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Operating Manual

Force Gauge CBSF-XS

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This manual describes operation of the CoboSafe-CBSF-XS force measuring device. Please pay particular attention to the information contained in chapter 1, "About this Manual."



Before beginning work of any kind, read this manual and the general safety instructions. Keep for later use!

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1 About this Manual

This manual describes operation of the CoboSafe-CBSF-XS force measurement device. The measuring method is part of a system and may be used only in conjunction with the following components:

- Software CoboSafe-Vision
- CoboSafe-Scan

Carefully and thoroughly read this document and the documentation for all of the components to be used to become familiar with the product before using it.

To prevent injury and damage to the product, pay particular attention to the associated document ☞ “CoboSafe – General Safety Instructions” as well as to the safety and warning notes in this document. Keep this documentation nearby to serve as a reference when needed. Pass the documentation along to later users of the product.



- The operating manual with safety instructions is a component of the measuring system and has to be stored near the measuring system, ensuring that it is readily accessible to personnel at all times.
- Operating personnel must read the entire manual and be familiar with the product before beginning any work.
- The fundamental requirement for working safely is consideration of all of the safety and warning notes as well as following the instructions in this and all related CoboSafe manuals.
- In addition, the local accident prevention regulations and general safety regulations apply to the area of application of the measuring system.





The illustrations in this manual are intended to aid in fundamental understanding of the product. They may deviate from the actual model.

1.1 Symbols and Warnings in this Manual

1.1.1 Warnings








Safety and warning notes in this manual are indicated by symbols. The safety and warning notes are preceded by signal words indicating the extent of the hazard.

To prevent accidents, personal injury and property damage, comply with the safety and warning notes and proceed with caution.

Safety and warning notes	
	This combination of symbol and signal word indicates an immediately dangerous situation that will lead to death or severe injuries if not avoided.
	This combination of symbol and signal word indicates a possibly dangerous situation that could lead to death or severe injuries if not avoided.
	This combination of symbol and signal word indicates a possibly dangerous situation that could lead to minor injuries if not avoided.
	This signal word indicates a possibly dangerous situation that could lead to property damage if not avoided.


1.1.2 Explanation of Symbols

The following symbols are used in this manual to emphasize instructions, results, lists, notes and other elements.

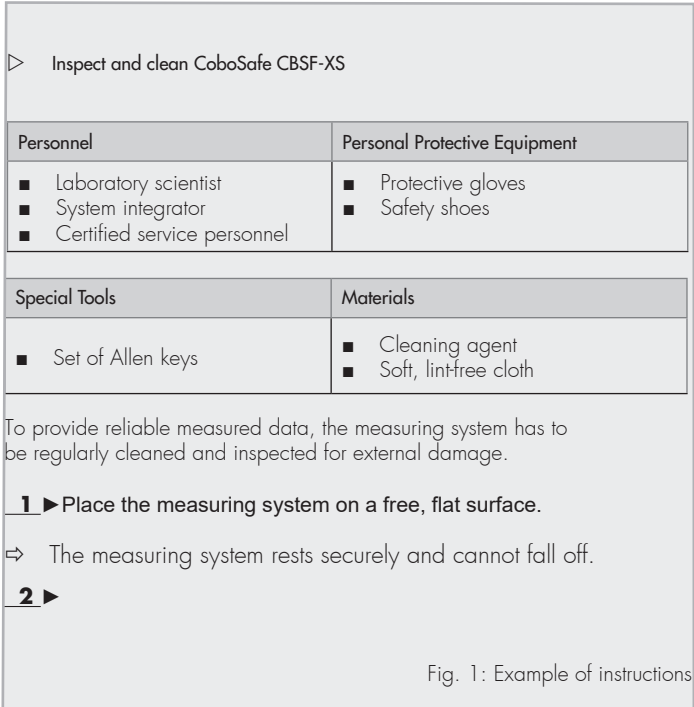
Symbol	Explanation
	Introductory information relevant to safety
	Helpful tips and recommendations as well as information to ensure efficient and uninterrupted use
	Precedes instructions
	Step-by-step instructions. The instructions are numbered in the order of the respective steps.
	Results of steps
	References to sections of this manual and to other applicable documents
	List with no specific order

1.2 Appearance of Instructions

The initial requirements in regard to personnel qualifications, personal protective equipment (PPE), special tools and materials are different for each step/process.

	It is imperative that the specified requirements for all instructions are met.
---	--

The following illustration shows an example of how a set of instructions is structured.



1. ▷ Inspect and clean CoboSafe CBSF-XS

<p>2. Personnel</p> <ul style="list-style-type: none"> ■ Laboratory scientist ■ System integrator ■ Certified service personnel 	<p>3. Personal Protective Equipment</p> <ul style="list-style-type: none"> ■ Protective gloves ■ Safety shoes
<p>4. Special Tools</p> <ul style="list-style-type: none"> ■ Set of Allen keys 	<p>5. Materials</p> <ul style="list-style-type: none"> ■ Cleaning agent ■ Soft, lint-free cloth

6. To provide reliable measured data, the measuring system has to be regularly cleaned and inspected for external damage.

