

O-SELECT

**Coordinate measuring
machine**



Operating instructions

(Translation of the original operating instructions)

ZEISS

Read first!

- Please read these operating instructions before putting the coordinate measuring machine (CMM) into operation.
- For your own safety, please keep all relevant accompanying documents always ready at hand.

All rights pertaining to changes in the CMM and its options, the program packages and the pertaining documents reserved.

This manual must not be circulated or copied, or its contents utilized and disseminated, without our express written permission. Persons misusing this manual are subject to prosecution.

All rights reserved, especially in cases of granting a patent or registering a utility model.

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

All product names are registered trademarks or trademarks of the corresponding proprietors.

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Preface

Information about this publication

The O-SELECT coordinate measuring machine (CMM) is described in these operating instructions.

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

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 objective 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
<i>not</i>	Words to be emphasized are represented in <i>italics</i> . The italicized print is sometimes used to mark a subheading, e.g. <i>Type of measurement</i> :
<i>Main switch</i>	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



Introduction

This chapter contains:

General specifications	1-2
Warranty	1-5

General specifications

Standard equipment

The standard version of the O-SELECT coordinate measuring machine comprises the following components:

- O-SELECT coordinate measuring machine (CMM)
- 24 V power supply unit including 3 country-specific connectors and Y cables.
- Touch-screen monitor HP S230tm
- Workstation HP Z230
- O-SELECT software
- Keyboard
- Mouse
- Speaker
- Documentation

CE marking

EC declaration of conformity as defined by the EC Machinery Directive 2006/42/EC Annex IIA

We hereby declare that by its design and construction and version we placed on the market, the machinery named below complies with the requirements set out in the EC Directive 2006/42/EC and in the additional EC directives listed below.

If modifications are made to the machinery without our prior approval, this declaration will no longer be valid.

Designation of the machine:	Coordinate measuring machine
Machine type:	O-SELECT
Additional EC directives:	EMC directive (2004/108/EC)

- Harmonized standards applied, in particular:
- EN 60204-1
 - EN 61326-1 Table 2, class B

For restrictions, see ➤ *Standards and regulations* [⇒ 1-3]

- EN 61010-1
- EN ISO 12100

The product has the CE mark on its type plate.

O-SELECT Ser.-Nr.: XXXXX 636523-0000-000 100-240VAC 50/60Hz max. 160VA Year: XXXX RevXX xxxx	<div> <div> Carl Zeiss Industrielle Messtechnik GmbH Carl-Zeiss-Straße 22 73447 Oberkochen </div> <div> Coordinate Measuring Machine  Made in Germany </div> </div>	
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Standards and regulations

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

Regulations

- BGV A3 (VBG 4): Accident prevention regulations -
Electrical systems and equipment

Standards

- EN (IEC) 61010-1:
Safety requirements for electrical equipment for measurement, control, and laboratory use
- GB 4793.1
Safety requirements for electrical equipment for measurement, control and laboratory use.
- EN ISO 12100:
Safety of machinery. General principles for design. Risk assessment and minimization
- EN 61326-1:2013:
Interference immunity IEC 61000-4-4 Tab. 1, IEC61000-4-5 Tab. 1, otherwise Tab. 2.
Interference emission class B

- GB 4824
Industrial, scientific and medical (ISM) radio frequency equipment -
Electromagnetic disturbance characteristics - Limits and methods
- CAN/CSA-C22.2 No 61010-1-12:
Safety requirements for Electrical Equipment for measurement, control and laboratory use.
- UL 61010A-1 3rd Ed. :
Standard for Electrical Equipment for Laboratory Use.
- EN (IEC) 62471:
Photobiological safety of lamps and lamp systems.

Warranty

Notes

- The specifications and statements in the German operating instructions are prevalent and binding for translations into other languages.
- All rights pertaining to changes in the coordinate measuring machine and its options, the software packages and the pertaining documents reserved.
- All rights reserved, especially in cases of granting a patent or registering a utility model.

The warranty *does not* cover the following:

- incidentals
- wearing parts.

Exclusion of warranty

The manufacturer cannot be held liable.....

- for actions contrary to the instructions given in this manual,
- for actions contrary to the instructions given in the separate »Installation Instructions« brochure,
- in case of alteration of the coordinate measuring machine version delivered by us,
- if maintenance work is not carried out by personnel specially trained at ZEISS,
- if measures for care are not taken by the operator or user according to the specified measures,
- if no original spare parts are used for maintenance and repair work,
- if the necessary maintenance work and measures for care are not carried out according to the technical documentation.

Any information regarding maintenance work and measures for care, incidentals and wearing parts is specified in separate publications.

Chapter 2

Safety

This chapter contains:

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Safety on the CMM.....	2-11

Intended use

Warranty

The coordinate measuring machine (CMM) may be used only for its intended purpose. The operator is liable for any damage incurred during any reasonably foreseeable misuse.

CMM

The CMM can be used to determine the geometric sizes of workpieces. The workpieces can be made, for example of metal, plastic, wood or natural rubber. Geometric sizes are width, length, angle as well as the diameter of bores, for example.

The position of bores is calculated from the measuring data. Furthermore, special software can be used to determine the form of workpieces and to calculate the deviation from geometrical forms.

NOTE

The CMM may be used only for determining geometric parameters of workpieces. The CMM must not be used for any purposes other than those listed below.

Only workpieces and objects required for measurement may be placed on the measuring table.

Functions of the CMM:

- Optical probing of the workpiece in the vertical direction.
Probing is performed by means of an optical probing system. For measurement, the workpieces must be placed on the measuring table.
The CMM has a moving axis. The optical probing system can be moved in Z direction.
- The measuring table is a fixed glass plate. The glass plate is installed in a steel frame. Workpiece pallets can be put on the steel frame. Stops, workpiece holders and additional illumination units can be also fastened to the steel frame.
The glass plate is used as deposit surface for workpieces and transparent fixtures.

Reasonably foreseeable misuse

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

Examples of reasonably foreseeable misuse:

- The CMM must not be used to measure living objects or parts of the body.

Optical probe

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

CMM probing systems are designed for determining the *coordinates* of a workpiece. The O-SELECT machine uses an optical measurement method for it.

Safe operation of the CMM

Requirements for the operator

The operator must ensure the following:

- The installation site requirements must be met.
- The operator has been properly instructed regarding handling and operation of the CMM.
- The operator has received the operating instructions for working with the CMM. The operating instructions should be suitable for all local and operating conditions and available in the language spoken by the operating personnel.

The operating instructions must always be available within easy reach of the CMM.

- The user must know and observe the safety instructions.
- Maintenance work and work on electrical equipment must be carried out only by competent specialists.

Defining a competent specialist

A competent specialist is a person who reliably performs the required work and who is able to recognize and avoid possible risks.

Performing a task is subject to the following conditions:

- The competent specialist has been authorized by the person responsible for the safety of the coordinate measuring machine to perform the required tasks.
- The competent specialist must have relevant training and experience.
- The competent specialist must have been instructed in the use of this device.
- The competent specialist must be familiar with the relevant standards, regulations, accident prevention regulations and present operating conditions.

Work to be carried out by a competent specialist

- CMM installation
- Maintenance work on the CMM
- Work on the electrical equipment, e.g. control unit

- Preparation of the measurement: workpiece setting; creation of measurement plans and CNC programs.

