 and store this note in a safe place.

  If the configuration is accidentally changed later on, you will be able to reestablish the original configuration.

Switch positions

Polarity switch

The TP200 probe is sensitive to switched polarity. In case of switched polarity, the indicators for «POWER» and «STOP» at the front of the PI200 interface are lit. At the back of the interface, there is a switch for switching the polarity.

– Move the switch to the other position (Reverse or Standard) ➤ *See [⇨ 2-<R>]*.

The probe should now work.

Order for mounting the TP200

Mounting the probe

1 Switch off the power supply for the CMM and the PI200 interface.

2 Mount the probe holder to the ram.

3 Mount the probe to the probe holder.

4 Switch the power supply on again.

Removing the probe

1 Switch off the power supply for the PI200 interface.

2 Then switch off the power supply for the CMM.

3 Remove the probe from the probe holder.

4 Remove the probe holder from the ram.

Changing the probe module

NOTE

Faults may occur when changing the probe module. See Renishaw operating instructions.

RDS with optical probes

ViScan optical probe

Use

The ViScan is an optical probe (image sensor with autofocus). The probe is used to measure workpieces for which contact probing is not possible.

The ViScan is installed in the adapter plate receptacle of the RDS probe holder, which allows probing in almost any direction.

NOTE

The ViScan probe is described in the separate brochure »Optical measurement« providing complete information on the use of the probe.

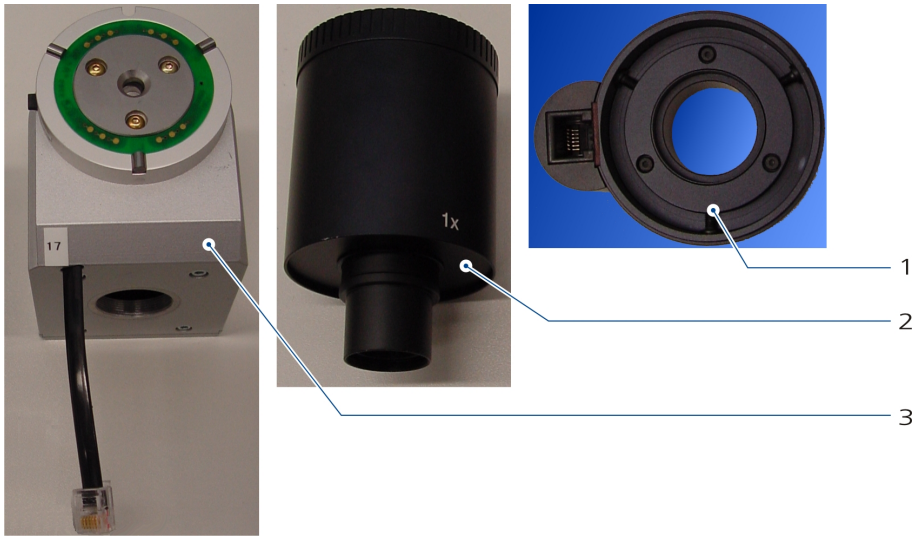
System requirements

To perform measurements using the ViScan probe, the following system requirements must be met:

System requirements for ViScan

Control:	C99
Measuring software:	CALYPSO
Probe holder:	RDS

Components



1 Illumination unit
2 Objective lens
3 Camera body

NOTE

A backlight table can be supplied as an accessory for the ViScan. This is a glass plate illuminated from below.

DTS

Use

The DTS is an optical probe (triangulation sensor). The probe is used to measure workpieces for which contact probing is not possible.

The DTS is installed in the adapter plate receptacle of the RDS probe holder, which allows probing in almost any direction.

Components

The DTS consists of an RDS adapter plate and a probe. Probing is acknowledged by LEDs.

1 RDS articulating probe holder
2 RDSAdapter plate
3 Probe
4 LED; probing acknowledgement
5 Tube

NOTE

The probe must *not* be unscrewed from the RDS adapter plate.

LineScan

The LineScan is a system composed of the laser line scanner and software components. The LineScan is used for profile measurement, quality control, and dimensional inspection.

The laser line scanner is installed in the adapter plate receptacle of the RDS articulating probe holder, which allows scanning in almost any direction.

The LineScan exists in two different versions. For technical reasons, only the older version can be used on some CMMs. Such is the case for the PRISMO CMM, for example.

Old version	New version
	

NOTE

Different operating instructions are available for the two LineScan models, providing complete information on the use of the probe.

System requirements for LineScan:

Control:	C99
Scan software:	WBScan
Measuring software:	CALYPSO or HOLOS
Probe holder:	RDS

Information on the measuring operation

Notes on the measuring run

Checking the styli

Regular inspection of the stylus systems is required to ensure correct workpiece measurement.

- Check the styli, the stylus system components and the adapter plate regularly.
- Remove any particles or grease film from the stylus tips and the adapter plate.
- Replace any styli that are damaged.

Effect of magnetic fields

NOTE

Probes are sensitive to magnetic fields. This leads to stylus deflections and thus to measuring errors. Possible causes of a magnetic field: e.g. magnetic workpieces, clamping tool.

Influence of temperature

NOTE

In order to carry out a temperature compensation between CMM and an inserted probe, an appropriate time period for this compensation has to be considered. This period depends on the temperature difference between the probe and CMM.

Types of measurement

Overview

Discrete-point probing, multipoint measurements, and scanning are possible using the corresponding probing system. When scanning, it is differentiated between passive and active measuring probing systems.

	Discrete point	Multiple point	Scanning	
			Passive	Active
ST	×			
ST 3	×			

	Discrete point	Multiple point	Scanning	
			Passive	Active
ST-ATAC	×			
DT DynaTouch	×			
XDT	×	×		
VAST XXT	×	×	×	
VAST XT / VAST XT gold	×	×		×
VAST XTR gold	×	×		×
VAST / VAST gold	×	×		×
HSS	×	×		×
RDS with RST-P	×			
RDS with XDT	×			
RDS with VAST XXT	×	×	×	
RDS with TP6	×			
RDS with TP2	×			
RDS with TP20	×			
RDS with TP200	×			
RDS with SP25 or SP25M	×	×	×	
RDS with SP600	×	×	×	
RDS with ViScan	×			
RDS with DTS	×			
RDS with LineScan		×	×	
Renishaw, e.g. MIH, with TP6	×			

Discrete-point probing

Discrete-point probing means that only one point is probed. Then the probe moves away from the workpiece. This procedure must be repeated if additional points are to be probed.

Complete measurement

With discrete-point probing, a workpiece can be measured completely. All dimensions of the workpiece are calculated by means of the probed single points. No information can be obtained regarding form. For this, scanning and a special software are required.

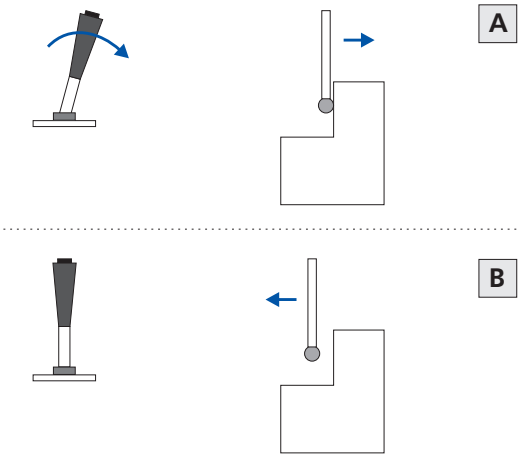
Probing with trigger probing systems

Acknowledgement by signal sound

A signal is sounded as soon as the measuring point probed is successfully transmitted to the measuring system. The joystick can then be released. The stylus automatically retracts in the direction opposite to the probing direction.

NOTE

In case of a fault, the joysticks are re-enabled after about two seconds. The stylus can be moved back via joystick control. The stylus can be moved in all directions at low speed. The collision protection is *not* active.

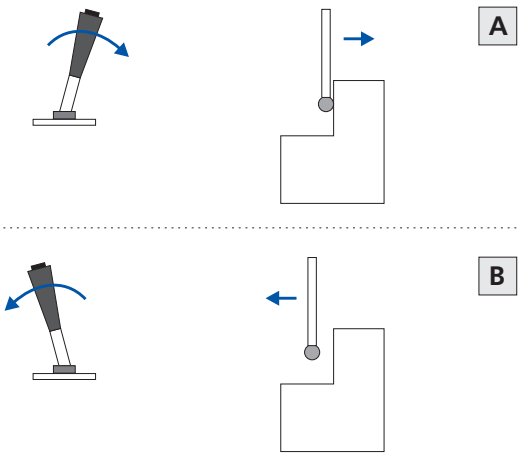


A Before probing

B After probing

Probing with measuring probing systems

The stylus must be moved back contrary to the probing direction after each discrete-point probing.



A Before probing

B After probing

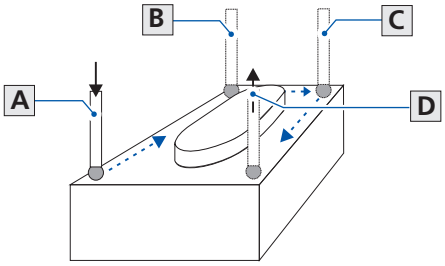
Exact measured values

With measuring probing systems, many measured values are recorded in each probing. Using these values, the control calculates the exact measured value. This guarantees a low deviation and a high reproducibility.

Multipoint measurement

Multipoint measurement is only possible with a measuring probing system. During multipoint measurement, the stylus, in the probing status, is moved perpendicular to the probing direction.

The probing axis runs parallel to the workpiece surface. During measurement, the stylus tip constantly remains in contact with the workpiece surface. The measuring force remains effective until probing is completed.



A Lowering the stylus and probing the workpiece using the left joystick.

B-D Move the stylus over the workpiece with the right joystick. The position in the Z axis remains unchanged.

D Lifting the stylus.

Applying the measured value

You can influence the transfer of measured values individually. The measured value can be transferred either dynamically or statically.

– *Dynamic measurement transfer* (not possible with the C99 controller and CALYPSO):

  The measured value is immediately transferred by pressing the push-button of the right joystick. The stylus movement is not stopped.

– *Static measured value transfer*:

  Each time the CMM stops traveling a measured value is created, but not transferred immediately. Measured value transfer occurs after a damping period of approx. one second (1 s).

Terminating the multipoint measurement

To terminate the measurement, deflect the joystick counter to the probing direction.

Scanning with VAST XT, VAST, and HSS

During scanning, the surface of a workpiece is continuously probed. The measuring points make it possible to calculate surfaces or provide information on the form of a surface.

No axis clamping

The axes of the probe are generally not clamped during scanning. This means that measurement takes place with freely movable axes.

Scanning modes:

VAST circle scanning:	For measuring shafts and bores; the CMM automatically differentiates between inside and outside bores.
VAST surface scanning:	For measuring surface-like workpiece areas.
VAST line scanning:	For flatness measurements or acquisition of curved shapes in predefined section planes. In this case, it is advisable to clamp one axis.

Special features of VAST gold and HSS

Different measuring routines are available for each scanning mode:

Four VAST stages:

VAST stage 1:	Exact measurement of dimensions, position, and form. Scanning with maximum precision for measurement of dimensions, form, and position.
VAST stage 2:	Fast measurement of dimensions, position, and form. High dynamic scanning for measurement of dimensions, form, and position ($2 \times V_2$).
VAST stage 3:	Exact measurement of dimensions and position Scanning with maximum precision for measuring dimensions and position.

VAST stage 4:	Rapid acquisition of the position. Scanning with maximum dynamics for measuring the position.

For more information, please refer to the operating instructions for the measuring software.

Special features of the ST and ST3

Probing procedure

The probing procedure is subdivided into three steps:

1. Contact with the workpiece
2. Generation of the probing pulse
3. Release of a mechanical switch

After contact, the probing pulse is generated. Then the stylus system starts to deflect. When the mechanical switch in the fixed part of the probe is released, the movement in the probing direction is stopped. The probe moves back. The deflected stylus system returns to its initial position.

Conditions for probing pulse

The probing pulse is generated by a very small amount of force (F < 0.1 N). This occurs as soon as the stylus tip contacts the workpiece. Observe the following to ensure perfect probing results:

Probing path:	The travel path before the contact point must be at least 0.5 mm.
Probing speed:	The time between the probing pulse and the release of the mechanical switch must be within a certain period. This means: The probing speed must exceed a certain value. The control console indicates when the probing speed is reached. An LED on the standard control console lights up.

NOTE

If the probing speed is too low, the probing is not registered. The probing must be carried out again.

Special features of the VAST XTR gold

Configuring the probe

Configuring probe and holder in the measuring software

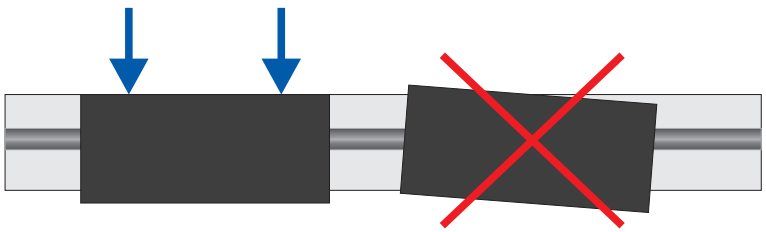
In the CALYPSO default settings, the probe must be set on the »Sensors« tab. To do so, select »VAST-XTR«. Select the »ZCR« type when creating a new stylus system holder in CALYPSO. See operating instructions for the measuring software.

Changing the position of a holder

To move a holder in the profile rail on the MSR changer rack, you must first slacken the two screws on the lower side of the holder.

1. Slacken the two screws on the lower side of the holder.
2. Move the holder to the desired position.
3. Retighten the screws.

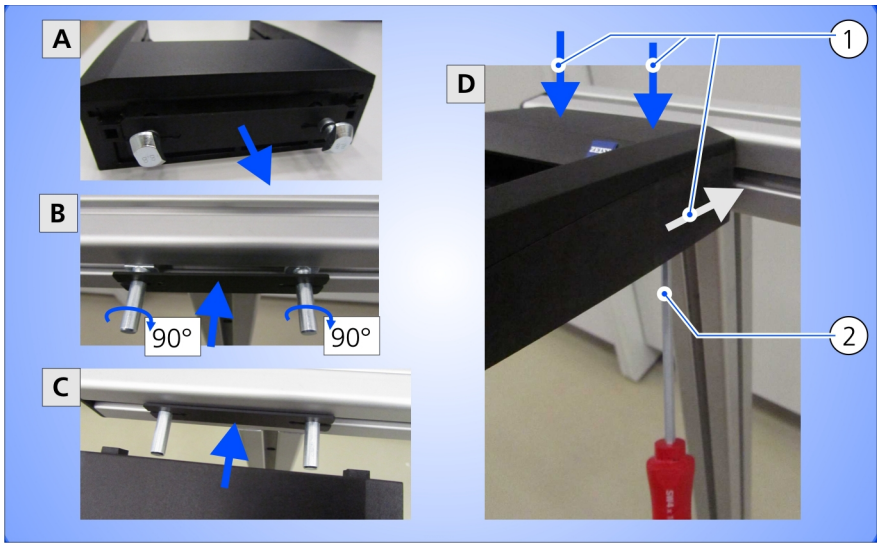
   NOTICE! When tightening, the holder may tilt to the side. To avoid inclined mounting of the holder in the profile rail, you must push the holder downwards against the profile rail while tightening the screws.



Inclined holder due to incorrect mounting

Mounting a holder between two existing holders

1. Remove the metal plate located on the rear side of the holder and the two holding pins **[A]**.
2. Slide the holding pins into the groove of the profile rail and turn by 90° **[B]**.
3. Slide the metal plate and the holder onto the two holding pins and retighten the screws **[C, 1, 2]**. See also note on point 3 above.



Mounting a holder between two existing holders

Qualification

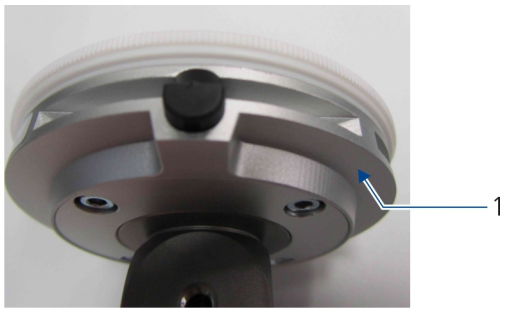
The holder can be qualified using any qualified stylus. The only condition is that the max. diameter of the stylus tip is 8 mm.

Qualification is a two-step procedure:

1. The sloped qualification surface on the holder must be probed with a stylus. Then CALYPSO automatically recognizes the type of the holder and the direction of approaching the holder.

1 Sloped qualification surface

2. Now, the stylus length must be determined. To do so, probe any plane surface with the stylus tip and with the lower edge of the adapter plate. **NOTICE! The smaller surface of the adapter plate must be used for probing as shown in the illustration. [1]**



1 Zone for probing

NOTE

The adapter plate can only be stored in one holder position. For this, the adapter plate is rotated automatically to the corresponding position.

The holders can be arranged such that approach in the ±X and ±Y directions is possible.

Installing and removing the adapter plate

The adapter plate must be installed with the styli mounted. No styli must be mounted to the installed adapter plate. This could damage the probing system.

1. To insert the adapter plate into the probe, press *both* push-buttons of the adapter plate and keep them pressed.
2. Then slightly push the adapter plate in horizontal position upwards into the adapter plate receptacle of the probe and release the push-buttons.

Adapter plateZSH-70-R-24

1 Push-button for locking the adapter plate

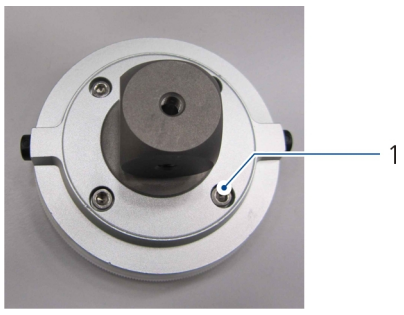
NOTE

After manual change of the adapter plate, make sure that both push-buttons return to their initial position. Otherwise, the adapter plate may not be recognized correctly in the system. Neither rotation nor probing is possible in this position.