7. **1 ▶ Place the measuring system on a free, flat surface.**

8. ⇨ The measuring system rests securely and cannot fall off.

2 ▶

Fig. 1: Example of instructions

Explanation of illustration “Example of instructions”

1. A triangle precedes the title of instructions or a step to be performed.
2. Indicates the qualification required of personnel to be able to safely perform the action described. In the above example, the person performing the task has to be a laboratory scientist or a system integrator. For a description of the personnel qualifications, refer to ⇨ chapter “Requirements of Personnel” in the general safety instructions.”

3. List of Personal Protective Equipment (PPE) required. In the above example, protective gloves and safety shoes have to be worn; ↪ chapter "Personal Protective Equipment" in the general safety instructions.
 4. If necessary: List of special tools required. A set of Allen keys is needed to check and clean the device.
 5. If necessary: List of consumables required. In the example above, a cleaning agent and a soft, lint-free cloth is needed.
 6. Introductory note on why action is required and what has to be kept in mind.
 7. Step in the set of instructions. Always perform the steps one after the other and as described.
 8. Result of the previous step.
- ▷ Always verify that the result is the same as what is described here.

2 For your Safety

The separate document ↪ "CoboSafe – General Safety Instructions" provides users with further information and must also be observed.

2.2.1 Intended Use

CBSF-XS force measuring devices are used to determine the forces that occur in collisions with collaborating robots. The forces are calculated in the device based on applicable standards and publications. Refer to the "CoboSafe – General Safety Instructions," chapter "Underlying Standards and Information Material." The software CoboSafe-Vision serves to visualize and archive the saved measured data. The CBSF-XS may be used only for the purpose indicated above.

2.1 Qualification Required of Personnel

Only qualified personnel may work with the measuring and test system to avoid serious physical injury or considerable damage to property. Qualified are persons who are familiar with the commissioning and operation of robots. They must have the appropriate qualifications. They must be able to assess the work assigned to them, identify possible sources of danger, and take appropriate safety measures.

2.2 Responsibility of the Operator

Please read the chapter of the same name in the corresponding document ↪ "CoboSafe – General Safety Instructions".


3 Brief Description

The CBSF-75-XS force measuring device is used to determine transient and quasistatic forces of collaborating robots as well as to check biomechanical thresholds in human-robot collaboration (HRC).

A highlight of the sturdy and precise CBSF-XS force measuring device is the compact design. It is designed for applications where there are confined gaps in which to perform measurements. The measuring mechanism in conjunction with the integrated electronics guarantees an optimum measuring accuracy and reproducibility. The optical signaling device provides information on the various operating modes, eliminating the need to observe the display. The integrated memory saves the measured values and can accommodate 100 single measurements. The transient and quasistatic values are shown on the display and can be transmitted wirelessly or via USB port to CoboSafe-Vision.

Because the measuring tips are only 10 mm high, the CBSF-XS is especially well suited to gripper applications. But it is also good for many other applications in which collisions near the operator's hand cannot be completely eliminated. The combination of spring rates and damping materials simulates the biofidelic properties of human hands and fingers. The way the force measuring device is designed enables it to be used as a hand-held or tabletop unit.

Its small size makes the CBSF-XS ideal when closing forces in gaps have to be measured.

	Only the specified measuring equipment may be used to perform a measurement. Measurement may not be performed when a configuration differs.
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4 Scope of Delivery

The CoboSafe-CBSF-XS measuring system consists of the following components:

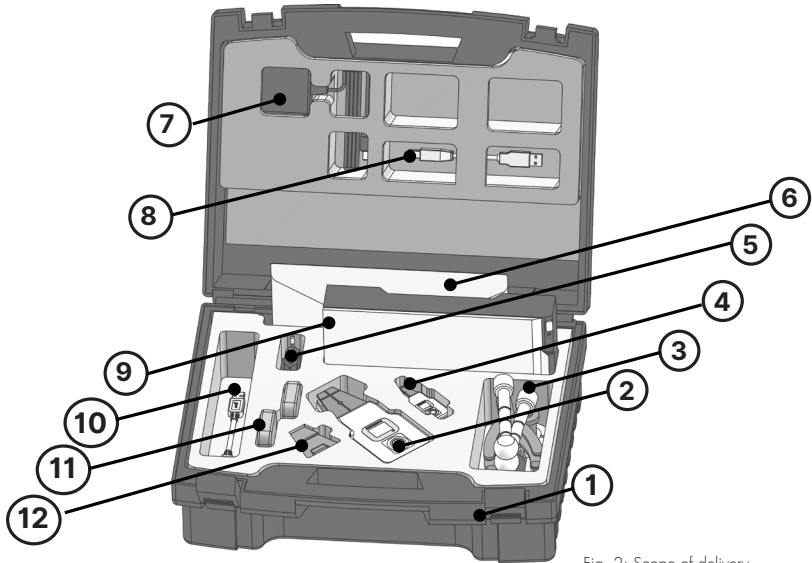


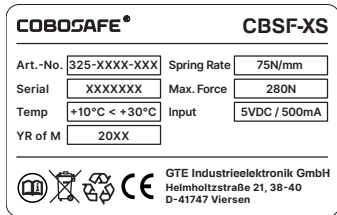
Fig. 2: Scope of delivery

- | | |
|--|--|
| 1. Transport case | 7. Power pack for scanner (optional) |
| 2. CBSF-XS | 8. Cable for Scanner (optional) |
| 3. Articulated arm (optional),
mounting foot and handle included | 9. A5 Scanner (optional) |
| 4. Flash drive containing CoboSafe-Vision | 10. Charging cable |
| 5. USB charger with power pack | 11. Fujifilm Prescale pressure measurement
films (2x, optional) |
| 6. Document case (calibration certificate,
quick reference guide, calibration
sheet, microfiber cloth) | 12. Damping element (K1) |

