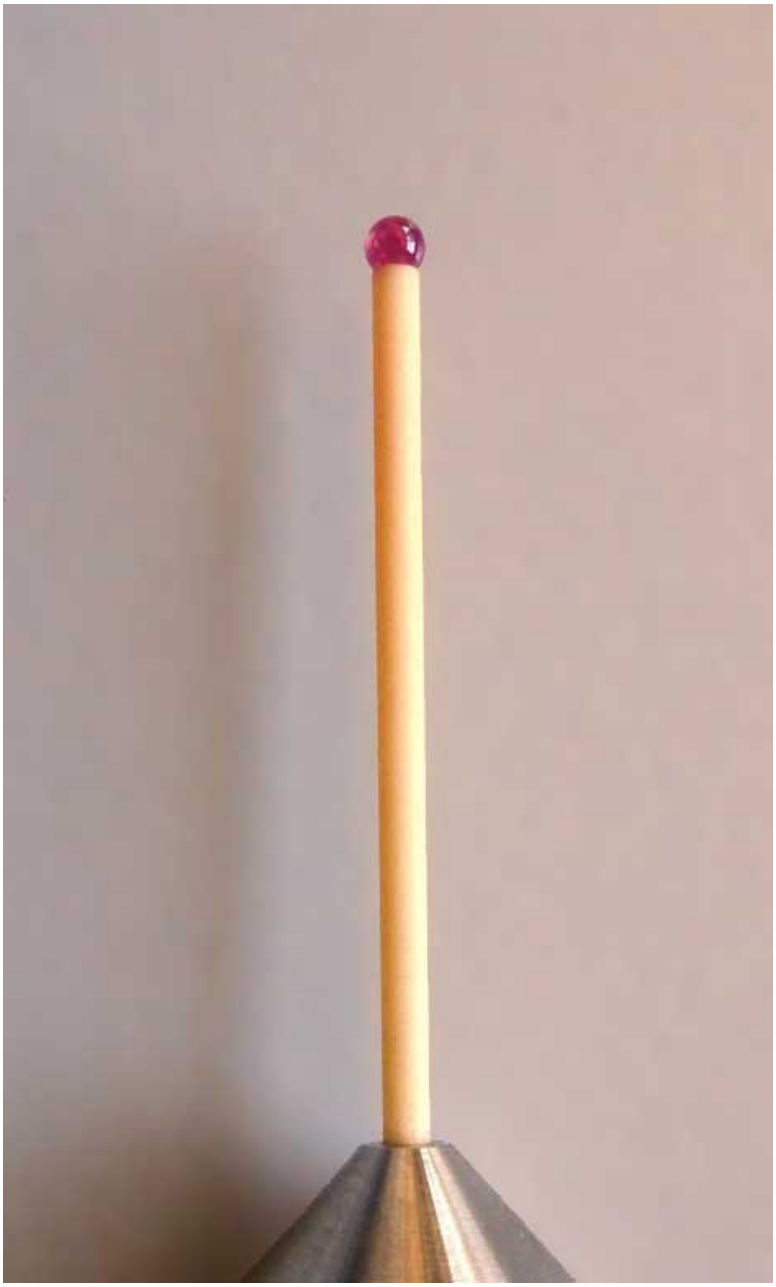

METROTOM P-Check

Test piece for METROTOM

Operating instructions

Read this first!

– Please read these operating instructions before using the test object.

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

Contact

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METROTOM P-Check
Operating instructions
2021-10-20
61211-6270402

Table of contents

Preface

About these operating instructions

These operating instructions describe the handling of the METROTOM P-Check. The test piece is an optional accessory for the METROTOM 1500 and METROTOM 800 CT scanners.

These operating Instructions address operators and users of the CT scanner.

Design of safety instructions

Safety instructions indicate a personal health hazard. We distinguish between two different levels: warning and caution. Both safety instructions are marked by the same warning symbol. The designation of the safety instruction is shown beside the symbol. The safety instructions used are described below.

Structure of a safety instruction

A safety instruction may have the following structure:

- Warning symbol and designation of the safety instruction (signal word): 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 have an intermediate result.
- At the end of all measures, a final result may be obtained.

Personal health hazard

⚠ WARNING

A »Warning« indicates a risk to life and limb.
If the operator does not observe the safety instruction, he may die or may be seriously injured.
Example: Risk of severe crushing of the body caused by heavy loads.

⚠ CAUTION

The note »Caution« indicates a personal health hazard.
If the operator does not observe the safety instruction, he may be slightly or moderately injured.
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 CT system or components may be damaged, this is indicated by the following notice.

A »Note« refers to possible damage to the CT system.
If the operator does not observe the safety instruction, the CT system or one of its components may be damaged.
Example: Collision between the workpiece and the X-ray tube.

Markup elements

Text 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 italic print is sometimes used to mark a subheading, e.g. *Examples:*
Main switch	Any reference to control elements in the text is highlighted typographically.
Tolerance field	Designation of parts of 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\protocol\protform	File and directories
CALYPSO	Product name
ZEISS	Company name
CAUTION! The measuring table must be clean.	Safety instructions embedded in the text.
Note: Pay attention to the correct orientation of the qualification marks.	Note embedded in the text.
[1]	Representation of position numbers in texts

1 Introduction

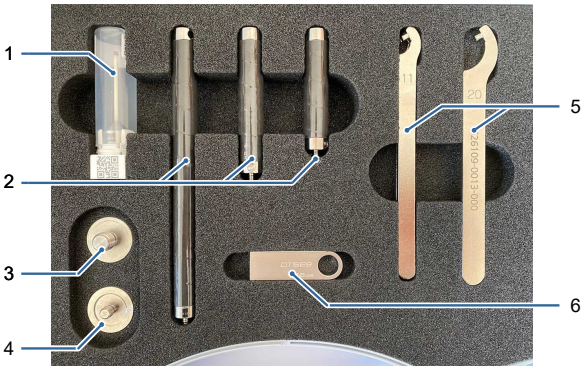
This chapter contains:

General information

Delivery package

The delivery package of the test piece includes:

- Operating instructions
- USB stick containing:
  - Operating instructions
  - Parameter overview
  - Calibration certificate
  - Calypso measurement plan
  - Excel evaluation file
  - Report header file
- Test piece with accessories in a transport case



1 Test piece
2 50, 60, and 120 mm extensions
3 M5-M8 adapter
4 Eccentric disk (only relevant for DAkkS)
5 Mounting tools (2 x 11 mm wrench , 1 x 20 mm wrench)
6 USB stick

System requirements

Use of the test piece requires the following prerequisites:

CMM	METROTOM 800 or METROTOM 1500 CT scanner
Data system	Computer with Windows 10 operating system
Measuring software	CALYPSO version 6.8/2019 or higher

Warranty

The METROTOM P-Check is an optional accessory for the METROTOM 1500 and METROTOM 800 CT scanners. With regard to warranty, the same conditions as for the CT scanner apply.

– Observe the corresponding notes in the operating instructions for METROTOM 1500 or METROTOM 800.

Safety

Intended use

The METROTOM P-Check test piece allows you to monitor the METROTOM 800 and METROTOM 1500 CT scanners.

Monitoring requires a test piece to be set up on the rotary table of the CT scanner and a CT measurement to be performed. The test piece may only be used for this purpose.

Risk of the sphere falling off the test piece due to impact.
The test piece is damaged and cannot be used for its intended purpose.

- Always handle the test piece carefully.
- Do not expose the test piece to impact loads.
- When not in use, store the test piece in its original packing.

Reasonably foreseeable misuse

The test piece must not be used for purposes contrary to the information given in these operating instructions.

Safety instructions

Basic safety instructions

The test piece is used on a CT scanner.

– Please observe the safety instructions for the use of the CT scanner. See METROTOM operating instructions.

Precautions

Damage to the test piece due to strong impacts
If the test piece is damaged, the CT scanner check cannot be carried out properly.

