Reliable Connections

fCAL 1
Calibration Measuring Unit

Instruction manual

Translation of the original instructions

Part no. 08906871
Issue 2511_V01_a

OETIKER Schweiz AG
Spätzstrasse 11
CH-8810 Horgen
Schweiz

1 Information regarding this document

1.1 Area of application

This instruction manual is intended for the safe, proper and efficient use of the device and contains all relevant information on safety, design, function, installation, commissioning, operation, maintenance and disposal.

It is part of the device and corresponds to the technical state-of-the-art at the time of publication.

Please note the following instructions:

- Read the operating instructions carefully before using the device. Make sure that you are thoroughly familiar with all the individual parts, their properties and how they work.
- Follow all instructions in this operating manual. They are a prerequisite to the long and reliable operation of the device.
- Observe all instructions marked with a warning symbol.

For reasons of better readability, the masculine form is used for personal names and personal nouns in this document. Corresponding terms apply to all genders in the interest of equal treatment. The abbreviated language form is for editorial reasons only and does not imply any judgment.

1.2 Storage

This instruction manual is part of the scope of delivery. It must be kept close to the device and must be accessible at all times.

The operator must ensure that the target group [▶ 8] has read and understood it.

It must also be handed over if the device is resold.

1.3 Navigation within this document

Marginal column

The marginal column contains additional information (pictograms, functional illustrations, keywords). They either point out dangers or make it easier to understand and search within the manual.

Cross-references

Cross-references are highlighted in color. They refer to information in other chapters, e.g. Navigation within this document [▶ 4]. These passages can be found via the table of contents or the glossary.

1.4 Presentation conventions

This document contains various symbols and text markups.

Buttons in the operating terminal

In the instructions, the corresponding button that must be pressed in the operating terminal is displayed alongside the text.

Symbols and text labels in the instructions

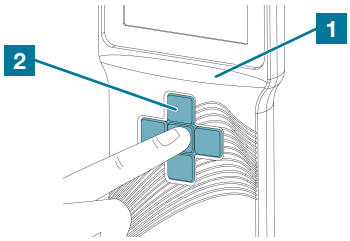
Symbol	Name	Function
•	List	The black dot indicates a list.
▶	Action	The gray triangle indicates actions that must be carried out in the corresponding order.
▶ ▷	Reaction	The white triangle indicates the reaction to an action.
Symbols/icon or text selection on the display (e.g. Measure)	Note regarding option selection	References to symbols/icons or text selections on the display are shown in a display-like format.
(1)	Reference to the picture	The brackets contain references to the positioning in the picture.
Target group [▶ 8]	Cross reference	The cross-reference is used to refer to a chapter within the document. They are linked and can be executed with a mouse click.

Symbol	Name	Function
	User notice	The light bulb indicates user notices and tips for the efficient use of the device.

Graphics

Graphics provide information about the appearance and location of an assembly or function. The parts relevant to a work step are assigned an item number and are colored. The corresponding parts are indicated in the text by a bracket, e. g.:

- ▶ fCAL 1 Measuring Device (MD) (1) Place on a flat surface or hold firmly in your hand.
- ▶ Press and hold the middle button on the control panel (2) for 1.5 seconds.
  - ▷ fCAL 1 Measuring Device (MD) (1) switches on.



1.5 Change notices

All technical information, data and operating instructions contained in this instruction manual correspond to the state-of-the-art at the time of printing and are issued based on our previous experience and findings, according to the best of our knowledge.

We reserve the right to make technical changes within the scope of the further development of the components covered in this instruction manual. Therefore, no claims can be derived from the information, illustrations and descriptions in this instruction manual.

We expressly point out that only original spare parts and original accessories approved by OETIKER Schweiz AG may be used. This also applies analogously to components from other manufacturers.

2 Safety

2.1 General safety information

Every person working with the device must have read and understood this instruction manual and in particular the chapter on safety.

Risk is reduced by observing the safety instructions and complying with the instructed occupational safety measures.

NOTICE

Read the instruction manual and safety instructions before use.

2.2 Warning signs

Warning signs in this manual are used to alert you to property damage and personal injury.

- ▶ Always read and follow these warnings.
- ▶ Compliance with a warning symbol and warning word is mandatory.

The warning signs are divided into four levels: Danger, warning, caution, notice. They contain: Type and source of danger, severity of consequences and measures to avert danger.

Personal hazards

⚠ DANGER

Danger

Signal word to indicate a high risk hazard that will result in immediate death or serious injury.

⚠ WARNING

Warning

Signal word indicating a hazard with medium risk, which could possibly result in death or serious injury.

⚠ CAUTION

Caution

Signal word to indicate a low-risk hazard that could possibly result in minor or moderate injury.

NOTICE

Notice

Signal word for a potentially harmful situation in which the device or an object in its vicinity may be damaged.

2.3 Symbols used

Symbol	Meaning
	Draws attention to dangerous situations with possible personal injury and damage.
	Read the instruction manual and safety instructions before use.

Symbol	Meaning
	**Mandatory general notices** Compliance with the safety instructions is mandatory.
	**Wearing safety goggles is mandatory!** Wearing safety goggles when working on the system is mandatory.
	**DO NOT USE IN DAMP ROOMS!** DO NOT EXPOSE TO RAIN OR USE IN DAMP ROOMS.
	**Correct disposal** The device must not be disposed of in the regular waste.

2.4 General safety instructions

⚠ DANGER

Warning against bodily harm

Failure to observe the personal dangers described in this instruction manual may result in personal injury.

- ▶ Read this instruction manual carefully before commissioning and operating the device.
- ▶ Observe the operating instructions.

2.5 Special safety instructions

⚠ DANGER

Attention: fire and explosion hazard

If batteries are left in the device, there is an acute risk of ignition or explosion if they are damaged or handled improperly.

- ▶ Always remove the batteries from the device before returning it.
- ▶ Do NOT include the batteries with the return shipment.

NOTICE

Warning against malfunctions

Operating the device to carry out functions not described in this instruction manual may damage the device.

- ▶ Read this instruction manual carefully before commissioning and operating the device.
- ▶ Observe the technical specifications stipulated in Technical data [▸ 13].

Maintenance and repair work or service work on this device may only be carried out by an OETIKER service technician (see Target group [▸ 8]).

- Switch off all devices.
- Before carrying out maintenance, repair or service work, disconnect the device from the power supply or remove the inserted batteries.

2.5.1 Noise level

The device does not generate any perceptible noise during operation and does not exceed any relevant sound pressure levels.

2.5.2 Ventilation

The device has no special ventilation requirements. No harmful gases, vapors or particles are generated during operation.

2.6 Safety-conscious operation

The fCAL 1 (CMU) calibration measuring unit is intended exclusively for indoor use.

If the fCAL 1 (CMU) calibration measuring unit is operated within its technical specifications and in compliance with the safety regulations, it does not pose any danger.

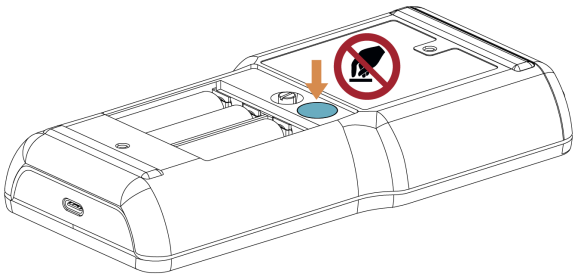
OETIKER accepts no liability for damage to property or personal injury caused by the incorrect interpretation of the measurement results.

All persons entrusted with the installation, commissioning, maintenance or repair of the device must have read and understood this instruction manual.

- Before using the fCAL 1 calibration measuring unit (CMU), check the device for visible damage and ensure that it is in perfect condition.
- Report any defects immediately to your supervisor and stop using the device.
- Error messages may only be acknowledged if the cause of the fault has been rectified and there is no further danger.

2.7 Changes to the device

If the seal on the device is damaged or removed without authorization, any warranty provided by OETIKER shall be rendered null and void.



In particular, extending or modifying the cables and carrying out repairs are prohibited.

Modifications to the device are generally not permitted. However, if modifications are necessary, the following points must be observed:

- Do not make any modifications or additions or perform conversions on the device without the express permission of OETIKER.
- Do not make any changes to the system software without the express permission of OETIKER.
- All conversion measures require written confirmation from OETIKER.

2.8 Target group

The operator is responsible for ensuring the required qualification of the personnel and their proper handling of the device. He must ensure that only competent and duly authorized personnel work on the device.

Competent persons are those who have sufficient knowledge, based on their technical training and experience, so as to be familiar with the commissioning and operation of the device. His qualifications should also enable him to assess the safe working condition of the device in accordance with the relevant occupational health and safety and accident prevention regulations and the generally recognized rules of technology and standards.

	User	Line Manager	Service technician (Oetiker)
Normal operation	X	X	X
Initial commissioning		X	X
Cleaning	X	X	X
Troubleshooting and fault correction		X	X
Maintenance, upkeep, repairs and servicing			X

User

The user must have read and understood this instruction manual in his own language.
The user:

- is familiar with the warnings and safety instructions in this document
- knows the relevant procedures described in this document
- has been trained accordingly
- has been trained by the responsible line manager

The user may:

- operate the device, using its basic functions
- clean the device
- has been instructed on all operating issues (including risks)

Line Manager

The line manager must have read and understood this instruction manual in his own language.
The line manager:

- possesses the knowledge described for the "User"
- trains the user
- can interpret and rectify errors

The line manager may:

- operate the device
- carry out the initial commissioning
- apply settings
- train users in handling the device
- make the original instruction manual available

Service technician (OETIKER)

The service technician must have read and understood this instruction manual in his own language.
The service technician:

- possesses the knowledge described for the "Line Manager"
- can carry out simple service activities in accordance with the instruction manual

The service technician may:

- operate the device
- carry out the initial commissioning
- apply settings
- train users in handling the device
- make the original instruction manual available
- carry out maintenance, servicing and repair work

2.9 Signs and labels on the fCAL 1 calibration measuring unit (CMU)

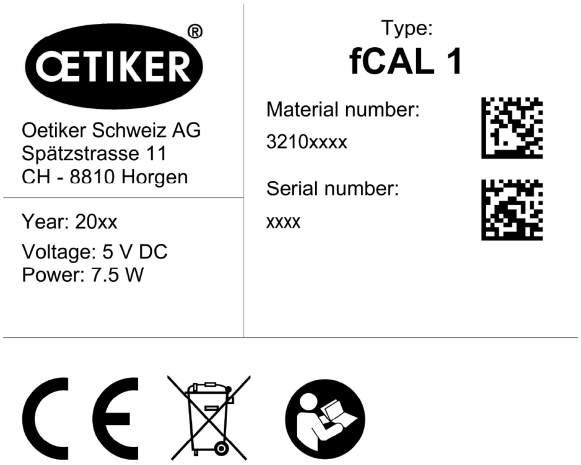
Symbol	Meaning
	**Beware of leaking batteries** Improper use of rechargeable batteries can damage the electronics of the device due to leakage. ▶ Use the NiMH battery type recommended in .

▶ Observe the safety signs and safety plates.
▶ Do not remove the safety signs and safety plates and always keep them in a legible condition.