5 Signs and Labels

ID plate

The ID plate is affixed to the underside of the CBSF-XS force measuring device. The ID plate shows the following information:



- Device type Article number
- Serial number
- Temperature range
- Year of manufacturing
- Spring rate
- Maximum force
- Input
- CE label

Fig. 3: ID plate

Inspection date

A label on the underside of the measuring device indicates when the manufacturer has to next inspect and calibrate the device. The year printed on the label is the year in which the next inspection is due. The month is indicated by the circle in which a month can be punched out.



Fig. 4: Inspection date

6 Informative Value of Measurement Results

The informative value of the results of specific applications is limited exclusively to the specific contact situation measured. The measuring device shows only the forces. The measured values can only be interpreted completely using the software CoboSafe-Vision and a pressure measuring process.

7 Design and Functioning

7.1 CoboSafe-CBSF-XS force measuring device

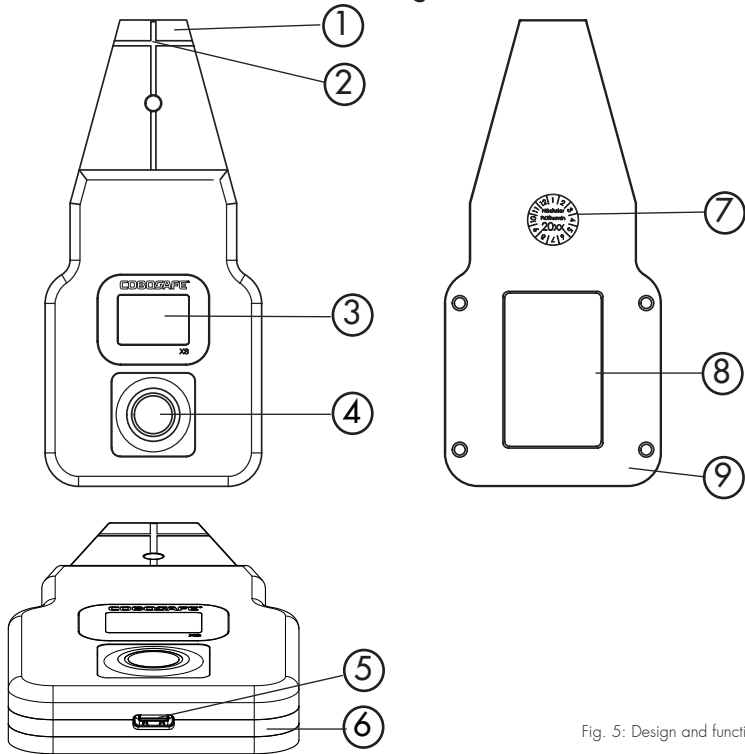


Fig. 5: Design and functioning

- Measuring tip [1]
- Optimal force application point [2]
- Display [3]
- Pushbutton [4]
- USB port [5]
- Light ring [6]
- Inspection date [7]
- ID plate [8]
- Base plate [9]

7.2 Display



Fig. 6: Home screen

- Charge level [1]
- Charging display [2]
- Time [3]
- Measurement number [4]
- Measured value display [5]
- Command line [6]

7.3 Menu Navigation

The device is operated by pressing the button on the top of the device briefly or for a longer time.

- Short press: Switch between menus and submenus.
- Long press: Open menu; confirm selection; exit menu.

Switch on:

- Long press: CBSF-XS starts up when the button is released.

Operating mode:





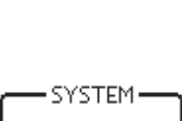
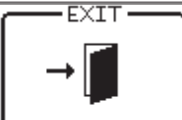
If the CBSF is switched on, touch the button briefly to start a measurement.

- Short press: Activate next measuring (in "manual" mode)
- Long press: Menu opens in "Shutdown" option (switch off).
- Long press: Switch off CBSF-XS
(Device switches off automatically after 45 min.).

Open menu:

- Long press: Switch on CBSF-XS.
- Long press: Menu opens in "Shutdown" option.
- Short press: Move to the next menu.
- Long press: Move to the submenu.
- Short press: Switch between the options in the submenu.
- Long press: Select the option and exit the submenu.