The current angular position of the adapter plates is automatically recognized after correct loading. The position in which the two type plates of the adapter plate point towards the front side of the probe defines the angular position «zero». See **[1]** below.

1 Home position of the adapter plate

The angular position can be changed in steps of 15°. Thus, a maximum of 24 positions is possible. By rotating the probe mounting cube you can adjust its position in smaller angular steps. To do so, the four screws on the lower side must be slightly loosened.



1 Screws for setting the angular position (4 pieces)

NOTE

You must retighten the four screws after setting the desired position. The torque is 1.5 Nm.

Removing the adapter plate

The procedure for manual removal of the adapter plate is initiated by a command via the control console or a software command. At the same time, the two push-buttons of the adapter plate must be pressed and kept pressed. After the audible release of the holding magnet, the adapter plate can be removed downwards.

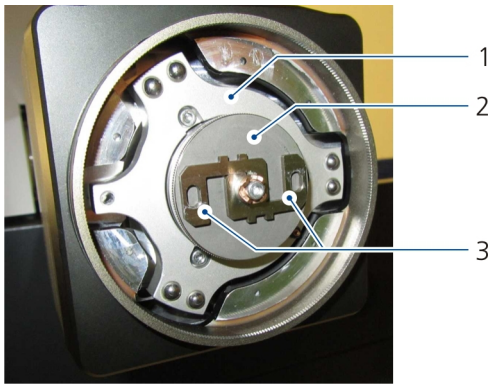
Collision protection

The collision protection of the probe is partly integrated in the adapter plate.

NOTE

If short styli are mounted directly to the adapter plate, only limited protection against collision is provided in case of maximum travel speed.

If, in case of collision, the adapter plate moves away from the probe, the body and the styli are pulled off the adapter plate. The anchor plate remains on the probe. Furthermore, the locking slides also remain on the anchor plate.



Adapter plate receptacle after a collision

1 Adapter plate receptacle
2 Anchor plate
3 Locking slides

The anchor plate can be removed from the probe by means of a software command. **NOTICE! The anchor plate can fall off automatically. Therefore, hold your hand under the anchor plate to prevent it from falling on the measuring table.**

NOTE

In individual cases, both locking slides need to be pushed manually outwards and the anchor plate must be removed by pulling downwards.

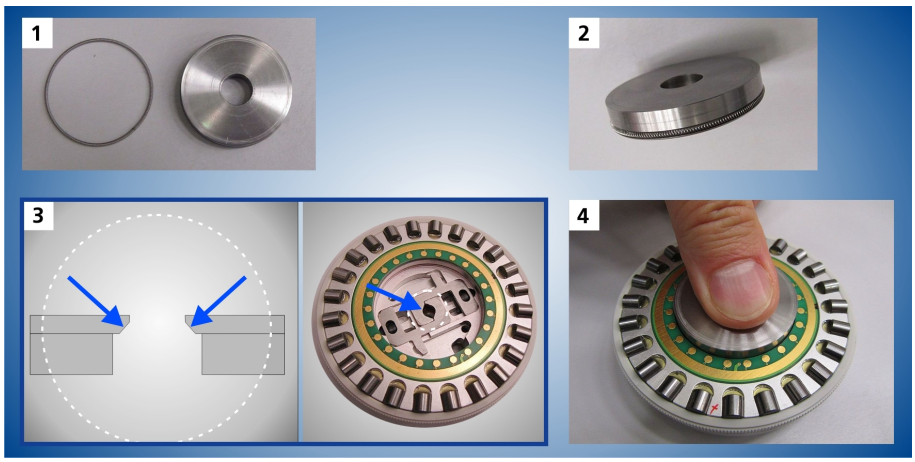
Subsequent measures:

1. After more than 3 collisions, insert new annular springs in the groove of the anchor plate **[1, 2]**.
2. Reinsert the locking slides **[3]**, making sure they are properly aligned.

   NOTICE! The beveled surfaces of the locking slides must point downwards.
3. Press the anchor disc into the adapter plate with the groove pointing downwards **[4]**.

NOTE

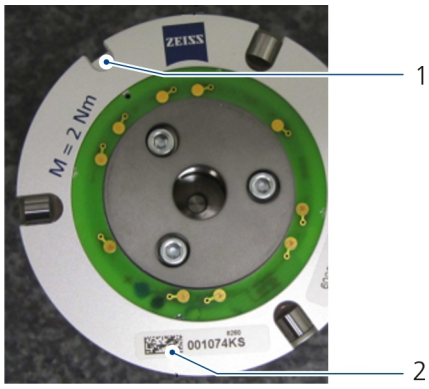
The replacement springs are included in the packaging of each adapter plate. Additional replacement springs can be ordered by specifying the order number »531-398«.



Use of other adapter plates

The adapter plate supplied for the master stylus and a recent type of the VAST adapter plate can also be installed in the adapter plate receptacle of the VAST XTR gold probe. These adapter plates can only be operated in the 0° position.

The usable VAST adapter plates can be recognized by a label with the DataMatrix code.



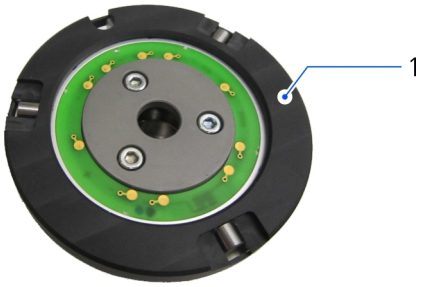
VAST adapter plate with DataMatrix code

1 Groove for proper positioning in the adapter plate receptacle

2 DataMatrix code

Collision protection

Before using VAST adapter plates, the collision protection ring must be pressed onto the adapter plate. Otherwise, no collision protection is provided for the VAST XTR gold.



1 Collision protection ring (order number: 600664-0298-000)

Installing adapter plates

The adapter plate supplied for the master stylus and the VAST adapter plate must only be installed in a specific position. The recess in the adapter plate must point in the -X direction of the CMM coordinate system. See first illustration. **NOTICE!** In contrast to other VAST probes, the adapter plate receptacle of the VAST XTR gold probe has no pin for proper positioning of the adapter plate. The adapter plate must therefore be inserted with care.

NOTE

If the adapter plate is accidentally inserted in the wrong position, it will not be recognized. In this case, the adapter plate must be released and installed again.

Special features used for measuring probing systems

Notes on measuring probing systems

The results of manual probings and automatic measuring runs may slightly differ from each other. The highest accuracy is generally reached with automatic measuring runs.

Precision positioning during probing

With measuring probing systems, the joysticks are temporarily deactivated as soon as the probe touches the workpiece. The CMM control takes over the precision positioning of the stylus. The measured value is accepted.

Setting the measuring force

The measuring force has to be set for the measuring probing systems. The value of the measuring force must be entered in the measuring software. See operating instructions for the measuring software.

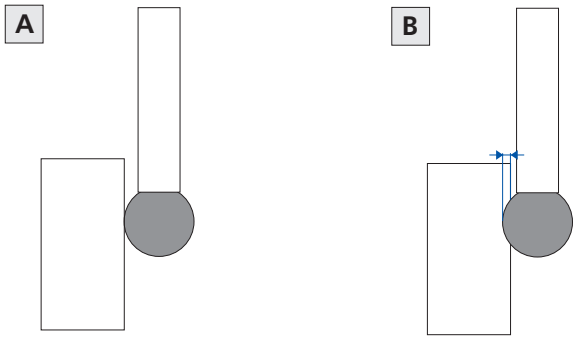
NOTE

The measuring force can be set individually for each stylus, if required.

Why does the measuring force have to be set?

During probing, the stylus tip can cause changes in the workpiece form. The extent of these form changes influences the precision of the calculated values. In order to avoid falsified measuring data, the measuring force should be adapted to the characteristics of the workpiece material.

Example: Greater changes in form can be expected with soft workpiece materials and high measuring force than with hard workpiece materials and low measuring forces. In this case, the measured value is falsified by the extent of the form change.



A Nominal status: no workpiece deformation.

B Falsified measurement due to indentation of the workpiece. Reason: soft material and high measuring force.

1 Extent of falsification

Information for VAST XT, VAST, and HSS

0.2 N - normal

The measuring force can be set continuously. Normally, a measuring force of 0.2 N has to be used for measurement. If larger form changes are to be expected, the measuring force should be 0.1 N.

– Set the measuring force according to your requirements.

NOTE

With *self-centering probing*, a higher measuring force in the MAN operating mode might be useful in order to improve centering. ➤ *See [⇨ 2-76]*

- Increase the measuring force if necessary.

Notes on other measuring probing systems

Adjustments of the measuring force and further particularities for the measuring operation are treated elsewhere.

– Please pay attention to the chapters dealing with the special features of the respective probing system.

Notes on scanning

Scanning speed

The possible scanning speed depends on the measuring force, the surface condition of the workpiece, the radius of the stylus tip and the required tolerance.

NOTE

Too high scanning speeds can lead to incorrect measuring results. The »navigator« software option offers you assistance for the choice of the optimum scanning speed.

Measuring force

The measuring force depends on the probe and can be adjusted within certain limits with many probes.

Abrasion or material deposits

NOTE

During scanning, the stylus remains continuously in contact with the workpiece. The stylus tip practically glides along the surface of the workpiece. This may cause abrasion and material deposits.

Abrasion:	Material may rub off the workpiece or the stylus tip (e.g. in case of sintered material) as the stylus glides along the surface of the workpiece during probing.
Material deposits:	With certain materials (such as aluminum), material may remove itself from the workpiece and deposit itself on the stylus tip.

For this reason, stylus tips should be checked regularly following all scanning operations and be replaced, if necessary.

1 Check the condition of the stylus tips and clean them.
For information on how to remove aluminum deposits, please refer to the operating instructions for the CMM.

2 If the stylus tip is damaged, you must replace the stylus.

Axis clamping

What you should know?

With regards to *actively measuring* probing systems, axes can be clamped or unclamped.

Clamping and unclamping can be carried out via the measuring software and the control console. It is possible to unclamp one, two or all three axes.

Why is clamping necessary?

You can cause the measuring force to act in a certain axis by clamping specified axes.

Two axes must be clamped when probing single points. The probe can be moved in the axis of the probing direction.

Notes

NOTE

In general, the measurement has to be carried out with the same axis clamping as for qualification

Example: In case of unclamped axes, probing should be carried out using a stylus. This stylus must be qualified in the same way. This means: All axes must be unclamped during qualification of the stylus.

Self-centering probing

If the probe can be moved freely in all axes, it will be centered automatically, e.g. a conical probe in a bore. A combination of one clamped and two unclamped axes is also possible.

NOTE

All axes are unclamped via the basic settings of the measuring software. Axis clamping must be carried out via the control console or the measuring software. See operating instructions for the measuring software.

Measuring force

With self-centering probing, it may be advisable to increase the measuring force or to specify the direction in which the measuring force is to act. The direction is specified by clamping the axes in which probing should not take place.

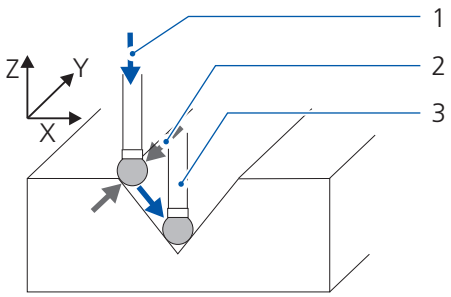
Measuring software or control console

The measuring software makes it possible to alter the value of the measuring force and to specify the direction in which the measuring force is to act. The direction of the measuring force can also be set via the control console.

Examples:

One axis clamped

Bottom of narrow V grooves.



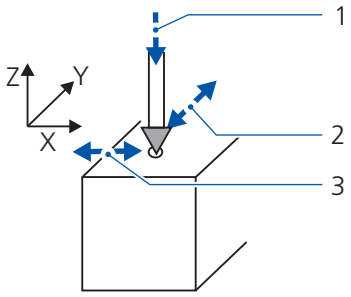
1 Probing in the Z axis; moving axis.

2 Y axis is clamped; no movement possible in the Y axis.

3 Self-centering in the X axis up to the bottom of the groove.

Three freely moving axes

Probing of a small bore with a conical probe.



1 Probing in the Z axis; moving axis.

2 The probe can move freely in the Y and X axes; the cone is automatically centered in the bore.

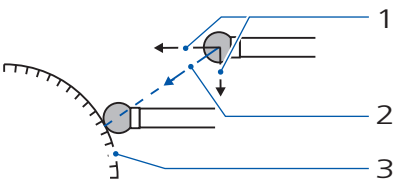
NOTE

Self-centering probing is not possible for all measuring probing systems. Please pay attention to the chapters dealing with the special features of the respective probing system.

All axes unclamped

Vector probing means that the probe can move freely in all three axes. This mode is generally selected in the basic settings of the measuring software.

Vector probing ensures optimum probing results for most measuring jobs. In the ideal case, the measuring force acts vertically on the surface being probed. Furthermore, exact correction of the probe bending is ensured.



1 Freely moving axis

2 Measuring force perpendicular to the workpiece

3 Workpiece

NOTE

To prevent any misunderstandings: The workpiece is not probed in two axes. In the manual mode, probing takes place in *one* axis of the workpiece coordinate system: either X, Y, or Z. In automatic measuring runs, probing is performed in the nominal vector direction.

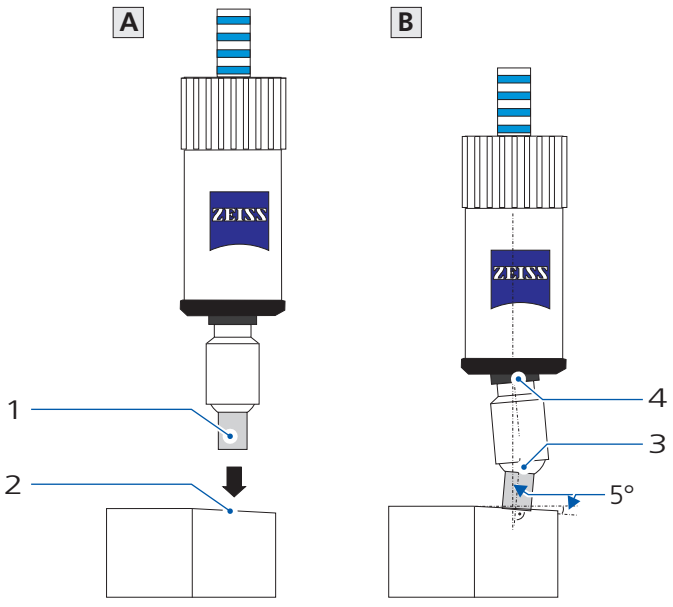
Temperature probe (option)

Notes on temperature measurement

- The temperature measurement should be carried out on thick-walled workpieces.
- The workpiece surface must be clean and flat.
- The surface to be probed should be larger than the contact surface of the temperature-sensing stylus.
- Measuring force: 1 N.
- The workpiece should be probed in the axis direction of the temperature probe.

  The max. angle between the axis direction and the standards of the workpiece surface may no exceed ±5°. Perfect measuring operation cannot be guaranteed with larger angles.

The temperature sensor adapts itself automatically to the inclination of the workpiece surface.



A Approaching an oblique workpiece surface

B Probing: Deflection at two points

1 Temperature sensor
2 Workpiece
3 Deflection at the probe
4 Deflection of the temperature sensor; maximum ±5°

Options

A temperature probe offers the following possibilities:

– Temperature compensation.
– Using the temperature probe in an automatic measuring run.
– Temperature monitoring.
– Temperature check.
– Temperature recording.

For more information, please refer to the table.

Option	Comment
Temperature compensation	When using the temperature probe for temperature compensation, the measuring time after positioning the temperature probe is approximately five seconds. During this time, measured values are continuously transferred, evaluated, and saved.
Using the temperature probe in an automatic measuring run.	If the temperature probe is to be included in a measuring run, the position of the temperature sensor must be known beforehand. – Determine the position of the temperature probe.
Temperature monitoring	It is possible to define *limit values* for the temperature. Furthermore, you can define when to perform the temperature measurement. There are two possibilities if the limit value is exceeded: A warning appears in the report or the automatic measuring run is cancelled.
Temperature check	The ambient air temperature can be measured at any time. The temperature is compared with the limit values. There are two possibilities if the limit value is exceeded: A warning appears in the report or the automatic measuring run is cancelled.
Temperature recording	If the data from the last temperature measurement is required, the temperatures of the workpiece and the air can be recorded.

NOTE

You need the measuring software to use the options provided by the temperature probe. See operating instructions for the measuring software.

Special features of the RDS

For more information on the RDS, please refer to the operating instructions for the measuring software.

Special features of the RST-P

Critical probings with RST-P

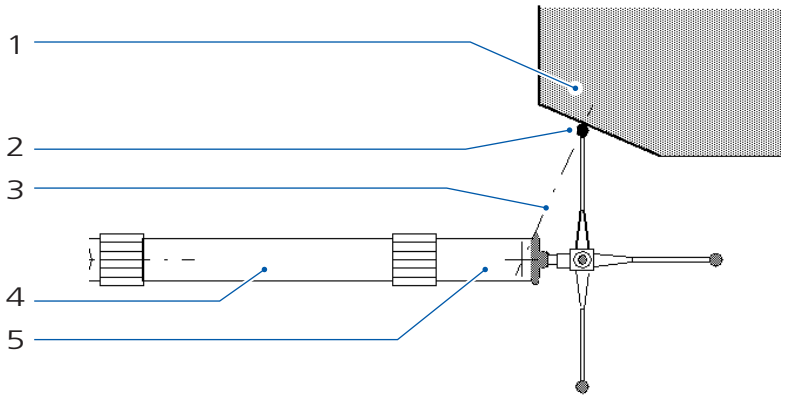
Condition for probing pulse

NOTE

A measured value is only valid if the probing pulse is confirmed by the mechanical contact in the probe within a certain period.