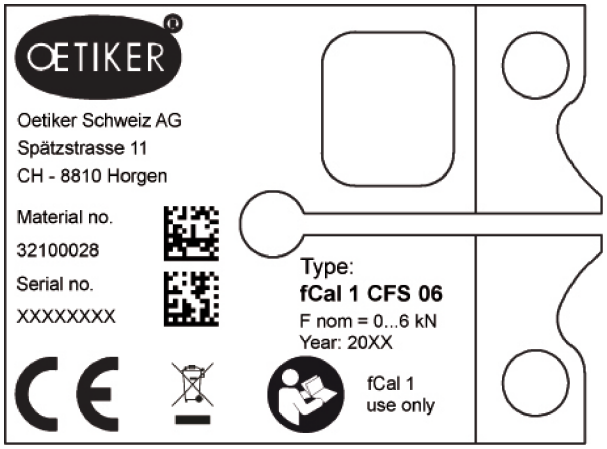
2.10 Rating plates (sample)

The rating plate is used to clearly identify the component. The rating plate is glued to the back of the fCAL 1 measuring device (MD) and lasered directly onto the metallic surface of the fCAL 1 closing force sensor (CFS). It contains the following information:

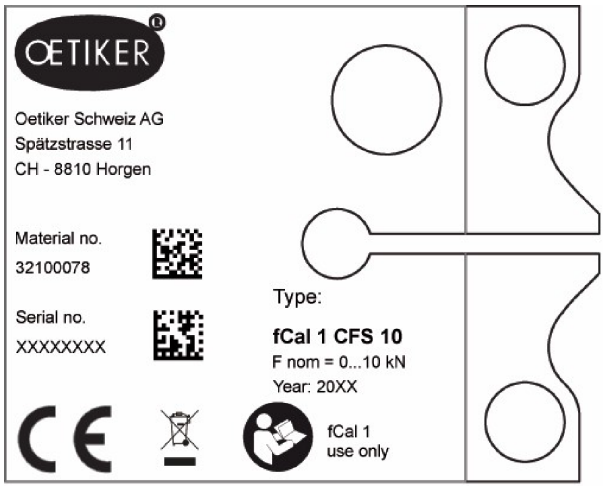
fCAL 1 Measuring Device (MD)



fCAL 1 Closing Force Sensor 6 kN (CFS 06)



fCAL 1 Closing Force Sensor 10 kN (CFS 10)



Symbol	Meaning
	Read the instruction manual and safety instructions before use.
	**Correct disposal** The device must not be disposed of in the regular waste.

3 Intended use

The fCAL 1 (CMU) calibration measuring unit consisting of the fCAL 1 measuring device (MD) and a fCAL 1 closing force sensor (CFS) has been developed according to the state-of-the-art and product-specific standards and is intended exclusively for checking the closing force and for interactive communication with pneumatic/hydraulic tools and other OETIKER tools.

The fCAL 1 calibration measuring unit (CMU) is used in technical production facilities, in industry in the area of commissioning and for process monitoring and quality assurance. Any use beyond this description is considered "not as intended".

Areas of application

- Calibration of OETIKER tools according to the list OETIKER products compatibility list [▸ 12]

The fCAL 1 measuring device (MD) can be operated both wirelessly (in battery mode) and with a wired setup (via the power supply).

The fCAL 1 measuring device (MD) can be used for force measurements in conjunction with a fCAL 1 closing force sensor (CFS).

The display shows the current measured value and the average values, which can then be sent to an OETIKER tool via an external interface or entered manually. In addition, the measured values can also be stored in the internal memory and read directly to a PC via the USB-C interface.

The fCAL 1 calibration measuring unit (CMU) cannot be operated independently and is therefore not suitable for safety applications.

"Improper use" includes, for example

- Force measurements on tools for which the fCAL 1 calibration measuring unit (CMU) is not approved and/or that are not OETIKER products [▸ 12].
- Operating the fCAL 1 calibration measuring unit (CMU) with a sensor not intended for this purpose
- Operating the fCAL 1 closing force sensor (CFS) with a measuring unit not intended for this purpose

Unintended use

The fCAL 1 calibration measuring unit (CMU) corresponds to the state-of-the-art and is safe to operate. Residual dangers exist in the event of improper use and operation by untrained personnel (see Target group [▸ 8]). The operator of the fCAL 1 calibration measuring unit (CMU), not the manufacturer, is responsible for any personal injury or damage to property, resulting from improper use.

3.1 OETIKER products compatibility list

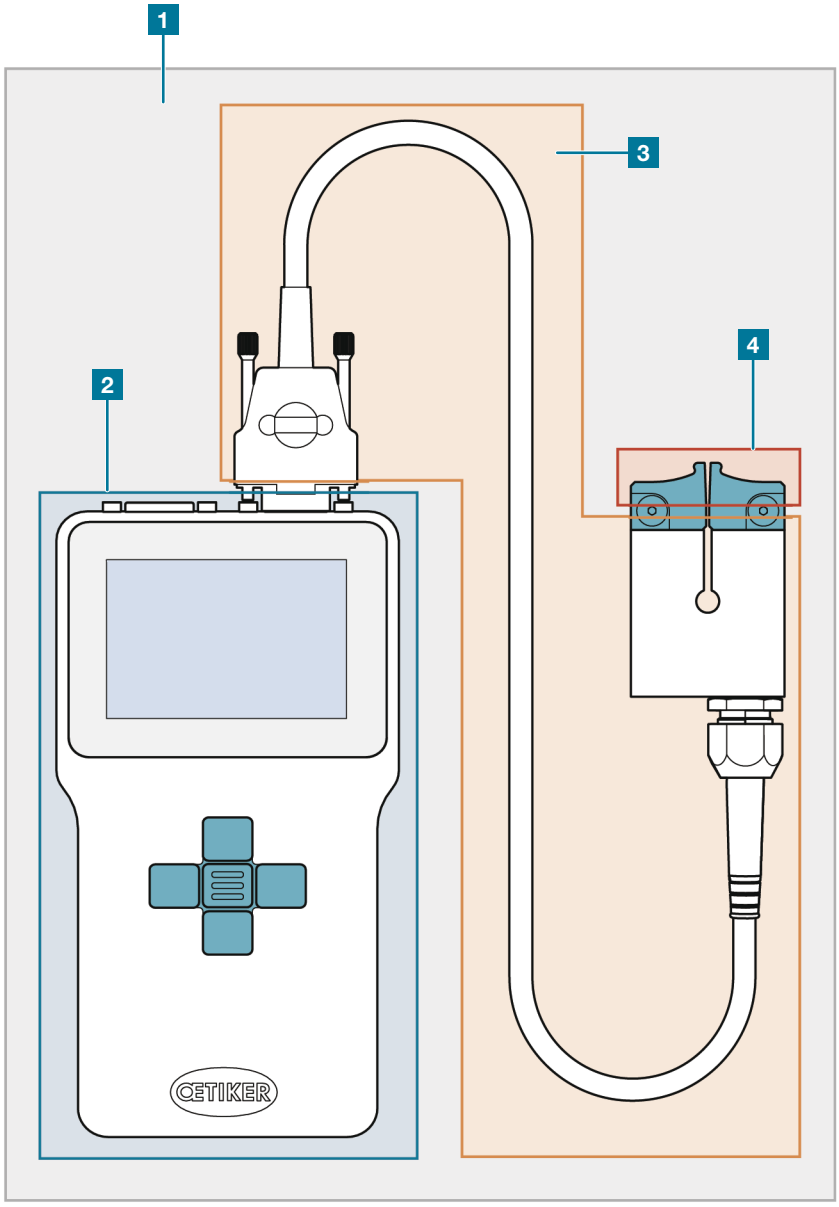
The fCAL 1 calibration measuring unit (CMU) is compatible with the following OETIKER tools:

- "EPC 01" Electronically controlled pneumatic pliers
- "FAST 3000" Stationary tool for mounting strap clamps
- "CP 10 / CP 20" Cordless clamp pincers
- "ELK 02" Electronically controlled pneumatic pincers
- "ME Pincer" mechanical pneumatic pincer series
- "HMK" manual pincers with force monitoring
- "SMART" sensor-monitored assembly and repair tool

4 Technical data

4.1 Technical specifications for the fCAL 1 calibration measuring unit (CMU)

The fCAL 1 Calibration Measuring Unit (CMU) consists of the fCAL 1 Measuring Device (MD) and the fCAL 1 Closing Force Sensor (CFS).



1 fCAL 1 Calibration Measuring Unit (CMU)
2 fCAL 1 Measuring Device (MD)
3 fCAL 1 Closing Force Sensor (CFS)
4 fCAL 1 Closing Force Jaws (CFJ)

fCAL 1 Calibration Measuring Unit (CMU)

Display resolution	1 N

Parameter	Value
Working temperature range	10 to 40°C
Altitude	Max. 2000 m above mean sea level.

Parameter	Value
Pollution level	2 (to EN 61010-1)
Overvoltage category	I (according to EN 61010-1)

Table 1: Ambient conditions

fCAL 1 Measuring Device (MD)

Parameter	Value
Voltage	5 V ±0.25 V
Current / output	• 1500 mA / 7.5 W (operation & battery charging) • 200 mA / 1 W (operation & no battery charging)
USB PD protocol	• USB PD 3.0 standard, profile 1 (operation & battery charging) • No PD protocol (operation & no battery charging)
USB cable	• Any cable with USB-C to USB-C connections. USB-PD-compatible cable not required (operation & battery charging) • Any USB-C cable (operation & no battery charging)
Energy source	• Limited Power Source (LPS) classified power supply according to IEC 62368-1 (USB-C power supply with corresponding safety certification)

Table 2: USB power supply

Parameter	Value
Type	4 x AA NiMh battery 1.2 V 2500 mAh

Table 3: Battery power supply

fCAL 1 Closing Force Sensors (CFS)
6 kN Closing Force Sensor (CFS)

Parameter	Value
Sensor type	Strain gauge (DMS) sensor
Measuring range	200 - 6000 N
Calibrated range	1200 - 6000 N
Accuracy	Up to 2000 N: ± 11 N Above 2000 N: ± 26 N over the full measuring range
Max. Force	6720 N (112%)
Working temperature range	10 to 40°C
Altitude	Max. 2000 m above mean sea level.
Pollution level	3 (according to EN 61010-1)
Overvoltage category	I (according to EN 61010-1)

10 kN Closing Force Sensor (CFS)

Parameter	Value
Sensor type	Strain gauge (DMS) sensor
Measuring range	200 - 10,000 N
Calibrated range	2000 - 10,000 N
Accuracy	± 45 N over the measuring range
Max. Force	11,200 N (112%)
Working temperature range	10 to 40°C

Parameter	Value
Altitude	Max. 2000 m above mean sea level.
Pollution level	3 (according to EN 61010-1)
Overvoltage category	I (according to EN 61010-1)

4.2 Operating mode

The fCAL 1 measuring device (MD) can be operated with 4x AA 1.2V NiMH rechargeable batteries or a USB-C power supply unit. Switching between battery and USB mode is automatic, with USB mode having priority.

USB operation without charging the batteries is possible at any time and there are no special requirements for the USB-C power supply unit. (see Charging the battery [▸ 31]).