Menu list and functions

Menu	Submenu	Function
		Switches off CBSF-XS
	Manual	Press the button to activate measurement. Measurement begins when force reaches $F > 20\text{ N}$.
	Auto	Measurement begins automatically when force reaches $F > 20\text{ N}$
	On	Switches on wireless transmission
	Off	Switches off wireless transmission
	Cancel	Cancels deleting
	All Data	Deletes all saved measurements
	SVN:	Firmware version
	S/N:	Serial number of CoboSafe CBSF-XS
	WL:	Wireless ID
	Temp.:	Temperature display
	Humidity:	Humidity display
	Bat. V:	Battery voltage in V
	Bat. A:	Battery voltage in mA
	Capacity:	Capacity of memory (quantity of measurements)
	Free:	Number of measurements still possible
	Used:	Number of measurements performed
	Last ID:	Last measurement number (ID)
		Exits menu and go to operating mode

7.4 Setting Date and Time

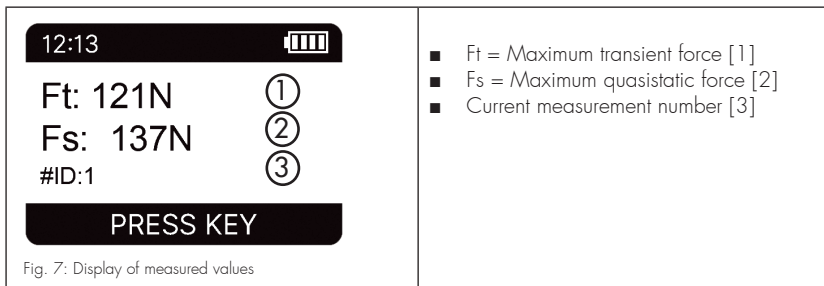
The date and time are set using the CoboSafe-Vision software, see Operating Manual of CoboSafe-Vision. Manual entry of the time is not possible.

7.5 Luminous Sequences

Luminous Sequence	Description
Runs around once counterclockwise	Device is starting up
Runs around once clockwise	Device is shutting down
Illuminated ring	Waiting for trigger
LED breathing	Measurement in process
Two seconds continuous illumination	Measurement completed
Flashes three times	Device connected
Flashes three times	Device disconnected

7.6 Display of Measured Values

When measurement is completed, the CoboSafe CBSF-XS shows the measured values in the display.



7.7 Damping Element K1 and Spring Rate K2

The compression properties of e.g., muscle tissue to fat tissue or to surfaces of the body less covered, such as fingers, differ. The biofidelic property in regard to pain perception and to the risk of injury differs as well. The body resistance must also be taken into account.

i	Biofidelic setup To create a biomechanical or biofidelic setup, specified compression elements K1 and K2 have to be used. <ul style="list-style-type: none">■ The damping elements K1 simulate the biomechanical property of body surfaces.■ The spring rate K2 simulates the biofidelic body resistance.
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The damping element K1 is classified applying Shore hardness. With the CBSF-XS, a red damping element with 70 Shore A is used.

The Shore hardness of the K1 damping element can change over time. The manufacturer recommends replacing it in the course of the calibration service after one year. If the K1 damping elements are exposed to unusual conditions, e.g., high ambient temperatures, high humidity or contact with liquids containing solvents, they may need to be replaced sooner.

Damping Element (K1):

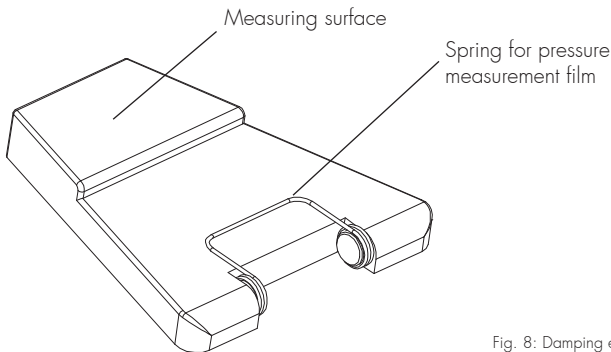


Fig. 8: Damping element

The damping element has a metal wedge for force transmission. The wedge is embedded in the damping material. It ensures the best possible force application at the optimal measuring point. The optimal point is marked by a cross, see illustration on the next page. A color sensor in the CBSF-XS detects the damping element.

8 Preparing for Measurement

The CBSF-XS is the fundamental device for force and pressure measurements. The measuring device is positioned at the collision points determined for the application. The additional damping element K1 is placed on the measuring surface, when this is defined in the test specification and included in the configuration of the measurement plan.

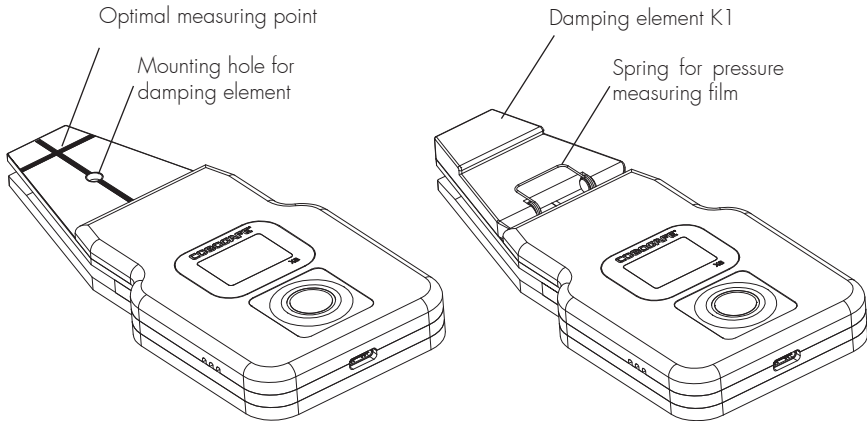


Fig. 9: Preparing for measurement



Keep in mind that the CBSF-XS has to acclimate to the surroundings for at least two hours before beginning operation.