Unfavorable conditions

In certain cases it may happen that the mechanical contact is released too late. In this case, the measured value is not accepted.



1 Workpiece
2 Probing point with lateral stylus
3 Surface normal in the probing point
4 Extension of RST-P: > 200 mm
5 Probe

Probing may be critical if the following four criteria coincide:

– Use of an extension which is longer than 200 mm for the RST-P probe.
– Surface normal at the probing point points to the center of the bearing plane, in the range of ± 5°.
– Probing with a lateral stylus.

– the probing direction runs parallel to an axis of the stylus system.

NOTE

Critical probing can be avoided if you ensure that at least one of the above mentioned criteria does not apply during probing.

How to avoid critical probings

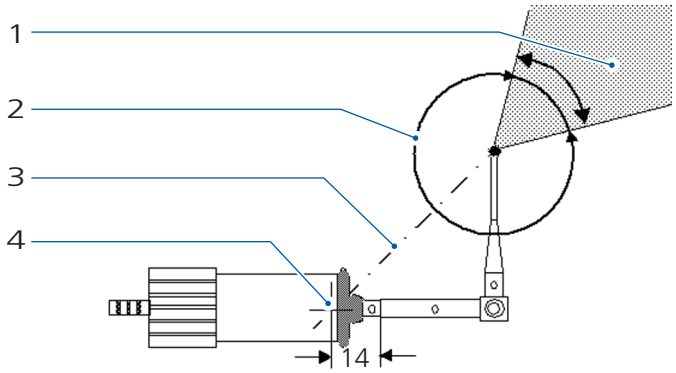
Critical probing can be avoided if the central stylus instead of the lateral stylus is used for the measuring point on the oblique surface.

Inadmissible zone for reverse probings

The stylus vector is different for each stylus. It determines the admissible and inadmissible zone for the probing.

NOTE

The stylus vector is a connecting line between the stylus tip and the bearing plane of the RST-P probe.



1 Inadmissible zone for reverse probings: angle of 60°.
2 Admissible zone for all probing directions
3 Stylus vector
4 Center of the bearing plane for the RST-P probe.

⚠ CAUTION

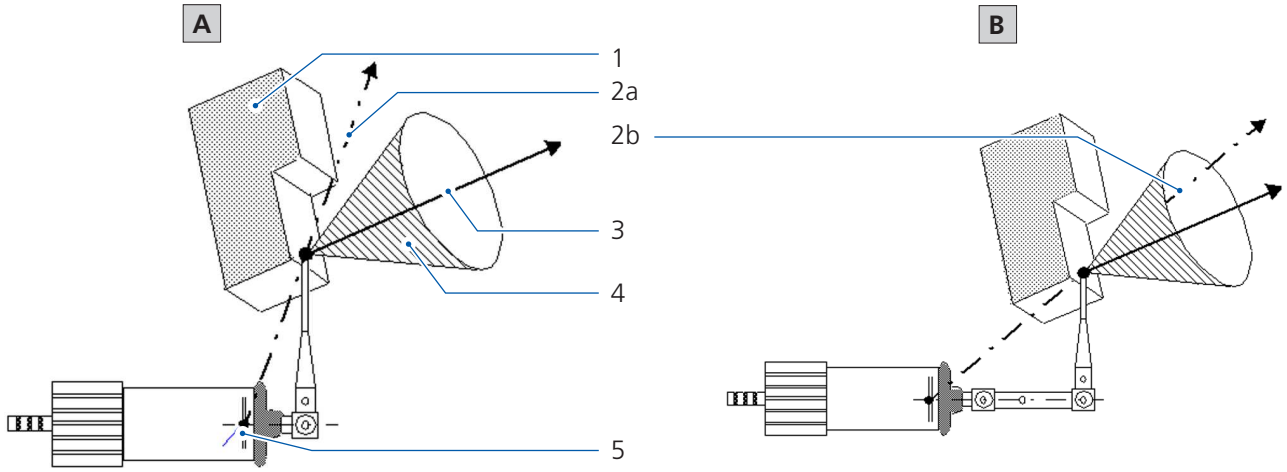
The bearing plane for the RST-P probe must not be loaded in the direction of pull. This may happen during reverse probings if the surface normal of the workpiece to be probed is superimposed on the stylus vector. This may lead to measuring errors and cause damage to the RST-P probe.

- Do not perform any reverse probing if there is a risk of stylus deflection within the inadmissible 60° range. See examples.

NOTE

Avoid reverse probings. However, if reverse probing is necessary, the stylus with which the largest angle between the surface normal and the stylus vector can be achieved should be used. See diagram above.

Examples



Examples of admissible and inadmissible reverse probing

A Admissible reverse probing: the stylus vector is *outside* the inadmissible vector range.

B Inadmissible reverse probing: the stylus vector is *inside* the inadmissible vector range.

1 Workpiece

2a Stylus vector outside the inadmissible range

2b Stylus vector within the inadmissible range

3 Surface normal of the workpiece in the probing point

4 Inadmissible range: 60° cone around the surface normal

5 Center of the bearing plane for the RST-P probe.

Special features of the RDS/XXT

Dead-weight offset

Since the VAST XXT is not provided with the counterbalancing function, the stylus sags down, more or less, depending on the weight and orientation of the probe. The resulting display on the probe-internal path measurement system is called dead-weight offset (DWO). Any probing during measuring operation takes place relative to this DWO.

A DWO is determined after certain actions. These actions may *not* be carried out while probing.

These actions include:

– Cold start of the control unit

  Switching the control unit on and off

– Swiveling of the stylus
– Stylus system change

NOTE

Make sure that the stylus does not come into contact with anything during these actions.

- Move the stylus free prior to carrying out one of these actions.

Notes on the operation

Probe deflection and measuring force

The measuring force depends on the probe type (TL1 or TL2), on the stylus length, and on the deflection at the stylus tip.

NOTE

Very thin styli may break. Styli of the applicable stylus system kit are suitable.

»Standard« presetting

The recommended presetting for the deflection is »Standard«, selectable in the CALYPSO measuring software. With this setting, the probe deflection during measurement value recording is 0.15 mm. This value is independent of the stylus length.

Modes for critical application cases:

Sensitive:	Small deflection, for example for soft workpieces or low scanning speed.
Robust:	High deflection, for example for rough workpieces or high scanning speed.

The different modes can be selected in CALYPSO.

Qualification

NOTE

The shaft of the reference sphere may not be probed during the qualification.

- Position the reference standard in a way to prevent probing of the shaft.

Please note:

– The maximum deflection occurring during qualification is 0.4 mm. A maximum probing force results from the deflection of 0.4 mm. The resulting probing force depends on the stylus length.

  Only use styli which will not show any inadmissible deformation at the maximum probing force.

– RDS CAA is not available.

  Each RDS position must be qualified separately.

– For requalification of already qualified styli, six probing points are sufficient.

Probing

– In the case of styli with a very thin stylus shaft, the probing dynamics may have to be reduced.

  Dynamic reduction is not necessary for the smallest stylus currently available. The smallest stylus from the stylus system kit for VAST XXT has the following features: 1 mm shaft diameter, 1,5 mm diameter of the stylus tip.

– Self-centering probing is not permitted.

  The moments generated by frictional forces lead to inaccurate measurements.

– Disk styli may not be used since those cannot be qualified.

Special features of the RDS/SP25M probing system

Dead-weight offset

Since the SP25M is not provided with the counterbalancing function, the stylus sags down, more or less, depending on the weight and orientation of the probe. The resulting display on the probe-internal path measurement system is called dead-weight offset (DWO). Any probing during measuring operation takes place relative to this DWO.

A DWO is determined after certain actions. These actions may *not* be carried out while probing.

These actions include:

– Cold start of the control unit

  Switching the control unit on and off

– Swiveling of the stylus

– Stylus system change

NOTE

Make sure that the stylus does not come into contact with anything during these actions.

- Move the stylus free prior to carrying out one of these actions.

Notes on the operation

Probe deflection and measuring force

The measuring force depends on the scanning module (SM25-2 or SM25-3), on the stylus length, and on the deflection at the stylus tip.

NOTE

Very thin styli may break. Styli of the applicable stylus system kit are suitable.

»Standard« presetting

The recommended presetting for the deflection is »Standard«, selectable in the CALYPSO measuring software. With this setting, the probe deflection during measurement value recording is 0.15 mm. This value is independent of the stylus length.

Modes for critical application cases:

Sensitive:	Small deflection, for example for soft workpieces or low scanning speed.
Robust:	High deflection, for example for rough workpieces or high scanning speed.

The different modes can be selected in CALYPSO.

The real measuring force can be estimated from the information given in the SP25M operating instructions.

Qualification

NOTE

The shaft of the reference sphere may not be probed during the qualification.

- Position the reference standard in a way to prevent probing of the shaft.

Please note:

– The maximum deflection occurring during qualification is 0.4 mm. A maximum probing force results from the deflection of 0.4 mm. The resulting probing force depends on the stylus length.

  Only use styli which will not show any inadmissible deformation at the maximum probing force.

– RDS CAA is not available.

  Each RDS position must be qualified separately.

– For requalification of already qualified styli, six probing points are sufficient.

Probing

– In the case of styli with a very thin stylus shaft, the probing dynamics may have to be reduced.

  Reducing the dynamics is not necessary for the smallest Renishaw stylus currently available. The smallest stylus has the following properties: 0.7 mm shaft diameter, 0.5 mm diameter of the stylus tip.

– Self-centering probing is not permitted.

  The moments generated by frictional forces lead to inaccurate measurements.

– Disk styli may not be used since those cannot be qualified.

Special features of the RDS/SP600

Dead-weight offset

Since the SP600 is not provided with the counterbalancing function, the stylus sags down, more or less, depending on the weight and orientation of the probe. The resulting display on the probe-internal path measurement system is called dead-weight offset (DWO). Any probing during measuring operation takes place relative to this DWO.

A DWO is determined after certain actions. These actions may *not* be carried out while probing.

These actions include:

– Cold start of the control unit

  Switching the control unit on and off

– Swiveling of the stylus

– Stylus system change

NOTE

Make sure that the stylus does not come into contact with anything during these actions.

- Move the stylus free prior to carrying out one of these actions.

Notes on the operation

Probe deflection and measuring force

An important criterion is the deflection on the stylus tip. The measuring force is proportional to the deflection. A deflection of 0.15 mm corresponds to a measuring force of approx. 150 mN.

Default setting

The recommended measuring force is 150 mN. This corresponds to the presetting in the measuring software.

Qualification

– No styli may be used that cannot withstand a measuring force of 500 mN. 500 mN is the highest force encountered during qualification.

– RDS CAA is not available.

  Each RDS position must be qualified separately.

– For requalification of already qualified styli, six probing points are sufficient.

Probing

– In the case of styli with a very thin stylus shaft, the probing dynamics may have to be reduced.

– Self-centering probing is not permitted.

  The moments generated by frictional forces lead to inaccurate measurements.

– Disk styli may not be used since those cannot be qualified.

Storage in the changer rack

NOTE

A stylus system placed manually into the changer rack cannot be picked up automatically.

- Use the automatic run to store a stylus system in the changer rack.

Special features of the RDS/ViScan

The ViScan probe is described in the separate brochure »Optical measurement« providing complete information on the use of the probe.

Special features of the DTS

Notes on DTS

LED on the probe

The LEDs on the probe serve to acknowledge a probing. They light up as soon as the probing is successfully completed.

Unfavorable measuring conditions

– Light quantity too low

  The light quantity reflected on extremely dark, specular and strongly inclined surfaces is low.

  Consequence: No switch signal. Risk of collision!

  Example: Black photosensitive resist, concentrating reflectors.

– Multiple reflection

  On inclined shiny surfaces, the light can be reflected at several points.

  Consequence: Wrong receiver signal.

  Example: Thread.

– Light penetrates into the material.

  Certain materials do not disperse the light on the object surface but let the light partly penetrate into the material and disperse it under the surface.

  Consequence: Reduced precision.

  Examples: Teeth, opal plastic materials, ceramic material.

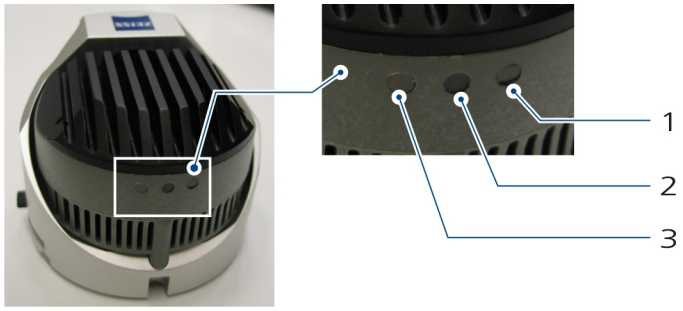
Remedy:

It is possible to remedy the above mentioned problems by coating the problematic surfaces with a diffusely reflecting bright material, e.g. a »Coating Spray Gray« by Wolf&Beck.

Risk of collision.
A collision may be caused if no switch signal is generated due to reflection.

Faults during the measuring run

Errors	Cause	Remedy
The power LED on the RDS adapter plate does not light up.	The contacts of the adapter plate are defective or soiled.	– Check and, if necessary, clean the contacts.
The system clock pulse LED on the RDS adapter plate does not flash.	CAN bus error	– Check and, if necessary, clean the contacts on the RDS adapter plate.
Error message: The adapter plate does not fit correctly in the adapter plate receptacle.	Stylus contacts are not closed.	– Remove the adapter plate and insert it again.
	Contacts on the adapter plate or on the adapter plate receptacle are soiled.	– Clean the contacts: with a dry or damp cloth. – Use a mild cleaning agent. – Dry the contacts to prevent oxidation. Make sure that the contacts are free from cleaning agent residues.
Error message during qualification: "No result"	The shaft of the reference standard has been probed unintentionally during the automatic qualification.	– Change the position of the reference standard so that the shaft will not be touched during qualification.
	Stylus or reference standard is loose.	– Fasten the stylus and reference standard firmly.
	Stylus tip or reference sphere is extremely soiled.	– Clean the stylus tip and reference sphere.
Measured value not accepted during probing.	Contacts are soiled. Contacts are on the adapter plate and its receptacle.	– Clean the contacts. Further information see above.



LED on the RDS-XXT adapter plate

1 LED for probe: The LED is permanently on if the probe has been installed in the adapter plate and if the adapter plate is fitted in the RDS adapter plate receptacle.

2 System clock pulse LED

3 Power LED: The LED is permanently on.

Technical data

Probes

ST probe

Probing directions	6; ± X, ± Y, ± Z
Probing force	
For data transfer	< 0.01 N
For stylus deflection	Vertical: up to 5 N Horizontal: up to 1.4 N
Diameter of adapter plate	44 mm
Stylus system weight, max.	200 g / incl. adapter plate
Stylus system length, max.	200 mm / stylus + extension

Environmental conditions:

Ambient temperature for operational readiness	+ 5 °C to + 40 °C
Admissible acoustic pressure	75 dBA with sinusoidal excitation 80 dBA noise

probeST3

Probing directions	6; ± X, ± Y, ± Z
Probing force	
For data transfer	< 0.01 N
For stylus deflection	Vertical: up to 5 N Horizontal: up to 1.4 N
Diameter of adapter plate	44 mm
Stylus system weight, max.	200 g / incl. adapter plate
Stylus system length, max.	200 mm / stylus + extension

Environmental conditions:

Ambient temperature for operational readiness	+ 5 °C to + 40 °C
Admissible acoustic pressure	75 dBA with sinusoidal excitation 80 dBA noise

DT DynaTouch and VAST XT probes

Dimensions	
Length	91 mm
Width	91 mm
Height	100 mm
Probing directions	6; ± X, ± Y, ± Z
Measuring force	0.05 to 1 N / continuous
Diameter of adapter plate	69 mm
Probe deflection	max. ± 2 mm
Stylus system weight, max.	500 g / incl. adapter plate
Stylus system length, max.	500 mm / stylus + extension
Max. torque of the adapter plate	0,3 Nm
Min. diameter of the stylus tip	0.3 mm (on some CMMs 0.5 mm)

Environmental conditions:

Ambient temperature for operational readiness	+ 5 ˚C to + 40 ˚C
Admissible acoustic pressure	100 dBA with sinusoidal excitation 100 dBA noise

VAST XTR gold probe

Dimensions	
Length	91 mm
Width	91 mm
Height	100 mm
Probing directions	6; ± X, ± Y, ± Z
Measuring force	0.05 to 1 N / continuous
Diameter of adapter plate	69 mm
Probe deflection	max. ± 2 mm
Stylus system weight, max.	500 g / incl. adapter plate
Stylus system length, max.	350 mm / stylus + extension
Max. torque of the adapter plate	0,15 Nm
Min. diameter of the stylus tip	0.3 mm (on some CMMs 0.5 mm)

Environmental conditions:

Ambient temperature for operational readiness	+ 5 ˚C to + 40 ˚C
Admissible acoustic pressure	100 dBA with sinusoidal excitation 100 dBA noise

VAST gold probe

Dimensions	
Length	91 mm
Width	91 mm
Height	200 mm
Probing directions	6; ± X, ± Y, ± Z
Measuring force	0.05 to 1 N / continuous
Diameter of adapter plate	69 mm
Probe deflection	max. ± 5 mm
Stylus system weight, max.	800 g / incl. adapter plate
Stylus system length,max.	800 mm / stylus + extension
Max. torque of the adapter plate	0,1 Nm
Min. diameter of the stylus tip	0,3 mm

Environmental conditions:

Ambient temperature for operational readiness	+ 5 ˚C to + 40 ˚C
Admissible acoustic pressure	100 dBA with sinusoidal excitation 100 dBA noise

HSS probe

Probing directions	6; ± X, ± Y, ± Z
Measuring force	0.05 to 1 N / continuous
Diameter of adapter plate	69 mm
Probe deflection	max. ± 2.6 mm
Stylus system weight, max.	600 g / incl. adapter plate
Stylus system length,max.	600 mm / stylus + extension
Max. torque of the adapter plate	0,2 Nm
Min. diameter of the stylus tip	0,3 mm

Environmental conditions:

Ambient temperature for operational readiness	+ 15 ˚C to + 30 ˚C

RDS probing system

RDS

Dimensions	
Diameter	64 mm
Height	140 mm (without adapter)
Adjustment range	
Rotary axis (A)	± 180 ˚
Tilting axis (B)	± 155 ˚ Valid for most of the bridge CMMs. A different angle range may apply in special cases.
Step width	2,5 ˚
Torque, max.	0,5 Nm

Environmental conditions:

Ambient temperature for operational readiness	+ 5 ˚C to + 40 ˚C

RST-P probe

Dimensions	
Diameter	24 mm
Length	56 mm
Weight	44 g
Extensions, max.	300 mm
Probing direction	Direction-independent
Min. diameter of the stylus tip	0,5 mm
Stylus system weight, max.	10 g
Stylus system length, max.	90 mm
Connection thread	M3

Environmental conditions:

Ambient temperature for operational readiness	+ 5 ˚C to + 40 ˚C
Admissible acoustic pressure	75 dBA with sinusoidal excitation 80 dBA noise

XDT probe

Probe extension, max.	100 mm
Probing direction	Direction-independent
Min. diameter of the stylus tip	0,3 mm
Stylus system weight, max.	15 g (TL3)
Stylus system length, max.	30 - 150 mm, depending on the version

VAST XXT probe

Probe extension, max.	100 mm
Probing direction	Direction-independent
Min. diameter of the stylus tip	0,3 mm
Stylus system weight, max.	10 g (TL1, TL2) 15 g (TL3)
Stylus system length, max.	30 - 250 mm, depending on the version

SP25 probe

Extensions, max.	100 mm
Probing direction	Direction-independent
Min. diameter of the stylus tip	0,5 mm
Stylus system length, max.	50 - 200 mm Depending on the scanning module.