Requirements for safe use

Reading the documentation

Proper use of the CMM is essential for a safe measuring run. It is assumed that you are familiar with the documents included in the scope of delivery. Read the CMM documents.

Prerequisites

In order to ensure safe operation of the coordinate measuring machine (CMM), certain requirements must be met.

Observe the following:

- 1 Ensure that the operating instructions for the CMM and the optional equipment are always available at the CMM.
- 2 Follow the generally recognized accident prevention regulations and safety instructions.
- 3 The CMM may only be used outside explosion-proof areas.
- 4 The CMM may only be used indoors.
- 5 Do not install the CMM in damp rooms. Avoid dripping and splash water in the vicinity of the machine.
- 6 Wear clothing suitable for the work.
- 7 Observe the maximum permissible workpiece weight (4 kg) and the maximum workpiece dimensions (height = 200 mm).
- 8 Do not place vessels filled with liquid on the machine. Make sure that no liquid can penetrate the machine.
- 9 Ensure sufficient illumination when operating the CMM.
- 10 Operate the CMM only with the protective devices provided for that purpose.
Do not remove any covers, protective equipment or warning signs.
- 11 Do not conduct routes through the working area.
- 12 Carry out a visual check before start-up.
- 13 Only use original power supply unit and mains cable which are in perfect condition.
- 14 Establish safe cable connections from the mains to the computer.

- 15** Insert the power plugs only in sockets equipped with a perfect protective ground connection. The power plug is used for disconnecting from the mains. The power plug must be easily accessible to allow disconnection from the mains in case of error.
- 16** Do not apply force while inserting electrical plug-in connectors (connectors, sockets). Check whether the connector matches the socket. If you detect damage to the plug-in connection, have the damage repaired by the ZEISS service.
- 17** Pull the power connector immediately if you notice smoke, sparks or unusual noise on your machine. Do not use the machine until it has been repaired by the ZEISS service.
- 18** Clean the measuring table and the workpiece.
- 19** Do not exceed the measuring volume. The workpiece must not be greater than the measuring volume.



⚠ CAUTION

Tilting of the workpiece in case of overhanging workpiece areas and collision of the workpiece with the objective.

Crushing of parts of the body.

Damage to the CMM and the workpiece.

- Observe the clearance distance of the objective to the workpiece.

-
- 20** Perform a homing run.
 - 21** Observe the notes regarding the end of the measuring operation.
 - 22** Pull the power plug before maintaining the machine.

No warranty claims

The manufacturer of the machine cannot be held liable for any damage caused by unauthorized interventions in the measuring system. In case of unauthorized manipulations, all warranty claims against the manufacturer and supplier as well as the validity of the EC declaration of conformity are void.

Safety instructions

NOTE

The »Safety« chapter contains a section with the basic safety instructions. Where necessary, further safety instructions are mentioned in these operating instructions. Read and follow all safety instructions.

Requirements for CNC program runs

The following points must be observed during the CNC program run:

- Only authorized persons may work with the CMM.
- The accessibility to the CMM by unauthorized persons must be prevented by taking the corresponding measures.
- The technician responsible for set-up must instruct the operator as to the operating position of the CMM.
- Safety devices must be used.
- It is necessary to make sure that no one is within the demarcated area.
- If the permanent presence of the operator during the series measurement mode cannot be guaranteed, the relevant safety regulations for unattended operation must be observed.

Basic safety instructions

Electric voltage



⚠ WARNING

Electric shock on electrical lines in the CMM.

Cardiac arrest, burns, and death.

- ✓ Any work on the CMM must be carried out only by a skilled electrician. The cover of the CMM may be removed only by a skilled electrician when the CMM is out of operation. The following measures need to be taken for this:
 - Switch the CMM off.
 - Remove the power plug.

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 occur in the Z axis. Sharp-edged workpieces increase the risk.



⚠ WARNING

Risk of injury caused by travel movement.

Crushing and cutting of parts of the body.

- Keep a safe distance to moving parts during manual operation.
- Ensure that nobody is at risk during manual operation of the machine.

CNC program

During a CNC program run, the CMM travels at the maximum speed in the Z axis.



⚠ CAUTION

Risk of injury during collision caused by incorrect CNC programs.

Crushing and cutting of parts of the body.

Damage to CMM and workpiece

- If a fault causes unexpected movements of the Z axis, pull the power plug.

Risk of tripping or stumbling



⚠ CAUTION

Risk of injury due to stumbling over exposed cables and accessories.

Falling and concussion injuries on head and body.

- ✓ Cables and accessories must not become a risk of tripping and stumbling.
- Run the cables in cable ducts.
- Install accessories securely at the predefined locations.

Suitable clothing

Certain work on the CMM presents a risk of injury caused by unsuitable clothing. This applies particularly to the loading of the measuring table and the workpiece set-up on the measuring table.



⚠ CAUTION

Risk of injury caused by heavy, sharp-edged workpieces.

Tearing of fingers and crushing of feet.

- Wear safety shoes.
- Wear safety gloves.

General measures of precaution

Delimiting the working area

The working area around the CMM should be delimited especially with regard to conduct routes, for example by means of a suitable marking on the floor.

Do not alter the CMM

If the delivered version of the CMM is modified, safe operation of the CMM is no longer guaranteed.

- Do not carry out any modifications on the CMM.

Maintenance work

Any work and maintenance work on the CMM may only be carried out by ZEISS service engineers or trained personnel authorized by ZEISS .

Sufficient illumination

Sufficient illumination is required for safe operation of the CMM.

- Ensure sufficient illumination before starting the CMM.

Visual check

A visual check must be carried out before switching the CMM on. The CMM may be switched on only if it is in perfect condition.

- Make sure that the CMM is in perfect condition.

Work on the CMM

Make sure that no travel movements are possible when working on the CMM.

- Switch the CMM off before proceeding with the following work:
 - Preparing the workpiece and the probing system
 - Care measures

Safety instructions

Risk of radiation

Several light sources are used to illuminate the workpiece and its immediate vicinity.



⚠ CAUTION

Risk of injury due to optical radiation.

Direct and prolonged exposure to the light sources can damage the eyes.

- Do not look into the illumination for a longer period of time during the operation of the light source.

Classification of the LEDs according to EN 62471-1:

Outer ring light	Free group Wavelengths: 300 - 700 nm
Inner ring light	Free group Wavelengths: 300 - 700 nm
Back lighting and coaxial incident light	Free group Wavelengths: 300 - 700 nm

Safety on the CMM

Safety symbols on the CMM

The following symbols are attached to the power supply unit of the CMM.



Danger symbol for electric voltage:
This symbol indicates a risk to life and limb.



Danger symbol:
This symbol indicates a danger to people and the CMM as well as to its components.

NOTE

Only the power supply unit included in the scope of delivery may be used.

NOTE

Any work on the CMM must be carried out only by a skilled electrician.

Safety devices

The coordinate measuring machine (CMM) is equipped with safety devices.

The standard safety devices include:

- Mechanical drive-force limitation in the Z axis:
150 N maximum.