8.1 Safety When Preparing a Measurement

⚠ CAUTION

Clamping point

The clamping point is located in the red shaded area, between the measuring surface and the measuring body (Refer to illustration below). During measurement, fingers or other body parts can be pinched here.

- Always hold the device on the body, never on the measuring tip.
- Use auxiliary equipment when the device cannot be safely held by hand.

Otherwise crush injuries can occur.

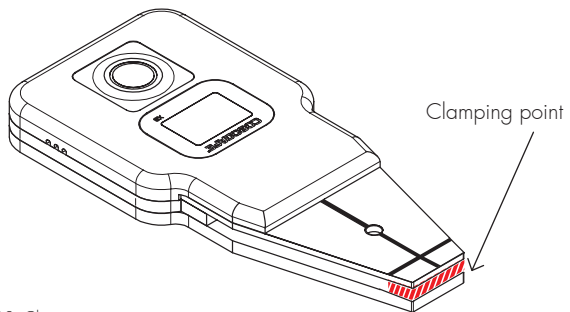


Fig. 10: Clamping point

8.2 Defining Measurement Target

The collision scenarios have to be defined before measurement begins. Body zones where potential collisions between robot work site personnel and robots have to be identified. The collision positions and collision vectors result from the determined scenarios for which collision measurement has to be performed.

8.3 Avoiding Damage to Device

NOTICE

Property damage resulting from high collisions speeds, forces and pressures!

- Combine only measuring devices such as those described in this manual.

If upon collision the robot exceeds the application limits of the force and pressure sensors, the measurement system can sustain damage.

How to design collision path:

Personnel	Personal Protective Equipment (PPE)
<ul style="list-style-type: none"> ■ Laboratory scientist ■ System integrator ■ Robot operator 	<ul style="list-style-type: none"> ■ PPE prescribed by robot manufacturer

Specifying the robot parameters determines the robot’s collision kinematics. The parameters have to be set in accordance with the target of measurement.

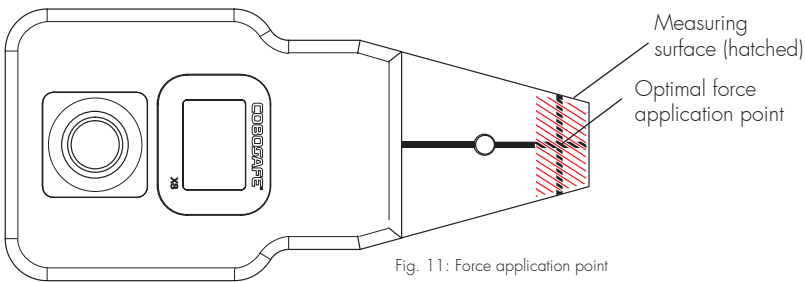


Fig. 11: Force application point

- ▶ Carefully plan adjustment of robot parameters.
- The vector of robot motion runs normal to the measuring surface of the sensor.
- The vector of robot motion hits the center of the measuring surface.
- ▶ Test collision motion without the force measuring device in place.
- ▶ First operate at significantly reduced speed and then slowly approach realistic collision conditions.

i	<p>Test measurement of parameters The determined parameters have to be checked with a test measurement. They may require repeated adjustment.</p>
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8.4 Checking Force Measurement

Personnel	Personal Protective Equipment (PPE)	Materials
<ul style="list-style-type: none"> ■ Laboratory scientist ■ System integrator ■ Robot operator ■ Certified personnel 	<ul style="list-style-type: none"> ■ PPE prescribed by robot manufacturer 	<ul style="list-style-type: none"> ■ Soft, lint-free cloth ■ Cleaning agent ■ Reference weight

<i>i</i>	<p>Damaged force measuring device A damaged device may not be used for measurements and has to be replaced.</p>
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8.4.1 Testing Proper Functioning of Force Measuring Device

- 1** ► Clean the measuring surface on your force measuring device.

- 2** ► Place the CBSF-XS on a flat surface. The measuring surface should face up.

- 3** ► Carefully lower the reference weight onto the measuring surface and wait until measurement begins.

If the force measured is the same as the force indicated on the reference weight, the test has been completed successfully. If the value is not the same, the device is damaged.

⇒ The CoboSafe CBSF-XS has been tested to confirm proper functioning.

8.5 Attaching Damping Element K1

Remove the damping element K1 from the case and position it by pressing it onto the measuring surface of the CBSF-XS in the direction of the arrow (see figure).