- Always handle the test piece carefully.
- Do not drop the test piece and do not subject it to impact loads.

2 Description

This chapter contains:

What is the purpose of the METROTOM P-Check?

The METROTOM P-Check allows you to monitor the probing errors P_S (size) and P_F (form) of the METROTOM CT scanners. The probing error describes, in accordance with DIN EN ISO 10360, the three-dimensional deviation behavior of the complete system consisting of coordinate measuring machine, CT sensor, and additional equipment (e.g. articulating systems) in a very small measuring volume.

Purpose of monitoring

The monitoring function guarantees the compliance of the CT scanner with the limit values requested by the operator.

How often is monitoring necessary?

The operator is responsible for the monitoring of the CT scanner, which has to take place at appropriate intervals.

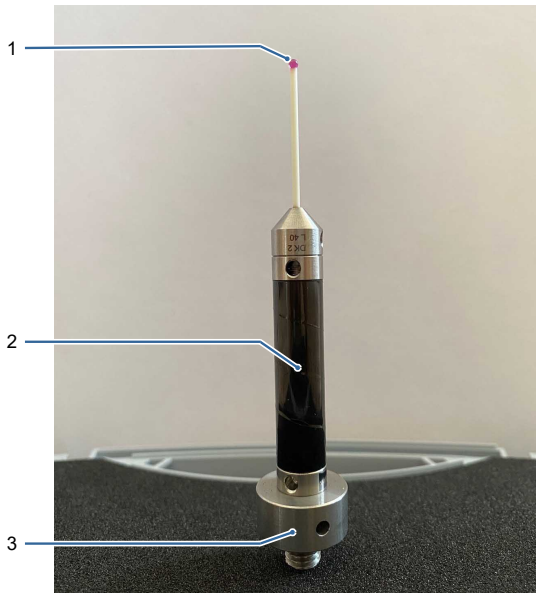
The CT measurement is performed according to VDI/VDE 2617 (Accuracy of coordinate measuring machines; parameters and their inspection) page 13 and VDI/VDE 2630 (Computed tomography in dimensional metrology) page 1.3.

Components

Test piece

NOTE

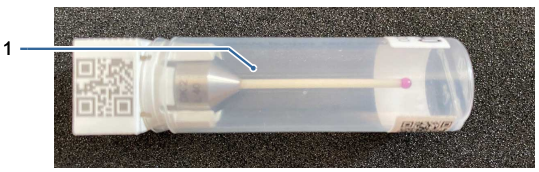
The sphere may fall off under impact load. When unpacking, packing, and cleaning the test piece, take care not to damage the sphere or remove it accidentally.



1 Ruby precision sphere with a diameter of 2 mm
2 Extension
3 Adapter

Storage

When not in use, store the test piece in its original packaging.



1 Original packaging

Files for evaluation

Special files are required for evaluation of the measurement results. These are stored on the supplied USB stick.

– CALYPSO measurement plan

– Report header files

– Excel evaluation table

See chapter ➢ *Preparation [⇨ 4-6]* for detailed information.

3

Specifications

This chapter contains:

Specifications

Test piece:

Calibration	DAkkS calibration certificate
Sphere material	Ruby
Expansion coefficient of ruby	5.5 x 10^{-6} 1/K
Material of the stylus shaft	Ceramic

4 Handling

This chapter contains:

CT measurement

Notes

METROTOM operating instructions

To perform a CT measurement, you must be familiar with the METROTOM operating instructions and comply with them.

Temperature influence

The temperature of the test piece may differ from that of the CT scanner's positioning system during storage, transport, and installation.

1 Before starting the measurement run, allow the test piece to acclimatize to room temperature.

2 Measure the temperature of the test piece and enter it in the CALYPSO measuring software when performing the evaluation. To determine this temperature, use a calibrated thermometer to perform a contact temperature measurement on the pallet next to the shaft, before and after the CT measurement.

NOTE

The use of highly volatile cleaning fluids, such as light gasoline or ethyl alcohol, can cause local cooling and thus thermally induced deformation.

NOTE

Run the measurement in the permissible temperature range of 18 °C to 22 °C specified for METROTOM.

Preparing a CT measurement

Preconditions for a CT measurement

Removing the filter

Ensure that no filter is attached to the x-ray tube during the CT measurement. Remove the filter if necessary.

Qualification procedure

Prior to the CT measurement, you must perform a geometric qualification and an axis qualification. See METROTOM operating instructions.

Setting up the test piece

1 Move to the loading position.

2 Clean the test piece if it is visibly contaminated. To clean the test piece, use stylus cleaning accessories (available in the ZEISS Webshop) and proceed with utmost care.

3 Screw the supplied threaded adapter into the faceplate.

NOTE

No torsional load must be induced in the stylus extensions during assembly. Apply torque only to the metal ends when screwing in and out. Use the wrench included in the transport case.

4 The measurement setup varies depending on whether centric or eccentric clamping is used. The contents of the test piece set allow both centric and eccentric checks: the sphere center is either located on the rotational axis (centric) or at a well-defined distance from the rotational axis (eccentric). The test piece is clamped centrically by default. Eccentric measurement is required for DAkkS applications only. This procedure is described in a separate ZEISS document that will be issued in individual cases with further documents required for DAkkS inspection.

- Select the extension for centered measurement: The vertical distance between the middle of the radiation exit window and the top of the pallet when the (vertical) Z axis is located at the upper end is decisive for the selection of stylus extensions during test piece setup. The distance between the P-Check sphere center and the lower end of the P-Check (with extensions) must be at least as large as this distance. This allows the sphere to be positioned in the image center. The following table serves as an orientation to help you reach the required lengths (a different setup is possible as long as the top position can be reached).

CT system	50 mm	60 mm	120 mm
METROTOM 800 G3		x	
METROTOM 1500 G3			x
METROTOM 800 G2	(x)	x	
METROTOM 1500 G2*	x		x
METROTOM 800 G1	x		
METROTOM 1500 G1			x

(x) = option

x = mandatory extension

* Without rotary table adapter, the 50 mm or 60 mm extension must be used in addition to the 120 mm extension.

- Screw the extension with screwed-in test piece into the central bore of a workpiece pallet.

5 Place the workpiece pallet on the rotary table.

6 Close the loading door.

Making settings

NOTE

The values for the use of the P-Check with the corresponding METROTOM CMM can be found in the document named *Parameter values*. The current parameter values of the test pieces for the respective METROTOM CMM can be viewed and downloaded on the ZEISS Portal. The P-Check parameters valid at the time of delivery can be found in the corresponding document on the supplied USB stick.

Position	
X position	Select the X position so that the test piece occupies 10% to 20% of the detector diagonal in the METROTOM OS live image.
Z position	The sphere should be centered vertically on the detector.

The individual successive positioning steps are described in the next section entitled CT-Messung durchführen.

Setting the reconstruction area

The reconstruction area must be selected in such a way that the distance between the sphere and the reconstruction area border is at least 20 pixels. For the perpendicular direction, the reconstruction area should include the shaft: at least 1 mm of shaft length should be included in the reconstruction area. In the METROTOM OS live image, this corresponds to half the sphere diameter. The shaft will be needed later for alignment in the CALYPSO measurement plan.

Adapting the histogram

The histogram is used to ensure good illumination of the detector. In particular, the detector must never be overexposed, as this would falsify the measurement results. If in doubt, adjust the detector parameters.

The gray scale values must be within the linear range of the detector.

– Change the parameters of the X-ray tube if the gray scale values are outside the linear range.

Performing a CT measurement

Once the preparations are complete, you can perform the CT measurement according to the METROTOM operating instructions.

If the shaft length is insufficient, measurement will be canceled in CALYPSO. The acquisition must be repeated then!