Chapter 3

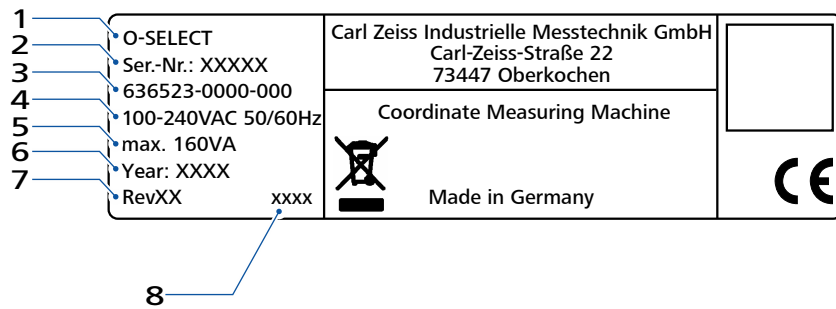
Description

This chapter contains:

Identification of a CMM	3-2
Design	3-3
Components and functions	3-4
Control and operation.....	3-6
Probing system	3-8

Identification of a CMM

The identification of your CMM is given on the type plate. The type plate is located on the CMM on the rear side of the basic body.



Type plate

- 1 Series and designation of the CMM type
- 2 Serial number
- 3 Number of the CMM type
- 4 Line voltage and frequency
- 5 Power consumption
- 6 Year of manufacture
- 7 Revision number
- 8 Designation of the type plate manufacturer

Design

Design of the CMM



- 1 Cover for drive and guiding systems
- 2 Probing system
- 3 Measuring table with backlight
- 4 Switch for switching on the CMM
- 5 Base
- 6 Connections (on rear side)

Components and functions

Measuring table

Backlight table

The measuring table is a backlight table with a light source below the glass plate. The light source is used for optical measurements. It provides a good contrast between the workpiece and its surroundings during the measurement.

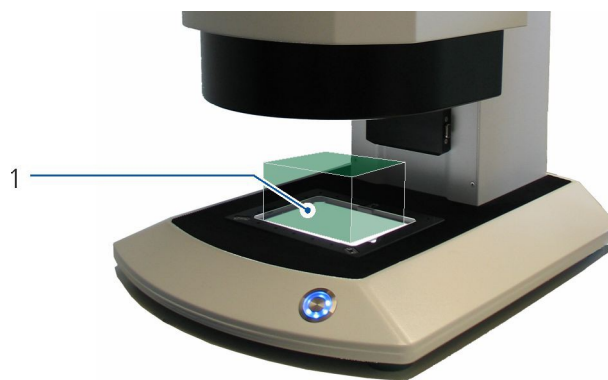
The workpieces to be measured are placed on the measuring table. The workpieces are either placed directly on the glass plate or clamped in transparent fixtures which can then be placed on the glass plate.

NOTE

Transparent fixtures may adversely affect the measuring results.

Measuring volume

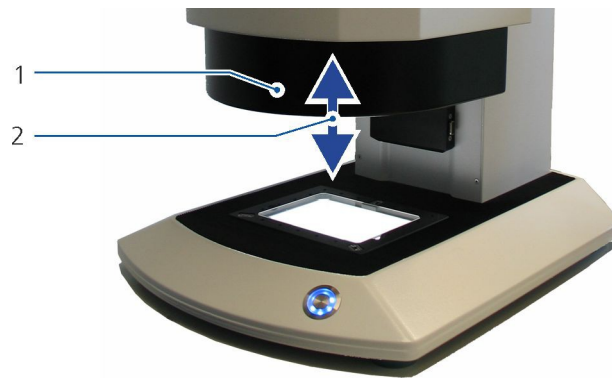
The measuring volume is the space in which workpieces can be optically probed.



1 Measuring volume

Coordinate axes

Vertical movement in the Z axes is possible with the coordinate measuring machine.



Travel directions

- 1 Probing system
- 2 Travel directions

Qualification

The qualification is carried out at the factory or by a ZEISS service engineer.

Control and operation

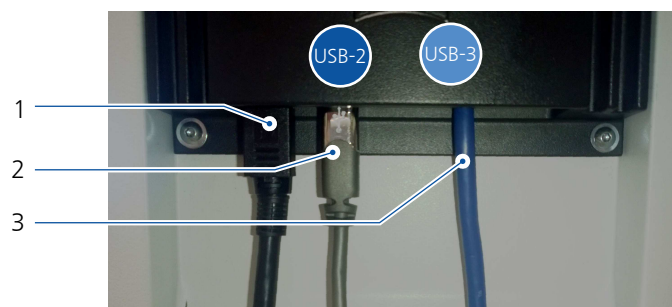
Control

CMM

The CMM is controlled by means of the software on the supplied PC

Connections on the CMM

The connection sockets are located on the rear side of the CMM.



- 1 CMM power supply
- 2 CMM control (USB-2)
- 3 Probing system control (USB-3)

Power supply of the CMM



Damage to the power supply unit

Use of a wrong connector may damage the power supply unit.

- Use the connector which is typical for the country of use.

A 24 V power supply unit is required for the power supply of the CMM.

NOTE

To operate the CMM, use only the supplied original power supply unit.



- 1 Power supply connection
- 2 Connection for CMM, 24 V

Control of the CMM

The firmware in the computer controls the travel movements of the CMM. The USB connecting cable for control must be connected to a free computer USB port without the X300 designation according to the installation instructions.

Probing system

The optical probing system is connected to the computer via the USB interface card (X300).



Probing system

Probing system

O-SELECT is equipped with an optical probing system.



- 1 Optical probing system
- 2 Telecentric measuring objective
- 3 LED of the inner illumination ring
- 4 LED of the outer illumination ring

A 2D camera sensor is used for measurements with the optical probing system.

Use

The optical probing system is used for the following applications:

- Measurement of the geometric characteristics of the object, no height measurement or distance measurement in the Z plane.

Application distinction in backlight measurement, incident light measurement and mixed operation.

Telecentric objective

The telecentric measuring objective has an image diagonal of 150 mm. The magnification is approx. 1:10.

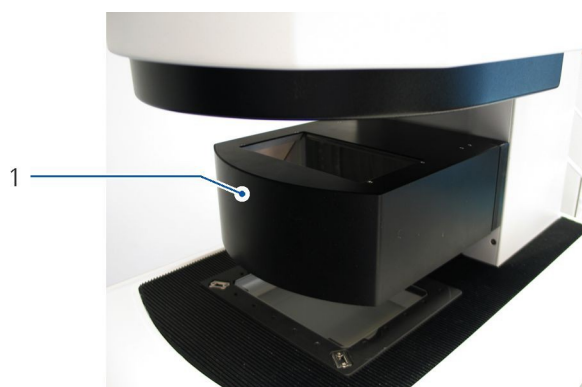
The optical probing system has a digital zoom controlled by the software.

Illumination

There are several ways of illuminating the workpiece. Which illumination type is selected depends on the measuring job.