4.3 Interfaces

Kind	Interface to	Type	OETIKER interface designation
Data communication	EPC (data)	RS 232	X3
Force measurement	CFS	Analog	X5
PC communication	PC	USB-C	USB-C

Data communication
X3 / RS232 for EPC 01 control unit or other device

Communication parameters	Values
Baud rate [bit/s]	9600 bd
Data bits	8
Parity	even
Stoppbits	1
Protocol	None (text as readable ASCII characters)

X5 for closing force sensor CFS (analog)

Specification	Values
Connection	9-pin SUB-MIN-D socket

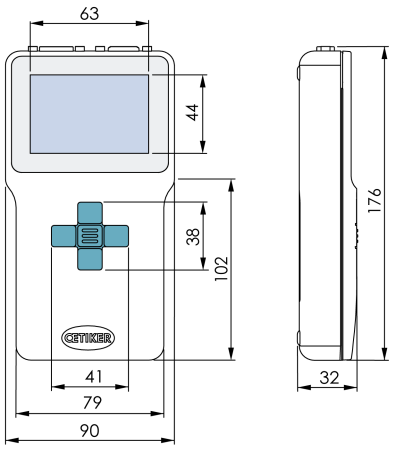
USB-C for PC

Communication parameters	Values
Baud rate [bit/s]	256'000
Data bits	8
Parity	odd
Stoppbits	1
New line at	LF

4.4 Dimensions, weight, materials - fCAL 1 measuring device (MD)

Dimensions [mm]

H x W x D	176 x 90 x 32



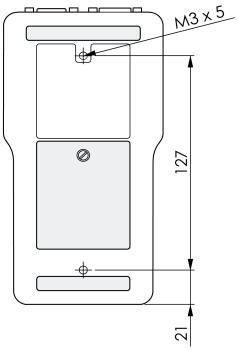
Weight [g]

Housing incl. electronics without batteries	280
Rechargeable batteries (4 pcs. approx. 20 g each)	80

Material

Housing	PC / ABS, black
Control panel	Silicone, light blue
Non-slip rubber feet	Silicone, black

Hole pattern for wall-mounting [mm]



4.4.1 fCAL 1 Display

Dimensions [mm]

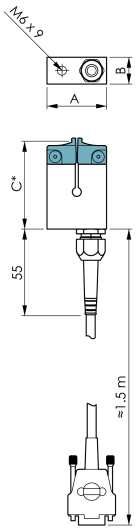
L x H	63 x 44

Material

LCD display	Tempered glass

4.5 Dimensions, weight, materials - fCAL 1 Closing force sensor (CFS)

Dimensions [mm]



	CFS 06	CFS 10
A	40	48
B	18	22
C	59	66.5

H x W x D	59* x 40 x 18
Cable length	1.5 m, must NOT be extended or shortened!
Connection	SUB MIN D 9-pin plug
Thread	M6 for instrument tray

fCAL 1 Closing force jaws (CFJ) variants

The dimension for the force application plane, which is marked with an * in the dimensional drawing, remains unchanged for all jaw shapes and jaw sizes.

Weight [g]

Sensor (without fCAL 1 closing force jaws (CFJ))	300

Material

CFS	Stainless steel

fCAL 1 Closing Force Jaws (CFJ)

The dimensions of the closing force jaws can vary depending on the type of clamp selected. For details on selecting the right closing force jaws for your particular application, please refer to the technical data sheet for the respective clamp type.

5 Design and function

5.1 Design of the fCAL 1 measuring device (MD)

1 Display
2 Keypad
3 Charging port (USB-C)
4 X5 Interface fCAL 1 Closing Force Sensor (CFS)
5 X3 Interface EPC 01 / ELK 02 (RS232)
6 2x M3 Mounting thread for wall installation
7 Battery compartment

5.2 Device operation

The device is operated via the central control panel. This switches it on and off and executes the functions available in the current menu.
The measured values are shown on the backlit LCD display.

The Oetiker logo appears on the display during the switch-on process:

Oetiker Logo Display

The last measurement menu used (Hold / Dynamic) is then displayed.

1 Information area
See also Display information area [▶ 20]

2 Measuring area
See also Display measurement area [▶ 20]

3 Operating area
See also Display operating area [▶ 20]

4 Keypad
See also Switch on/off and confirm [▶ 20]

5.2.1 Display information area

08:15 Time

Hold Measure mode


No sensor connected. Please connect sensor and try again.


Battery load

5.2.2 Display measurement area

/6 Amount of closures

4383 N Average force

5 N Currently acting force

4351 N Measured value of the last closure

5.2.3 Display operating area


Depending on the submenu, different operating elements (symbols/icons) may appear in the operating area to those described here. The additional operating elements are described in detail in the corresponding chapters.


Back


Set zero


Send average measured value to connected OETIKER tool via X3 interface


Save measurement


Delete/reset measurement

5.2.4 Switch on/off and confirm


Press and hold the middle button (1.5 s) to switch the device on or off.
This can also force a restart of the device(reboot [▶ 49]).
Briefly press this button to select and/or confirm the desired function on the display.

5.2.5 Vertical scrolling


Use the up/down button to "scroll" within the selected menu or submenu.
Pressing and holding these buttons ("hold press") enables fast scrolling.

5.2.6 Horizontal menu navigation

The left/right button is used to navigate horizontally in the lower display menu bar.
Pressing and holding these buttons ("hold press") enables fast scrolling.
Both buttons also allow you to switch directly from the first to the last submenu.

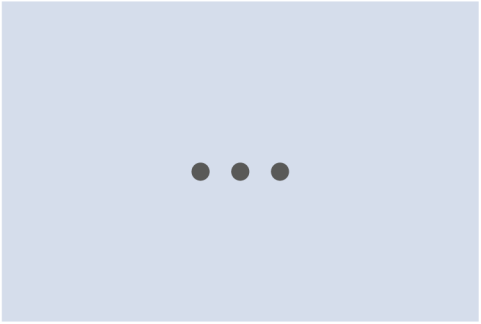
5.3 Device function

When the fCAL 1 measuring device (MD) is switched on, the main menu appears. The control panel can be used to navigate from the main menu to the lower menu levels.

The loading screen appears when the measuring device (MD) is switched on or off. This display may also appear if the device is busy performing a task and cannot process any further user input until the task has been completed.

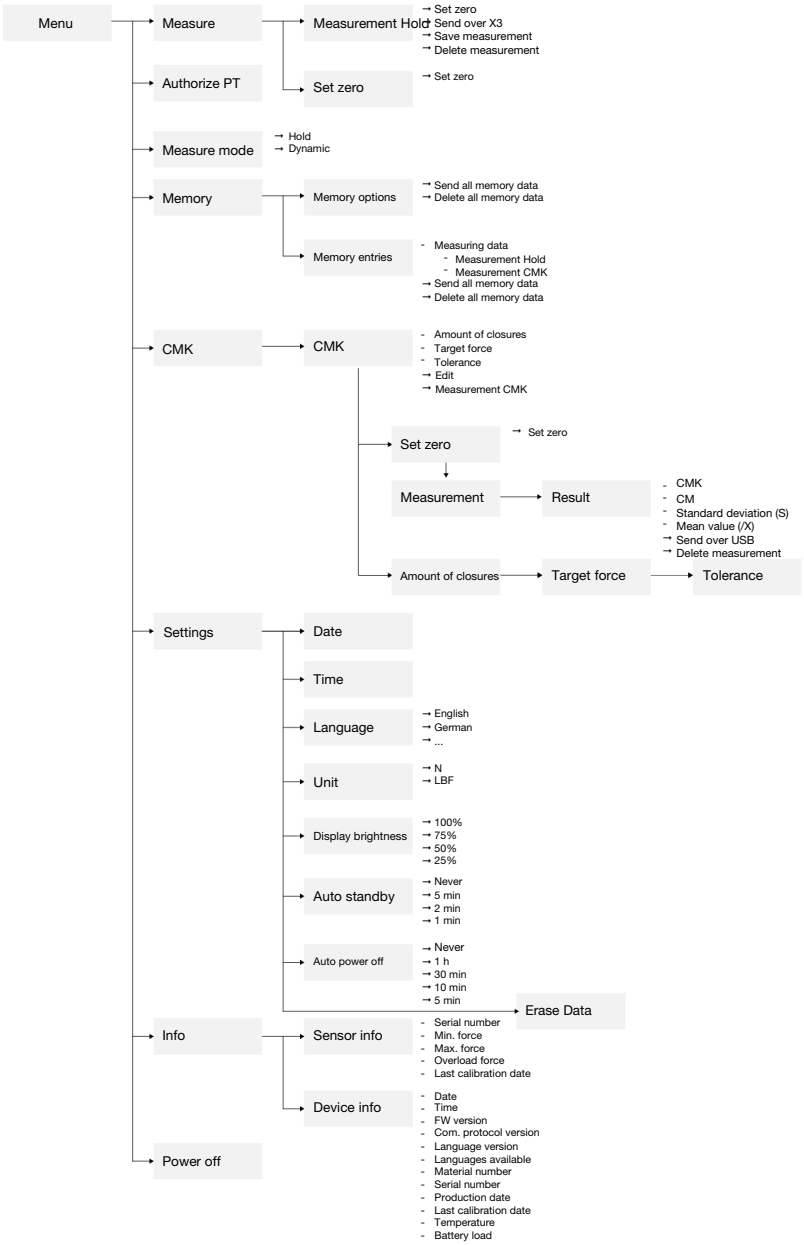
As long as the loading screen is displayed:

- Do not switch off the device.
- Leave the batteries and/or the USB charging cable plugged in.



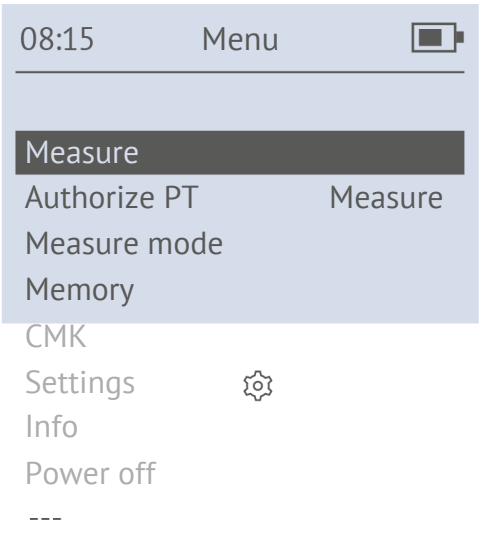
5.3.1 Menu structure

The complete graphical menu structure is shown below:


Menu
Measure
Measurement Hold
→ Set zero
→ Send over X3
→ Save measurement
→ Delete measurement
Set zero
→ Set zero
Authorize PT
Measure mode
→ Hold
→ Dynamic
Memory
Memory options
→ Send all memory data
→ Delete all memory data
Memory entries
- Measuring data
- Measurement Hold
- Measurement CMK
→ Send all memory data
→ Delete all memory data
CMK
CMK
- Amount of closures
- Target force
- Tolerance
→ Edit
→ Measurement CMK
Set zero
→ Set zero
Measurement
Result
- CMK
- CM
- Standard deviation (S)
- Mean value (/X)
→ Send over USB
→ Delete measurement
Amount of closures
Target force
Tolerance
Settings
Date
Time
Language
→ English
→ German
→ ...
Unit
→ N
→ LBF
Display brightness
→ 100%
→ 75%
→ 50%
→ 25%
Auto standby
→ Never
→ 5 min
→ 2 min
→ 1 min
Auto power off
→ Never
→ 1 h
→ 30 min
→ 10 min
→ 5 min
Erase Data
Info
Sensor info
- Serial number
- Min. force
- Max. force
- Overload force
- Last calibration date
Device info
- Date
- Time
- FW version
- Com. protocol version
- Language version
- Languages available
- Material number
- Serial number
- Production date
- Last calibration date
- Temperature
- Battery load
Power off

5.3.2 Main menu

The following submenus can be selected from the main menu of the fCAL 1 measuring device (MD):



- Measure [▶ 23]
- Authorize pincer test [▶ 23] / Authorize PT (-> Measure)
- Measurement mode [▶ 23]
- Memory [▶ 24]
- CMK [▶ 25]
- Settings [▶ 27]
- Info [▶ 28]
- Switch off [▶ 29]

5.3.3 Measure

The "Measure" function can be used to determine the force applied by an Oetiker tool. The determined force is visualized on the fCAL 1 display.