Evaluation with CALYPSO

General procedure

The evaluation comprises the following steps:

1. Open a measurement plan.
2. Check and, if necessary, correct the nominal values of the characteristics.
3. Import the CT volume data.
4. Visualize the CT volume data.
5. Perform a manual alignment by probing.
6. Run the measurement plan.
7. Evaluate the measuring results.

Preparation

A measurement plan, report header files, the calibration certificate, and the corresponding evaluation table are required for the evaluation. These files are stored on the USB stick supplied and must be copied to the hard disk.

NOTE

Please note that the designations on the USB stick are in English and German.

For example, the folder for the measurement plan has the name »Pruefplan_TestPlan«, the folder for the calibration certificate has the name »CalibrationCertificate_CalibrationCertificate«.

Folder and file to be copied	Medium	Directory
P-Check_x-xxx_PL measurement plan	USB stick	*\P-Check\Measurement plan*
	Hard drive	*…\Calypso\workarea\inspections*
METROTOM_CHECK_PR evaluation table	USB stick	*\P-Check\Evaluation table*
	Hard drive	*…\Calypso\data\excel_report*
userfields.ini file and *CT calibration* folder	USB stick	*\P-Check\Printout header files*
	Hard drive	*…\CALYPSO\protocol\protform*
P-Check_Diameter.txt file	USB stick	*\P-Check……\Measurement Plan\PCM*
	Hard drive	*C:\Users\Public\Public Documents\Zeiss\Calypso*

Disabling write protection

The measurement plan cannot be run when write protection is enabled.

– Disable the write protection of the copied files.

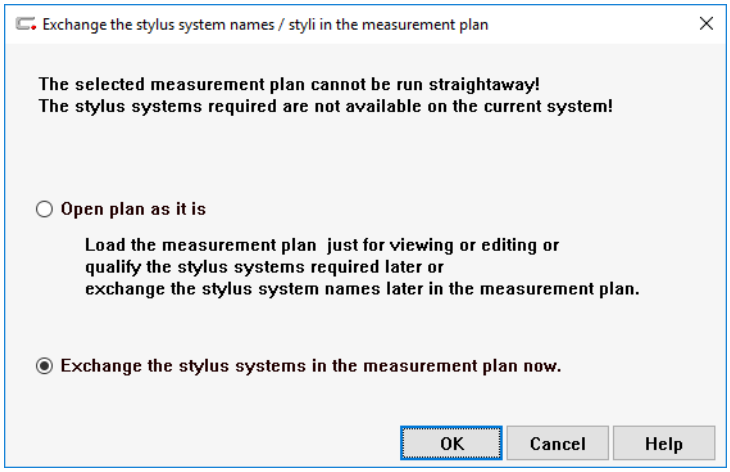
Performing the evaluation

Preparing the measurement plan

1 Start CALYPSO.

2 Open the »P-Check_x-xxx_PL« measurement plan.

When the measurement plan is loaded for the first time, the following message may be displayed:



3 Select **Open plan as it is**.

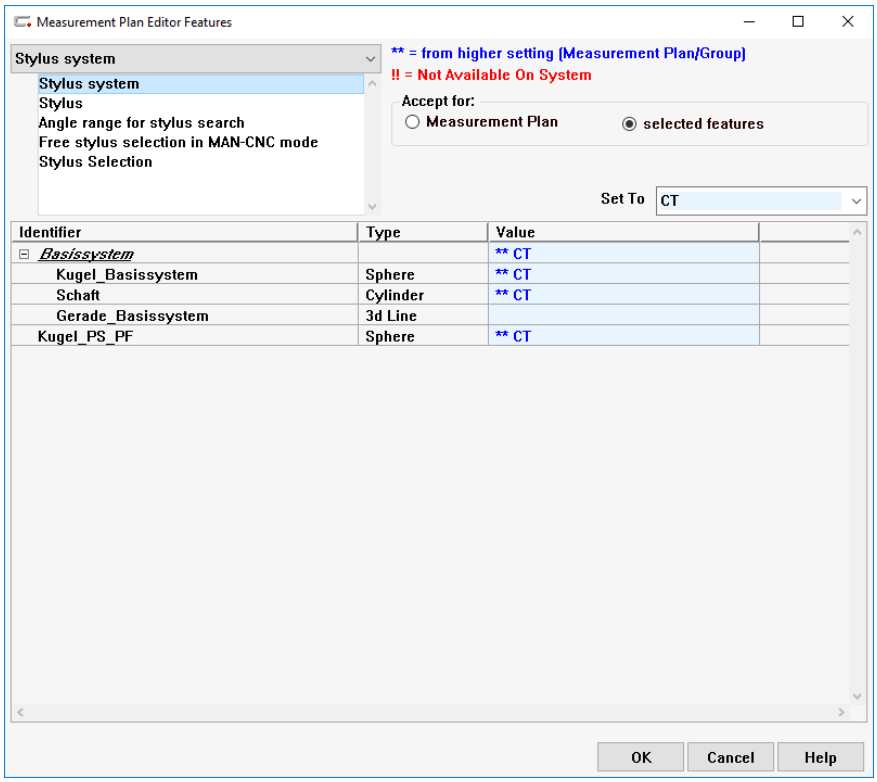
4 Click **OK**.

5 After opening the measurement plan, save it once via **File → Save**.

This is required to ensure that the measurement plan is updated to a new revision.

6 Select **Resources → Measurement Plan Editor Features** to open the Features editor.

The following window opens:



7 Click **Stylus system**. Select **Measurement plan**.

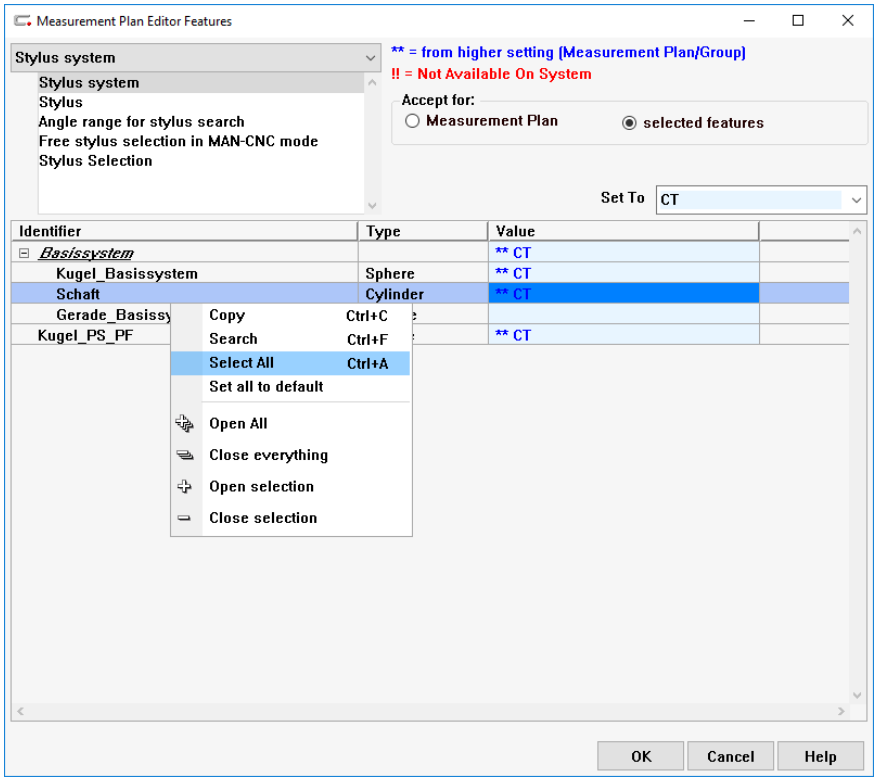
8 In the **Set To** selection field, select a stylus system, e.g. «CT_Probesys».