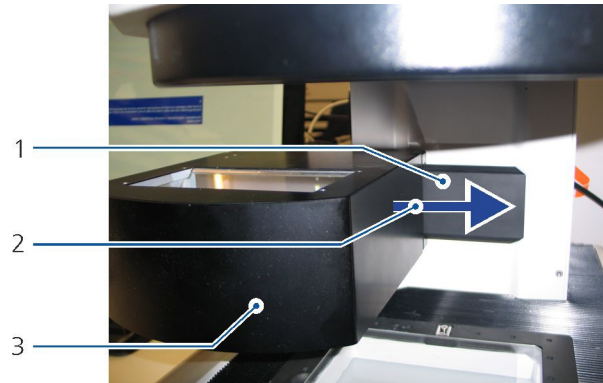
Illumination options:

Illumination type	Description
Backlight	<p>The illumination source for the backlight is located under the measuring table.</p> <p>The backlight is the illumination type with the strongest contrasts. It can be used for measuring perforations or outer edges.</p> <p>This illumination type provides clear contours with flat components.</p>
Outer ring light for lateral illumination	<p>The ring light consists of 80 white LEDs for the homogenous illumination of the entire object field in the focal plane of the objective.</p> <p>The LEDs can be switched on or off segmentally.</p> <p>The outer ring light provides complete lateral illumination. It is particularly suitable for highlighting contrasts of three-dimensional characteristics. It is possible to use shading for workpieces extended in height.</p> <p>The intensity of the LEDs can be regulated and the LEDs can be automatically switched on and off in the CNC run.</p>
Inner ring light for a steeper illuminating angle	<p>The ring light consists of 80 white LEDs for the homogenous illumination of the entire object field in the focal plane of the objective.</p> <p>The LEDs can be switched on or off segmentally.</p> <p>The inner ring light provides complete lateral illumination. It is particularly suitable for highlighting contrasts of three-dimensional characteristics. It is possible to use shading for workpieces extended in height.</p> <p>The intensity of the LEDs can be regulated and the LEDs can be automatically switched on and off in the CNC run.</p>
Coaxial incident light (option) [1]	<p>The coaxial light illuminates the workpiece vertically from the objective axis. In particular with deep bores, it is an important illumination source for checking dimensional, form and position tolerances on the bore bottom.</p>



1 Incident light housing

Mounting the incident light housing



- 1 Dovetail guide with electrical contacting
- 2 Sliding direction
- 3 Incident light housing

Chapter

4

Technical data

This chapter contains:

CMM	4-2
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CMM

Note

The table below lists a selection of technical data.

General data

Dimensions and weight		Value
Dimensions		
Width	[mm]	400
Length	[mm]	510
Height	[mm]	737
Weight		
CMM (without packaging)	[kg]	27
Workpiece, max.	[kg]	4
Noise level of the CMM	[dBA]	<70
Travel speed	[mm/s]	0 to 40
Travel range in Z axis	[mm]	75
Measuring range X/Y/diagonal	[mm]	114/91/146

Characteristic values of the coordinate measuring machine

Category	Characteristic value
Overvoltage category (IEC)	II
Overvoltage category (CSA)	II
Degree of pollution	2
Protection class	I

Electrical data

Line voltage	100 - 240 V AC
--------------	----------------

Frequency	50 to 60 Hz
Power consumption	Max. 160 VA
Fuse (provided by the customer):	
with 230 V or 240 V	C 16 A
with 100 V or 125 V	15 A

Environmental conditions

The following conditions must be fulfilled to guarantee perfect operation of the coordinate measuring machine.

Ambient temperature for operational readiness	+ 10 °C to + 35 °C
Relative humidity	20 % to 80 % (without condensation)
Room temperature for measuring operation	20 °C \pm 2 K
Elevation above NHN	max. 2000 m above NHN

Chapter 5

Transport and installation

This chapter contains:

Transport	5-2
Installation	5-3

Transport

To be observed on delivery

The coordinate measuring machine is delivered in disposable cardboard packaging on a transport pallet.

Requirements regarding the fork-lift truck

A fork-lift truck with sufficient carrying capacity has to be used for transport. The fork-lift truck must be suitable for the weight. In order to avoid tilting of the load, the forks must reach completely underneath the transport pallet or the shipping container. In addition, the fork arm width must be variable. Information on weight and dimensions can be found in chapter ➤ *Technical data* [⇒ 4-2].

NOTE

The packing material or the shipping containers must not be damaged. The packing material may only be removed at the installation site.

Ambient temperature + 5 °C to + 40 °C

The transport pallets or shipping containers must be stored in a covered area until the machine is installed. The ambient temperature in the storage area must be within + 5 °C to + 40 °C.

Transport conditions

The transport route from the storage area to the installation site must be selected carefully. It might be necessary to prepare it to meet the requirements.

Prerequisites for transport

Observe the following regarding transport:

- Weight: Is the bearing capacity of the floor along the routes suitable for the weight of the shipping containers and the fork-lift truck?
- Dimensions: Are the height and width of the doorways and routes sufficient for the transport containers and the fork-lift truck?
- Fork-lift truck: Does the fork-lift truck comply with the requirements?

Installation

Selecting the installation site

The CMM has been designed as table unit. The table must meet the following requirements. The following questions must be clarified:

- Is the bearing capacity of the table provided (≥ 30 kg)?
- Is there sufficient space for the CMM, the PC and the monitor?
- Does the installation site comply with all the environmental conditions required for perfect operation of the CMM?
- Is the installation site free from coarse dirt particles such as casting sand and metal chips?
- Are there problems with the power supply?

Prerequisites for installation

The customer can install the CMM. A ZEISS service engineer is not required for this.

Prior to installing the CMM, the following preparations must be made:

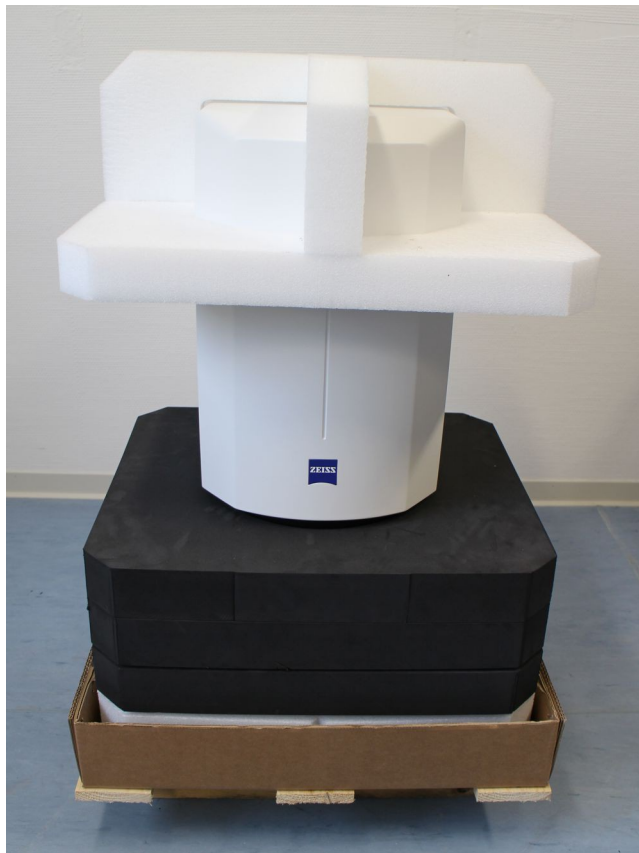
- Install power supply
- Adapt the CMM to room temperature.

Unpacking the CMM

- 1 Remove the upper cardboard cover.