Renishaw probes

Type		TP6	TP2-5	TP20	TP200
Dimensions					
Diameter	[mm]	25	13	13,2	13,5
Length	[mm]	41	38	38 [1]	30
Weight	[g]	56	22	22	22

Type		TP6	TP2-5	TP20	TP200
Extensions, max.	[mm]	200	300	300	300
Probing direction		±X, ±Y, ±Z			
Connecting thread for stylus		M3	M2	M2	M2
		[1] including module for probing force. There are several modules for different probing forces.			

Environmental conditions:

Ambient temperature for operational readiness	+ 5 °C to + 40 °C
Admissible acoustic pressure	75 dBA with sinusoidal excitation 80 dBA noise

Renishaw probe holders

Type	MIH	MH8	MIP
Adjustment range			
Rotary axis (A)	± 180°	± 180°	± 180°
Tilting axis (B)	± 105°	± 90°	± 105°
Step width	7,5°	15°	15°
Weight	580 g	205 g	200 g
Extensions, max.	300 mm	50 mm	300 mm

Type	PH10	PH1	PH6
Adjustment range			
Rotary axis (A)	± 180°	± 180°	-
Tilting axis (B)	± 105°	± 105	-
Step width			
Rotary axis (A)	7,5°	15°	-
Tilting axis (B)	7,5°	Variable	-
Weight	645 g	125 g	48 g
Extensions, max.	300 mm	-	-

Chapter 3

Stylus systems

This chapter contains:

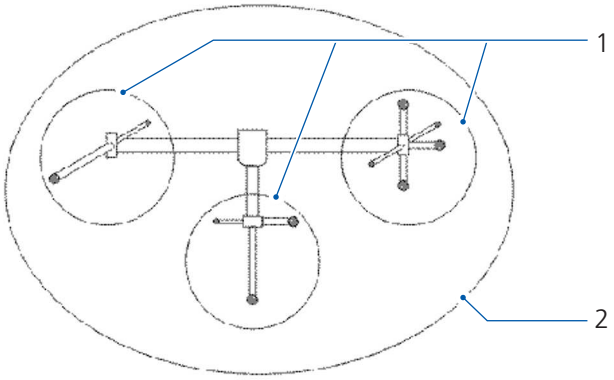
Information on the stylus system

Probing system components

A stylus consists of one or more styli and joining elements.

Stylus combination

A distinction is made between stylus system and stylus combination. The stylus system can consist of several stylus combinations. A stylus combination consists of several styli.



1 Stylus combinations
2 Stylus system

NOTE

It is basically possible to create a stylus system with several stylus combinations. However, certain assembly criteria must be observed to ensure exact measurement. ➤ *See [⇨ 3-9]*

Design and functions

Stylus

Shaft + stylus tip

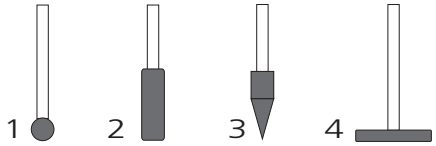
A stylus consists of a shaft and a stylus tip. Shafts differ with regard to size and material. Furthermore, stylus tips differ with regard to form. ➤ *See [⇨ 3-3]*

Connecting elements

The probe kits for the probing systems contain styli of different sizes and components used to create stylus systems, e.g. extensions.

Stylus tips

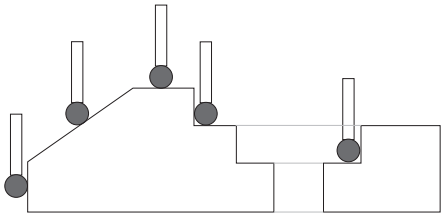
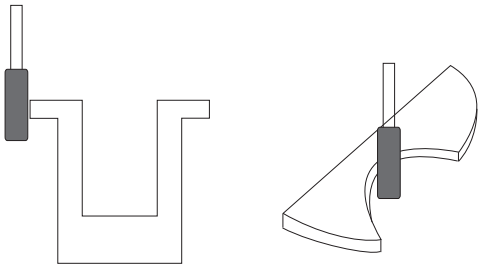
Stylus tips may have various forms. Examples of stylus tips: Sphere, cylinder.

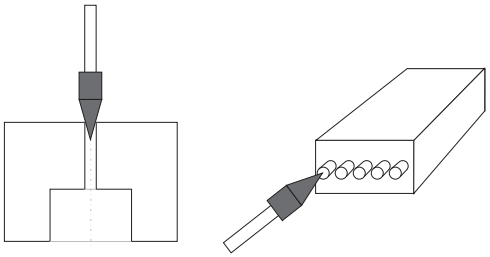
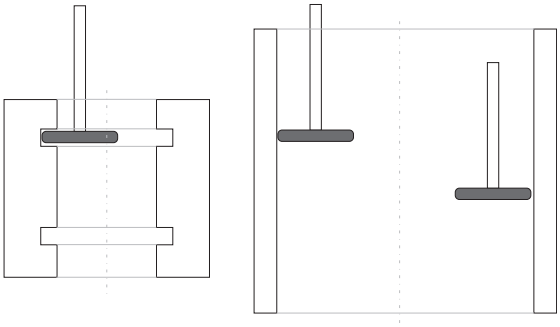


Types of stylus tips

1 Sphere
2 Cylinder
3 Cone
4 Disk

Application of the stylus tips

Stylus tip	Description
Sphere	The sphere is the standard stylus tip suitable for most measuring jobs. 
Cylinder	Cylinders are preferably used for probing thin sheet-metal parts and narrow workpiece edges. 

Stylus tip	Description
Cone	Cones are required for two applications: 1. Self-centering probing 2. High-precision probing of specified positions. 
Disk	A disk is used for probing deep grooves and large holes. For large holes, a disk offers the advantage of shorter travel paths as compared with the sphere. 

Principles for assembly

Principles for assembly

There are two ways to assemble a stylus system:

1. Screwing technique
2. The clamping technique.

Preference should be given to the screwing technique.

Stylus systems may be assembled individually. Probe kits with different components are available.

NOTE

The limit values for probing systems must be observed when assembling.

Screwing technique

The stylus system components have threads for screwing the components together. Depending on the probing system, different thread sizes are used: M2, M3 and M5.

Examples of the thread sizes used:

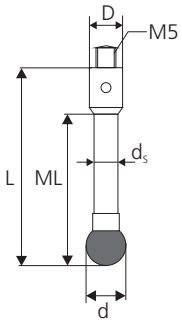
M5:	ST, ST 3, and VAST
M3	RST-P, VAST XXT
M2, M3:	Renishaw probes.

Technical data of stylus system components

The stylus system components differ with regard to material and geometry, e.g. length of the stylus and diameter of the stylus tip.

The following table shows the technical data of some available styli. This data reveals the influence of the material and the geometric sizes (e.g. length of the stylus) upon the weight of the stylus. A table with the technical data of other stylus system components is included with the stylus system kits.

Excerpt from technical data of styli:

	d	L	D	ML	d_s	Weight
	[mm]					[g]
	Hard metal					
	3	25	11	15	2	4
	3	33,5	11	23,5	2	4
	5	50	11	40	3,5	9
	8	63,5	11	50,5	6	25
	8	114,5	19	92,5	6	59
	9	64,5	19	42,5	6	38
	10	65,5	11	52,5	6	27
	Ceramic material[1]					
	5	53	11	43	3,5	5
	8	63,5	11	50,5	6	8
	8	114,5	19	101,5	6	38
	9	64,5	19	42,5	6	34
	10	65,5	11	52,5	6	9

[1] The stylus shaft is made of ceramic material.

	d	L	D	ML	d_S	Weight
	[mm]					[g]

Stylus system kits

There are different stylus system kits for probing systems, such as for small and for large workpieces.

Clamping technique

Laterally oriented styli are inserted in grooved discs and clamped by the vertically oriented end stylus. The end stylus is screwed into the stylus extension or directly into the adapter plate. In this way the laterally oriented styli are clamped.

The stylus system components for the clamping technique and assembly instructions are included in the stylus system kit.

ThermoFit

CFRP styli and CFRP extensions are used for special measuring jobs.

Advantages:

Advantages:

- No length modifications caused by varying temperatures
- Low weight.

Storage of stylus systems

Once the stylus has been assembled, it can be used as long as required. It does not need to be disassembled. Careful handling is necessary. This applies particularly to the adapter plate and stylus tips.

Stylus system protection

The stylus system must be protected against the following influences:

- Force of impact and other external mechanical influences.
- Dust and dirt.

A changer rack is recommended for storage if you measure every day with the CMM. When no measurements are carried out with the CMM over a longer period, the stylus systems should be stored in a place protected against environmental influences:

Storage options:

Separate packing materials	E.g. box made of cardboard, styrofoam, wood When using a metal box, wrap the stylus system in a cloth. This is necessary to protect the adapter plate and stylus tips against being scratched.
Drawer	Wrap the stylus system in a cloth or lay it on a soft support. This is necessary to protect the adapter plate and stylus tips against being scratched.
Special cabinet	The stylus systems are hooked into special fixtures. Such a cabinet is available from ZEISS.

Stylus cabinet

Stylus system assembly

Screwing technique or clamping technique?

Although the stylus system can be assembled by clamping its parts together, it is preferable to use the screwing technique.

Advantages of the screwing technique:

- Easy assembly
- Complex stylus systems possible
- Stable construction.

The following example describes how to assemble stylus systems using the screwing technique. Further information is given elsewhere. ➢ *See [⇨ 3-4]*

Safety instructions and measures of precaution

Safety instructions

⚠ WARNING

Risk of eye injury due to stylus tip fragments.
Stylus tips are generally made of ruby. Falling onto a hard surface, the stylus tips may splinter and cause injuries. The eyes are particularly vulnerable to injury from the fragments.

- Treat styli and other stylus system components carefully. Make sure not to drop them.

Measures of precaution

Stylus systems must not be assembled on the probe. The probe could thereby be damaged.

- Do not attach any styli to the stylus system as long as the stylus system is located in the adapter plate receptacle.

Assemble the stylus systems carefully. Do not exert any force when screwing the components together. Furthermore, you should wear gloves, thus avoiding an excess heating of the stylus. Due to this heating the measuring results can be falsified.

- Screw the components together manually. Assemble them fully.
- Use the pin included in the kit to tighten the components.

Observe the limit values regarding weight and length when assembling the stylus system. The limit values depend on the probing system. ➤ *See [⇨ 3-9]*

The weight of all components and the length of the stylus, extensions and joining elements must be considered when assembling a stylus system.

- Observe also the *weights indicated* for the individual styli, joining elements and the adapter plate when assembling a stylus system.
- Observe the *length specifications* for the styli, extensions and other joining elements when assembling a stylus system.

The joint of the RST-P on which styli are mounted must not be damaged under any circumstances.

- When mounting styli, use the supplied auxiliary tool to fasten the joint.

Criteria and limit values

Criteria

An unfavorable stylus system configuration may impair the measuring accuracy. Therefore, it is necessary to observe the following criteria for assembly.

– Only use styli with an M5 thread.

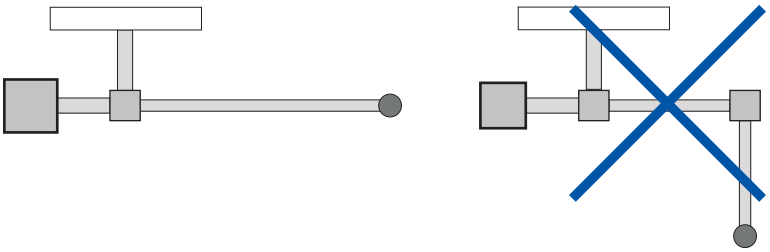
– Stable structure with as few components as possible.

– Symmetrical design with respect to weight; the center of gravity must be located in the physical center; use counterweights if necessary.

  Stylus extensions may be used as counterweights.

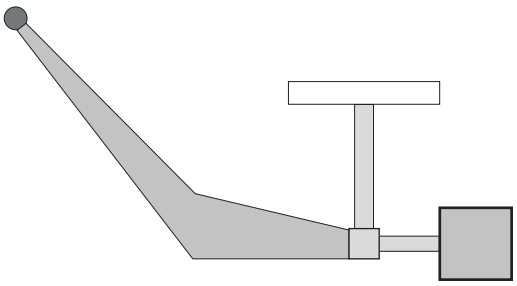
NOTICE! Check the balance by holding the adapter plate between two fingers and letting the stylus system swing back and forth until it comes to a stop. The stylus system must point downward in a vertical direction.

– Do not assemble probes with more than *one* branching.



– If possible, never use joints when assembling oblique stylus configurations.

  It is preferable to use components shaped according to your corresponding requirements. You can also make such components yourself, provided that you observe the permissible limit values for the stylus system.



– Use only components that are in perfect condition.

  Component requirements:

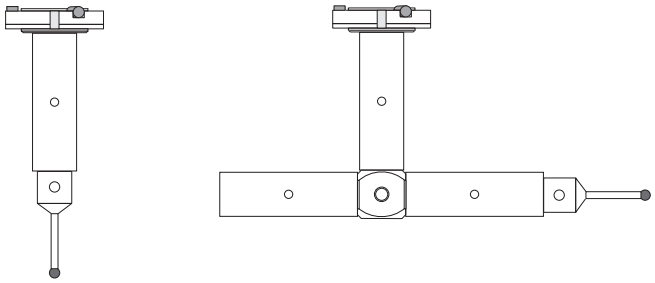
  – Not damaged
  – Clean
  – Grease-free

– Observe the limiting values for the stylus system: Length, weight and torque.

Instructions for ST and ST 3

Extensions

Short and long thin styli are not suitable. Preferable, extensions should be used. This applies for vertical as well as horizontally-oriented styli.



Advantages:

- Higher stability of the stylus system configuration,
- Reduced deflection force on the stylus tip,
- Improved probing precision.

Contact surfaces plan

If own stylus system components are used, then it must be noted that all contact surfaces are surface-ground. Only then a firm fit of the interfaced components is guaranteed.

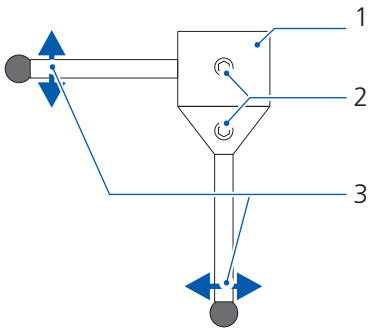
Unfavorable styli

Long styli, for which the stylus shaft is only kept in a small area, are not suitable. Especially the following styli should not be used:

With this stylus, the stylus shaft is only kept in a small area. Alternatively, also styli, whose shaft is kept in a longer area, are suitable.

One-sided clamped styli

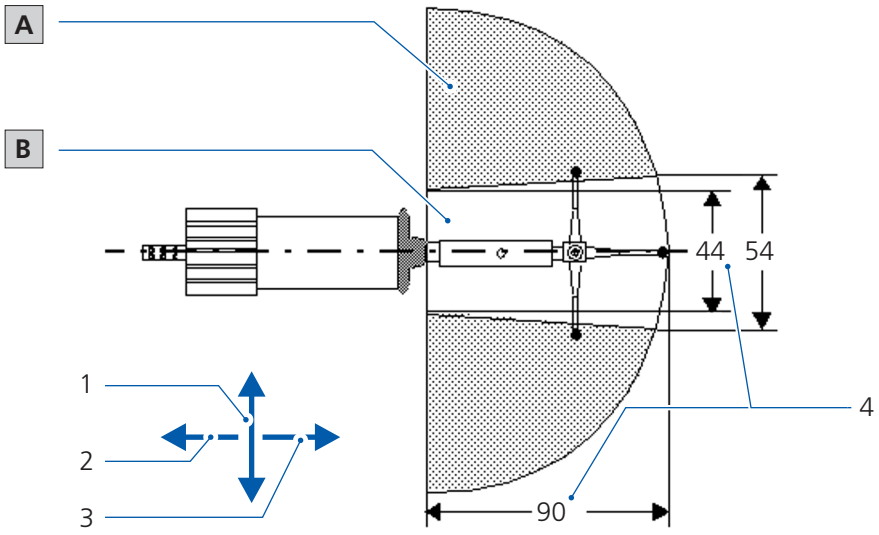
Basically, the clamping technique should be avoided when assembling the stylus system. One-sided clamped styli should not be used at all. Example:



1 Support for styli
2 Locking screws
3 Direction, in which the stylus is not fastened.

In this example, the stylus shaft is guided into a support and fastened there with a locking screw. The problem is here, that the stylus shaft is only fastened in one direction.
NOTICE! If this clamping technique cannot be avoided, then the styli must be glued in the support.