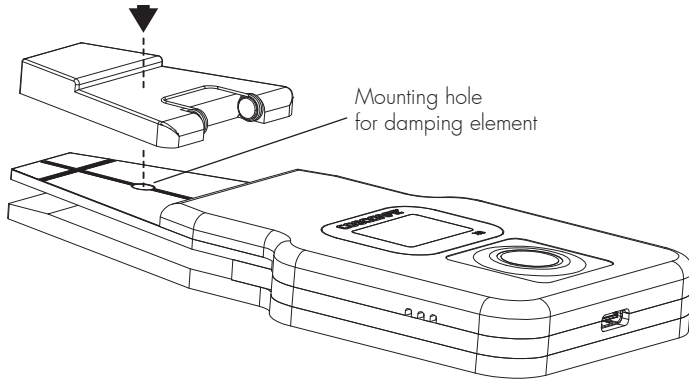


Fig. 12: Attaching damping element

8.6 Affixing Pressure Measurement Film

Once the damping element K1 has been positioned properly on the device, place the pressure measurement film on the measuring surface. There is a spring to help ensure proper placement. Use the spring to secure the pressure measurement film.

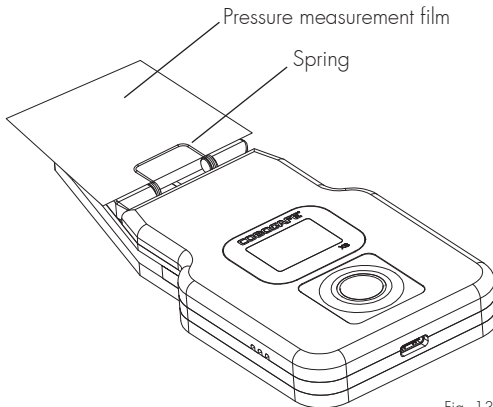


Fig. 13: Affixing pressure measurement film

9 Performing Measurement

Once the measuring device is positioned properly, measurement can begin.

After completion of the first measurement, the results can be assessed in CoboSafe-Vision.



Test measurements

The initial test measurements can be performed without pressure measurement to save consumables. The results of force measurement appear on the CBSF-XS display. If the application is such that the forces are below the threshold values, pressure measurement can be added.



Measurement numbers

Each measurement is assigned a number. It is advisable to note the number of a completed force and pressure measurement on the CoboSafe-Scan pressure image. This enables it to be later correlated to the force measurement.

WARNING

Dangerous robot motion

Risk of crush and collision between robot and measuring device! The collision situation to be measured can be dangerous.

- Do not reach into the collision range during measurement and keep a safe distance away from collision range.
- Perform collisions only with the properly prepared measuring device.

Body parts between the robot and the measuring device can be pinched or bumped.

9.1 Performing Measurement with the CBSF-XS

Personnel	Personal Protective Equipment (PPE)
<ul style="list-style-type: none"> ■ Laboratory scientist ■ Robot operator ■ System integrator 	<ul style="list-style-type: none"> ■ Protective clothing ■ Safety gloves ■ Safety shoes ■ Industrial safety helmet ■ PPE prescribed by robot manufacturer

- 1** ▶ Switch on the device.
- 2** ▶ Press the push-button.
- 3** ▶ Read the measurement number on the display and write it down.
- 4** ▶ Start moving the robot.
Observe the optimal measuring point.
- 5** ▶ Wait until the measurement is finished.
The measured force data is saved in the internal memory.
- 6** ▶ End the contact situation as described in the robot manual.
- 7** ▶ Disconnect the measuring device.
- 8** ▶ Remove accessories such as the microfiber cloth, pressure measurement film and damping element K1 from the measuring device.



When using the CoboSafe-Scan measuring system: Scan the films promptly!
The film C of the CoboSafe-Scan measuring system is dyed red by the collision contact. Film C has to be scanned promptly to quantify the measured data. For more information, read the product operating manual for CoboSafe-Scan.

10 Transmitting Measured Data

10.1 Data Set CBSF-XS

The force measurements performed are saved and indexed in the CBSF-XS. The data set contains the following information:

- Date
- Time
- Measurement number
- Device type
- Damping element K1 used
- Ambient temperature during measurement
- Humidity during measurement

The data can be transmitted wirelessly or via USB port in CoboSafe-Vision. Additional information can be found in the CoboSafe-Vision product operating manual.

10.2 Wireless Data Transmission

To be able to transmit data wirelessly, wire transmission has to be activated by selecting “ON” in the wireless menu. Read to chapter “Menu Navigation” to learn about this.

The range of wireless transmission is about 20 meters under normal conditions. It may be restricted by external factors. If transmission is restricted or not possible at all, use a USB cable for transmission.

10.3 Transmission via USB Port

Use the included USB cable to transmit data. Plug the cable into the USB port on the CBSF-XS and the USB port on the PC. Additional information on data transmission can be found in the CoboSafe-Vision product operating manual.

	<p>USB cable Only a shielded USB cable approved by the manufacturer may be used to connect the CBSF-XS to the PC.</p>
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11 Maintaining Functionality

The CBSF-XS force measuring devices should be inspected before and after measurement to ensure proper functioning. Look for apparent damage and excessive pollution. Never use a damaged device.