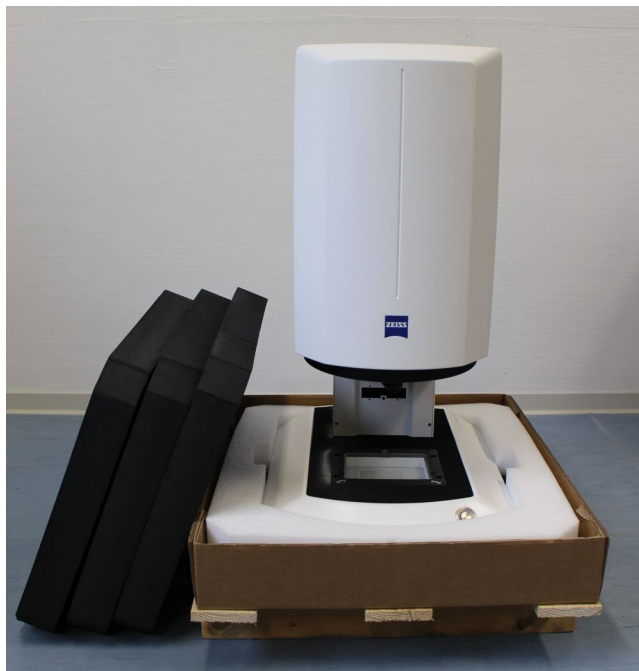
- 2 Remove the cardboard from the wooden pallet.



- 3 Remove the upper white foam cushioning from the front housing.

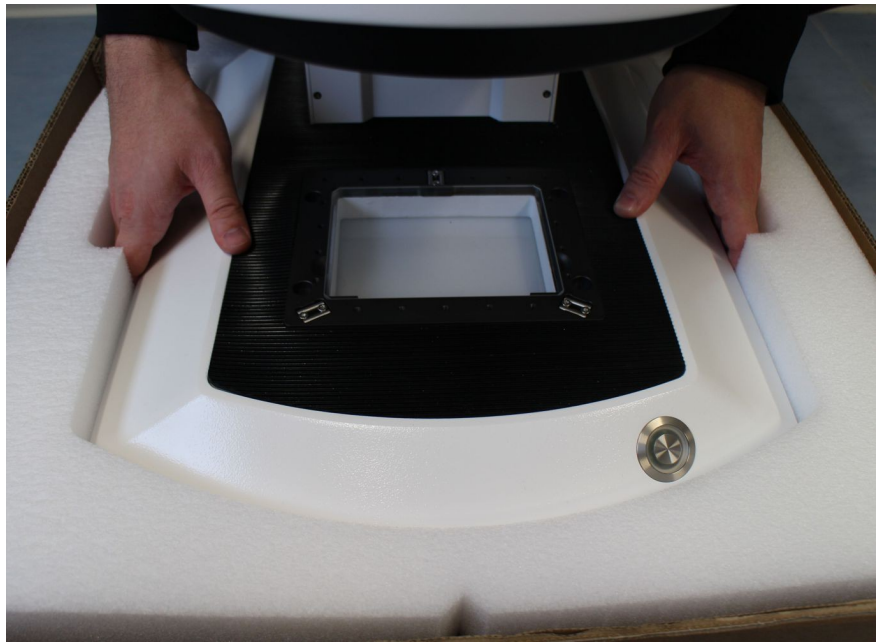


- 4 Pull out forward the black safety cushions located between measuring table and objective.



Installation of the CMM

- 1 Remove the CMM from the rear side due to the center of gravity and the handles in the foam material.



⚠ CAUTION

Back injuries caused by the CMM weight

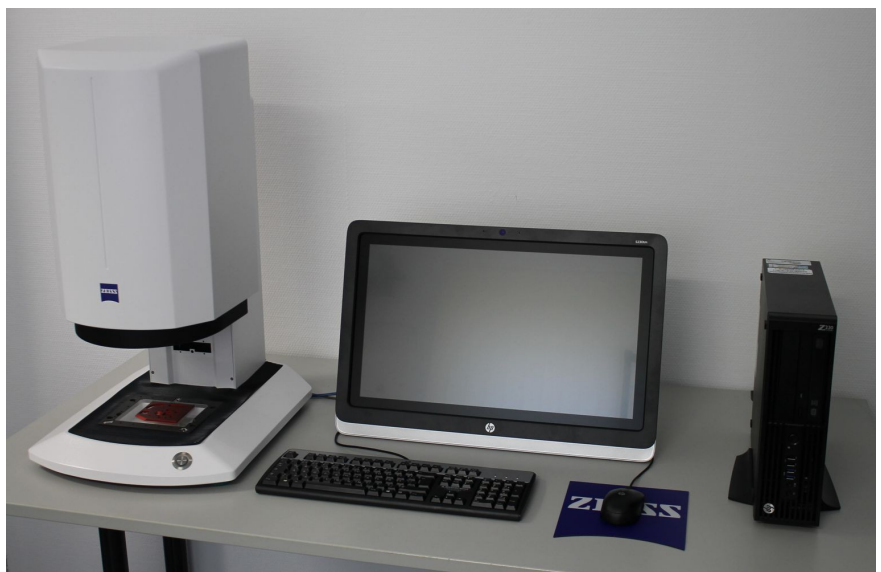
Back injuries caused by lifting the CMM.

- Lift the CMM in a back-friendly way.

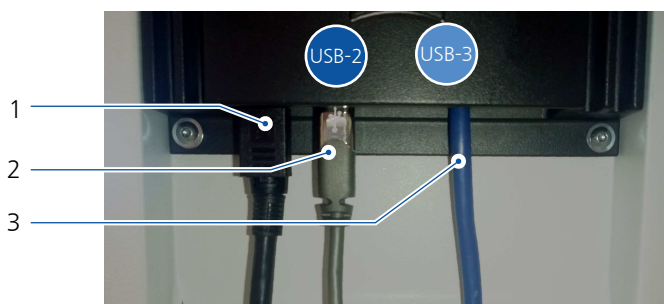
- 2 Place the CMM on the desired table.

Connecting the CMM

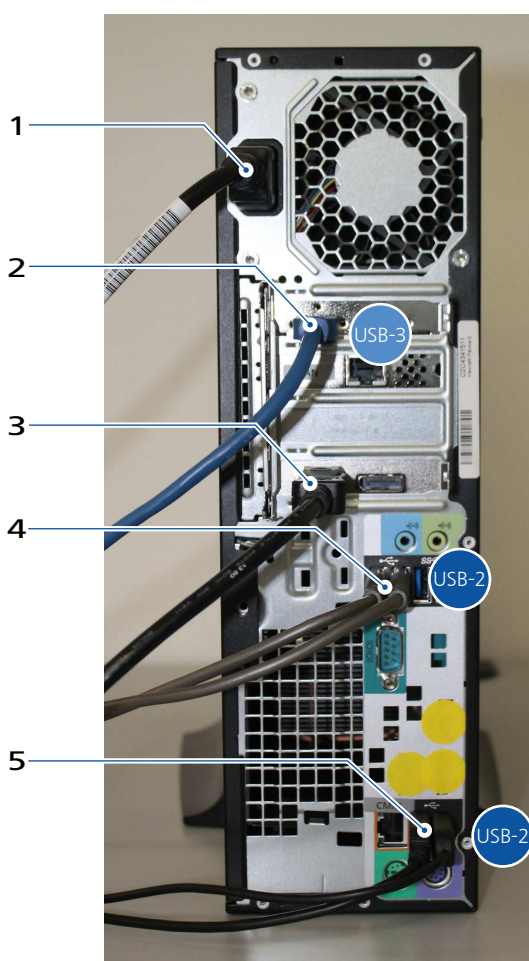
- 1 Set up the CMM and all components (monitor, computer, keyboard and mouse) on your table.