▶ Select the Measure function in the main menu.
▶ Zero the measured values on the display(Hold or Dynamic mode [▶ 23]).
▶ The measured value "0" now appears on the display.
  ▷ The measurement can now be carried out (see Perform measurement [▶ 35]).

5.3.4 Authorize pincer test

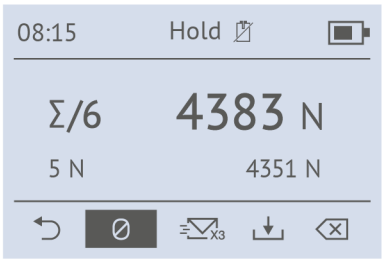
The operated OETIKER tool can be calibrated with the "Authorize pincer test" function.

▶ Select Authorize pincer test in the main menu.
▶ Authorize pincer test [▶ 36]

5.3.5 Measurement mode

The measurement mode can be set to "Dynamic" or "Hold".
By default, "Hold" is activated as the measurement mode for measurements and calibrations.

The maximum force measured is displayed in the Hold measurement mode. The measured value is not shown on the fCAL 1 display until the jaws of the operated OETIKER tool are released.



Dynamic measurement mode is an available option for self-testing the measuring device.

The dynamically varying force applied to the fCAL 1 closing force sensor (CFS) is displayed on the fCAL 1 measuring device (MD) and is continuously adjusted. The displayed measured value can therefore not be used for calibration.

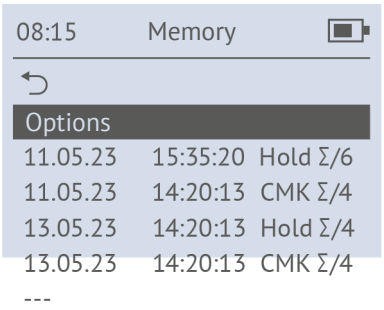
▶ Only activate the "Hold" measurement mode for calibration purposes!

5.3.6 Memory

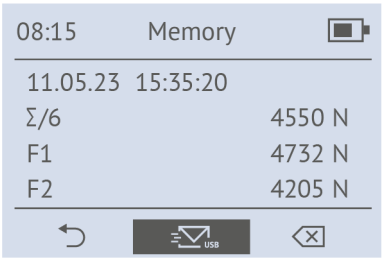
The "Memory" function enables measured values to be saved, managed and recalled.
100 measured values can be stored in each measurement series.
A total of 100 measurement series of 100 measured values each can be saved.

The date and time must be set correctly for the application to work properly.
If the date and time have not yet been set or are no longer up to date, proceed as described in chapter Settings [▶ 27].

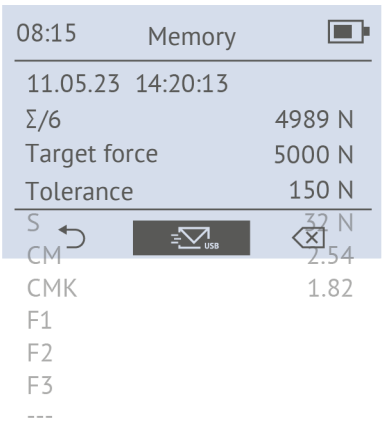
▶ Select the Memory function in the main display to access the memory functions.
▶ Use the Options submenu function to manage the entire measurement series.



Simply call up the stored measured values or measurement series using the date and time.
▶ Select the desired data series to access further details concerning the saved measurement series.



Memory Hold Details Display



Memory CMK Details Display

▶ Send all data

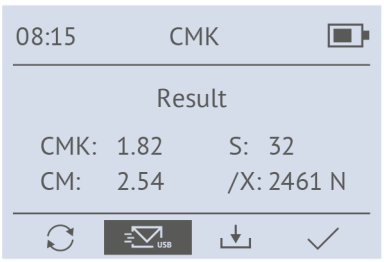
Sends all data via USB

▶ Delete all data

PERMANENTLY deletes all data and clears the memory.

5.3.7 CMK

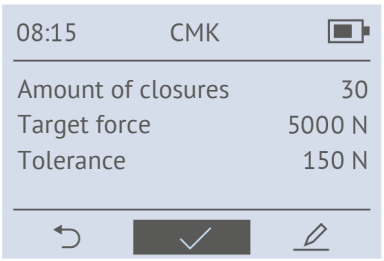
The CMK value (machine capability index) indicates how well a machine is able to produce parts within specified tolerances.
The following values can be read from the fCAL1 display:



- CMK: Information concerning the definition of terms in connection with the use of fCAL 1 Calibration Measuring Unit (CMU) can be requested from the OETIKER Service Center (see Contact details [▶ 54]).
- S: Standard deviation
- CM: as per CMK
- /X: Mean value of the measurements

The "CMK" function can be used to determine the CMK value of the OETIKER tool being operated.

▶ Select the CMK function in the main menu.
  ▷ All default settings that can be applied in connection with a CMK measurement appear on the display.
▶ The preferred default settings can be defined in the CMK submenu, e.g. Amount of closures, Target force, Tolerance.



CMK settings display

▶ Check the default settings.
▶ Edit the values individually via the control panel where necessary.
▶ Follow the menu navigation.

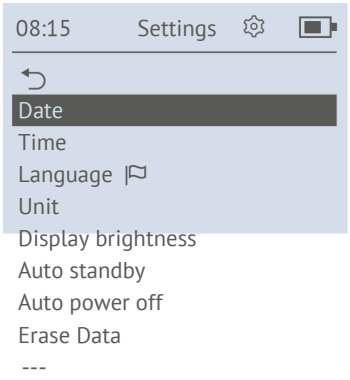
▶ Where necessary, adjust the default settings for the number of closures, target force and tolerance via the control panel, using the up/down button or left/right button.

▶ Confirm your settings.
▶ Zero the value currently shown on your display.

▷ The CMK measurement can now be started (see Determining the CMK value [▶ 37]).

5.3.8 Settings

In the Settings menu, settings such as Date, Time, Language, Unit, Display brightness, etc. can be applied individually on the measuring device.
With the central keypad, the settings within the menu can be configured using the up/down and right/left buttons and confirmed with the middle button.



NOTICE

No automatic summer or winter time changeover
The change from summer to winter time is not automatic on the fCAL 1 measuring device (MD).
▶ When changing the time, set the summer or winter time manually.

Date

In order to produce a time stamp for the recorded data, the system date must be set in the Date submenu. If the batteries have run out or if the device is operated from the mains (without batteries), the date is retained for approx. two weeks. The date must then be reset.

Time

For a time stamp of the recorded data, the system time must be set in the Time submenu. If the batteries have run out or if the device is operated from the mains (without batteries), the time is retained for two weeks. The time must then be reset.

Language

When the fCAL 1 measuring device (MD) is first delivered, the start menu appears in English after switching on. Starting from the start menu, the desired language can be set on the device under the Language menu. Use the up/down button to scroll to the desired language. Press the middle button on the control panel to confirm the language selection.

Available languages on the fCAL 1 measuring device (MD):
Chinese • German • English • French • Italian • Japanese • Korean • Dutch • Polish • Portuguese • Portuguese BR • Romanian • Swedish • Serbian • Slovakian • Slovenian • Spanish • Czech • Turkish • Hungarian

Unit

The desired unit of measurement is set in the Unit menu.
The displays for the settings, tolerance limits and calibration are then shown in the selected unit.
When transferring, the unit of measurement must match the unit of measurement settings applied on the OETIKER tool being used.

The following units of measurement can be set:
N (Newton) - lbf (pound-force)

Display brightness

Various brightness levels can be set in the Display brightness menu.
Lower brightness values can increase energy efficiency and therefore preserve battery life.

The following brightness levels can be set:
100% • 75% • 50% • 25%

Auto standby

The time after which the device switches to standby mode can be set in the Auto standby menu. Standby mode switches off the display backlight, which preserves the battery life.
The device only switches to standby mode after the configured time if no action (by pressing a button, performing measurements or USB communication) has been detected. Each action resets the counter to the configured automatic standby time.

The following auto standby times can be set:
Never - 5 min - 2 min - 1 min

Auto power off

In the Automatic switch-off menu, you can set the time after which the device switches off automatically.
The device only switches off after the configured time if no action (by pressing a button, measurements or USB communication) has been detected. Each action resets the counter to the configured time for automatic switch-off.
If the device remains switched on but is not used, the automatic switch-off function automatically switches the device off after the configured time, which preserves the battery life.

The following times can be set for automatic switch-off:
Never - 1 h - 30 min - 10 min - 5 min

Delete data

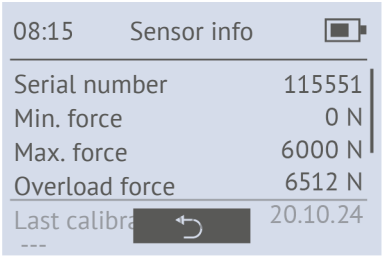
NOTICE

Process cannot be undone: Complete data loss!
Once the Delete data function has been executed, it is no longer possible to restore data.
▶ Back up important data stored on the device elsewhere before performing the function.

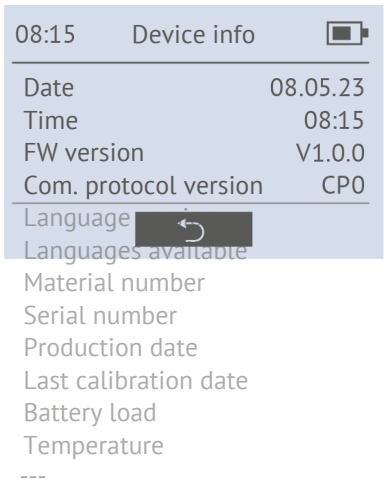
Executing the Delete data function will completely reset the device to the original factory settings. All user-specific data, settings and saved data will be irrevocably deleted.
This function is used to:
- prepare the device for a new start-up.
- delete sensitive data before passing on or disposing of the device.

5.3.9 Info

Information about fCAL 1 Measuring Device (MD) and the connected fCAL 1 Closing Force Sensor (CFS) can be called up in the Info menu.
The control panel can be used to scroll to the desired information.
The following information can be called up in the Sensor info submenu:



The following information can be called up in the Device info submenu:



5.3.10 Switch off

The fCAL 1 measuring device can be switched off as follows:

- Press and hold the middle control panel button (1.5 s)
- By selecting the Switch off function in the main menu.

6 Commissioning

6.1 Scope of supply

The scope of delivery must be checked for completeness and visible external damage. The following parts are included in the scope of delivery of an fCAL 1 transport case:

Designation	Abbreviation	Item number / remarks	Quantity
Calibration measuring unit	CMU	-	-
Measuring device	MD	32100060	1
Closing force sensor kN	CFS 06	32100028	1
Calibration set CFS 06-10-FC		32100038	1
Calibration set CFS 06-07-FC		32100040	1
Calibration set CFS 06-05-FC		32100042	1
Calibration set CFS 06-168-03-FC		32100044	1
Calibration set CFS 06-168-13-FC		32100045	1
Calibration set CFS 06-192-FC		32100047	1
Calibration set CFS 06-292-FC		32100055	1
Calibration set CFS 06-270		32100051	1
Calibration set CFS 06-268/298-FC		32100052	1
Closing force sensor 10 kN	CFS 10	321100078	1
Calibration set CFS 10-10-FC		32100087	1
Calibration set CFS 10-12.5-FC		32100083	1
USB-C / USB-C cable	-	32100026	1
X3 data cable		32100057	1
NiMH rechargeable batteries (AA)	-	32100022	1
Hexagon wrench		08907258	2
fCAL 1 transport case		08904623	1
fCAL 1 transport case foam insert		32100090	1
Instruction manual		0890XXXX - depending on language	1
Declaration of conformity		08906869 - depending on the language	1

6.2 Unpacking

The fCAL 1 calibration measuring unit (CMU) is properly packaged and delivered by OETIKER. It is protected from the weather during transportation and is equipped with suitable packaging materials.