9 Click **Stylus**.

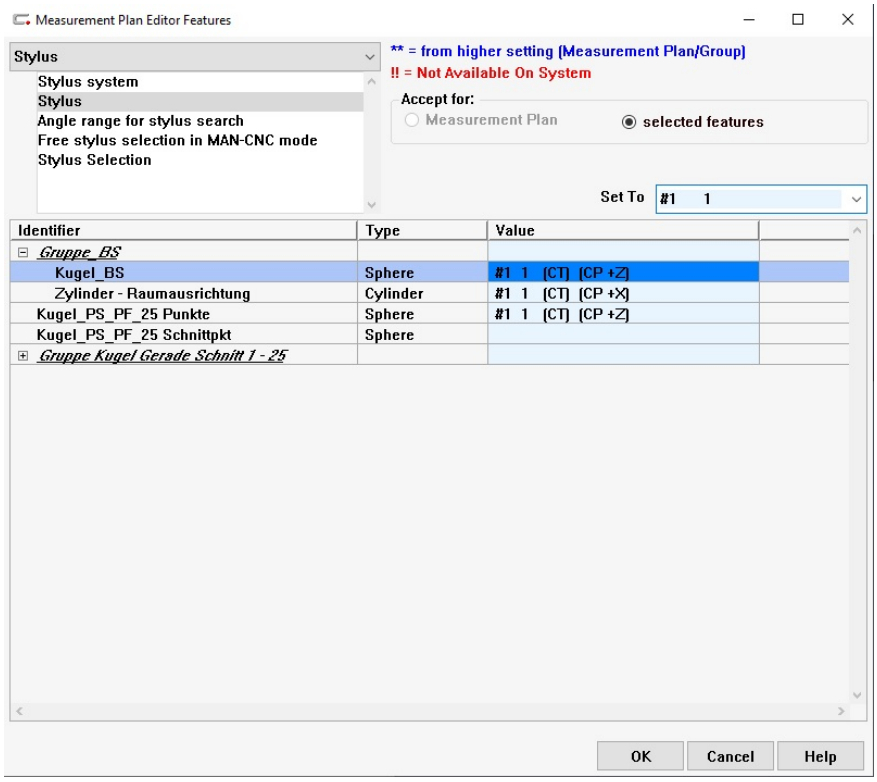
10 Choose **Selected items**.

11 Choose **Select All** in the context menu.

All elements are highlighted in blue.



12 In the **Set To** selection field, select a stylus, e.g. «#1 ct_probe».

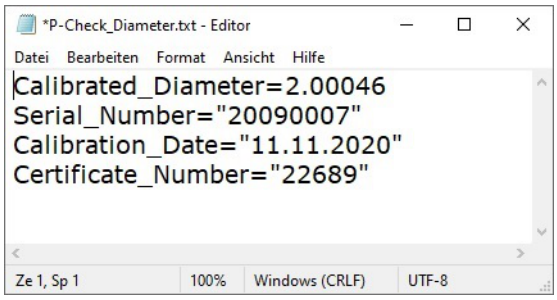


NOTE

In the folder *P_Check_USB_Stick …. \Pruefplan_TestPlan\PCM* on the USB-stick, you will find the *P-Check_Diameter.txt* file.

After the installation, the file is located on the computer in the folder *C:\Users\Public\Public Documents\Zeiss*.

This file contains the following information:



13 Compare the information given in the file with the values of the calibration certificate stored on the USB-stick under *P_Check_USB_Stick … \Kalibrierzertifikat_CalibrationCertificate*.

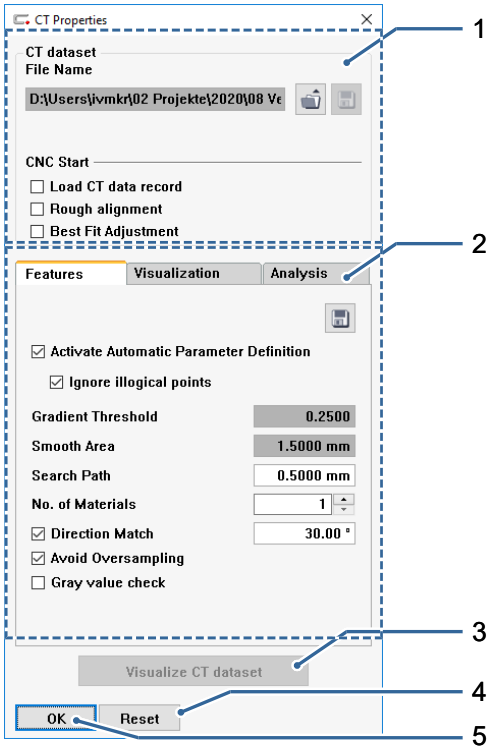
14 If the values differ, enter the correct values and save the file.

The file will be updated when the P-Check is sent in for calibration every 2 years. Then copy the new file to the computer!

Importing CT volume data

1 Click the red button for CT volume data in the window showing the preparation functions.

The following window opens.



CT Properties, »Measurement«

1 Opens a file

2 Settings for the CT volume data
The »Properties« tab under »Settings« is only available when CT volume data has been loaded.

3 Visualizes the CT volume data

4 Returns to CALYPSO without applying the settings

5 Applying settings

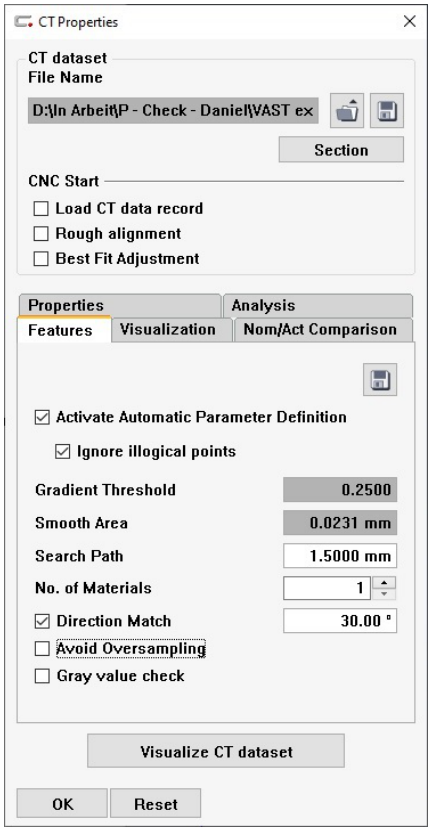
2 Click the button shown here.

The file selection window opens

- Select the »*.uint16_scv« **file type**.
- Select the file containing the volume data just measured.

3 Click **Open**.

Visualizing CT volume data

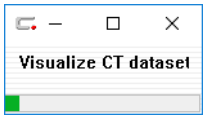


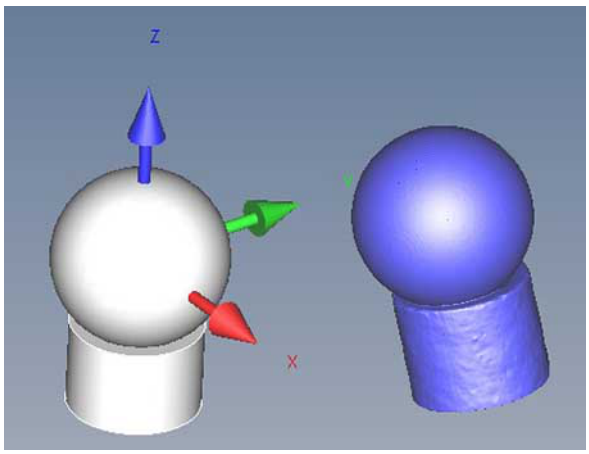
1 If ticked, untick the **Avoid Oversampling** check box on the »Measurement« tab.

Enable the selection fields as shown in the screenshot.

2 Click **Visualize CT volume data**.

The visualization window shows the progress.





The CT volume data is shown with a more or less large offset to the CAD model.