- Connect cables to O-SELECT.



- 2 Connect the power supply (1).
 - 3 Connect the USB cable for the communication with the control unit (2).
 - 4 The USB cable (Labeling: X300) for the data transfer of the camera is installed permanently (3).
- Connect cables to PC.



- 5 Connect the power supply of the PC (1).

- 6** Connect the USB cable (Labeling: X300) for the data transfer of the camera to the PCI express card (2).
- 7** Connect the display port between monitor and PC (3).
- 8** Connect the USB cable between the control unit and the PC (4). Connect the touch screen function of the monitor to the PC using USB cable.
- 9** Connect mouse and keyboard (5).
 - Connect monitor.



- 10** Connect the power supply of the monitor (1).
- 11** Connect the display port to the monitor (2).
- 12** Connect the touch function using the USB cable (3).

Chapter 6

Start-up

This chapter contains:

Preparations for start-up	6-2
Switching the CMM on	6-3
Setting up the workpiece	6-4
Start-up checklist	6-6

Preparations for start-up

Before you start!

What you should know!

The preparation includes activities that are not necessary to be carried out on a daily or weekly basis. One exception to this is the visual check. The visual check should be part of your daily measuring operation routine.

Connecting the power supply

The electrical power supply must be close to the installation site in order to be able to make the electrical connection of the CMM. The corresponding measures must be taken before installing the CMM.

- Please observe the electric data.

Visual check and check list

The visual check must be part of the routine work to be carried out during the daily measuring operation. Before switching the CMM on, make sure by means of a visual check that the measuring system components do not show any visible damage.

In case of damage, ...

Start-up of the CMM is not allowed in case of damage to the CMM.

1 In this case, protect the CMM against switching on.

- Remove the power plug.

2 Inform the ZEISS service division.

Cable for power supply

The cable must be in perfect condition. It must not be bent nor damaged.

- Ensure that no heavy objects are lying on the cable.

Switching the CMM on

Safety measures and notes

Visual check

NOTE

A visual check must be carried out before switching the CMM on. The CMM may be switched on only if it is in perfect condition.

- Make sure that the CMM is in perfect condition.

Switching on

- 1 Remove the protective cap of the objective and store it with the operating instructions.



- 2 Computer and CMM must be switched on separately, the sequence does not matter.
The switch is lit in blue.

Setting up the workpiece

Safety instructions

Setting up the workpiece



⚠ CAUTION

Risk of injury due to the vertical movement of the objective

Crushing of body parts by the weight of the objective and the peripheral units. Sharp-edged workpieces increase the risk.

Risk of injury caused by the vertical movement of the objective cannot be excluded as, in case of crushing, the force acting downward is limited to the weight of the objective and peripheral units less the spring force acting upward (<150N).

Cleaning the measuring table and the workpiece

Soiling of the bearing glass plate effects illumination and has a negative impact on it. In addition, it can be located in the focal plane of the objective and thus be measured as well.

There must not be any grease film on the measuring table. Workpieces may slide and fall off of the measuring table, thus presenting a risk to the personnel and the CMM.



⚠ CAUTION

Risk of injury due to a workpiece sliding down as a result of a lubricating film on the measuring table.

Crushing of parts of the body.

- ✓ Make sure that the workpiece and the measuring table are free from lubricants before placing a workpiece on top of it.
- Clean the workpiece and the measuring table before placing a workpiece on the measuring table.
- Remove any greasy or oily substances from the measuring table and the workpiece.

Measures of precaution

Certain safety measures have to be observed to avoid damage to the CMM and the measuring table.

- 1 Observe the permissible workpiece weight and maximum workpiece height. See ➤ *Technical data* [⇒ 4-2].
- 2 Carefully put the workpiece down on the measuring table.
- 3 Do not slide the workpiece on the measuring table.
The surface of the table could be scratched when sliding the workpiece, thus affecting measuring accuracy.



Damage caused by hard particles

Any hard particles lying underneath the workpiece may lead to inaccurate measurements. Moreover, the surface of the measuring table and of the workpiece may be damaged.

- ✓ The workpieces must have full contact with the measuring table.
- Clean the measuring table before placing a workpiece on top of it.
- When using the pallet frame, pay attention to the correct positioning of the three-point support.

Positioning the workpiece

Position the workpiece so that all required measurements can be carried out without changing the workpiece position.

NOTE

Workpiece and fixtures may cause a collision with the moving objective or the ring light.

- Observe the maximum object height.
- Position the workpiece such that no collision can occur during the measuring run.

NOTE

Workpieces made of soft materials may be deformed by chucks, thus falsifying the results of the measurement.

- If necessary, use special chucks to avoid deforming of the workpieces.

NOTE

Do not leave workpieces on the support glass for a longer period of time when the backlight or ring light is on as otherwise measurement errors due to thermal effects may occur.

Start-up checklist

Switch-on order

- Have all devices been switched on in the correct sequence? See ➤ *Switching the CMM on [⇨ 6-3]*
- Power supply connected?
- CMM switched on?
- Computer switched on?

Positioning the workpiece

- Is the workpiece / are the workpieces positioned correctly?
- Is it possible to measure all workpiece dimensions, preferably in the measuring range center, in one cycle?
- Is measurement possible without collision with the objective? For example: Collision with stops, workpiece holders, protruding workpiece parts.
- Is the position of the pallet frame in the three-point support correct?

Chapter

Measuring operation

This chapter contains:

What you should know!.....	7-2
Safety during the measuring operation.....	7-3
Preparation for measuring operation.....	7-5
Optical measurement.....	7-7
Evaluation of the measuring results.....	7-8
Terminating the measuring operation.....	7-10

What you should know!

Measuring software

For the preparation work and the actual measurements, the O-SELECT measuring software is required.

- Please read the corresponding chapters in the operating instructions for the measuring software before operating it.

Safety during the measuring operation

Safety instructions

Measurement



⚠ WARNING

Risk of injury caused by travel movement.

Crushing and cutting of parts of the body.

- Keep a safe distance to moving parts during manual operation.
- Ensure that nobody is at risk during manual operation of the machine.

Measures of precaution

CNC program



Collisions due to CNC programs that have not been tested.

Damage to the CMM and the workpiece.

Magnetic effect



Magnetic effect of workpieces and clamping devices.

Data loss, for example with diskettes and credit cards.

- Keep the data carriers away from magnetic materials.

Liquids



Interferences caused by liquids in electrical equipment.

Impairment of the CMM function.

- Keep liquids away from the CMM to avoid unintentional penetration of liquids into the electrical equipment.

Radio signals



Interferences caused by radio signals.

Malfunctions of the CMM.

- Do not use any cellular phones or walkie-talkies within a 3 m radius of the CMM.

Failures caused by vibrations and shocks

NOTE

Vibrations and shocks may impair the function of the CMM.

Vibrations can be caused, for example, by:

- Heavy machining centers
- Transport devices
- Presses.

Preparation for measuring operation

Prerequisites for a precise measuring run

The following preparations have to be made to ensure maximum accuracy when measuring with the CMM.

NOTE

The CMM must be adapted to room temperature prior to the measuring run.