Admissible zone for styli on the RST-P



A Admissible zone for the stylus
B Limited central zone for reverse probings

1 Lateral
2 Reverse
3 Forward

4 Data in mm

Admissible zone **[A]**	When probing forwards and sidewards, all stylus systems are admissible, in which the styli are arranged within the drawn semicircular area.
Limited central zone **[B]**	If reverse probing is to be carried out, the styli arranged in the conical central zone must not be used for the probing. **NOTICE!** When assembling a stylus system, make sure that the styli are arranged within the admissible zone. **CAUTION! If a stylus is located outside the admissible zone, probing errors may be caused. Furthermore, the probe may become damaged, especially during reverse probings.**

Limit values

To ensure error-free measurement by the probing system, the maximum weight and length must not be exceeded. Furthermore, the maximum torque may not be exceeded.

Overview

The limit values depend on the probing system used. The limit values of the available probing systems are listed below:

NOTE

The limit values for the maximum weight refer to stylus system and adapter plate. For some probes, there is no adapter plate, for example for the RST-P.

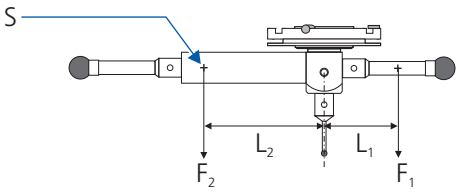
Probing system	Length	Weight	Torque
ST	200	200	–
ST 3	200	200	–
ST-ATAC	200	200	–
XDT-TL3 and RDS with XDT -TL3	150	15	–
VAST XXT-TLx and RDS with VAST XXT-TLx			
-TL1	125	10	–
-TL2	250	10	–
-TL3	150	15	–
DT DynaTouch	500	500	0,3
VAST XT and VAST XT gold	500	500	0,3

Probing system	Length	Weight	Torque
VAST XTR gold	350	500	0,15
VAST and VAST gold	800	800	0,1
HSS	600	600	0,2
RDS with RST or RST-P	90	10	–
RDS with XDT	See XDT		
RDS with VAST XXT	See VAST XXT		
RDS with TP6	See Renishaw operating instructions.		
RDS with TP2	See Renishaw operating instructions.		
RDS with TP20	See Renishaw operating instructions.		
RDS with TP200	See Renishaw operating instructions.		
RDS with SP25 or SP25M	See Renishaw operating instructions.		
RDS with SP600	200	20	–
RDS with ViScan	–	–	–
RDS with LineScan	–	–	–
RDS with DTS	–	–	–

Calculation of the torque

The K_M torque can be calculated as follows:

$K_M = |F_2 \times L_2 - F_1 \times L_1|$



S : Center of gravity of a probe

F : Force in the center of gravity

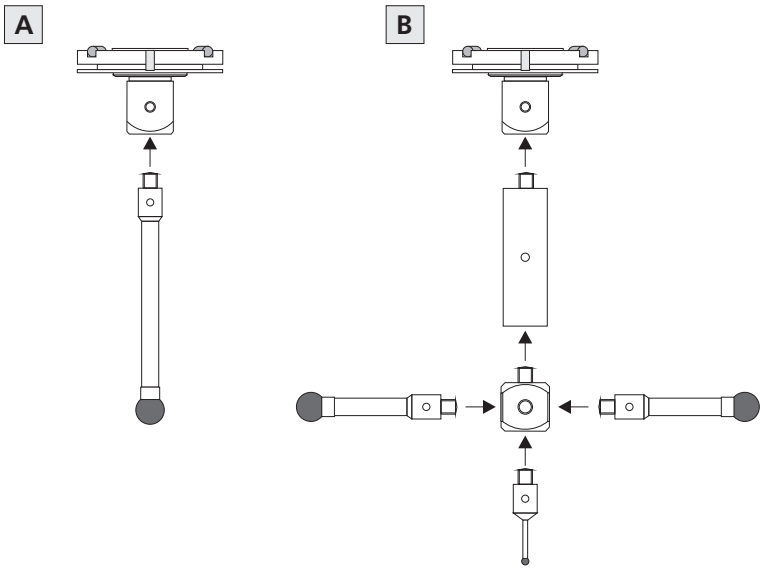
L : Distance between the center of gravity and the bisecting line

Example

Connecting parts are normally needed to assemble the required stylus systems. It is also possible to screw the stylus directly into the adapter plate.

Screwing technique

Assembly example, applying the screwing technique with the VAST adapter plate:



A Stylus in the adapter plate

B Extension in adapter plate

Aligning the stylus system

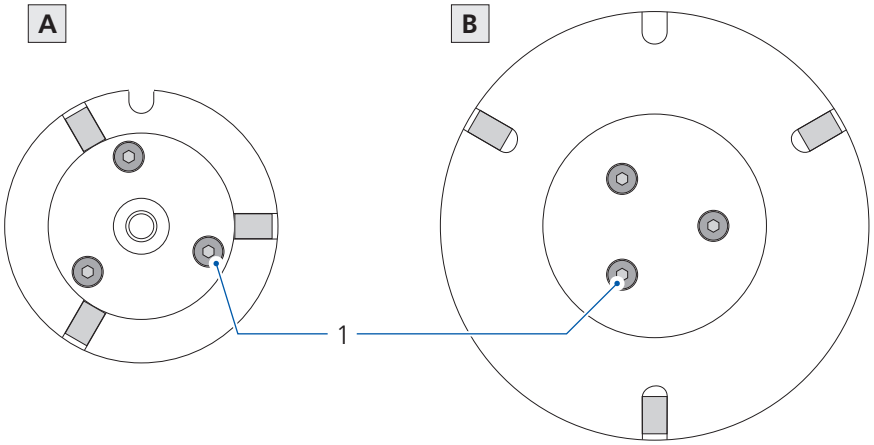
It is still possible to align the stylus system after it has been assembled. This may be necessary if some points on the workpiece cannot be probed.

Stylus systems for the RDS articulating probe holder must not be aligned.

NOTE

During the alignment, make sure that shaft probing is prevented during probing.

1 Loosen the three screws in the adapter plate so that the stylus system can be turned. **NOTICE! Do not completely unscrew the screws.**



Adapter plate

A ST 3 adapter plate. The ST adapter plate has spheres instead of cylinders.
B VAST adapter plate for all VAST probes and HSS extensions
1 Screws

2 Insert the stylus system in the adapter plate receptacle.

3 Rotate the stylus system to the required position.

4 Hold the stylus system and take it out of the adapter plate receptacle.

5 Tighten the screws until you feel resistance.

Torque for tightening the screws:

ST 3 and ST adapter plates:	1 Nm
VAST adapter plate:	2 Nm

Inserting / removing the stylus system

Measures of precaution

The stylus system is held in place by an electromagnet or solenoid. If the measuring software calls for an insertion or change of the stylus system, the magnetic force is reduced. After insertion of the stylus system, the full magnetic force becomes effective after a short delay.

The measuring software is required for inserting and changing a stylus system. See operating instructions for the measuring software.

Damage to the probe.
Stylus systems must not be assembled on the probe. The probe could thereby be damaged.

- Install only complete stylus systems, equipped with all necessary styli.
- Do not attach any styli to the stylus system as long as the stylus system is located in the adapter plate receptacle.

The adapter plate of a VAST or HSS probing system automatically falls off the adapter plate receptacle after a given period of time following the initiation of the stylus system change.

- Hold onto the stylus system immediately after activating the change in order to avoid damaging the stylus system, the workpiece, or the measuring table.

  The period of time after which the stylus system falls off is set in the measuring software.

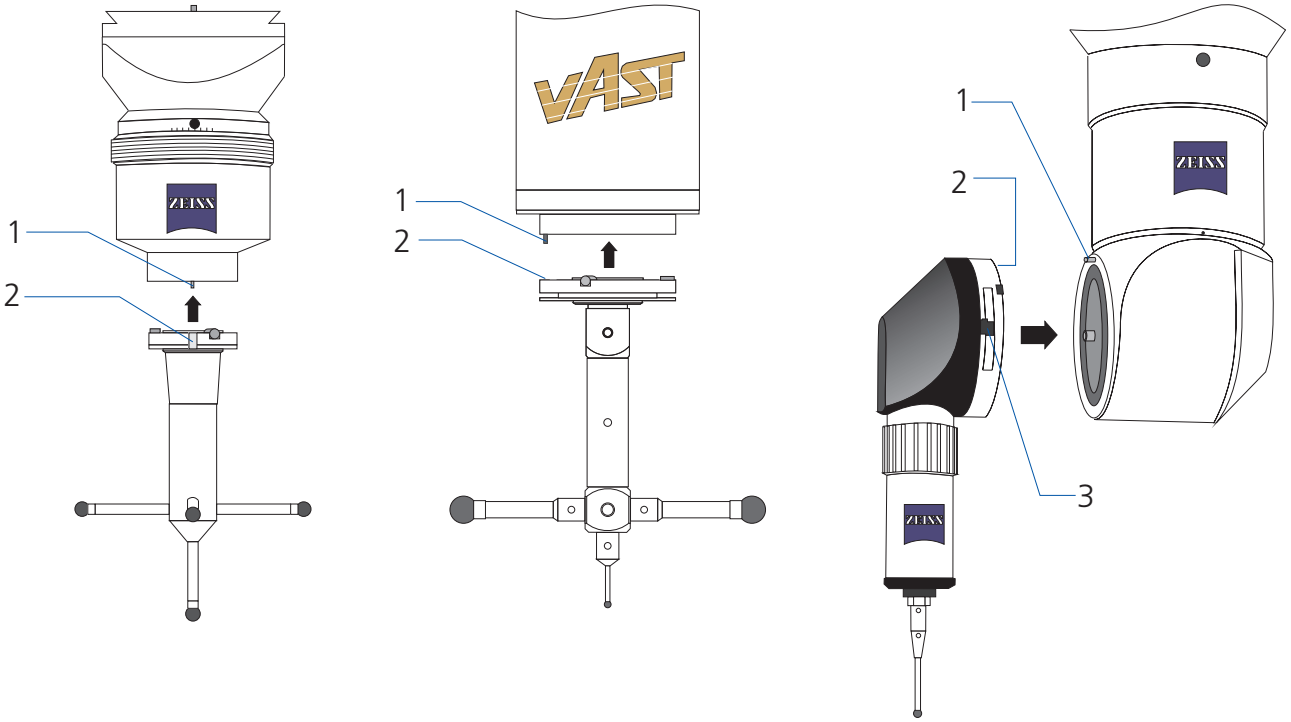
Installing the stylus system

The procedure for installing a stylus system is basically the same as for the individual probing systems. This procedure must be initiated by the measuring software. See operating instructions for the measuring software.

1 Initiate the procedure via the measuring software.
Then insert the stylus system within 20 seconds. If the stylus system is not inserted within this time, you will have to repeat the procedure.

2 Insert the stylus system in the adapter plate receptacle.

The pin must engage in the notch. See sketch. The stylus system is attracted by the magnet. As soon as stylus system installation is complete, this is indicated by an audible click.



1 Pin in the adapter plate receptacle of the probe

2 Groove in the adapter plate

3 Push-button for releasing the safety catch. Press the push-button only when removing the RDS adapter plate.

Pin position:

ST and ST 3	Pin at the front.
VAST gold	Pin on the left side.
RDS with RST-P	Pin in any position. The position depends on the setting of the tilting axis. The angle of the tilting axis is set in the measuring software.

NOTE

With ST and ST 3 probing systems, counterbalancing is required after insertion of the the stylus system. ➤ *See [⇨ 2-7]* and ➤ *see [⇨ 2-12]*

Removing the stylus system (manually)

The procedure for removing a stylus system is basically the same as for the individual probing systems. However, several special points must be observed. This procedure must be initiated by the measuring software. See operating instructions for the measuring software.

1 Initiate the procedure via the measuring software.
For the VAST and HSS probing systems, the delay required before the stylus system is released from the adapter plate receptacle must be specified in the measuring software.
Set the delay so that enough time always remains to grasp the stylus system after initiating the stylus system removal. This is essential to prevent damage to the stylus system, workpiece, or the measuring table.

2 Remove the stylus system.

Special aspects to be considered for probing systems:

ST and ST 3	The stylus system must be deflected manually. Then the adapter plate is released from the adapter plate receptacle.
DT DynaTouch, VAST XT, VAST gold	Hold the stylus system. It drops down automatically.
VAST XTR gold	Two push-buttons on the adapter plate need to be pressed at the same time and kept pressed.
RDS with RST-P	The stylus system must be deflected manually. This releases the magnet in the RDS adapter plate receptacle.
RDS with Renishaw TP probes	The stylus system must be deflected manually. This releases the magnet in the RDS adapter plate receptacle.
RDS with XDT and VAST XXT	– The stylus system is held magnetically and can be removed manually. – Hold the stylus system below the adapter plate and tilt it to the side.
RDS with SP25 or SP25M	– The stylus system is held magnetically and can be removed manually. – The scanning module is held magnetically and can be removed manually.
RDS with SP600	The stylus system is held magnetically and can be removed manually.

NOTE

The RDS adapter plate is locked. To remove it, press the push-button on the adapter plate.

Start-up checklist

Stylus system assembly

– Have the criteria for the assembly been observed? ➤ *See [⇨ 3-9]*.

– Have the limit values for the stylus system been observed? ➤ *See [⇨ 3-13]*.

Installing the stylus system

– Has stylus system counterbalancing been performed? - Required only for ST and ST 3.

Chapter 4

Changer rack

This chapter contains:

Information for the changer rack

NOTE

The changer rack must be mounted and installed such that there is a distance of at least 25 mm between the changer rack and the column of the bridge.

NOTE

Exact changer rack alignment is necessary to enable trouble-free stylus system change. The deviation must not exceed 0.1 mm over the total length of the profile rail.

When fastening the holders, it is important to make sure that the holders are pressed downwards against the profile rail.

NOTE

The stylus system holders must have been qualified to enable automatic stylus system change. For more information, please refer to the operating instructions for the measuring software.

Qualification of the VAST XTR gold stylus system holder is described in this document. ➢ *See [⇨ 2-67]*

MSR changer rack

Changer rack MSR

The changer rack is preassembled. The standard version of the changer rack has two levels; a third level is optional. The height of the changer rack depends on the CMM.

Different stylus system holders can be mounted to the profile rails, for example VAST and RDS holders.

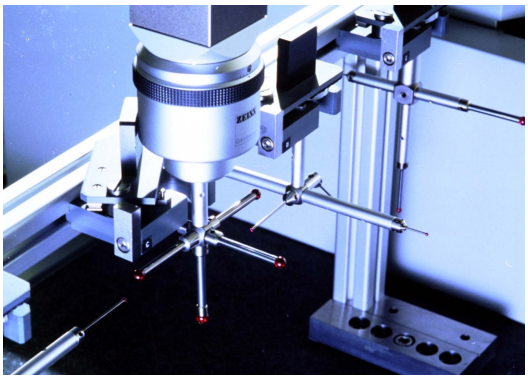
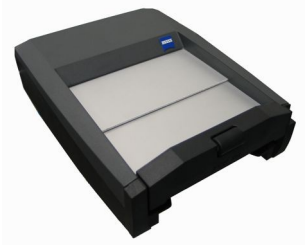
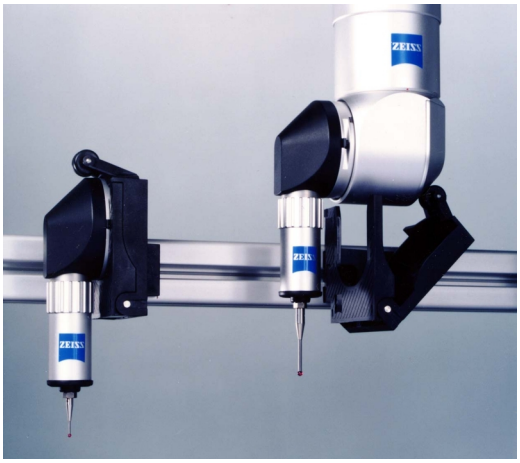
For more information, please refer to the operating instructions for the CMM.

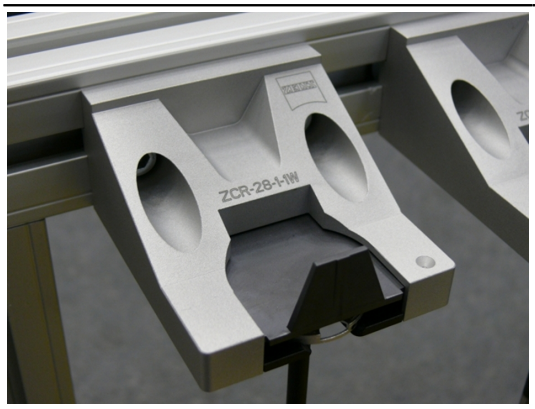
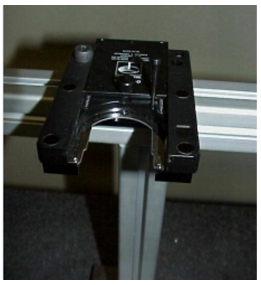
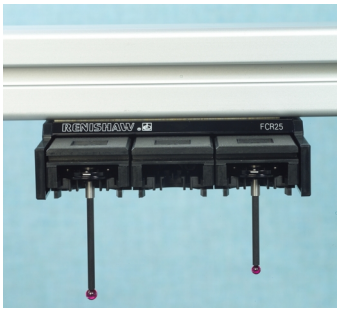
MSR mini

A space-saving changer rack is available for a CMM with small measuring range.