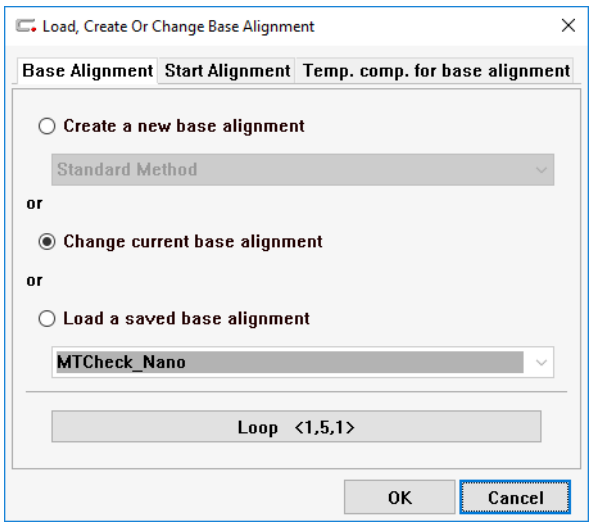
Aligning CT volume data

When CT volume data is loaded for the first time, its alignment does not correspond to the alignment of the CAD model. This, however, is required for running the measurement plan automatically. Therefore, you must first perform a manual alignment.

1 In the list of prerequisites, click the »Base/Start Alignment« button.

If a base alignment has already been defined, the button is green.

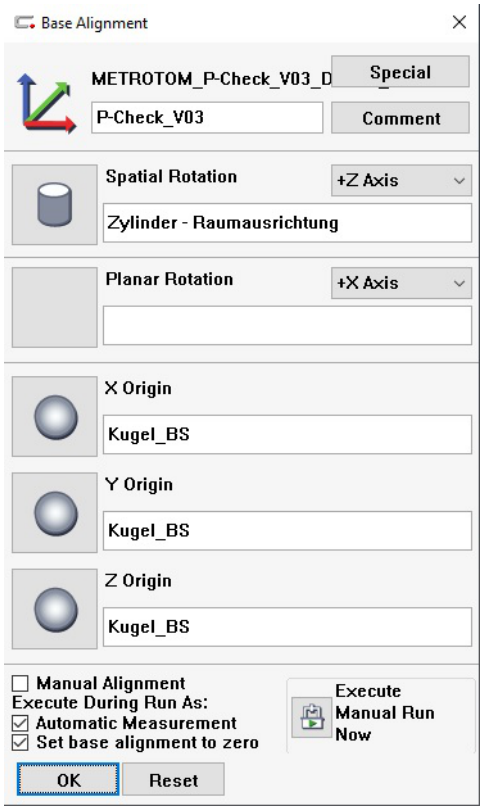
The following window opens. The »Base Alignment« tab is in the foreground.



2 Select the **Change active base alignment** option.

3 Click **OK**.

The following window opens:

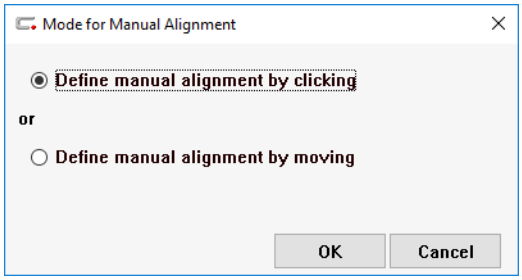


»Base Alignment« window

4 Activate the **Automatic Run** and **Set Base Alignment to zero** functions.

5 Then click the **Execute Manual Run Now** button.

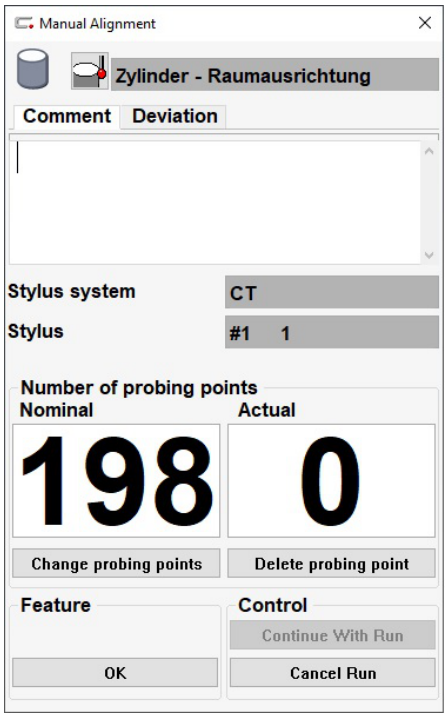
The following window opens:



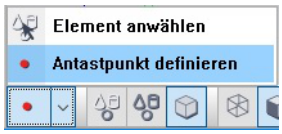
6 Select **Define manual alignment by clicking**.

7 Click **OK**.

The following window shows the feature to be probed.



8 Select the **Define points** mode before you select the probing points.



9 On the CT volume data, click several points of the feature requested by CALYPSO.

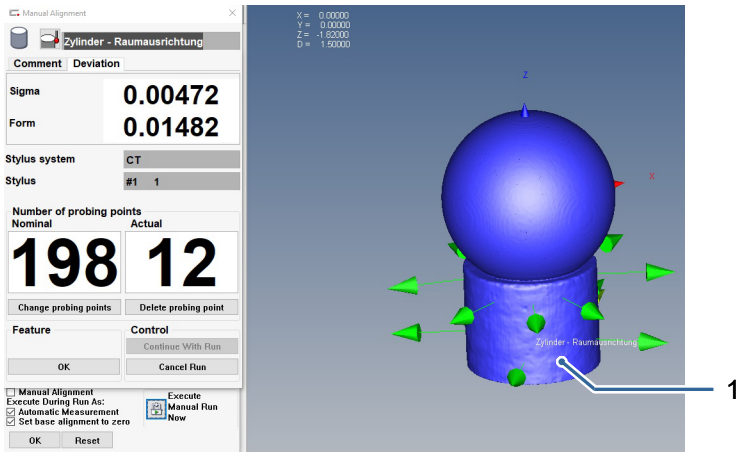
The **Cylinder** feature needed to measure the shaft **[1]** is located below the sphere. Click as many points as necessary to properly fit the cylinder to the measurement data. This is indicated by a low rating (< 0.01).

The probing points are marked as green dots.

- Take care to spread the probing points as evenly as possible.

NOTE

By distributing the 12 set points on the shaft, the cylinder is defined without errors. Bear in mind that the entire cylinder is only 1 mm high.



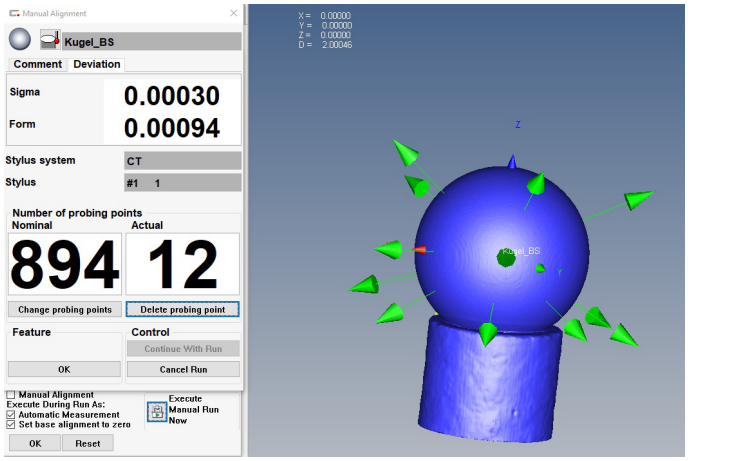
10 Click **OK**.

The window for measuring the **Kugel_BS** (sphere) opens.

- Take care to spread the probing points as evenly as possible.

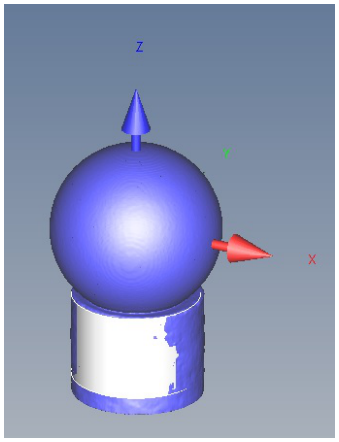
The probing points are marked as green dots.