After the system has been switched on (PC, machine and software until the live image of the camera is displayed), the measurements within the specified performance data, depending on the environmental conditions, can be carried out after a waiting time of *15 - 30 minutes*.

Homing run

Home position

The home position corresponds to the origin of the machine coordinate system. The home position is located at the top in the maximum Z axis position.

NOTE

In case of collision with the workpiece, the reference to the home position will be lost.

Qualification of the optical probe

What you should know!

Why to qualify?

A camera calculates in pixels. A distance, however, is given in mm or μm . In order to calculate the distance, the μm value corresponding to the pixel value must be known.

Qualification

O-SELECT requires no qualification.

The scale calculation is carried out at the factory or by a ZEISS service engineer.

Optical measurement

Starting a measurement on the CMM

Further information on the start and the settings of a measurement can be found in the O-SELECT measuring software documentation.

- 1** To start a measurement, press the switch on the CMM.
The blue LED will briefly light up brightly.

Evaluation of the measuring results

Special features of a digital measuring projector

The measuring projector provides two-dimensional coordinates (X, Y) from an image. The information on the position of the optical system perpendicular to the image plane (Z) serves only for focusing and cannot be used for measurement.

The metrological performance is specified in the focal plane. Due to the change of the distortion along the Z axis, the measurement error outside the focal plane may become greater.

During the movement of the optical system in order to focus (movement of the Z axis), a lateral shift of the optical system (shift in the XY plane) may occur so that elements measured in different Z positions of the optical system should not be combined with each other.

Limit values for deviations

Standard deviation

The result is evaluated according to the standard deviation. There is no maximum standard deviation which applies to all applications. The tolerable deviation depends on many factors: for example resolution and accuracy of the CMM, cleanness of the environment, surface and form of the workpiece.

It might be necessary to decide whether or not to accept measuring inaccuracies.

Causes of scattering and measurement errors

The sources of faults and errors which may lead to increased deviations are listed below.

Source of error	Cause
Home position	– No reference measurement has been carried out.
Qualification	– The bottom side of the qualifying template is damaged.

Source of error	Cause
Workpiece condition	<ul style="list-style-type: none">– The workpiece shows signs of deformation and roughness.– The workpiece is soiled.– The workpiece is covered with oil, for example drops of oil in the small bores.
Status of the CMM	<ul style="list-style-type: none">– Supporting plate is soiled or scratched.
Magnetic field	<ul style="list-style-type: none">– A fault was caused by a magnetic field. <p>Possible causes of a magnetic field: for example workpiece, clamping tool.</p>

Terminating the measuring operation

What does the system shutdown do?

If you put the CMM out of operation and switch it off completely, the following data will be lost:

- Home position
- Information about the current valid coordinate system.

When putting the machine into operation again, a reference point travel has to be carried out.

The desired workpiece coordinate system must be called again in the software.

Shutdown procedure

After the CMM has been shut down, the probe remains in its last position. The space coordinates of its position are lost. Proceed as follows:

- 1** Move the probing system to a safe position.
This position must be inside the measuring volume. Prepare for the next start-up by positioning the probe close to the home position.
- 2** Close the measuring software.
- 3** Shut down the operating system.
- 4** Switch the computer off.
- 5** Press the switch on the CMM for more than 3 seconds to switch off the CMM.

Chapter 8

Errors and faults

This chapter contains:

Errors occurring prior to the measuring run	8-2
Faults during the measuring run	8-3
Special measures.....	8-4
Service features.....	8-5

Errors occurring prior to the measuring run

If the CMM cannot be started, check whether the following errors can be excluded:

Errors	Cause	Measure	Check
The CMM cannot be started.	Wrong start-up sequence.	<ul style="list-style-type: none">– Follow the given sequence.– First, switch on the computer and then the CMM.	
	Power supply is not provided.	<ul style="list-style-type: none">– Check the correct position of the plug-in connections between socket and power supply unit, and power supply unit and CMM	LED on the power supply unit is lit in blue.

- If the above mentioned errors can be excluded, put the CMM out of operation and repeat the start-up procedure.
- If measuring operation is still not possible, call a ZEISS service engineer or our support team. See ➤ *Support* [↪ 8-5]

Faults during the measuring run

The following table helps you to identify and eliminate faults occurring during the measuring run.

NOTE

A fault may have different causes. One or more measures may be necessary to eliminate a certain cause. If two measures are proposed, this does not mean that both of them have to be taken to eliminate the fault.

Fault	Cause	Measure	Check
No travel movement possible.	Collision, for example, with the workpiece.	<ul style="list-style-type: none"> – Eliminate the cause of the collision. – Reinitialize the CMM if necessary. 	
The switch on the CMM flashes blue.	Error	<ul style="list-style-type: none"> – Count how many times the switch lights up in succession and report the number to the ZEISS support. 	
The CMM does not react any longer.	Possibly crash	<ul style="list-style-type: none"> – Press the switch on the CMM for more than 10 seconds. 	

Special measures

After a collision

If the probe collides with an obstacle, the current measurement process will be canceled.

Proceed as follows:

- 1** Eliminate the cause of the collision.
- 2** Restart the measurement process. For more information, please refer to the operating instructions for the O-SELECT measuring software.

NOTE

If the probe collides with an obstacle, the objective, ring light, guideway and other components of the CMM may be damaged. In this case, an exact measuring operation cannot be guaranteed.

- If you detect damage on the CMM, contact a ZEISS service engineer or the support.

Stop Light window

Information on the behavior of the Stop Light window in case of collision can be found in the operating instructions for the O-SELECT measuring software.

Service features

Support

If a fault cannot be eliminated and if it occurs again after a renewed start-up, call a ZEISS service engineer or our support in Oberkochen (Germany).

Telephone numbers for the support:

Within Germany:	0 73 64.20.6337
From abroad:	+49.73 64.20.6337

Teleservice

ZEISS offers fast and economical help in the form of online diagnostic tools. There are several options here.

Teleservice tools

- Online diagnosis of errors
- Online software update
- Online service
- Online training

If you are interested in this type of assistance, call our support team.

Chapter 9

Maintenance and care

This chapter contains:

Maintenance and lubrication.....	9-2
Care.....	9-4

Maintenance and lubrication

Maintenance

Information on maintenance

O-SELECT is a low-maintenance CMM.

To ensure a permanent, perfect functioning of the Z axis, depending on the usage intensity, it is necessary to lubricate the drive system at least once a year. If a maintenance agreement exists, this can be done by the ZEISS service engineer or by a person trained by the ZEISS service engineer.

To carry out maintenance, housing parts must be removed and then mounted again. This procedure is described in detail in the document *Instructions for drive lubrication*.

See also

- ➤ *Support [⇒ 8-5]*

Lubrication

Some components of the CMM must be lubricated within the scope of maintenance work.

NOTE

Lubrication may only be carried out by competent specialists.



⚠ CAUTION

Crushing by moving parts

- Do not operate the machine without cover!
- Moving the slide to a favorable lubricating position by rotating on the vibration damper.

