

CoboSafe – General Safety Instructions

Force and Pressure Measurement System

- CBSF product series
- CoboSafe-Scan pressure measurement set
- CoboSafe-Tek pressure measurement set
- CoboSafe-Vision software

325-2810-010 EN12



Operating Manual

CoboSafe – General Safety Instructions

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CoboSafe - General Safety Instructions
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Technical changes reserved!

Range of Application

The general safety instructions are part of the operating manual for the products of the "CoboSafe" series. The following safety instructions apply to these products:

- CoboSafe-CBSF product series
- CoboSafe-Scan pressure measurement set
- CoboSafe-Tek pressure measurement set
- CoboSafe-Vision software



Before beginning work of any kind, read this manual. Keep for later use!

Product Monitoring

We work continually to improve our product and make it safer. In the case of questions regarding the product or suggestions for improving this manual, please contact our customer service (→ Chapter "Customer Service"). Should unforeseen events (e.g., accidents) occur when working with the test system, please notify us of this.

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1 About this Manual

The manual enables safe and efficient handling of the force and pressure measuring system (also referred to as "measuring system" below).

	<ul style="list-style-type: none">■ The operating manual including the general safety instructions are a component of the measuring system and must be stored near the measuring system, ensuring that it is 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.
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The illustrations in this manual are intended to aid in fundamental understanding of the product. They may deviate from the actual model.

1.1 Manufacturer and Publisher


GTE Industrieelektronik GmbH
Helmholtzstr. 21, 38-40
41747 Viersen
Germany

1.2 Further Applicable Documents

In addition to these instructions, other documents apply. The safety instructions and warnings in the documents listed below must be taken into account when dealing with the measuring system. Instructions contained therein must be followed and information in these documents must be observed and implemented:


- Technical documentation CoboSafe-Scan:
 - User's manual FUJITSU fi-65F
 - Datasheets of the pressure films
- Technical documentation of the PC on which CoboSafe-Vision is to be installed. This includes the software instructions of the text processing software and operating system used.
- Technical documentation of the robot whose collision forces are to be detected.

1.3 Underlying Standards and Information Material

	Check for possible updates for standards before using the measuring system.
---	---

The following standards were taken into account during product development:

Standard	Description
ISO/TS 15066:2016	Robots and robotic devices - Collaborative robots
ISO 10218-1	Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots
ISO 10218-2	Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration
DGUV FB-HM 080	DGUV Information: Collaborative robot systems Planning of plants with the function "power and force limitation"

	<p>Test specification</p> <p>The evaluation of the measurements with CoboSafe-Vision is carried out according to the requirements of the standards, guidelines and information documents requested by the software. Country-specific and local requirements are not taken into account, if these are not explicitly listed in the specification. If the correct test specification is not available, consultation with the manufacturer is required.</p>
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1.4 Copyright Protection

This manual is protected by copyright. The transfer of this manual to third parties, copying in any form or form - even in extracts - as well as the utilization and/or communication of the contents without written permission of GTE Industrieelektronik GmbH (herein after also "manufacturer") is not permitted except for internal purposes, violations require compensation. The manufacturer reserves the right to make additional claims.

1.5 Symbols and Warnings in this Manual








1.5.1 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.

Warnings	
 DANGER	This combination of symbol and signal word indicates an immediately dangerous situation that will lead to death or severe injuries if not avoided.
 WARNING	This combination of symbol and signal word indicates a possibly dangerous situation that could lead to death or severe injuries if not avoided.
 CAUTION	This combination of symbol and signal word indicates a possibly dangerous situation that could lead to minor injuries if not avoided.
NOTICE	This signal word indicates a possibly dangerous situation that could lead to property damage if not avoided.