Holders

The illustrations below show holders for various probing systems. The following holders can be mounted to a changer rack.

Probing system	Holder	Comment
ST and ST 3		
VAST, VAST XT, DT DynaTouch, HSS	 *VAST holder*	**NOTICE!** The VAST holder must not be used for the VAST XTR gold.
VAST XTR gold	 *ZCR 70 holder*	
RDS		

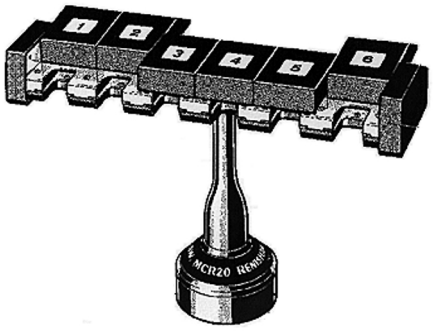
Probing system	Holder	Comment
XDT, VAST XXT		This is a changer unit with three holders. The changer unit is mounted to the profile rail of a changer rack.
	 *ZCR-28-1-1W holder*	The single holder is mounted to the profile rail of a changer rack.
SP600	 	The holder is mounted to the profile rail of a changer rack.
FCR25 changer rack for SP25M		The FCR25 changer rack is used for storing SM25 scanning modules and SH25 adapter plates. An adapter is needed for the adapter plates. The FCR25 changer unit is mounted to the profile rail of a changer rack.

See also

- ➢ *Use of other adapter plates [⇨ 2-71]*

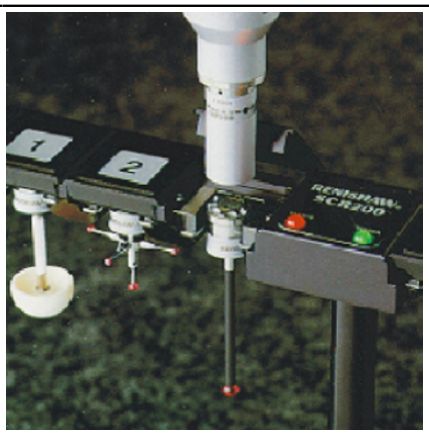
Renishaw changer rack

MCR20 changer rack



The MCR20 changer rack is used for storing TP20 probe modules.

SCR200 changer rack



The SCR200 changer rack is used for storing TP200 probe modules.

Chapter 5

ROTOS

This chapter contains:

Safety

Intended use

The ROTOS sensor is used exclusively on ZEISS coordinate machines. The sensor allows measuring the roughness of workpiece surfaces. Roughness measurement is performed by a roughness probe carrying a stylus provided with a diamond tip.

A VAST gold or VAST XT gold probe is required to use the Rotos sensor. Moreover, the sensor needs to be authorized for the CMM in question. See operating instructions for the CMM.

Range of application of the ROTOS sensor:

- Combined measurement of form, location, and surface on mechanical parts.

  Examples: gear boxes, motors, or other parts with corresponding geometries and sufficiently hard surfaces.
- Process control
- Quality assessment

Reasonably foreseeable misuse

NOTE

The ROTOS sensor must only be used for its intended purpose. The user is liable for any damage caused by reasonably foreseeable misuse.

The ROTOS sensor must not be used for purposes contrary to the intended use.

Examples of reasonably foreseeable misuse:

- Measurement of soft, viscous, or gluey surfaces
- Measurement under water
- Measurement without mechanical connection to the CMM
- Measurement on sharp flanks such as cutting faces, for example
- Measurement along edges, gaps, and recesses

  The stylus tip may get damaged.

Standards and directives

The ROTOS sensor has been designed, manufactured, and tested according to the following standards and regulations:

EC directives

– R&TTE directive 1999/5/EC

Standards

– EN 61010-1

– EN 61326, Table 2, Class A

– EN 300 328

FCC standard

The ROTOS sensor complies with the FCC (Federal Communications Commission) standard.

Original text: »Information on exposure to radio frequency radiation in accordance with FCC - The emitted output power of the component is far below the FCC limit values for radio frequency exposure. Nevertheless, the component should be used in such a way that potential contact with persons during normal operation is kept to a minimum. NOTE Part 15 of FCC regulations - This component complies with Part 15C of FCC regulations – Operation of the component is subject to the following two conditions:

– the component must not cause any harmful interference and

– the component must accept any interference received, including interference that may cause undesired operation. NOTE Modification or conversion

Any modification or conversion not explicitly approved by Carl Zeiss will invalidate the FCC license for the operation of this component.«

Radio transmitter modules

The ROTOS sensor contains the following radio transmitter modules:

– FCC ID: X3ZBTMOD3

– IC: 8828A-MOD3

Product safety

Measures of precaution

- Protect the ROTOS sensor from mechanical impact.
- Protect the ROTOS sensor from heat and humidity.
- Keep the ROTOS clean and dry.
- Do not open any components of the ROTOS sensor.
- Follow the instructions regarding the battery.

Information on the battery

The ROTOS sensor head contains a nickel-metal hydride battery.

NOTE

The battery must only be replaced by a ZEISS service engineer.

Only open the sensor head if you want to dispose of the ROTOS sensor. Opening the sensor head will invalidate the warranty for the ROTOS sensor.

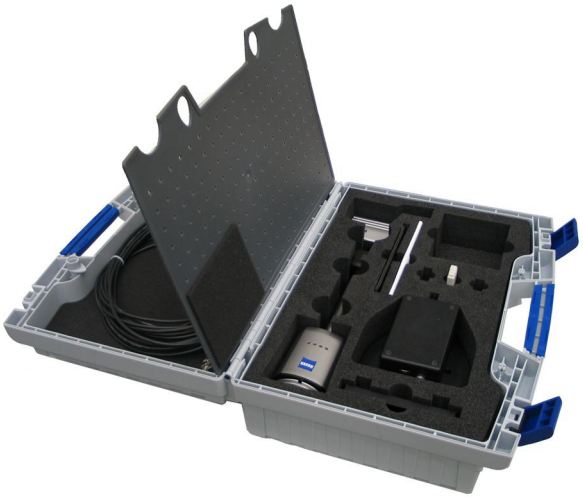
Description

Standard equipment

The standard equipment of the ROTOS sensor includes the following components:

- Bluetooth USB stick
- Roughness standard
- Stylus with »2µm 90°« stylus tip; yellow mark
- Charging device with adapter plate
- Connecting cable for charging device (12 m)

The components are supplied in a special case.



Option

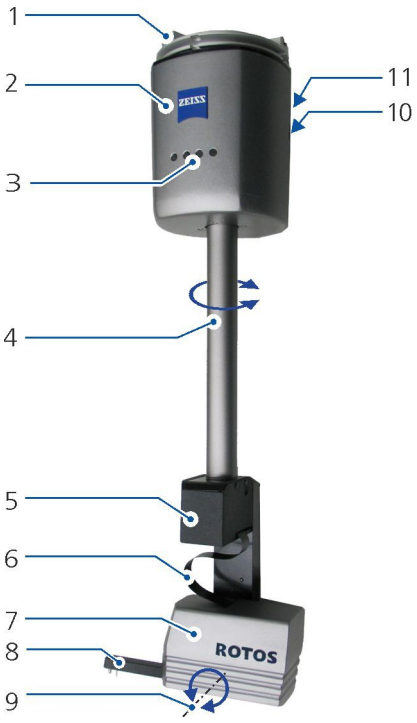
- Stylus with »2µm 60°« stylus tip; red mark
- Stylus with »2µm 90°« stylus tip; green mark
- Special versions

System requirements

Software	CALYPSO 2015
CMM	Authorized CMMs according to the current price list
Probe	VAST gold and VAST XT gold

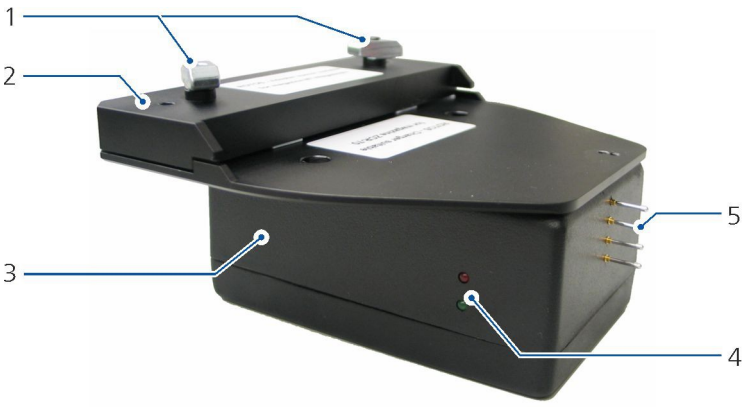
Changer rack	Distance between holder and measuring table: min. 350 mm

Components



ROTOS sensor

1 Adapter plate
2 Sensor head
3 Status LEDs
4 Probe extension
5 Probe swivel unit
6 Ribbon cable
7 Roughness probe
8 Stylus protection with workpiece contact pin
9 Swivel axis
10 «ON-OFF» switch
11 Battery contacts for battery charging



Charging device

1 Slot nut for fixing the charging device to the profile rail of the changer rack
2 Adapter plate for use of a VAST changer rack
3 Charging device
4 LEDs (red and green)
5 Spring contact pins

NOTE

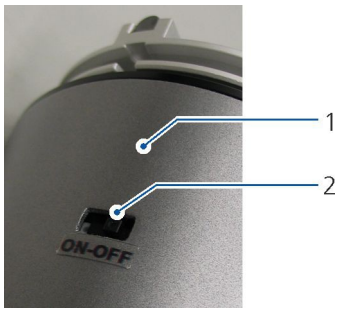
The adapter plate will not be needed if the ZCR 70 holder is used.

Operator's controls on the sensor head

«ON-OFF» switch

The «ON-OFF» switch is located on the rear side of the sensor head. Normally, the ROTOS sensor is on («ON» position). The following situations require the switch to be set to «OFF»:

– «OFF» if the CMM is off.
– «OFF» if the ROTOS sensor is stored in the holder, the CMM control unit is switched off, but the computer remains on. The computer provides the Bluetooth connection to the ROTOS sensor.
– «OFF» if, contrary to the recommendation, the ROTOS sensor remains unused in the probe for a longer period of time and the computer is not switched off.
– «OFF» during transport of the ROTOS sensor.
– «OFF» if the ROTOS sensor is stored for a prolonged period of time.



1 Sensor head

2 Switch for switching the ROTOS sensors on and off.

NOTE

The ROTOS sensor has to be stored in its holder after each measurement to allow the battery to be recharged.

Automatic switching off of the ROTOS sensors

If the Bluetooth connection is interrupted for more than 30 minutes, the ROTOS sensor will switch off automatically. This is to prevent the battery from being discharged. The blue LED goes off if the Bluetooth connection is interrupted.

The ROTOS sensor can be switched on again in two ways:

– Placing the ROTOS sensors into its holder on the changer rack

– Switch on the sensor head: turn the switch off and then on again.

LEDs on the sensor head

Status LEDs

1 Yellow: roughness measurement

2 Green: two functions. 1) LED is on: the ROTOS sensor is on. 2) LED is flashing: battery is being charged. *Note*: A flashing LED does not mean that the ROTOS sensor has been switched on.

3 Blue: Bluetooth connection to the PC

4 White: firmware update installation

NOTE

All LEDs flashing means that a Bluetooth connection to the computer has just been established or that the »Identify sensor« function has been used.

Charging device

The sensor head contains a rechargeable NiMH battery. The battery charging device is located below the holder.

NOTE

Before mounting the charging device, check the following:

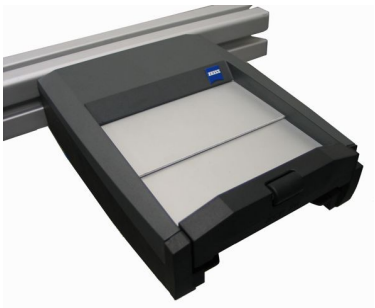
- Is the profile rail high enough for the ROTOS sensor?
- Which probe holder is used?

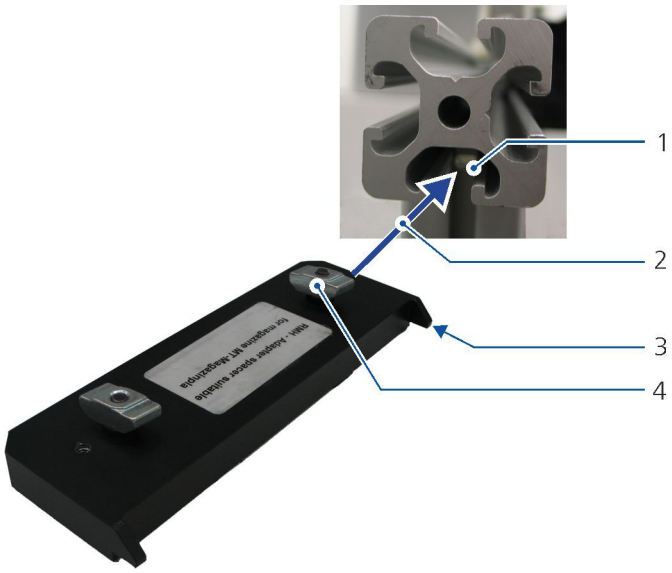
  With a VAST holder, you need an adapter plate for mounting the charging device.

Mounting the charging device to the changer rack

First attach the holder provided for the ROTOS sensor to the changer rack. Then mount the charging device. The mounting procedure depends on the type of holder used.

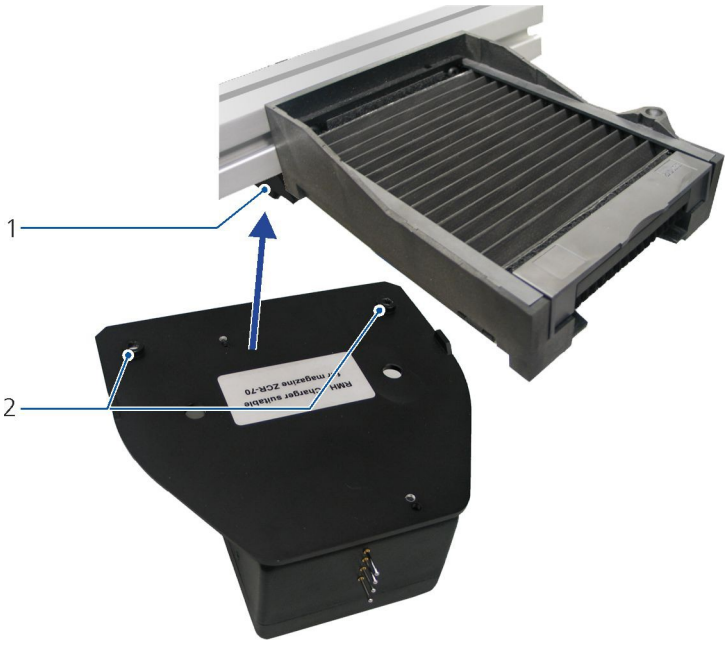
Holder	Procedure
 *VAST*	1. Mount the VAST holder. 2. Slide the adapter plate onto the profile rail with the help of the slot nuts and clamp it to the profile rail underneath the holder. See first picture below. 3. Screw the charging device from below to the adapter plate. See second picture below.

Holder	Procedure
 *ZCR 70*	1. Mount the ZCR 70 holder. 2. Slide the charging device onto the profile rail with the help of the slot nuts and clamp it to the profile rail underneath the holder. See third picture below.



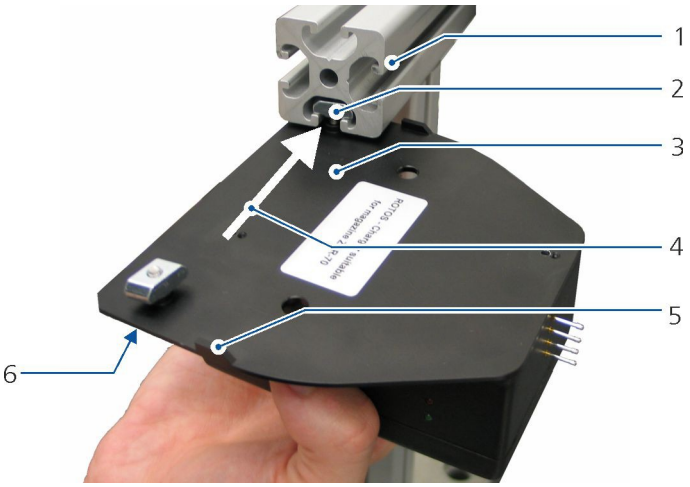
Mounting the adapter plate for a VAST holder

1 Slot in the profile rail
2 Sliding direction for slot nuts
3 Slot nut for mounting the adapter plate to the profile rail
4 Edge pointing to the holder



Mounting the charging device for a VAST holder

1 Mounted adapter plate
2 Through holes for screwing the charging device to the adapter plate

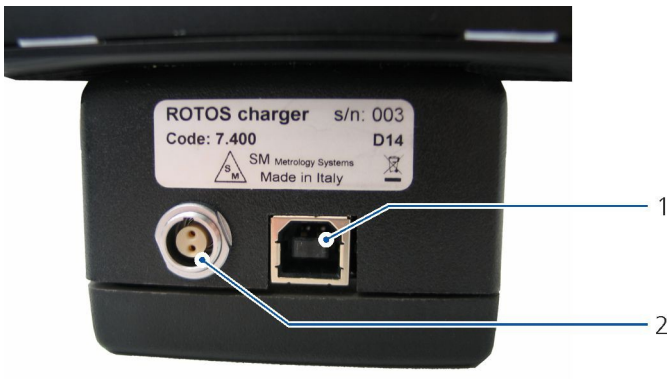


Mounting the charging device for a ZCR 70 holder

1 Horizontal profile rail of the changer rack
2 Slot nut
3 Charging device without adapter plate; for ZCR 70 holder
4 Direction of movement for mounting the charging device
5 Edge for alignment with the holder. **NOTE!** The edge must rest against the holder.
6 Screw for clamping the slot nuts; one screw per slot nut

Connections on the charging device

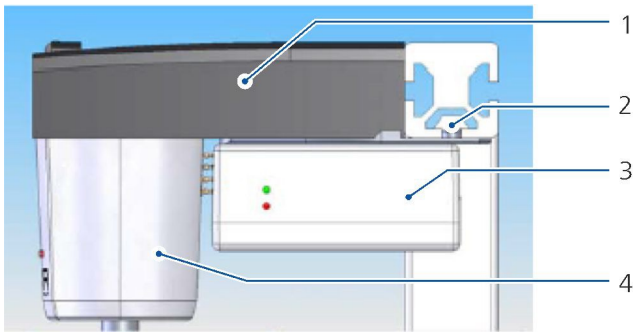
Two connections are provided on the rear side of the charging device. For its operation, you only need the power supply connection. The second connection is for service purposes only.