If there is any uncertainty regarding proper functioning or precision, e.g., because the device has been dropped or shows damage, the CBSF-XS should be sent to the manufacturer to be inspected.

11.1 Inspection and Cleaning

Instructions on inspecting and cleaning the CBSF-XS force measuring device and the damping element K1.

Personnel	Personal Protective Equipment (PPE)	Materials
<ul style="list-style-type: none"> ■ Laboratory scientist ■ System integrator 	<ul style="list-style-type: none"> ■ Protective clothing ■ Safety gloves ■ Safety shoes 	<ul style="list-style-type: none"> ■ Soft, lint-free cloth

11.1.1 Checking and Cleaning Device

- 1** ▶ Wipe the housing with a clean cloth.
Check particularly for coarse particles such as grains of sand or metal chips.
- 2** ▶ Use a soft cloth to clean the display on the device as well. Verify that the screen is clearly legible.
- 3** ▶ Check the measuring surface and casing for external damage.



Damage to CBSF-XS

If there is no damage apparent on the housing or the measuring surface, inspection is completed. Please contact the manufacturer in the event of damage.

⇒ Inspection and cleaning of the device are completed.

11.1.2 Inspecting and Cleaning Damping Element K1

- 1** ▶ Check the surface of the damping element K1 for damage and foreign objects.
- 2** ▶ Clean the damping element K1 if necessary.
- 3** ▶ Bend the damping element slightly and check for porosity.
Porous damping elements show lasting cracking when bent. A porous damping element K1 may not be used and must be replaced.
- 4** ▶ Use a cloth to carefully clean the surfaces of the damping element K1.
Shore hardness 70: Use a damp, lint-free cloth.

⇒ The damping element is free of impurities and ready for use.

11.2 Charging Battery

The charger specifications can be found in the manufacturer's documents and on the ID plate. Always comply with the technical data regarding charging voltage and maximum charging current.

The battery can be charged via the following options:

- Charge with the charger. The specifications can be found in the technical data.
- Charge via the USB port on the PC.

**Cyclic Charging**

Charge the device at regular intervals, especially during prolonged periods of inactivity.

11.3 Replacing Battery


The battery cannot be replaced by the operator. In the course of annual calibration by the manufacturer, the batteries and their charging cycles are checked and replaced if necessary. Batteries are replaced at the latest every two years.

11.4 Calibration

Calibration ensures precision of the measurement results. Contact customer service to have the measuring system calibrated.

The measuring system can be mailed to the manufacturer to have it calibrated.

11.4.1 Inspection Date

A label on the device indicates when the force measuring device has to be inspected and calibrated by the manufacturer; refer to  chapter "Signs and Labels" (inspection date).

11.4.2 Calibration by a Certified Laboratory

The force measuring device can be calibrated by a lab accredited according to DIN EN ISO/IEC 17025. We recommend having calibration performed by the manufacturer.

11.4.3 Temperature/Humidity

The integrated thermometer and hygrometer are calibrated along with the CBSF-XS measuring devices.

11.4.4 K1 Damping Element

The damping elements K1 are checked by the manufacturer for compliance with their specification during calibration of the CBSF-XS. Otherwise the damping elements K1 should be replaced when worn or at the latest once a year.

11.4.5 Spare Parts

Use only original spare parts or parts approved by the manufacturer. Spare parts can be obtained from GTE Industrieelektronik GmbH. Please contact customer service for assistance.

Maintenance Schedule

Inspection Interval	Maintenance Tasks	Personnel
Before each measurement	Inspection and cleaning Refer to ↪ chapter 12.1	Laboratory scientist System integrator
After every measurement	Inspection and cleaning Refer to ↪ chapter 12.1	Laboratory scientist System integrator
After approx. 8 hours of operation or when indicated	Charging batteries Refer to ↪ chapter 12.2	Laboratory scientist System integrator
Every year	Calibration of CoboSafe CBSF-XS	Manufacturer
	Replacement of damping element K1 with element equivalent to new	Laboratory scientist System integrator
Every 2 years	Replacing batteries Refer to ↪ chapter 12.3	Manufacturer

12 Properly Storing CBSF-XS

- Ensure prescribed storage conditions (Refer to chapter “Technical Data”)
- Always store CBSF-XS devices in the included transport cases.
- Store CBSF-XS devices such that they are not exposed to shaking or vibrations.

13 Detecting and Remediating Malfunctions

Error Description	Cause	Remedy	Personnel
Display on CBSF-XS is blank when device is switched on.	Batteries dead	Charge batteries	Laboratory scientist System integrator
	Batteries defective	Check CBSF-XS and have it repaired. Contact customer service in this case.	Manufacturer
Light ring does not turn on	Batteries dead	Charge batteries	Laboratory scientist System integrator
No wireless data transmission	Wireless deactivated	Activate wireless	Laboratory scientist System integrator
	CBSF-XS and notebook too far apart.	Decrease distance	Laboratory scientist System integrator
	No connection	Use USB cable for data transmission	Laboratory scientist System integrator
Error code	Cause	Remedy	Personnel
#1	Device not started successfully. Internal error	Restart device	Laboratory scientist System integrator
		Send device to manufacturer to be checked	Manufacturer
#2	Device defective	Send device to manufacturer to be repaired	Manufacturer
#3	Weight on device before startup	Restart the device	Laboratory scientist System integrator
#4 No measurement executable	Memory full	Clear measured values	Laboratory scientist System integrator

13.1 Firmware Update

Firmware is updated via the CoboSafe-Vision software.