Components to be lubricated:

Component	Type of grease	Procedure
Guide shoes, all	ISO FLEX (see label on the machine)	2 strokes with grease gun
Spindle nuts, all	Dynalub (see label on the machine)	2 strokes with grease gun

Accessories:

Accessories	Order no.	Comment
Grease gun	000000-0519-373	The grease gun supplies approx. 0.6 g per stroke.
ISO FLEX grease	639093-0767-000	ISO FLEX LDS 18 Spezial A, manufacturer: Klüber Lubrication
Dynalub grease	000000-0580-629	Dynalub 520 grease, manufacturer Rexroth
Collecting felt	482-574	Felt, black and self-adhesive, 60 mm x 70 mm x 1 mm



Excess grease must be removed from the guide rails during cleaning of the guideway system or next maintenance.
During maintenance, replace the collecting felt for excess grease, if required.

See also

- ➤ *Support [⇒ 8-5]*

Care

What you should know!

Why is care necessary?

Although the CMM is robust and easy to care for, a certain degree of care is still required. The sensitive measuring system of the CMM requires a certain degree of cleanliness. Even smallest dust particles and soiling (e.g. by oil or fluffs) on the objective or glass supporting plate may cause measuring inaccuracy. The measuring table requires daily care.

NOTE

Avoid any kind of scratches on the supporting glass caused by hard objects or unsuitable cleaning.

The measures for care also include the regular cleaning and checking of certain components.

Cleaning agent:

Detergent	Purpose
Mild cleaning agent (diluted)	Cleaning the housing
Fluff-free cloth, e.g. made of linen	Cleaning the housing Cleaning the glass supporting plate
Isopropanol	Cleaning the glass supporting plate
Dusting brush	Cleaning the objective
Air dust blower	Cleaning the objective

Safety instructions



⚠ WARNING

Risk of injury due to travel movements.

Crushing and cutting of parts of the body.

- ✓ When carrying out care measures, make sure that no travel movements are performed.
- Move the optical head to the topmost position.
- Switch the CMM off.



⚠ CAUTION

Injuries can be caused by sharp edges.

Cutting or tearing of the skin.

- Be very careful and wear appropriate clothing, if required, e.g. gloves.

Measures of precaution



Contamination of components by compressed air.

The functioning of some sensitive components may become impaired by dust particles.

- *Do not use compressed air* for cleaning the CMM.

NOTE

Use *grease-dissolving* and *non-corroding* cleaning agents.

NOTE

Preventive care also includes making sure that all workpieces to be measured are clean. The workpieces must be free from machining residues (e.g. metal chips, oil) and dust.

- Clean the workpieces before placing them on the measuring table.

Overview

The components requiring care are listed below. The time intervals only apply if all installation site requirements are met.

Care measures:

Object	Interval	Type of care
Measuring table (glass plate)	Every week or more frequently	Cleaning with isopropanol
Probe	As required	Dusting brush or air dust blower NOTICE! Do not touch the front lens of the objective!
Covers	Every month	Mild, normal cleaning agent

Care measures

Glass plate of the measuring table

The bearing surfaces of the workpiece or the clamping device and the measuring table must be clean. Any particles lying underneath the bearing surface may lead to inaccurate measurements. Moreover, the surface of the measuring table and of the workpiece may be damaged. Before placing a workpiece on the measuring table, make sure that the measuring table is clean, otherwise possible dirt particles will be also measured.

The glass plate of the measuring table must be clean to guarantee exact measurements.

1 Clean the glass plate with isopropanol.

2 Then dry the glass plate.

Make sure that the glass plate is free from cleaning agent residues.

Objective

The lighting fixture and the lens must be free from dirt particles and smears.

- Clean the glass surfaces using a dry lint-free cloth or a brush.

Covers

You can clean the covers with a damp cloth.

NOTE

The covers may be removed only during maintenance.

Chapter 10

Shutdown and disposal

This chapter contains:

Shutdown.....	10-2
Disposal	10-3

Shutdown

If you want to shut down the CMM for a longer period of time, the CMM must be disconnected from the power supply. We recommend storing the CMM in a dust-protected place.

- 1 Remove the power plug.
- 2 Attach the protective cap of the objective.
- 3 Pack the CMM.



Damage to the CMM caused by wrong packing

The CMM does not function during the next start-up.

- Pack in reverse order to unpacking. See ➤ *Unpacking the CMM* [⇒ 5-3]
 - During packing, ensure that the nose in the white foam material indicates where the front side of the CMM must be.
- 4 Store the CMM in a dust-protected place.
 - Please observe the transport instructions. See ➤ *Transport conditions* [⇒ 5-2].

In addition, we recommend covering the CMM, e.g. by means of a tarpaulin.

See also

- ➤ *Transport* [⇒ 5-2]

Disposal

Package

The regulations of the country in which the CMM is installed apply to the disposal of the packaging material.

CMM

General information

Why is proper disposal necessary?

Proper disposal of the product serves to protect the health and environment.

Resale

If you wish to resell the CMM or its peripherals, you must inform the buyer about his obligation to ensure proper disposal.

Labeling of electronic components

Some components of the CMM carry the symbol shown below. This symbol indicates that the component contains electronic component parts that must not be disposed of with general household waste.



Validity for EU 28 member states

The marked components must be disposed of correctly according to the WEEE directive 2002/96/EC or the respective country-specific legislation applicable within the EU 28 member states. This symbol is only valid within the European Union.

Category 9 (WEEE)

Information about WEEE and RoHS

All products by Carl Zeiss IMT GmbH including the trade goods, such as **TSK** and **OEM** products, sold by us and carrying the ZEISS logo, are assigned to Category 9 of the Appendix of the WEEE Directive:

If the technique permits it, new products are designed according to RoHS.

Hazardous materials according to RoHS:

Hazardous material	Chemical symbol
Lead	Pb
Mercury	Hg
Cadmium	Cd
Hexavalent chromium	Cr ⁶⁺
Polychlorinated biphenyls	PBB
Polybrominated diphenyl ethers	PBDE

Amounts of hazardous materials in CMM components:

CMM components	Hazardous materials					
	Pb	Hg	Cd	Cr ⁶⁺	PBB	PBDE
Control	0	0	0	0	0	0
Cabling	0	0	0	0	0	0
Electromechanics	0	0	0	0	0	0
Mechanics	0	0	0	0	0	0
If a hazardous material is not present or the quantity of the hazardous material is below the limit value, the hazardous material will have the value «0». The weight percentages of the hazardous materials are calculated for the entire system.						

Regulations

The CMM and peripherals can be returned to us for disposal. Of course, it is also possible to set up other regulations for disposal according to the German Electrical and Electronic Equipment Act (ElektroG). The return of the CMM takes place on the basis of the General Terms and Conditions.

For customers within the European Union:

- Please contact your dealer or supplier regarding the disposal of electrical and electronic devices.

Outside the European Union:

- Comply with the corresponding laws and other local regulations regarding the disposal of electrical and electronic devices.

Glossary

Term	Explanation
AGB	Abbreviation for »General Terms and Conditions«
CMM	Abbreviation for »coordinate measuring machine«
CSA	Acronym for »Canadian Standard Association«
ElektroG	German Electrical and Electronic Equipment Act, which implements the EU Directives WEEE and RoHS
IEC	Acronym for »International Electrotechnical Commission«
NHN	Abbreviation for standard elevation zero (elevation of average sea level)
RoHS	Abbreviation for »Restriction of the use of certain Hazardous Substances«; EU Directive on the restriction of the use of certain hazardous substance in electrical and electronic equipment
WEEE	Acronym for »Waste Electrical and Electronic Equipment«; EU Directive on Waste Electrical and Electronic Equipment

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