Click as many points as necessary until a plausible rating is displayed for the sphere (see previous point).



11 In the »Manual Alignment« window, click **OK** under **Feature**.

The CT volume data is aligned with the CAD model.



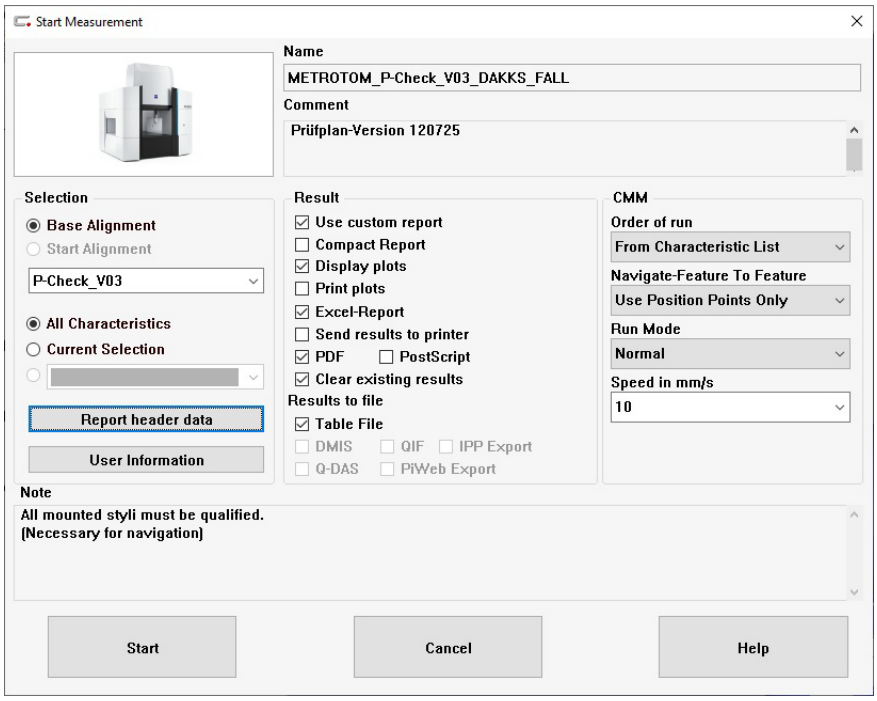
12 Click **OK** in the »Base Alignment« window. ➤ *See [⇨ 4-14]*

The alignment is complete.

Running a measurement plan

1 Select **Plan → CNC-Start**.

The following window opens:

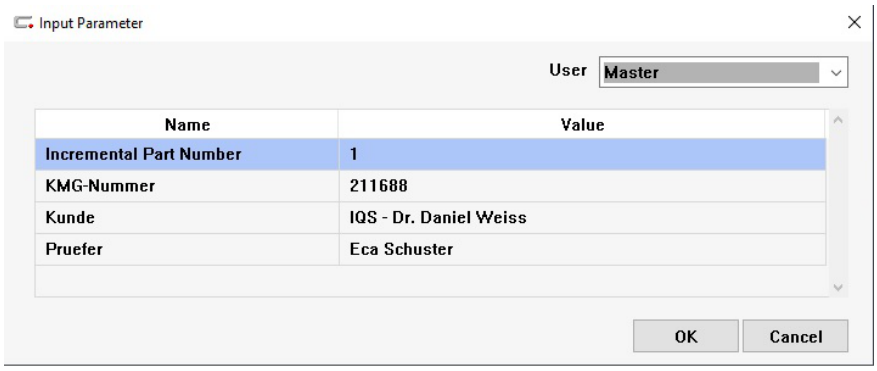


Start measurement plan

2 Select **Custom report, Excel report, PDF**, and **Clear existing results**.

3 Click **Start**.

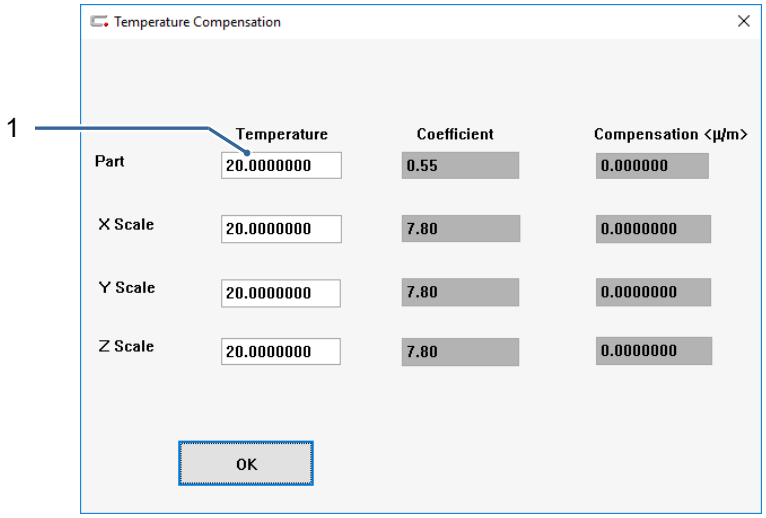
The following window opens:



4 Fill in the input fields in the **Value** column.

5 Click **OK**.

The following window opens:



6 Enter the test piece temperature in the input field next to **Workpiece [1]**.

The temperature for the X, Y, and Z scales remains unchanged.

7 Click **OK**.

Then the CNC run starts.

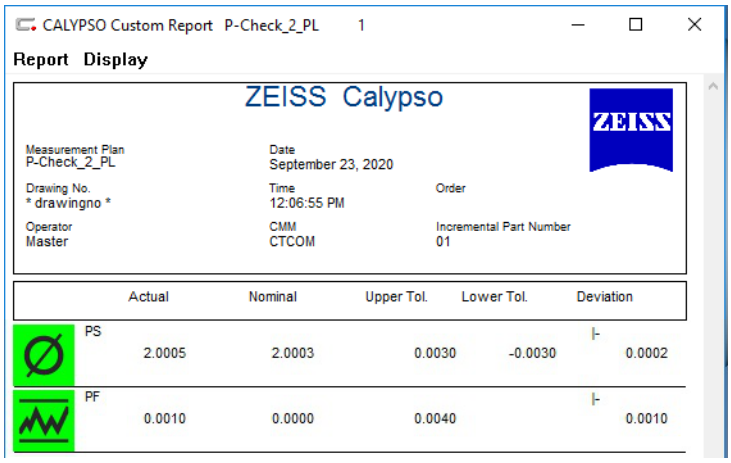
At the end of the CNC run, the CALYPSO custom report and the Excel report are displayed. Additionally, the Excel report, a table file, and a graphical report are written to the »results« directory: *C:\Users\Public\Public Documents\Zeiss\CALYPSO\workarea\results*.

The graphical report comprises form plots and a custom report.

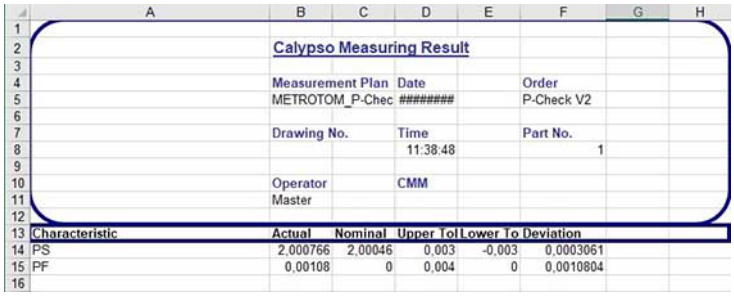
The names of the reports are composed according to the following pattern:

measurement plan name + incremental part number + date + name of the CT volume data.