14 Technical Data

14.1 Technical Data CoboSafe CBSF-XS

Weight and dimensions:

Specification	Value	Unit
Weight	350	g
Measuring surface size	350	mm ²
Height [Measuring surface height]	15 [10]	mm
Length	140	mm
Width	65	mm

Performance data:

Specification	Value	Unit
Voltage supply	3.7	V (DC)
Measurement curve memory	> 100	piece
Measuring range	20 ... 280	N
Maximum pressure on measuring surface	1 500	N/cm ²
Measurement inaccuracy, typical	± 1	% v. E.
Measuring error maximum, in measuring range	± 3	% v. E.
Spring rate (SI)	75	N/mm
Sampling rate	≥ 1	kHz
Interface	USB/wireless	-
Charging battery	2	hour
Battery life	8	hour
Power consumption	500	mA

Operating conditions:

Specification	Value	Unit
Relative humidity, non-condensing	20 ... 90	% RH
Temperature	+10 ... +30	°C

Storage conditions:

Specification	Value	Unit
Relative humidity, non-condensing	20 ... 90	% RH
Temperature	+5 ... +40	°C

14.2 Technical Data Accessories

Performance data USB charging adapter for mains operation:

Specification	Value	Unit
Nominal voltage, primary side	100 ... 230	V (AC)
Nominal voltage, secondary side	5	V
Charging current	0.7 ... 2	A

14.3 Requirements for Measurement Setup

Mechanical requirements contact surface:

Specification	Value	Unit
Stiffness measuring points	> 2000	N/mm
Contact surface	at least 350	mm ²



Requirements bearing surface

The stated values represent recommendations of the manufacturer.

14.4 Requirements for Temperature and Humidity Measurement

Temperature measurement:

Specification	Value	Unit
Measurement inaccuracy	± 5	°C

Humidity measurement:

Specification	Value	Unit
Measurement inaccuracy	± 3	% RH

(RH – relative humidity)

15 Customer Service

Scope of customer service	<ul style="list-style-type: none"> ■ Arrangement of authorized contact persons for the calibration ■ Spare part orders ■ Assistance with problems with the measuring system
Phone	Customer service is available from Mo - Thu, 8:00 to 16:00 (08 AM – 04 PM) Fridays from 8:00 to 14:30 (08 AM – 2:30 PM) +49 2162 3703-0
E-mail	cobosafe@gte.de
Mailing address	GTE Industrieelektronik GmbH Customer Service Helmholtzstraße 21 41747 Viersen, Germany
Further information	www.cobosafe.com

16 Disposal

NOTICE

Improper disposal

The measuring system contains electronic components and rechargeable batteries that can damage the environment if disposed of improperly.

Damping elements as well as the transport case are not biodegradable.

- Do not dispose of the measuring system in residual waste. Environmental damage due to improper disposal!

Disposal by the manufacturer

The measuring device can be returned for disposal by the manufacturer at the end of its serviceable life. Contact customer service before sending the device (Refer to the chapter "Customer Service").

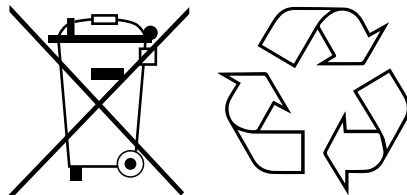
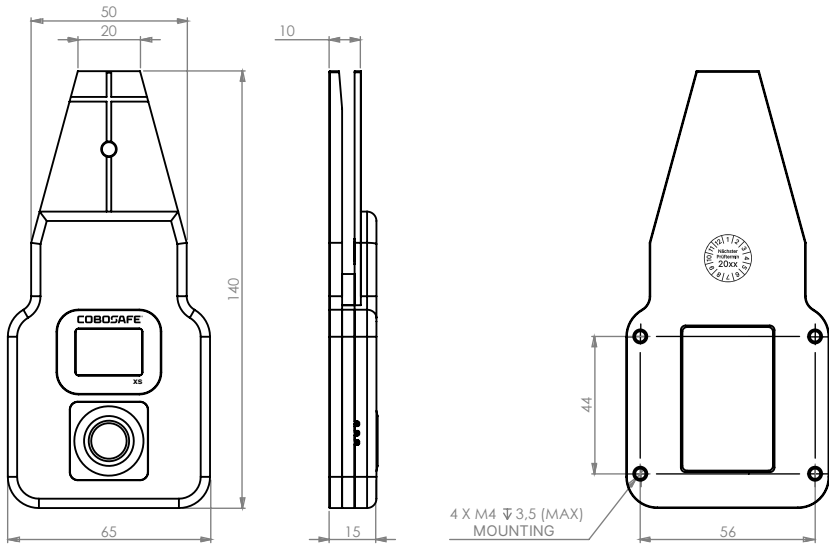


Fig. 14: Disposal

17 Appendix



Damping element K1