1.5.2 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
	Lists with no specific order

1.6 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-75**

②

Personnel	Protective Equipment
<ul style="list-style-type: none">■ Laboratory scientists■ System integrators	<ul style="list-style-type: none">■ Protective gloves■ Safety shoes

③

④

Special Tools	Material
<ul style="list-style-type: none">■ Set of Allen keys	<ul style="list-style-type: none">■ Cleaning agent■ Soft, lint-free cloth

⑤

⑥

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

⑦

1 ▶ Place the measurement system on a free, flat surface



⑧

⇒ The measurement system rests securely and cannot fall off.

2 ▶ ...


Fig. 1 : Example of instructions

Explanations 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 ensure that the result is as described.**


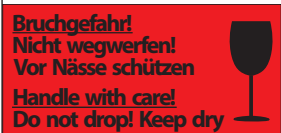

2 For your Safety



All information in this chapter is security relevant. If any comprehension questions arise while reading this chapter, do not use the product until they have been answered. In order to clarify comprehension questions, first read the complete operating manual. If the comprehension questions remain unanswered, please contact customer service.

2.1 Labeling on the Package

The labels on the packaging provide information on how to handle the package. The following labels are attached to the packaging:

	<p>Top</p> <p>The arrowheads of the symbol indicate the top of the package. They must always point upwards, otherwise the contents could be damaged. The product must be transported and stored upright and must not be dropped.</p>
	<p>Risk of fracture/protect from moisture</p> <p>Protect packages from moisture and keep dry. Never expose such marked packages to rain or snow. In addition, packages marked in this way must not be thrown or dropped, as the contents could otherwise be damaged.</p>
	<p>Sensitive electrical appliances</p> <p>The packages contain fragile or sensitive content. Handle the package with care, do not drop it and do not expose it to shocks or vibrations.</p>

2.2 Intended Use

The force and pressure measuring system CoboSafe is designed exclusively for the measurement of transient and quasi-static collision loads by collaborating robots. The force sensor CoboSafe-CBSF is designed for the measurement of transient and quasistatic forces.

In combination with a suitable pressure measuring system, e.g., CoboSafe-Scan or CoboSafe-Tek, the cumulative pressure measurement over the collision period is also part of the intended use. The measurement is limited to the application limits specified in the technical data of the respective product operating instructions and requires a measurement setup and environment that meet the specified requirements. The intended use is restricted to commercial and university

areas and requires qualified personnel as described in this manual (↗ chapter "Requirements for Personnel").

2.3 Improper Use

WARNING

Risk of injury due to improper use

- Use the measuring system exclusively as described in the intended use.
- Always ensure that software and compression elements comply with current requirements.
- Do not use the measuring system outside the specified application limits (product operating instructions, ↗ chapter "Technical Data").
- The maximum forces specified in the technical data of the product instructions for use must not be exceeded.
- Do not use the measuring system in flammable atmospheres.
- Only form measurement units that are specified by CoboSafe-Vision for the specific application.
- Create only measuring setups as described in the respective product operating instruction.
- Only use the measuring system by personnel who meet the requirements described in this manual. ↗ Chapter "Requirements for Personnel".
- Prepare and carry out measurements and evaluation of measurement data only as described in the product operating instructions.

Incorrect use of the measuring system can lead to dangerous situations and personal injury.

2.4 Qualifications Required of Personnel

2.4.1 Personnel Requirements for Laboratory Scientist

The laboratory scientist has a university degree (Bachelor, equivalent or higher) in robotics and automation technology recognized at the place of work or a degree course close to the subject. The laboratory scientist has already experience in handling technical laboratory equipment (e.g. robots, measuring and control equipment and software intended for scientific use). The laboratory scientist is familiar with the safety regulations and regulations for handling laboratory equipment applicable at the place of use.

Due to his professional experience and his analytical, methodological and technical knowledge acquired during his studies, the laboratory scientist is able to carry out the following activities safely and with valid results:

- Establish safe measurement setups taking into account the state of the art.
- Design, evaluate and interpret measurement series.
- Adapt the parameters of the measurement setup and the measurement process in a target-oriented manner.