⚠ CAUTION

Caution during initial commissioning

Risk of injury and possible material damage due to damage to the device

- Check the device for damage. If transport damage is suspected, contact your local OETIKER Service Center (see Contact details [▸ 54]).
- Do not switch on the device if it shows signs of transport damage.
- Only operate the device within the technical specifications described in these operating instructions and for the purpose described.

6.3 Inserting the batteries

▶ The rechargeable must be inserted before operation.

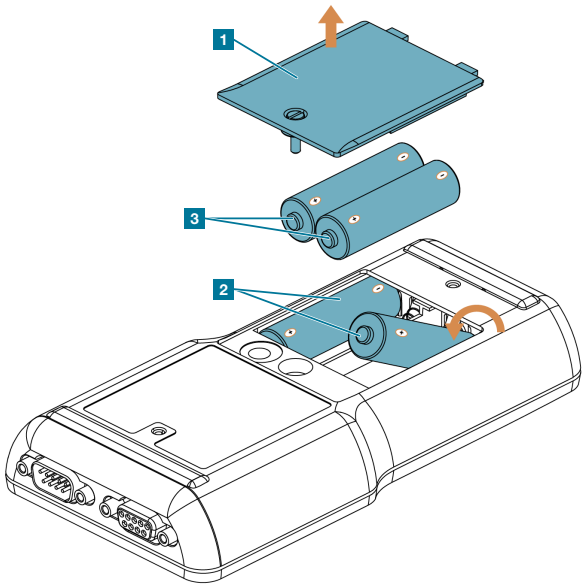
NOTICE

Be careful not to handle rechargeable batteries improperly

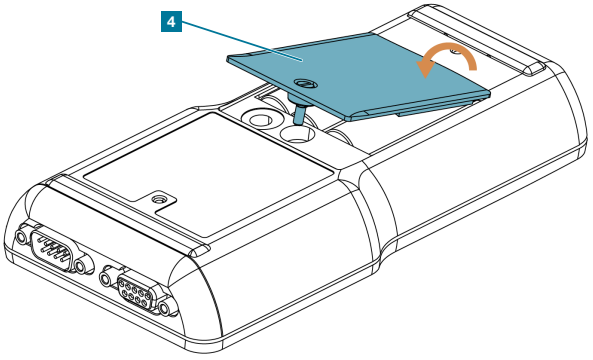
Damage to the measuring device due to improper handling of batteries. Observe the following points when operating the device with AA rechargeable batteries:

- ▶ Insert the batteries according to the battery arrangement diagram in the battery compartment.
- ▶ Always use a set of batteries with the same charge level.
- ▶ Do not replace individual old empty batteries with new ones.
- ▶ Always use batteries from the same manufacturer and of the same type when replacing the batteries.
- ▶ Observe the battery manufacturer's instructions.

- ▶ Open the battery compartment cover (1) with a size 3 screwdriver.
- ▶ Insert the outer batteries (2).
- ▶ Insert the inner batteries (3).



- ▶ Insert the battery compartment cover (4) and tighten with a size 3 screwdriver.



6.4 Charging the battery

The fCAL 1 measuring device (MD) can be charged via the USB-C port with inserted NiMH rechargeable batteries (see Technical data [▶ 13]).

⚠ DANGER

Warning against fire hazard when operating with a non-certified USB-C power supply unit

The use of a non-certified power supply unit can lead to overheating and may pose a fire hazard.

- Ensure that the power source is a power supply classified as a "Limited Power Source" (LPS) in accordance with IEC 62368-1 (see Technical data [▶ 13]).
- Only use a USB-C power supply unit with the appropriate safety certification.

NOTICE

Warning against leakage when charging non-rechargeable batteries or a battery type other than that which is recommended.

Damage to the batteries/rechargeable batteries and possible leakage of battery/rechargeable battery fluid in the device.

- Only use NiMH rechargeable batteries for charging.

The fCAL 1 measuring device (MD) uses four AA NiMH rechargeable batteries. The device learns from the battery information to provide accurate information concerning the battery charge. To support this process, complete charge and discharge cycles may need to be carried out using the same set of batteries in the device. If the set of batteries is removed while using the USB power supply, the MD's learning process is reset.

The battery symbol shows the charge level in 25 percent increments and the device information screen displays it as a percentage. The accuracy of the displayed charge level indicator may vary depending on the battery type and the learning process.

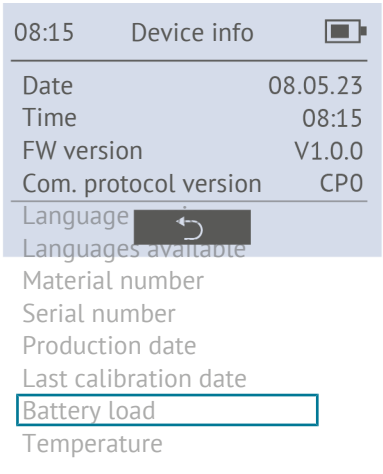
NOTICE

Warning against inaccurate battery charge display values

Inaccurate information concerning the battery charge and interruption of the battery charging process of the measuring device (MD)

- Carry out several complete charge and discharge cycles with a new set of batteries before using the device for the first time.
- Only use the same set of batteries.

The battery status of the fCAL 1 measuring device (MD) can be read via the symbol in Information area (see Display information area [▶ 20]) or in the Device info menu under Battery charge.



The corresponding symbol is shown on the display while the battery is charging.

Current battery level

Battery is charging

Battery fully charged

6.5 Switch on

NOTICE

Condensation on the fCAL 1 measuring device (MD) due to moisture ingress

Damage to the device and its electronics can occur if a damp measuring device is switched on.

- Dry the measuring device.
- Before switching the measuring device back on, make sure that there are no traces of moisture in or on the housing.
- In the event of malfunction, cease using the measuring device and contact your local OETIKER Service Center.

NOTICE

Damage to the measuring device (MD) after prolonged periods of non-use

Impairment of the measuring accuracy due to damage to the measuring device (MD) due to potential battery damage.

- Before using the measuring device (MD) again, check whether one or more batteries have leaked/ are damaged.
- If the rechargeable batteries in the battery compartment are damaged, please cease using the measuring device (MD) and contact your local OETIKER Service Center.

Press and hold the middle button (1.5 s) to switch the device on or off.
This can also force a restart of the device(reboot [▶ 49]).

6.6 Connection

⚠ CAUTION

Take care when connecting products other than those described in the instructions without authorization

Risk of injury and damage to the device if products other than those recommended by OETIKER are connected.

- Only use the fCAL 1 calibration measuring unit (CMU) in conjunction with original OETIKER tools.
- Please refer to the compatibility list [▶ 12] of OETIKER products.

NOTICE

fCAL 1 closing force sensor (CFS) is not connected to fCAL 1 measuring device (MD).

Measurement not possible.

- Connect the fCAL 1 closing force sensor (CFS) to the fCAL 1 measuring device (MD) in order to carry out a measurement using the measuring device.

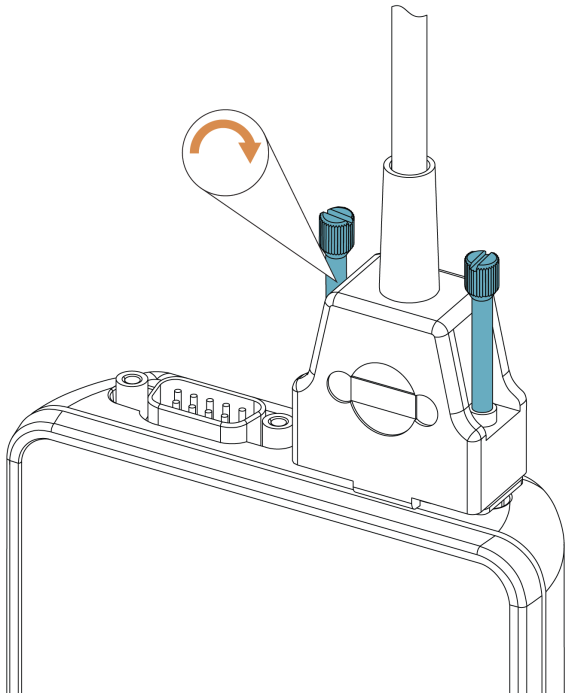
If the fCAL 1 closing force sensor (CFS) is not connected to the fCAL 1 measuring device (MD), this is indicated by the corresponding symbol on the display.

NOTICE

Warning against inaccurate measured values

Impairment of the measurement accuracy due to incorrect connection of the closing force sensor (CFS) to the measuring device (MD)

▶ Tighten the screws of the closing force sensor (CFS) after inserting it.



6.7 Switch off

The fCAL 1 measuring device (MD) can be switched off in two ways:

- By operating the central control panel:

Press and hold the middle button (1.5 s) to switch the device on or off.
This can also force a restart of the device(reboot [▶ 49]).

- In the display submenu Switch off [▶ 29]

7 Operation

7.1 Perform measurement

⚠ DANGER

Risk of eye injuries if the fCAL 1 closing force jaws (CFJ) break off during the measurement!

Flying sharp parts or splinters from the fCAL 1 closing force jaws (CFJ) can cause serious eye injuries.

- ▶ Wear safety goggles when working with the measuring device.

⚠ WARNING

Warning against hand injuries due to contact with sharp-edged parts!

Broken off sharp parts or splinters from the fCAL 1 clamping force jaws (CFJ) can cause cuts.

- ▶ Wear your personal protective equipment when working with the fCAL 1 measuring device (MD).

NOTICE

Warning against incorrect measurement

Incorrect measurement due to use outside the specified measuring or temperature range.

- ▶ Operate the fCAL 1 measuring device (MD) and the fCAL 1 closing force sensor (CFS) within the specified measuring and temperature range.
- ▶ Observe the technical specifications under Technical data [▷ 13] in these operating instructions.

NOTICE

Warning against dropping

Damage to the device and plug connections. This can affect the accuracy of the measured values.

- ▶ Place the device on a flat surface during operation or hold it firmly in your hand.
- ▶ Attach the device to the wall. Use the threaded sleeves on the back of the device for this purpose.

NOTICE

Risk of damage to the fCAL 1 closing force sensor (CFS)

Damage to the closing force sensor due to improper holding or lifting.

- ▶ Always hold or lift the fCAL 1 closing force sensor (CFS) by its base body.

- ▶ Select the Measure [▷ 23] function.

NOTICE

Use of the fCAL 1 closing force sensor (CFS) above its overload limit

Incorrect measurements and permanent damage to the sensor due to exceeding the overload limit.

- ▶ The measuring range of the fCAL 1 closing force sensor (CFS) is specified on its type plate. Use the closing force sensor within this measuring range.
- ▶ If 112% of the final value is exceeded, the sensor must be recalibrated by an accredited body.

- ▶ The measurement can now be started.

7.2 Authorize pincer test

⚠ DANGER

Risk of eye injuries if the fCAL 1 closing force jaws (CFJ) break off during the measurement!

Flying sharp parts or splinters from the fCAL 1 closing force jaws (CFJ) can cause serious eye injuries.

- ▶ Wear safety goggles when working with the measuring device.

⚠ WARNING

Warning against hand injuries due to contact with sharp-edged parts!

Broken off sharp parts or splinters from the fCAL 1 clamping force jaws (CFJ) can cause cuts.