1 Connection for service purposes
2 Power supply

LEDs on the charging device

The charging device has two LEDs.



Charging device on the changer rack

1 Charging device (here: ZCR 70)
2 Slot nut for fixing the charging device to the profile rail of the changer rack
3 Charging device
4 Sensor head

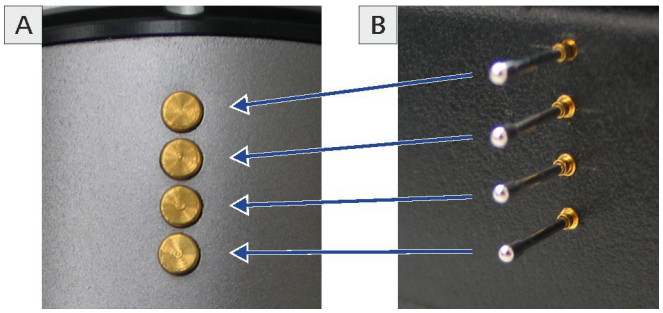
LEDs on the charging device:

LED color	Meaning
Red	Voltage is applied.
Green, slowly flashing:	The battery is being charged.

LED color	Meaning
Green, constantly flashing:	The battery has been fully charged.
Green, flashing fast:	An error has occurred.

Charging the battery

For charging the battery, the sensor needs to be stored in the holder. The sensor is placed in the holder such that the spring contact pins of the charging device press against the four battery contacts of the sensor head. Check if necessary.



A Battery contacts on the sensor head

B Spring contact pins on the charging device

Impairment to the charging process due to soiled or damaged spring contact pins.

Grease on the spring contact pins and deformed pins impair the charging process.

- Do not touch the spring contact pins with your fingers.
- Prevent the spring contact pins from damage.
  The pins must not be deformed.

NOTE

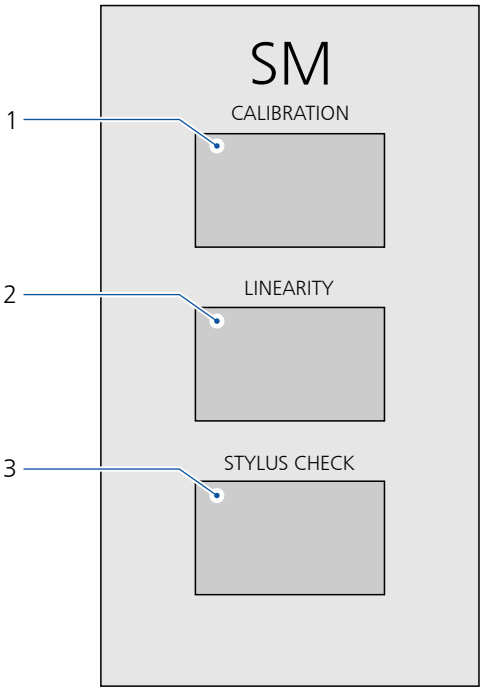
The ROTOS sensor must be stored in the holder when switched on. Additionally, the ROTOS must remain switched on for the charging process.

- Set the »ON-OFF« switch to «ON».

Roughness standard

The roughness standard is used to perform the alignment and to test the accuracy of the measuring system.

A metal plate with three areas of different roughnesses serves as the roughness standard. For the alignment of the measuring system, all three areas have to be probed one after the other from the left to the right. ➤ *See [⇨ 5-19]*



1 Area for the alignment
2 Area for the accuracy test
3 Area for the stylus tip check

NOTE

All three measures are performed using the measuring software. See operating instructions for the measuring software.

Technical data

Dimensions:

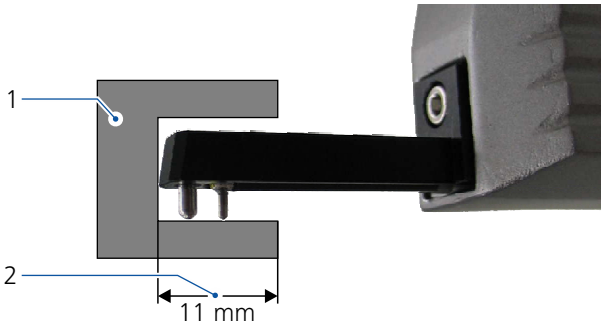
Dimensions		
		
Height	335 mm	Swivel axis in horizontal position.
Width, max.	107 mm	
Width, min.	75 mm	By rotating the swivel axis
Length of cable	12 m	

Rotational axis/swivel axis:

Rotational axis		
Area	380°	
Speed	160°/s	
Accuracy	± 0,25°	
Swivel axis		
Area	160°	
Speed	40°/s	
Accuracy	± 0,167°	

Limit values for measuring operation:

Bore diameter for stylus, min.	15 mm	
Bore diameter for roughness probe, min.	75 mm	
Bore depth for stylus, max.	30 mm	
Bore depth for roughness probe, max.	350 mm	Only in vertical direction.
Length of test object, min.	11 mm	With standard stylus protection.



Length of test object in bores

1 Workpiece
2 Minimum test object length

Stylus deflection (in Z), max.	1 mm

Stylus:

Measuring system	Skidless (according to EN ISO 3274 Appendix A)
Stylus tip radius	2 µm (option: 5 µm)
Angle of the stylus tip cone	90° (option: 60°)
Measuring force	approx. 2 mN

System requirements:

Software	CALYPSO 2015
CMM	Authorized CMMs according to the current price list
Probe	VAST gold and VAST XT gold
CMM damping	Air damping
Changer rack	Distance between holder and measuring table: min. 350 mm

Roughness parameters:

Primary parameters	Pa, Pq, Pt, Pz, Pp, Pv, Psk, Pku, Pdeltaq, Pc, PSm, Pdeltac, PPc
Waviness parameters	Wa, Wq, Wt, Wz, Wp, Wv, Wsk, Wku, Wdeltaq, Wc, WSm, Wdeltac, WPc
Roughness parameters	Ra, Rq, Rt, Rz, Rp, Rv, Rsk, Rku, Rdeltaq, Rc, RSm, Rdeltac, RPc, Ry5, Rmax
Material proportion parameters	Rk, Rpk, Rvk, Mr1, Mr2, A1, A2

Accuracy:

Static noise (Ra)	< 10 nm

Dynamic noise (Ra)	< 50 nm
Measurable roughness on the CMM (Ra)	> 0.5 µm
Straightness (Wt)	< 0.5 µm

Measuring system:

Travel range, max.	15 mm
Resolution (digital)	0.1 nm
Resolution used	500 nm
Measuring speed	0.05 - 0.5 mm/s

Profile amplitude in the Z axis:

Measuring range	1000 µm
Resolution	0.05 nm
Resolution used	10 nm

Filtering:

Selectable section lengths λ_C	80 µm, 250 µm, 800 µm, 2500 µm
Available filters	Gauss

Bluetooth:

Version	3.0	IEEE 802.15.1
Output power, max.	+10 dBm	
Power Class	Class 1	
R&TTE Class	Class 1	
RF frequency	2400 - 2483,5 MHz	
Number of channels	79	

Battery:

Type	NiMH	Rechargeable battery.
Voltage	9,6 V	
Voltage range	8 - 12 V	
Rated capacity	800 mAh, minimum 780 mAh	
Max. charging current	250 mA	Temperature and voltage are monitored.
Automatic disconnection time	30 minutes	If no Bluetooth connection exists.

Reactivation		By placing the sensor into its holder.
Charging cycles	More than 500	IEC standard
Service life	24 months	

Charging device:

Supply voltage	24 V

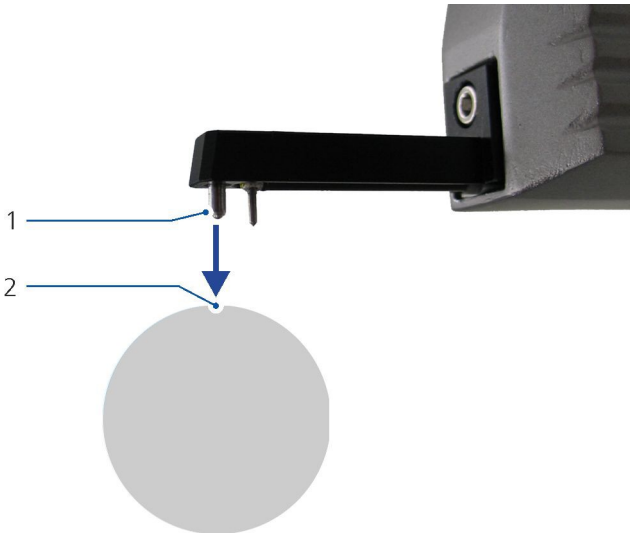
Operation

Qualification

The ROTOS sensor must be qualified against the reference sphere like a normal stylus. See operating instructions for the measuring software.

– Probe the reference sphere pole with the workpiece contact pin.

  Then the qualification process continues automatically.



Probing the reference sphere

1 Workpiece contact pin
2 Pole of the reference sphere

Alignment, accuracy test, and check of stylus tip

It is necessary to perform an alignment between the measuring system and the roughness standard and to test the measuring system's accuracy. Furthermore, you should also check the stylus tip.

The roughness standard supplied with the sensor is used for these three processes. All three measures are performed using the measuring software. See operating instructions for the measuring software.

Measure	Description
Alignment	Alignment of the measuring system relative to a roughness standard by repeatedly measuring a surface of know roughness. The alignment has to be performed in the following cases: – Prior to its first use. – In the environmental conditions change, e.g. change in temperature.
Accuracy test	Testing the measuring system's accuracy be measuring a surface of known roughness. The result should be within the specified tolerance. It is recommended to perform the accuracy test after the alignment.
Check of stylus tip	Determining the degree of wear of the stylus tip. The check should be performed in the following cases. – Prior to its first use. The measuring results should be stored as reference values for subsequent measurements. Only then will it be possible to clearly assess the wear of the stylus tip. – Comparative measurements at regular intervals, e.g. every month. The check intervals depend on the number of measurements performed.

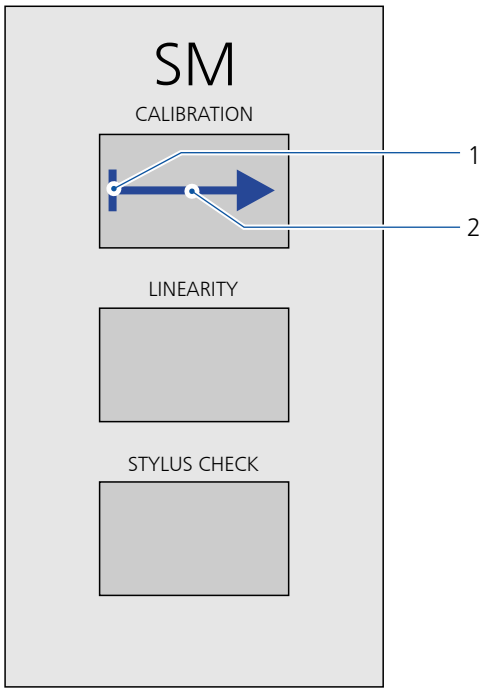
NOTE

The roughness standard must not move while performing the individual measures.

- Fix the roughness standard on the measuring table.

Performing the alignment

For the alignment, probe the upper part of the roughness standard with the stylus tip perpendicular to the fluting. In this area, the surface has a uniform structure with defined roughness.



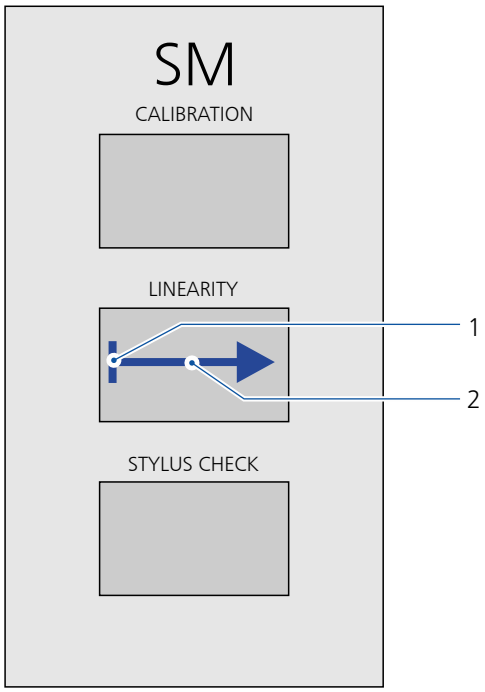
Performing the alignment

1 Start point

2 Direction of stylus tip movement

Performing the accuracy test

For the accuracy test, probe the middle part of the roughness standard with the stylus tip perpendicular to the fluting. In this area, the surface has an irregular structure with defined roughness.



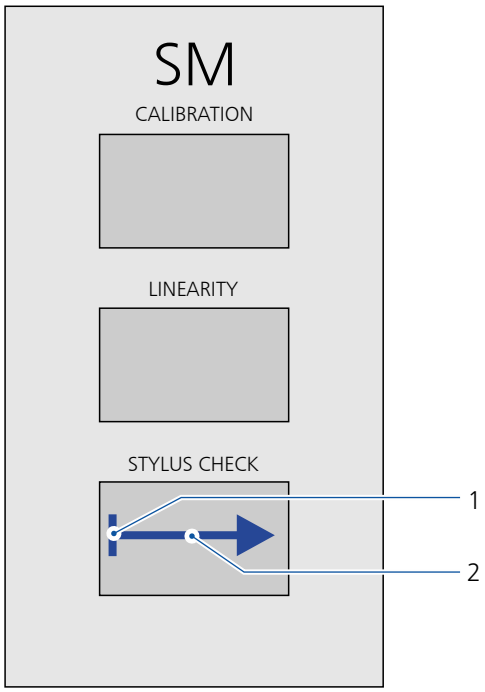
Performing the accuracy test

1 Start point
2 Direction of stylus tip movement

Checking the stylus tip

For checking the stylus tip, probe the lower part of the roughness standard with the stylus tip perpendicular to the fluting. In this area, the surface has an regular structure with defined roughness. In contrast to the other areas, the surface structure density is higher in this area. Probing this area with worn stylus tips will deliver bad results.

If the results differ significantly from the reference values stored, the stylus should be replaced.