Additionally, the laboratory scientist provides the following IT-skills:

- Operation of Microsoft® Windows PCs:
 - Install and run programs.
 - Manage file repositories.
 - Connect and use USB devices.
 - Use word processing programs (e.g. Microsoft® Word®).

2.4.2 Personnel Qualifications for Robot Operators

Robot operators are qualified to operate the collaborating robot whose collision forces are to be recorded and to program the robot controller. The robot operator's knowledge includes all behaviors, safety rules, hardware and software knowledge as well as training content required by the robot manufacturer for the safe use of the robot.

If the robot manufacturer specifies this, the robot operator must have the certificate specified by the robot manufacturer. The robot operator can use his knowledge to perform at least the following activities without endangering himself, others or property:

- Shut down the robot in an emergency.
- Use the hand-held operating device.
- Safely design and program robot parameters:
 - Simulate movements.
 - Use inching mode.
 - Set the traverse speed.
 - Define traverse paths.
 - Define collision parameters.
- Start collision movement.
- End collision situation.
- Safely mount collision surfaces.

In addition, the robot operator must be authorized by the operator to deal with the robots whose collision forces are to be detected.

2.4.3 Personnel Qualifications for System Integrators

The system integrator has a university degree (bachelor's degree, equivalent or higher) in mechanical engineering or a course of study close to the content recognized at the place of employment. The system integrator has already gained experience in the field of robotics in an industrial environment (e.g. industrial robots, measuring and control equipment and analysis software intended for industrial use). In particular, he has acquired problem-solving strategies

for the integration of robots into production systems through his activities or studies.

The system integrator is familiar with the safety regulations and regulations for handling production equipment and on-site infrastructure applicable at the place of use. Due to his professional experience, his analytical, methodological and technical knowledge acquired during his studies, the system integrator is able to carry out the following activities safely and with valid results:

- Establish safe measurement setups taking into account the state of the art.
- Design, evaluate and interpret measurement series.
- Adapt parameters of the measurement setup and the measurement process in a target-oriented manner.
- Communicate motion parameters.

Additionally, the system integrator provides the following IT-skills:

- Operation of Microsoft® Windows PCs:
 - Install and run programs.
 - Manage file repositories.
 - Connect and use USB devices.
 - Use word processing programs (e.g. Microsoft® Word®).

2.4.4 Certified Service Personnel

Certified service personnel are authorized by GTE Industrieelektronik GmbH to perform service activities on the measuring system and can prove their authorization by a certificate issued by GTE Industrieelektronik GmbH.

2.4.5 Unsuitable Personnel

When handling the measuring system, the personnel must be in good mental and physical condition. Adequate reaction, even to unforeseen events, must be ensured at all times. Persons whose ability to react or judge is affected by taking alcohol, medication or drugs must not work with the measuring system.

Whether mental or physical disabilities prevent responsible and safe working with the measuring system must be decided on the basis of recognized medical findings in the individual case in accordance with the applicable regulations at the place of use. Persons whose age at the place of use is too low for work in the commercial or university sector according to labor law regulations are also excluded from handling the measuring system.

2.4.6 Laboratory Scientists and System Integrators

Laboratory scientists and system integrators are the two target groups to whom this manual is directed. The measurement system is intended for use by these target groups. If both qualifications are listed as an introduction to an instruction for action, the activity can be performed either by a laboratory scientist or by a system integrator.

2.4.7 Operation of the Robot



In order to carry out measurements with the measuring system when used as intended, the movements of a robot must be set up. Robots can cause extremely serious injuries and material damage if operated improperly, caused by collisions, for example. Robots must therefore be operated and set up by robot operators. Laboratory scientists or system integrators can also be robot operators. The prerequisite for this is that the person concerned has all the characteristics listed in the description of both personnel qualifications (laboratory scientist and robot operator or system integrator and robot operator).