- ▶ Wear your personal protective equipment when working with the fCAL 1 measuring device (MD).

⚠ WARNING

Incorrect measurement due to incorrect clamp test preparations

Failure to follow the tool-specific instructions for the OETIKER tool being operated can result in incorrect measured values.

- ▶ Depending on the OETIKER tool, you must carry out the preparations for a pincer test accordingly.
- ▶ Follow the instructions in the respective instruction manual for the OETIKER tool being operated.

- ▶ Select the Authorize pincer test [▶ 23] function.
- ▶ Further operation is dependent on the operated OETIKER tool.

Each OETIKER tool has an individual procedure for the pincer test. This procedure can be found in the corresponding instruction manual.

All OETIKER instruction manuals can be found and downloaded online at Oetiker | Downloads.

7.3 Closing force measurements with the fCAL 1 closing force sensor (CFS)

⚠ DANGER

Risk of eye injuries if the fCAL 1 closing force jaws (CFJ) break off during the measurement!

Flying sharp parts or splinters from the fCAL 1 closing force jaws (CFJ) can cause serious eye injuries.

- ▶ Wear safety goggles when working with the measuring device.

⚠ WARNING

Warning against hand injuries due to contact with sharp-edged parts!

Broken off sharp parts or splinters from the fCAL 1 clamping force jaws (CFJ) can cause cuts.

- ▶ Wear your personal protective equipment when working with the fCAL 1 measuring device (MD).

NOTICE

Warning against malfunctions

Operating the fCAL 1 measuring device (MD) and/or the fCAL 1 closing force sensor (CFS) beyond its technical specifications can result in malfunctions.

- ▶ Observe the technical specifications stipulated in Technical data [▶ 13].
- ▶ Observe the technical specifications on the corresponding type plate [▶ 9] in this instruction manual.

- Device Switch on [▶ 33].
- Check the battery charge level and, if necessary, before measuring Charging the battery [▶ 31].
- Connect the fCAL 1 closing force sensor (CFS) to the fCAL 1 measuring device (MD). Use the "X5" interface provided for this purpose. Connection [▶ 33]
- Perform measurement [▶ 35]

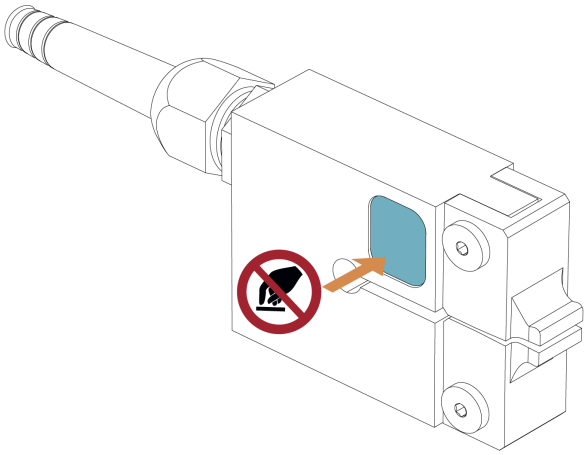
Please note:

NOTICE

Warning against inaccurate measured values

Impairment of the measuring accuracy due to incorrect holding of the closing force sensor (CFS)

▶ When measuring, hold the closing force sensor (CFS) in such a way that you are not touching the casting compound.



7.3.1 Bracket variants for the fCAL 1 closing force sensor (CFS)

The fCAL 1 closing force sensor (CFS) can be held or attached as described below:

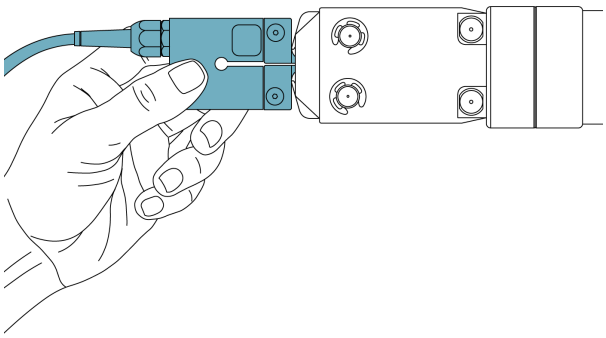
Make sure that you do not expose yourself to any danger.

- **Manual**

The fCAL 1 clamping force sensor (CFS) is held manually between the pincer jaws of the OETIKER tool being operated.

Insert the fCAL 1 closing force jaws (CFJ) of the fCAL 1 closing force sensor (CFS) flush into the pincer opening as such that:

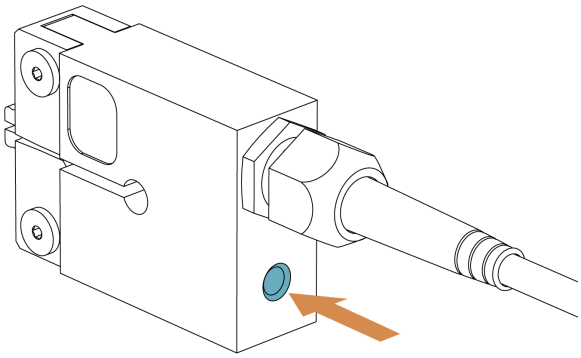
- they are against the stop
- they are centered in the pincer jaws
- the sensor body is parallel to the pincer head



- **With an individual holding tool**

If it is possible to fasten the sensor mechanically within the assembly chain of your system or installation, the M6 thread provided for this purpose can be used.

On the underside of the fCAL 1 closing force sensor (CFS) (next to the cable connection) there is an M6 thread into which a holder or bracket of your choice can be screwed to enable mounting on an individual holding tool or holding mechanism.



7.4 Determining the CMK value

The fCAL 1 calibration measuring unit (CMU) can be used to determine the CMK value of compatible OETIKER tools as listed at OETIKER products compatibility list [▶ 12].

⚠ DANGER

Risk of eye injuries if the fCAL 1 closing force jaws (CFJ) break off during the measurement!

Flying sharp parts or splinters from the fCAL 1 closing force jaws (CFJ) can cause serious eye injuries.

▶ Wear safety goggles when working with the measuring device.

⚠ WARNING

Warning against hand injuries due to contact with sharp-edged parts!

Broken off sharp parts or splinters from the fCAL 1 clamping force jaws (CFJ) can cause cuts.

▶ Wear your personal protective equipment when working with the fCAL 1 measuring device (MD).

The date and time must be set correctly for the application to work properly.
If the date and time have not yet been set or are no longer up to date, proceed as described in chapter Settings [▸ 27].

▶ Select the "CMK [▸ 25]" function.

▷ As soon as all default settings have been confirmed with the "Confirm icon", you return to the CMK main menu to carry out the CMK measurement from there.

▶ Start your CMK measurement.

7.4.1 Transferring determined CMK values

NOTICE

Warning against unintentional data loss

If the CMK results screen is exited with "Repeat" or "Back" – you are taken directly to the corresponding submenu. All determined CMK data will be lost.

▶ Save your data before exiting the CMK results screen, either via the save icon...

▶ Or send your data to a device connected via USB.

- The operated OETIKER tool has the "Transfer X3" function:

▶ Read and follow the instructions for data transmission via X3 in the instruction manual for the OETIKER tool being operated.

All OETIKER instruction manuals can be found and downloaded online at Oetiker | Downloads.

- The operated OETIKER tool does NOT have the "Transfer X3" function:

▶ Enter values manually in the desired file format.

7.4.2 fCAL 1 measuring device (MD) USB communication

Forces output via the USB interface are specified in newtons, even if the device is configured in lbf.

The USB commands described below can be used to retrieve specific device information.
The USB commands are sent to the USB-C connection of the fCAL 1 measuring device (MD) via a virtual Com-Port connection (see parameter: Interfaces [▸ 15]).

NOTICE

Impairment of the measurement accuracy

Sending commands to the device via USB-C during a measurement produces inaccurate measured values.

▶ Do not communicate with the fCAL 1 measuring device (MD) via the USB-C interface during a measurement.

USB function	Command (bold, in Courier font)	Description
Statistics	statistics	The "statistics" command retrieves the device statistics from the internal memory.
Log	log	The "log" command retrieves all saved logs from the internal memory.
Device info	device info	The "device info" command retrieves the environmental data for the device, the production data and some of the calibration data.
Sensor info	sensor info	The "sensor info" command retrieves the information stored in the closing force sensor memory.
Sensor IDs	sensor ids	The "sensor ids" command retrieves the IDs and connection data for the last ten sensors connected to the measuring device.
Firmware version	fw version	The "fw version" command retrieves the measuring device firmware version.
Firmware info	fw info	The "fw info" command retrieves the detailed firmware identification information.
Calibration data	get calibration data	The "get calibration data" command retrieves the calibration data for the measuring device (gain, offset, V-source and last calibration date).
Production data	get production data	The "get production data" command retrieves the production data for the measuring device (material number, serial number and production date).

8 Maintenance

8.1 Maintenance schedule

⚠ DANGER

Any modification to the fCAL 1 calibration measuring unit (CMU) without the consent of OETIKER is prohibited!

OETIKER accepts no liability for any damage caused if this requirement is not observed.

- ▶ Repairs should only be carried out by OETIKER specialists!

- ▶ Check the fCAL 1 calibration unit (CMU) at least once per shift for externally visible damage and proper function.

To maintain the high quality of this measuring instrument, OETIKER recommends that an annual calibration be performed by your nearest OETIKER Service Center.

- ▶ To do this, send the fCAL 1 calibration unit (CMU) to your nearest OETIKER Service Center (see Contact details [▶ 54]).

8.2 Calibration

Calibration includes both the external testing of the device by an accredited laboratory and the use of the device by the user.

The fCAL 1 Measuring Device (MD) and the fCAL 1 Closing Force Sensor (CFS) can also be calibrated together as a set by an accredited laboratory. After this, the fCAL 1 Measuring Device (MD) and fCAL 1 Closing Force Sensor (CFS) may no longer be used separately unless they are recalibrated individually.

For more information, please contact your local OETIKER Service Center (see Contact details [▶ 54]).

8.3 Customer service

Please contact our OETIKER Service Center (see Contact details [▶ 54]) if you have any repair questions or questions relating to the functions of the fCAL 1 calibration measuring unit (CMU).

Please have the serial number of the device to hand. This can be found on the type plate of your fCAL 1 calibration measuring unit (CMU).

8.4 Repair

Return shipment

⚠ DANGER

Attention: fire and explosion hazard

If batteries are left in the device, there is an acute risk of ignition or explosion if they are damaged or handled improperly.

- ▶ Always remove the batteries from the device before returning it.
- ▶ Do NOT include the batteries with the return shipment.

In the event of defects or malfunctions, return the defective component (fCAL 1 Measuring Device (MD) / fCAL 1 Closing Force Sensor (CFS)) to your nearest OETIKER Service Center (see Contact details [▶ 54]). If the faulty component cannot be identified, return the entire unit fCAL 1 Calibration Measuring Unit (CMU).

For warranty claims and commissioned repairs, it is a requirement that you fill out the return form for power tools - please go to: https://www.oetiker.com/de-de/powertoolreturn and follow the instructions there.

OETIKER recommends returning the device in its original packaging.

If this is not possible, the device must be packed in equivalent packaging.
If the device is damaged due to defective packaging, the customer shall bear the costs, irrespective of any justified warranty claims and commissioned repairs.

8.5 Cleaning

⚠ CAUTION

Water entering the device!
Damage to the device due to the ingress of moisture during operation.
- ▶ Do not immerse the fCAL 1 calibration unit (CMU) in water.
- ▶ Do not hold the fCAL 1 calibration unit (CMU) under running water.