Example: »P-Check_mit CADPlott_110211_50_163_2011-2-15_P-Check 2010-11-4 8-56.uint16_scv_gra.pdf«



CALYPSO custom report



Excel report

1 Actual values

2 Nominal values

NOTE

For displaying the Excel report, Excel must be installed on the METROTOM CMM computer. If Excel is not installed, you must copy the existing table file and open it on a computer on which Excel is installed. By default, the table file is saved to the following directory: *C:\Users\Public\Public Documents\Zeiss\CALYPSO\workarea\results*. This path can be changed in the system configuration of CALYPSO.

The values of the PS and PF characteristics must be transferred from one of the above reports to the Excel evaluation report. See ➤ *Creating an acceptance report [⇨ 4-20]*.

Creating an acceptance report

Transferring values to the Excel evaluation file

Conditions

– The CNC run has been completed. As result, a CALYPSO custom report and an Excel report have been output. See ➤ *Running a measurement plan [⇨ 4-17]*.

1 Open the »METROTOM_P-Check_PR« Excel evaluation file.

2 Select a language: you may choose between German and English.

3 Switch to the »Input_fields« sheet.

- Select the correct designations of the CMM (line 4) and the test piece (line 5) from the drop-down list.
- Under *Test uncertainty* (line 6), select add or subtract in order to demonstrate compliance or non-compliance. To prove compliance, subtract the test uncertainty (TU) from the MPE values; to prove non-compliance, add the TU to the MPE values.
- In lines 27 to 34, enter the test piece information from the calibration certificate.

2	Sprache / Language	Deutsch
3	**Füllen Sie bitte die blau umrahmten Felder aus!**	
4	KMG	METROTOM 800 130kV
5	Prüfkörper	P-Check 2
6	Testunsicherheit	Subtrahieren / subtract
7		
8	**KMG**	
9	KMG-Typ	METROTOM 800 130 kV
10	Messbereich X [mm]	800
11	Seriennummer	ENTER_CMM_SN
12		
13	**Kunde**	
14	Name	ENTER_CUSTOMER_NAME
15	Straße	ENTER_CUSTOMER_STREET
16	Ort	ENTER_CUSTOMER_CITY
17	Kunde	ENTER_CUSTOMER_OPERATOR
18	Telefon-Nr.	ENTER_CUSTOMER_PHONE
19	E-Mail	ENTER_CUSTOMER_EMAIL
20		
21	**Prüfkörper**	
22	Bezeichnung des Prüfkörpers	P-Check 2
23	Material der Kugel	Rubin
24	Längenausdehnungskoeffizient [10^-6/K]	5.5
25	Erweiterte Unsicherheit des Längenausdehnungskoeffizienten [10^-6/K]	0.5
26	Nominaldurchmesser Kugel [mm]	2
27	Prüfkörper-Nr.	ENTER_PHANTOM_NO
28	Datum der Kalibrierung	ENTER_CERT_DATE
29	Kalibrierschein-Nr.	ENTER_CERT_NO
30	Kalibrierdienst	ENTER_CERT_SERVICE
31	Gemessener Durchmesser [mm]	2.00031
32	Erweiterte (k=2) Messunsicherheit des Durchmessers [µm]	0.4
33	Formabweichung [µm]	0.13
34	Erweiterte (k=2) Messunsicherheit der Formabweichung [µm]	0.4
35		
36	**Software**	
37	CT-Software	METROTOM OS
38	Version	ENTER_MOS_VERSION
39	Auswerte-Software	ENTER_EVAL_SW
40	Version	ENTER_EVAL_SW_VERSION

- The MPE values to be checked have to be entered in lines 43 and 44. These are usually the values specified by the manufacturer.
- In lines 47 and 48, enter the test piece values for P_S and P_F determined in the CT measurement; these are the results of the volume data evaluation made by CALYPSO.

42	**Maximum Permissible Errors (MPE)**	
43	P_S MPE [µm]	3
44	P_F MPE [µm]	4
45		
46	**Messwerte**	
47	P_S [µm]	-1.5
48	P_F [µm]	2.3
49		
50	**Temperatur Kalibrierkörper [°C]**	
51		22.2
52		
53	**Messposition**	
54	X Position [mm]	ENTER_MEAS_X_POS
55	Z Position [mm]	ENTER_MEAS_Z_POS
56		
57	**CT-Datensatz**	
58		ENTER_CT_DATA_FILE
59		
60	**Messparameter**	
61	Röhrenspannung [kV]	ENTER_TUBE_VOLTAGE
62	Röhrenstrom [µA]	ENTER_TUBE_CURRENT
63	Integrationszeit [ms]	ENTER_INT_TIME
64	Bildmittelung	ENTER_IMAGE_AVERAGING
65	Verstärkung	ENTER_IMAGE_GAIN
66	Vergrößerung	ENTER_MAGNIFICATION
67	Vorfilter	ENTER_PREFILTER
68	Anzahl Projektionen	ENTER_NUMBER_PROJECTIONS
69	Binning-Modus	ENTER_BINNING_MODE
70	Medianfilter (ein/aus)	ENTER_MEDIAN_FILTER
71	Filter zur Rauschunterdrückung	ENTER_NOISE_SUPPRESSION
72	Brennfleckü berwachung (ein/aus)	ENTER_FSC
73	Y-Bewegung (ein/aus)	ENTER_YSHIFT
74		
75	**Einstellungen Auswerte-Software**	
76	ENTER_EVAL_SW	Messstrategie Kugel: 6 Kreisbahnen mit je 130 Punkten
77		Filterung der Kreisbahnen mit Gauss-Filter, Tiefpaß, 15 W/U
78		
79	**Bemerkungen**	
80		
81		
82		
83		
84	**Zeiss Techniker**	ENTER_ENGINEER
85		
86	**Datum**	ENTER_DATE

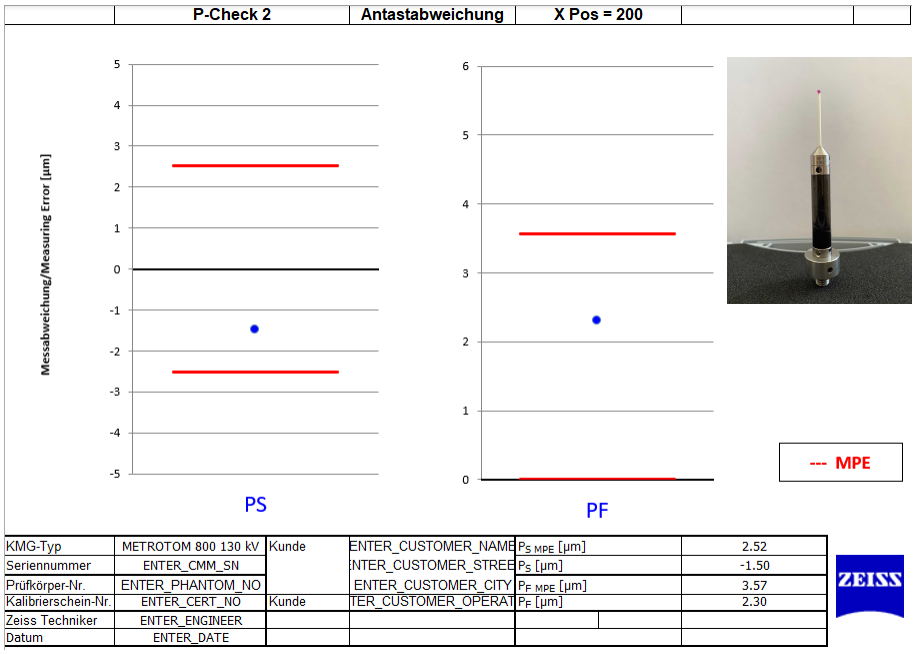
»Input_fields« of the Excel evaluation report

4 Fill in the fields marked in blue.

You can find the probing error values in the CALYPSO custom report or in the Excel report.