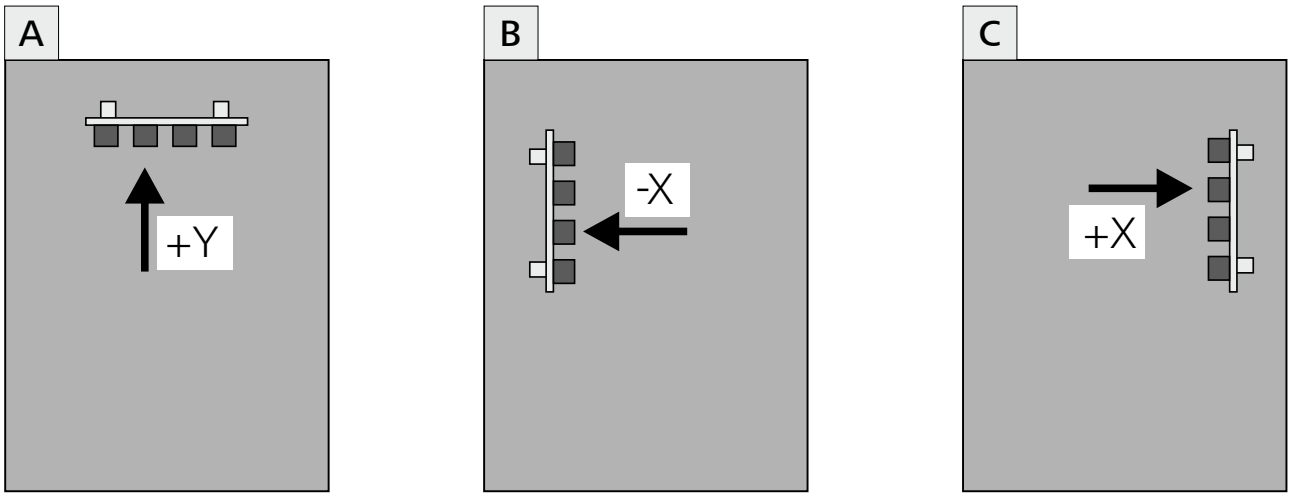
Checking the stylus tip

1 Start point

2 Direction of stylus tip movement

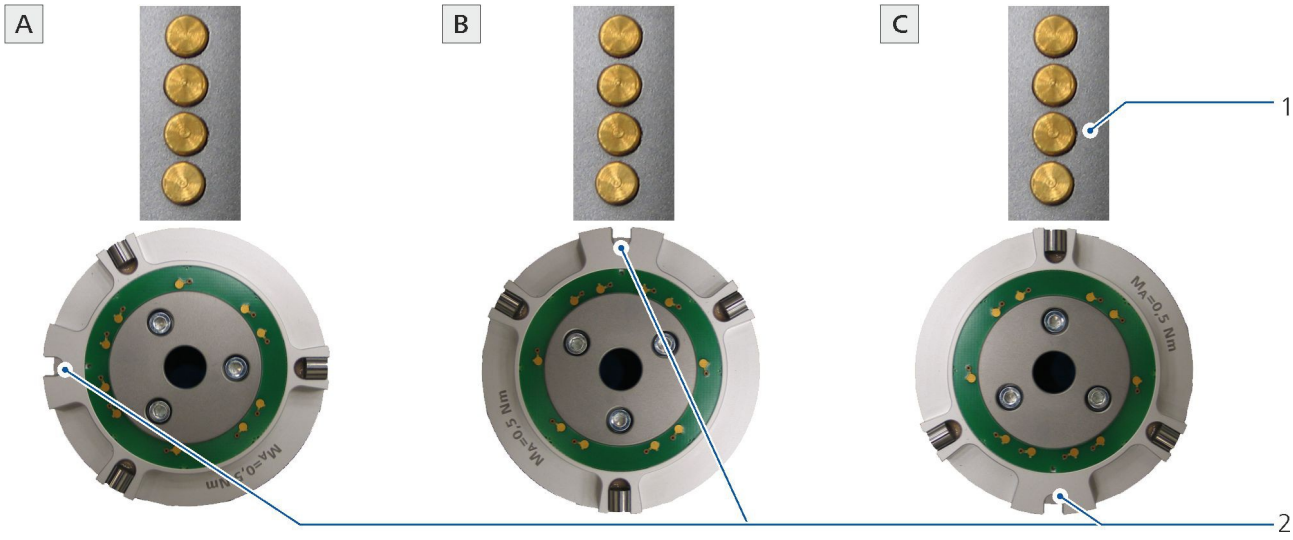
Adapter plate positions

The adapter plate position depends on the changer rack position. Generally, the changer rack is located at the end of the Y measuring range. However, it may also be located to the left or to the right. Depending on the changer rack's position, the slot in the adapter plate must point in a certain direction, since the battery contacts always have to point in the direction of the charging device.



Possible positions of the changer rack

A At the rear, direction of entry into the holder: Y
B To the left, direction of entry into the holder: -X
C To the right, direction of entry into the holder: X



Adapter plate positions

A Changer rack at the rear

B Changer rack to the left

C Changer rack to the right

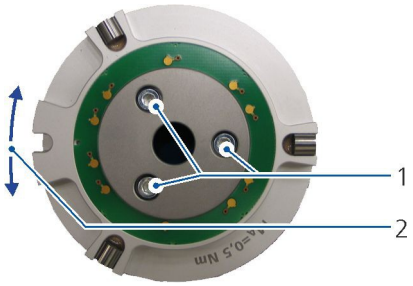
1 Battery contacts at the rear of the sensor head

2 Position of the slot in the adapter plate

Rotating the adapter plate

1. Loosen the three screws of the adapter plate, but do not completely unscrew them.

   If the screws are only slightly loosened, in a way to just allow the adapter plate to be rotated, locating the four possible positions will be supported by an engaging mechanism provided on models from version «Rev.02».



1 Allen screws in the adapter plate

2 Direction of rotation ±90°

2. Rotate the adapter plate by 90° into the desired position.

   NOTE! After rotating the adapter plate, check whether the spring contact pins of the charging device meet the battery contacts of the sensor head when the ROTOS sensor is stored in its holder.

3. Tighten the three Allen screws to 0.5 Nm.

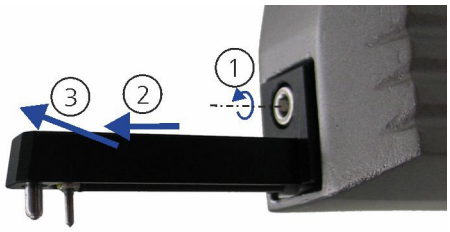
NOTE

Once you have rotated the adapter plate, you need to requalify the ROTOS sensor against the reference sphere.

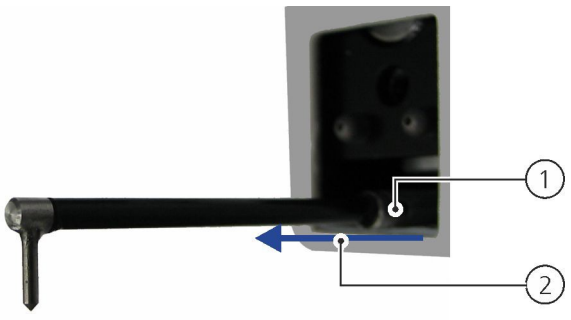
Changing the stylus

To change the stylus, proceed as follows:

1. Unscrew the stylus protection unit from the roughness probe and carefully remove it.



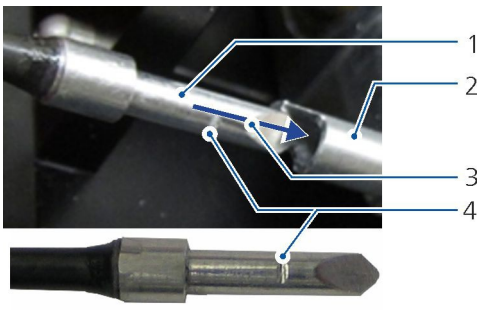
2. Hold the stylus close to the roughness probe and pull the stylus out.



3. Insert the new stylus into the support at the roughness probe.

   A notch is located on the lower side of the stylus. The stylus is firmly fitted in its support when the notch engages.

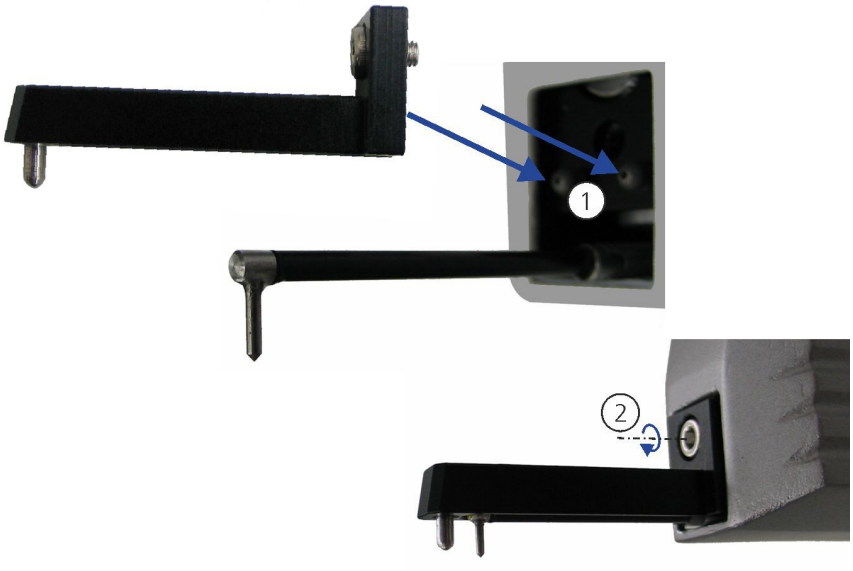
   NOTICE! Carefully insert the stylus. Forcing the stylus into the support could damage the measuring system of the roughness probe.



1 Stylus
2 Support in the roughness probe
3 Direction of insertion
4 Notch

4. Carefully put the stylus protection device onto the two rubber bungs of the roughness probe and fasten the protection device to the probe with screws.

   NOTE! Do not touch the stylus to prevent it from being damaged.



Notes on the measuring run

Damage to the stylus tip

Damage to the stylus tip due to uneven workpiece surfaces.
Notches in the workpiece surfaces may damage the stylus tip. The deeper the notches and the steeper their flanks, the higher is the risk of damage to the stylus tip.

- Inspect the workpiece surface before starting the roughness measurement.

Damage to the stylus tip when the stylus arm touches the workpiece.
If the workpiece contact pin of the stylus protection has no contact with the workpiece surface, the stylus arm may touch the workpiece surface. This may cause damage to the stylus and the stylus tip.

- Make sure that the workpiece contact pin always has contact with the workpiece surface.

Clean workpiece surfaces

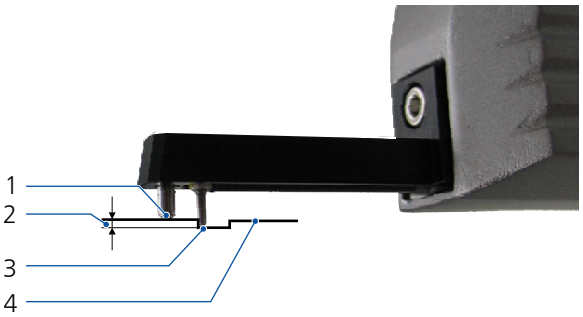
NOTE
The stylus tip and the workpiece contact pin must be clean before starting the measurement. To maintain them clean even during the measurement and to guarantee error-free roughness measurement, the workpiece surface must also be clean.

- Thoroughly clean all workpiece surfaces before performing roughness measurements.

Canceling the measurement

NOTE
The minimum test object length must always be ensured. If the minimum length is not reached, the probing distance will be too short to record sufficient measurement data. Roughness measurement will be canceled then.

NOTE
The difference in height between the workpiece contact point and the point where the stylus tip records a value must be less than 1 mm. A greater height difference will cancel the roughness measurement.



1 Workpiece contact point

2 Height difference between workpiece contact point and point of measurement acquisition

3 Measurement acquisition

4 Workpiece surface

Impact of floor vibrations

NOTE

Floor vibrations may have an unfavorable effect on the measurements. This applies in particular to roughness measurements of surfaces with low roughness. It is therefore necessary to keep the floor vibration limit curves and to monitor the floor vibrations at the installation site.

- If necessary, repeat the measurement to exclude any influence of floor vibrations on the measurement.

Battery discharging

NOTE

If the ROTOS sensor is not stored in its holder, the battery will discharge, even when not in use.

- After the measurement, move the ROTOS sensor back to its holder in the changer rack to recharge the battery.
- Set the »ON-OFF« switch to «ON».

Information on battery charging: ➤ *See [⇨ 5-9]*

Errors and faults

Fault	Cause	Measure
No LED lit on the charging device.	The connectors at the rear of the charging device are loose or disconnected.	– Check the connections at the rear of the charging device.
	The charging device is not properly connected to the control unit.	– Call a ZEISS service engineer.
	The control unit is switched off.	– Switch on the control unit at the control cabinet.
	Defective fuse in the charging device.	– Call a ZEISS service engineer.
The battery is not charged.	The ROTOS sensor is off.	– Set the »ON-OFF« switch on the sensor head to «ON».
The green LED on the charging device flashes fast.	An error has occurred.	– Store the ROTOS sensor in the holder.
	The battery is not charged properly.	– Check the spring contact pins on the charging device. The pins must not be deformed. All four spring contact pins must touch the corresponding battery contacts on the sensor head. – Check the fixing of the charging device. The charging device must be firmly mounted.
The green LED on the sensor head is not lit although the «ON-OFF» switch is set to «ON».	The battery is empty.	– Store the ROTOS sensor in the holder to recharge the battery.
	The Bluetooth connection has been interrupted for more than 30 minutes.	– Set the «ON-OFF» switch of the sensor head to «OFF» and then to «ON» again.
	Disturbance of the Bluetooth connection	– Arrange all components needed for operation of the CMM and the ROTOS sensor in a way to prevent radio interference.

Fault	Cause	Measure
The measurement is cancelled with an error message.	The difference in height between the workpiece contact point and the point where the stylus tip records a value is more than 1 mm.	– Repeat the measurement at a different point.
	The roughness probe is not parallel to the workpiece surface.	– Correct the roughness probe alignment and repeat the measurement.
Bluetooth connection to the ROTOS sensor is not possible.	The green LED is not lit.	– Place the ROTOS sensor near the Bluetooth USB stick plugged into the computer. – Plug the Bluetooth USB stick into a USB port on the front side of the computer. This allows expanding the transmission area.
The ROTOS sensor cannot be withdrawn automatically from the VAST holder.	The ROTOS sensor has possibly not been inserted properly into the VAST holder.	– Carefully remove by hand the ROTOS sensor from the holder.
The ROTOS sensor cannot be positioned as desired.	Battery insufficiently charged.	– Recharge the battery.
	The rotational axis or the swivel axis of the ROTOS sensor is blocked by an obstacle, for example.	– Remove the obstacle. – Check the axis for dirt particles and carefully clean them, for example by means of a brush.
The ROTOS sensor turns off once taken out of the holder.	The ROTOS sensor is off.	– Set the »ON-OFF« switch on the sensor head to «ON».
Measurement values are not correctly recorded.	The stylus tip is soiled, for example with grease.	– Remove the stylus and clean it in fat-dissolving liquid. – Replace the stylus. **NOTE!** Do not touch the stylus tip with your fingers.

Care

Sensor head and roughness probe

The sensor head and the roughness probe can be cleaned as needed using a damp cloth.

Rotational axis/swivel axis

The rotational axis and the swivel axis must remain free from dirt particles.

– Regularly clean the axes with a lint-free cloth or a brush.

NOTICE! Do not use compressed air for cleaning, since this could damage the measuring system.

Stylus tip

The stylus tip must be absolutely clean. It must always be free from dirt particles or grease. Even slight contact with the skin can make the stylus tip grease.

– Use a clean and fin brush to remove dirt particles and do this very carefully.

NOTICE! Applying pressure while cleaning may damage the stylus tip, the stylus, and the measuring system.

– To remove a grease film, dismount the stylus and clean the stylus tip in a fat-dissolving liquid.

Workpiece contact pin

The workpiece contact pin must be absolutely clean. It must always be free from dirt particles.

– Clean the workpiece contact pin with a lint-free cloth.

Disposal

You need to remove the battery before you can dispose of the ROTOS sensor. The ROTOS sensor must not be disposed of with the battery still inside.

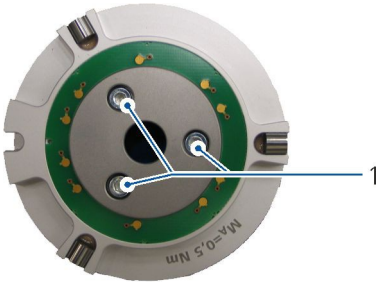
NOTE

The battery is located in the sensor head. You have to open the sensor head to remove the battery for disposal.

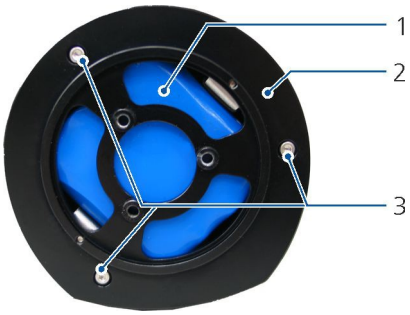
Only open the sensor head if you want to dispose of the ROTOS sensor. Battery replacement may only be done by a ZEISS service engineer.

Removing the battery

1. Set the »ON-OFF« switch to «OFF».
2. Unscrew the three Allen screws of the adapter plate. **[1]**

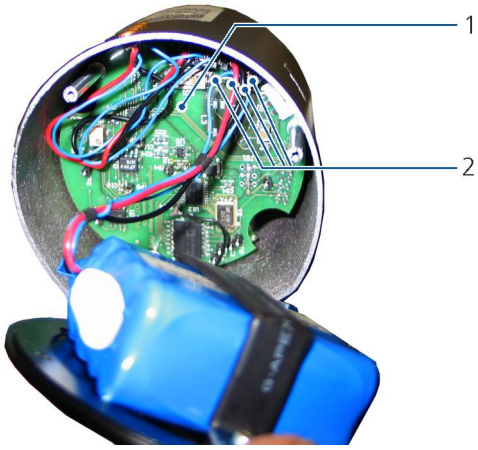


3. Unscrew the three Allen screws of the battery holder.



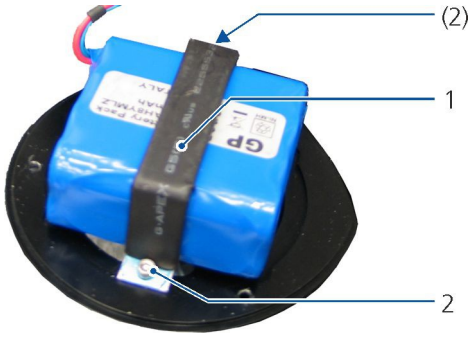
1 Battery
2 Battery holder
3 Allen screws

4. Carefully take off the battery holder.
5. Pull the four battery connecting cables out of the board slots.



1 Board
2 Slots for four connecting cables

6. Unscrew the four Allen screws of the holding bracket.



1 Holding bracket

2 Allen screws

NOTE

The battery must handed in for disposal to a special waste management center.

All the other components of the ROTOS sensor can be transferred to facilities specializing in recycling reusable materials.

Glossary

Term	Explanation
ATAC	Acronym for »Adaptive Touch Advanced Control«; probing strategy for the ST 3 probe
CAN bus	Asynchronous, serial bus system (CAN: acronym for »Local Area Network«)
CFRP	Abbreviation for »Carbon Fiber Reinforced Plastic«.
CMM	Abbreviation for »coordinate measuring machine«
FCC	Acronym for »Federal Communications Commission«
LED	Acronym for »light-emitting diode«
MSR	Acronym for »Multi Sensor Rack«
NiMH	Abbreviation for »nickel-metal hydride«
R&TTE	Acronym for »Radio and telecommunications terminal equipment«

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