8.5.1 Recommended cleaning agents

NOTICE

Damage to the device due to the use of incorrect cleaning agents
Damage to the device.
- ▶ Do not use any cleaning agents containing acids, alkalis or solvents!
- ▶ Wipe the device with a dry cloth.

8.6 Checking/replacing closing force jaws

Check

- ▶ e.g. visual inspection (check for breakage)

Replace

NOTICE

Damage to the fCAL 1 closing force sensor (CFS) and/or the fCAL 1 measuring device (MD) due to improper maintenance
Replacing the fCAL 1 closing force jaws (CFJ) when the fCAL 1 closing force sensor (CFS) is connected can damage the sensor and measuring device.
- ▶ Disconnect the fCAL 1 closing force sensor (CFS) from the fCAL 1 measuring device (MD) before replacing the fCAL 1 closing force jaws (CFJ).

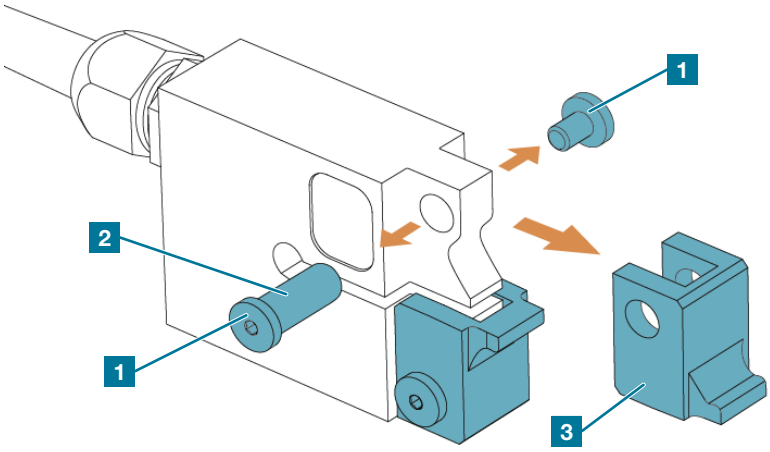
NOTICE

Incorrect measurement when replacing a single fCAL 1 clamping force jaw (CFJ)
The simultaneous use of new and already used fCAL 1 closing force jaws (CFS) can produce incorrect measured values.
- ▶ Always replace both fCAL 1 closing force jaws (CFS), even if only one of the closing force jaws is damaged.

NOTICE

Damage to the locking force-jaw screw connection due to overtightening of the screws
After changing the jaws, the closing force jaws (CFJ) are easily movable. This is a deliberate functional phenomenon intended to avoid impairing the measurement accuracy.
- ▶ Do not tighten the screws beyond the max. tightening torque of 2 Nm.

The closing force jaws (CFJ) are supplied complete with screws and bolts.
When replacing the closing force jaws (CFJ), ensure that you use the new screws and bolts supplied.



- Remove the left or right screw (1) using one of the Allen keys provided. Use the second Allen key to exert force against the direction of rotation on the opposite screw (1).
- Remove the second screw including the dowel pin (1+2) screwed to it.
- Remove the first fCAL 1 closing force jaw (CFJ) (3).
- Proceed in the same way to remove the second closing force jaw (upper or lower closing force jaw, depending on which jaw was removed first).
- Clean the contact surfaces of the sensor and the closing force jaws with a dry cloth.
- Insert the new closing force jaw (upper or lower closing force jaw).
- Secure the new closing force jaw with the dowel pin (2) and the screw (1) that is screwed to it.
- Secure the new closing force jaw by tightening the second screw (1) with the Allen key. During installation, use the second Allen key to exert force against the direction of rotation on the opposite screw (1).
- Carry out three closures with the currently configured closing force on the replaced closing force jaws (CFJ) to ensure that the jaw system is seated correctly. Your closing force sensor (CFS) is now ready for the next closing force measurement.

NOTICE

Damage to or loss of the replaced fCAL 1 clamping force jaws (CFJ)

Improper storage of the fCAL 1 clamping force jaws (CFJ) can lead to damage or loss.

- Place the replaced fCAL closing force jaws (CFJ) in the container provided.

8.7 Replacing the batteries

- When replacing the batteries, proceed in the same way as described in the chapter Inserting the batteries [▶ 31].
- Dispose of batteries properly: Decommissioning and disposal [▶ 50]

8.8 Original spare parts

Oetiker original spare parts can be found in the scope of delivery table (see Scope of supply [▶ 30]).

⚠ DANGER

Danger as a result of using the wrong spare parts!

The use of spare parts that have not been tested and approved by Oetiker can impair the measuring accuracy and cause serious physical injury due to subsequent faults in Oetiker Power Tools.

- Only use Oetiker spare parts.

8.8.1 fCAL 1 Spare parts

For spare parts, please contact your local OETIKER Service Center (see Contact details [▸ 54]).

In our endeavor to continuously improve the quality of our products, we reserve the right to make improvements without changing the Operating Instructions. For this reason, the specified data for e.g. dimensions, weights, materials, performance data and designations may differ for some individual parts.

9 Eliminating faults

To prevent faults, see Safety-conscious operation [▶ 8].

9.1 Troubleshooting

If the fCAL 1 measuring device (MD) can no longer be operated, this is indicated by an error message or a symbol on the display.

If the fCAL 1 closing force sensor (CFS) is not connected to the fCAL 1 measuring device (MD), this is indicated by the corresponding symbol on the display.

The error messages contain error codes as well as instructions that must be carried out by the user.
The faults can be identified using the fault descriptions.

⚠ WARNING

Warning against improper troubleshooting

Failure to observe the error messages and the measures to rectify them can result in personal injury and damage to property.

- ▶ Have faults or errors that you cannot rectify yourself rectified by qualified personnel (see Target group [▶ 8]).

NOTICE

Warning against incorrect measurement results

Dropping the fCAL 1 measuring device (MD) or the closing force sensor (CFS) can result in inaccurate measurement results.

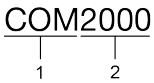
- ▶ **Perform a visual inspection:** Check the MD and the CFS for visible damage.
- ▶ **Perform a plausibility check:** Ensure that the measurement results are within the expected tolerances.
- ▶ **Initiate recalibration:** If the measurement results are inaccurate after the plausibility check, send the MD or the CFS to a certified calibration laboratory for recalibration.

Error display

Errors are displayed as follows:

- The error is shown as an error message with a clear identification on the display of the control unit.
- Errors that cannot be shown on the display of the control unit are described separately.

The error message in the display is structured as follows:



Position	Characters	Designation	Description
1	COM	Communication	
	PRO	Process	
	SYS	System	
2	—	Number	The four-digit number describes the unique identification.

Error message	Cause of the error	Troubleshooting measures
COM1000	X3 communication failed. Please try again.	▶ Use original OETIKER X3 cable. ▶ Check connection. ▶ Check the readiness of the connected device. ▶ Restart the measuring device. ▶ If this occurs several times, contact your local OETIKER Service Center.
COM1001	X3 data has been incorrectly received from the connected device. Please try again.	▶ Check the readiness of the connected device. ▶ Use original OETIKER X3 cable. ▶ Check connection. ▶ Restart the measuring device.
COM1002	The connected device is not responding. Please check the connection.	▶ Check the readiness of the connected device. ▶ Use original OETIKER X3 cable. ▶ Check connection. ▶ Restart the measuring device.
COM1010	USB communication failed. Please try again.	▶ Check connection. ▶ Ensure that the correct virtual communication port is active in the PC software (virtual com port software). ▶ Disconnect and reconnect the USB cable and reactivate the virtual communication port. ▶ Restart the measuring device. ▶ Connect the measuring device directly to the PC (without hubs etc.) ▶ Restart the PC. ▶ If this occurs several times, contact your local OETIKER Service Center.
COM1020	ADC sensor comm. failed. Device may not be working properly.	▶ Do not perform any further measurements. ▶ Restart the measuring device. If the error occurs again, return the measuring device to your local OETIKER Service Center.
COM1021	TEDS sensor comm. failed. Device may not be working properly.	▶ Do not perform any further measurements. ▶ Unplug the closing force sensor and plug it in again. ▶ Check closing force sensor connection. ▶ If this occurs several times, contact your local OETIKER Service Center.
COM1030	RTC comm. failed. Device time may be inaccurate.	▶ Restart the measuring device. ▶ Return the measuring device to your local OETIKER Service Center.

Error message	Cause of the error	Troubleshooting measures
COM1040	FRAM comm. failed. Device may not be working properly.	▶ Restart the measuring device. ▶ Please return the measuring device to your local OETIKER Service Center.
COM1050	FLASH comm. failed. Device may not be working properly.	▶ Restart the measuring device. ▶ Return the measuring device to your local OETIKER Service Center.
COM1051	Measured value memory is full. Please free up disk space.	▶ Free up storage space (see Memory [▶ 24]).
COM1052	Failed to save the measurement in FLASH.	▶ Restart the measuring device. ▶ Try again. ▶ If this occurs several times, contact your local OETIKER Service Center.
COM1053	Failed to delete the measurements.	▶ Restart the measuring device. ▶ Try again. ▶ If this occurs several times, contact your local OETIKER Service Center.
COM1060	Communication with temperature sensor failed.	▶ Restart the measuring device. ▶ Return the measuring device to your local OETIKER Service Center.
PROC2000	The number of CMK closures must be between 5 and 120.	▶ Select the number of closures between 5 and 120 (see CMK).
PROC2001	CMK nominal force must be greater than or equal to 500 N (112 lbf).	▶ Select a force that is greater than or equal to 500 N (112 lbf) (see CMK).
PROC2002	CMK tolerance must be greater than or equal to 50 N (11 lbf).	▶ Select a tolerance that is greater than or equal to 50 N (11 lbF) (see CMK).
PROC2010	The set time is invalid.	▶ Enter a valid time.
PROC2011	Set date is invalid.	▶ Enter a valid date.
PROC2020	No sensor connected. Please connect the sensor and try again.	▶ Connect the closing force sensor and check the plug connection. ▶ Unplug the closing force sensor and plug it in again. ▶ If this occurs several times, contact your local OETIKER Service Center.
PROC2030	A force greater than the maximum permissible force was measured.	▶ Check the maximum permissible closing force specified on the type plate of the closing force sensor. ▶ Measure again with a force that is less than the maximum permissible force.
PROC2031	A force greater than the maximum permissible force was measured. Recalibration required.	▶ Check the maximum permissible closing force specified on the type plate of the closing force sensor. ▶ Have the closing force sensor recalibrated.

Error message	Cause of the error	Troubleshooting measures
PROC2032	A force greater than the maximum permissible force was measured. Sensor damaged.	▶ Check the maximum permissible closing force specified on the type plate of the closing force sensor. ▶ Return the closing force sensor to your local OETIKER Service Center.
PROC2040	No measurement available. Please carry out a measurement and try again.	▶ Perform a closing force measurement with a force higher than 200 N. ▶ Please carry out a measurement and try again.
SYS3000	Self-test failed. Device is not working properly.	▶ Do not perform any further measurements. ▶ Restart the measuring device. If the error occurs again, return the measuring device to your local OETIKER Service Center.
SYS3010	Configuration could not be updated. Please try again.	▶ Please contact your local OETIKER Service Center if this occurs several times.
SYS3020	Internal non-assignable error. Please restart the device.	▶ Restart the measuring device. ▶ Read the log and search for the log entry before and after the SYS1010 error (see fCAL 1 measuring device (MD) USB communication). ▶ Contact your local OETIKER service center and provide log information.
SYS3030	Invalid production data.	▶ Restart the measuring device. ▶ Return the measuring device to your local OETIKER Service Center.
SYS3031	Invalid calibration data. Force measurement may not function properly.	▶ Restart the measuring device. ▶ Return the measuring device to your local OETIKER Service Center.
SYS3032	Invalid sensor data. Force measurement may not function properly.	▶ Do not perform any further measurements. ▶ Unplug the closing force sensor and plug it in again. ▶ Check the plug connection of the closing force sensor. ▶ Return the closing force sensor to your local OETIKER Service Center.
SYS3040	Significant deviation of the zero force. Sensor may be incorrectly calibrated.	▶ Zero the closing force sensor without load. ▶ Check the closing force sensor, cable and plug connection for damage. ▶ Return the sensor to your local OETIKER Service Center.
SYS3050	Battery charging function defective.	▶ Please return the measuring device to your local OETIKER Service Center.
SYS3051	The USB charger is not PD-capable.	