All values and settings are combined on the »Protocol« sheet. In addition to the output of all parameters, values for the test uncertainty of P_S and P_F are displayed here and these TU values are applied (added or subtracted) to the corresponding MPE values. The actual P_S and P_F values are compared with the values thus obtained.

The values and settings are displayed graphically on the »Graphic« sheet.



KMG-Typ	METROTOM 800 130 kV	Kunde	ENTER_CUSTOMER_NAME	$P_{S\ MPE}$ [µm]	2.52
Seriennummer	ENTER_CMM_SN		NTER_CUSTOMER_STREE	P_S [µm]	-1.50
Prüfkörper-Nr.	ENTER_PHANTOM_NO		ENTER_CUSTOMER_CITY	$P_{F\ MPE}$ [µm]	3.57
Kalibrierschein-Nr.	ENTER_CERT_NO	Kunde	TER_CUSTOMER_OPERAT	P_F [µm]	2.30
Zeiss Techniker	ENTER_ENGINEER				
Datum	ENTER_DATE				

Values and settings on the »Graphic« sheet

Printing the evaluation report

1 For METROTOM 800, select »Cover_M800« and for METROTOM 1500, select »Cover_M1500«. Additionally select »Protocol« via SHIFT + left mouse button.

2 Choose **Selected sheets** in the print window.

3 Click **OK**.

The acceptance report is printed out.

NOTE

Document and file the acceptance results in a suitable manner.

Causes of measurement errors

If the measurement results are outside the specified tolerances, this may be due to an error in operating the measurement software or to errors in the CT measurement run.

METROTOM CT scanner

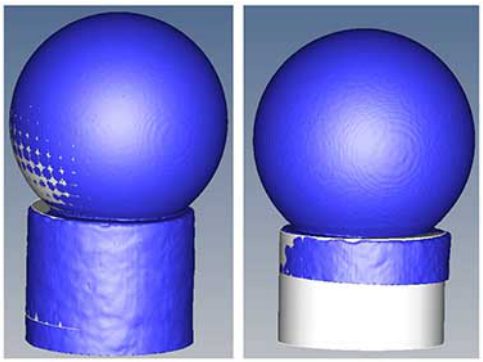
Possible reasons:

- No geometry or axis qualification was carried out.
- The test piece is seated loosely: the P-Check must be firmly screwed into the pallet.
- The reconstruction area is too small.
- Parameters were incorrectly set, e.g. voltage, number of projections.
- Check whether the measurement has been performed without physical prefilter.

CALYPSO measuring software

Possible errors after manual alignment:

- If the volume shown is shorter than the cylinder's CAD model, an automatic measurement run cannot be performed.



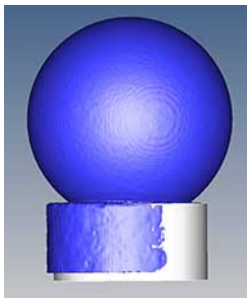
Sufficiently long shaft and too short shaft

NOTE

Volume data can only be evaluated if at least 1 mm of the shaft is located in the reconstruction area. This corresponds to half the sphere diameter. It may be possible to create a sufficiently long shaft in the volume data by reconstructing the existing projection data with an adjusted reconstruction area (i.e., no new measurement required).

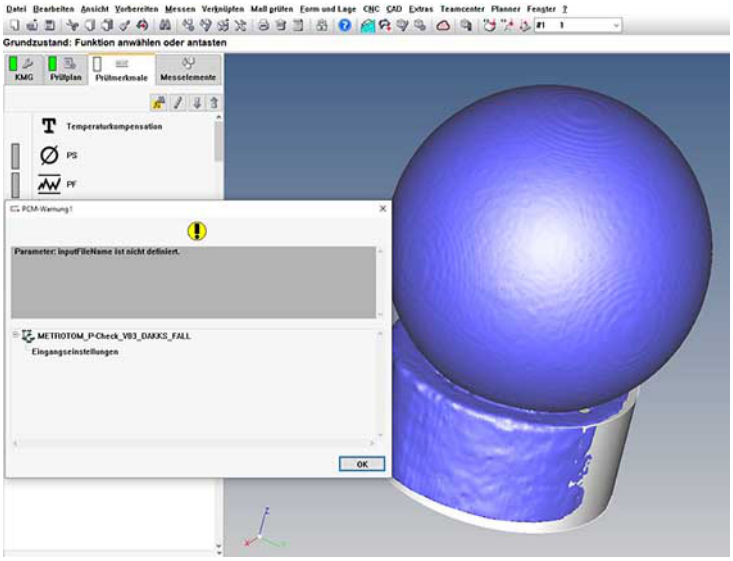
Hint: If you get an offset similar to the one shown in the illustration below, this is the offset of the sphere center from the shaft axis. It is not an alignment error. You can run the automatic measurement. The offset

has no effect on the measurement plan, since the cylinder is used as the axis to determine the spatial orientation and the sphere center is used for the alignment.

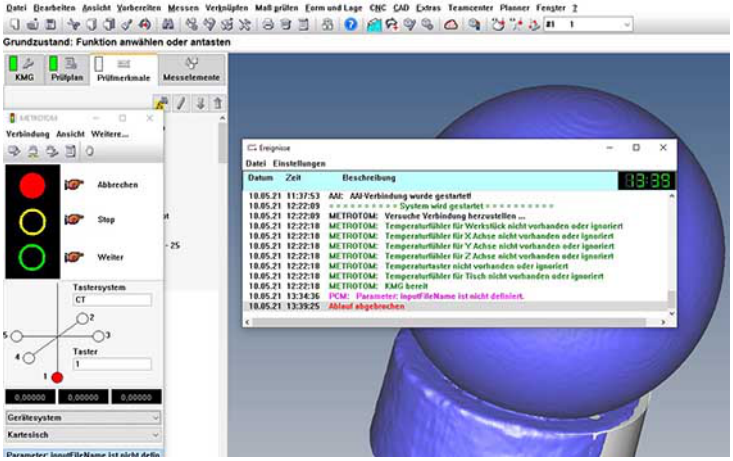


Possible errors when starting the automatic measurement run:

– If the following PCM warning is displayed and the automatic run stops, check whether the *P-Check_Diameter.txt* file is stored correctly (*C:\Users\Public\Public Documents\Zeiss*).



– Click OK to confirm. The run is canceled and the following error message appears.



– Set the stoplight back to green.
– As described above, copy the *P-Check_Diameter.txt* file from the USB-stick to the correct location.
– Restart the automatic measurement run.

Service

If it is not possible to eliminate the error, inform the ZEISS service department. You will find the phone number in the METROTOM operating instructions.

5 Care

This chapter contains:

Care and storage

Care

The test piece does not require any special measures for care. Nevertheless, you should observe the following:

– Handle the test piece with care.

– Avoid any impact loads.

NOTE

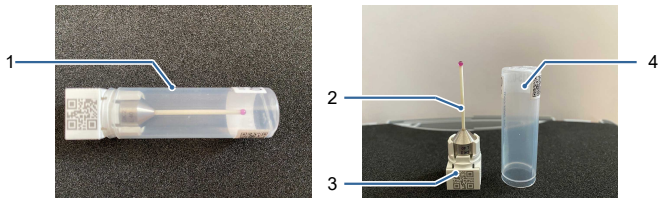
Start by recalibrating the test piece once a year. If you determine constant values, you can extend the interval. Contact your ZEISS service organization in this matter.

Storage

When not in use, store the test piece **[2]** in its original packaging **[1]**.

1 Squeeze the holder of the original packaging from both sides with two fingers. This causes the two studs of the holder **[3]** to move outwards. Position the test piece with its holes in such a way that when released the studs fix the test piece over the holes.

2 Then press the transparent cap **[4]** onto the holder. Store the test piece in the transport case (see ➢ *Delivery package [⇨ 1-2]*).



1 Original packaging
2 Test piece
3 Holder
4 Cap

METROTOM P-Check
Operating instructions
2021-10-20
61211-6270402