Error message	Cause of the error	Troubleshooting measures
SYS3060	Battery status monitoring system defective.	
SYS3070	Non-rechargeable batteries detected. Please replace with rechargeable batteries.	▶ Only use NiMH rechargeable batteries. ▶ Replace the entire set of batteries. ▶ In the event of multiple occurrences with NiMH rechargeable batteries, contact your local OETIKER Service Center.
SYS3071	Low battery. Please charge the device.	▶ Charge the measuring device via USB-C. ▶ Replace batteries when they have reached the end of their service life. ▶ If this occurs several times during or after charging, contact your local OETIKER Service Center.
SYS3072	The battery is empty. The device is switched off.	▶ Charge the battery.
SYS3080	Device temperature is too high. Device may not be working properly.	▶ Only operate the measuring device within the specified ambient conditions (see Technical data [▸ 13]). ▶ Unplug the USB-C cable. ▶ Switch off the measuring device and allow to cool down. ▶ If this occurs several times within the specified ambient conditions, contact your local OETIKER Service Center.
SYS3081	Device temperature is too low. Device may not be working properly.	▶ Only operate the measuring device within the specified ambient conditions (see Technical data [▸ 13]). ▶ Allow the measuring device to acclimatize to a higher ambient temperature. Avoid condensation (see Technical data [▸ 13]). ▶ If this occurs several times within the specified ambient conditions, contact your local OETIKER Service Center.
SYS3090	Date and time of the device invalid. Please set a valid date and time.	▶ Set a valid date and time. ▶ If this occurs several times, contact your local OETIKER Service Center.

9.2 Malfunctions that cannot be rectified

If the fCAL 1 measuring device (MD) can no longer be operated for no apparent reason or is blocked in a mode and does not respond, a restart must be forced.

9.2.1 Restarting the device

NOTICE

Data loss due to restarting the measuring device (MD)

The following data is lost during a restart:
- Unfinished closures
- CMK closures and CMK results

The device is restarted by switching it off and on again.

- ▶ Press the middle keypad button (see also Switch on [▶ 33]).
  - ▷ Oetiker logo [▶ 000] is displayed.
  - ▷ Device is switched off.
- ▶ Press the middle keypad button again (see also Switch on [▶ 33]).
  - ▷ Oetiker logo [▶ 000] is displayed.
  - ▷ Device is switched on.

⚠ CAUTION

Warning against improper operation!

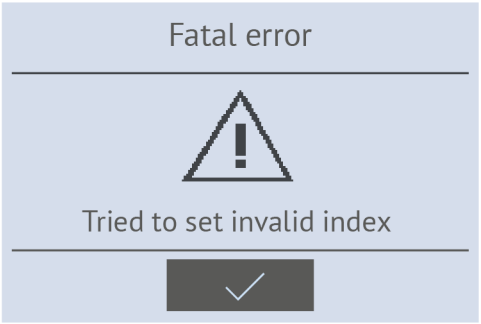
Using the device after an unsuccessful restart (reboot) produces incorrect measurement results.

- ▶ Send your fCAL 1 measuring device (MD) to your local OETIKER Service Center (see Contact details [▶ 54]).

9.2.2 Fatal error

If the fCAL 1 calibration measuring unit (CMU) can no longer be operated properly, a fatal error is generated.

This error, known as a "fatal error", is displayed on the screen in the following form:



When a fatal error is generated, the status of the device is unknown. This means that it is not possible to determine whether the communication interfaces and other parts of the CMU functionalities are available. The device attempts to log the error in the internal memory and on the USB communication interface.

- ▶ Please note the description of the "Fatal Error" from the internal memory and report the problem to your local OETIKER Service Center.
- ▶ Click on the confirmation checkmark.
  - ▷ MD is restarted.
- ▶ If the device cannot be operated properly again, contact the OETIKER Service Center.

10 Decommissioning and disposal

10.1 Decommissioning

- ▶ Disconnect the fCAL 1 closing force sensor (CFS) from the fCAL 1 measuring device (MD).
- ▶ Disconnect the USB-C cable from the mains if connected.
- ▶ Disconnect any connected OETIKER tools from the fCAL 1 measuring device (MD).
- ▶ Remove the batteries.
- ▶ Pack the fCAL 1 measuring device (MD) and fCAL 1 closing force sensor (CFS) in suitable transport containers. Secure the components against damage and sudden changes in position.

10.2 Storage conditions

fCAL 1 Measuring device (MD) ambient conditions

Parameter	Value
Humidity	Max. 80% up to 31°C
Storage temperature	-20°C to 50°C
Altitude	Max. 2000 m above mean sea level.
Pollution level	1 (according to EN 61010-1)

fCAL 1 Closing force sensor (CFS) ambient conditions

Parameter	Value
Humidity	Max. 80% up to 31°C
Storage temperature	-20°C to 50°C
Altitude	Max. 2000 m above mean sea level.
Pollution level	1 (according to EN 61010-1)

NOTICE

Condensation on the fCAL 1 measuring device (MD) due to moisture ingress

Damage to the device and its electronics can occur if a damp measuring device is switched on.

- ▶ Dry the measuring device.
- ▶ Before switching the measuring device back on, make sure that there are no traces of moisture in or on the housing.
- ▶ In the event of malfunction, cease using the measuring device and contact your local OETIKER Service Center.

Non-permitted locations and environmental conditions

- With rapid changes in ambient temperature
- With direct sunlight
- With humidity above 80% and condensation
- Where excessive dust or debris can accumulate on the CMU, unless the CMU is stored in the carrying case.
- In which salty moisture can penetrate

Prepare the fCAL 1 measuring device (MD) and fCAL 1 closing force sensor (CFS) for storage as follows:

- ▶ Perform decommissioning [▸ 50].
- ▶ Clean the fCAL 1 measuring device (MD) and fCAL 1 closing force sensor (CFS).

- ▶ Pack components in suitable dust-tight storage containers. Ensure that the components are secured against damage and sudden changes in position.

10.3 Disposal

Principle

Ensure that the raw materials contained in the fCAL 1 calibration measuring unit (CMU) are handled with care. Before disposing of materials and components, their suitability for reuse must be checked. The aim must be to maximize reuse. Careless or incorrect disposal can result in unforeseeable damage to the environment. Follow the manufacturer's instructions and the applicable laws and regulations.

Materials, packaging materials and machine parts

The components must be separated according to material and an attempt must be made to recycle:

- Aluminum from steel scrap
- Copper and non-ferrous metals in electrical parts and conductors
- Batteries
- Plastics

Electronic components

The fCAL 1 calibration measuring unit (CMU) must not be disposed of with household waste.

Correct disposal

This symbol requires the separate disposal of electrical and electronic components. Such devices may contain dangerous and environmentally hazardous substances. These devices must be disposed of at a designated collection point for the recycling of electrical and electronic devices. This helps to protect resources and the environment. For further information, please contact your local authorities.

- ▶ Disconnect the fCAL 1 measuring device (MD) from the power supply if connected via USB-C.
- ▶ Have operating materials, components and packaging material disposed of by a specialist company in accordance with local and statutory regulations.
- ▶ Optionally, send the fCAL 1 calibration measuring unit (CMU) to your local OETIKER Service Center Contact details [▶ 54] to have it disposed of.

11 Conformity

11.1 Declaration of conformity

OETIKER Schweiz AG declares that the device complies with the applicable EMC Directive (2014/30/EU). Details on the device can be found in the declaration of conformity (see below).

This instruction manual is a non-contractual document. Subject to errors, misprints and changes.

Sample (German / English)

EG-Konformitätserklärung

EU Declaration of Conformity

(Original-EG-Konformitätserklärung)
(Translation from the German original Declaration of Conformity)

Wir,
We,

Oetiker Schweiz AG
Spätzstrasse 11
CH-8810 Horgen
SWITZERLAND

erklären in alleiniger Verantwortung, dass das Produkt
declare under our sole responsibility that the product

fCAL 1 Calibration Measuring Unit (CMU)

als Gesamtsystem bestehend aus dem unten aufgeführten Messgerät und den Sensoren:
as a complete system consisting of the measuring device and sensors listed below:

Typ */ Type*
Material Nummer */ Material number*
Serien Nummer */ Serial number*

fCAL 1 MD
32100060

Typ */ Type*
Material Nummer */ Material number*
Serien Nummer */ Serial number*

fCAL 1 CFS 06
32100028

Typ */ Type*
Material Nummer */ Material number*
Serien Nummer */ Serial number*

fCAL 1 CFS 10
32100078

Typ */ Type*
Material Nummer */ Material number*
Serien Nummer */ Serial number*

allen grundlegenden Anforderungen der nebenstehenden Richtlinien – jeweils mit deren Änderungen – entspricht:
meets all the essential requirements of the directives listed alongside – in each case with their revisions:

2014/30/EU – EMV-Richtlinie
2014/30/EU – EMC Directive

Angewandte harmonisierte Normen:
Applied harmonised standards:

Elektrische Mess-, Steuer-, Regel- und Laborgeräte – EMV-Anforderungen – Teil 1: Allgemeine Anforderungen *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*	EN IEC 61326-1:2021 EN 61326-1:2013
Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte – Teil 1: Allgemeine Anforderungen *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*	EN 61010-1:2010+A1:2019
Beschränkung gefährlicher Stoffe *Restriction of Hazardous Substances*	2011/65/EU 2017/1011/EU RoHS

Bevollmächtigte Person für das Zusammenstellen der technischen Unterlagen:
Authorised person for compiling the technical file:

* Oetiker Schweiz AG
Pascal Moser
Spätzstrasse 11
CH-8810 Horgen
SWITZERLAND

Unterzeichnet für und im Namen von Oetiker Schweiz AG
Signed for and on behalf of Oetiker Schweiz AG

Horgen, 27. August 2025

Pascal Moser
Head R&D
CoC Automatic Assembly Tools Oetiker Group

Andreas Pulver
Plant Head Switzerland

12 Contact details

If you require help or technical support, please contact your local Oetiker Service Center.
For further information, see www.oetiker.com.

EMEA	
E-mail	ptsc.hoe@oetiker.com
Tel. number	+49 7642 6 84 0

America	
E-mail	ptsc.oea@oetiker.com
Tel. number	+1 989 635 3621

China	
E-mail	ptsc.cn.tianjin@oetiker.com
Tel. number	+86 22 2697 1183

Japan	
E-mail	ptsc.jp.yokohama@oetiker.com
Tel. number	+81 45 949 3151

Republic of Korea	
E-mail	ptsc.kr.seoul@oetiker.com
Tel. number	+82 2 2108 1239

India	
E-mail	ptsc.in.mumbai@oetiker.com
Tel. number	+91 9600526454

Reliable Connections

OETIKER Schweiz AG
Spätzstrasse 11
CH-8810 Horgen
Schweiz