2.5 Personal Protective Equipment

2.5.1 Personal Protective Equipment for Working with Robots

For the handling of the robot, no specifications for the protective equipment can be made in these instructions, since the robot used is not known. For instructions on protective equipment for handling robots, refer to the relevant operating instructions of the robot manufacturer.

Special protective equipment for handling robots must always be worn in addition to the protective equipment required in this manual. If the same protective equipment (e.g. safety shoes) is required in parallel in this manual and in the operating manual of the robot manufacturer, always wear the variant that ensures the higher safety level.

2.5.2 Description of Protective Equipment

All protective equipment that must be worn when handling the measuring system is described below. The specific protective equipment that must be worn is listed in the introduction to each instruction by naming the protective equipment.



Fig. 5: Protective clothing

Protective clothing

Protective clothing protects against scratches and skin abrasion. Protective clothing has the following characteristics:

- Long sleeves and trouser legs
- Low tear strength
- Low flammability
- Tight fit



Fig. 6: Industrial hard hat

Industrial hard hat

The industrial hard hat protects against head injuries caused by impacts and falling objects. The industrial hard hat has the following characteristics:

- Unbreakable shell
- Secure fit (e.g. with neck strap)



Fig. 7: Protective gloves

Protective gloves

Protective gloves are used to protect the hands from friction, abrasions and cuts.



Fig. 8: Protective shoes

Safety shoes

Safety shoes protect against injuries to the feet caused by falling or pointed objects and against slipping. Safety shoes have the following characteristics:

- High slip resistance
- Toe protection by steel caps
- Solid upper material
- Puncture-resistant sole

Safety shoes meet at least protection class 3 according to DIN EN ISO 20345.

3 Responsibility of the Operator

Operator

Operator is the person who operates the measuring system for commercial or economic purposes or for research purposes or who leaves it to a third party for use/application and who is legally responsible for the product during operation.

Responsibility of the Operator

The measuring system is intended for use in commercial or university applications. The operator of the measuring system is therefore subject to the legal obligations for occupational safety. In addition to the safety instructions in this manual, the safety, industrial safety and environmental protection regulations applicable at the place of use of the measuring system must be observed.

With regard to the measuring system, the operator must ensure the following points:

- The handling of the measuring system is restricted to persons with the qualifications described in these instructions.
- The responsibilities for handling the measuring system are clearly regulated and defined.
- The specified activities to maintain functionality are carried out at the times and intervals specified in these instructions.
- All persons handling the measuring system have read and understood these instructions. In addition, the personnel is trained at regular intervals and informed about the dangers.
- Access to the measuring system is restricted to authorized and qualified personnel only.
- Access rights to the PC are limited to authorized and qualified personnel.
- Passwords for the "CoboSafe-Vision" software are only accessible to authorized, qualified personnel and will not be passed on to third parties.

4 Residual Risks

4.1 Residual Risks when Operating Robots



Robots whose collision forces are measured with the measuring system are dangerous. Improper adjustment of movement paths and parameters can lead to serious injuries during robot adjustment and measurement.

⚠ WARNING**Risk of injury and material damage due to improper handling of robots!**

- Robots should only be operated by robot operators.
- Follow the instructions in the robot manufacturer's manual.
- Use significantly reduced speeds.
- Determine movement paths carefully.
- Ensure that unauthorized persons have no access to robots.

Improper operation of robots can cause severe impacts and crush injuries as well as material damage to the measuring setup, the robot and the operating environment.

4.2 Dangerous Measurement Setup

The measurement setup must meet requirements with regard to stiffness and at the same time guarantee stability. Therefore, hard and stiff components must be used, which must be firmly connected to each other. If the measurement setup is carried out using aluminum profiles, burrs, corners and edges can cause cut and impact injuries. Falling or tilting components of the measurement setup can cause injuries.

⚠ WARNING**Risk of injury due to improperly constructed measuring setup!**

- Manufacture measuring setup only with deburred components.
- Pad corners and edges.
- Secure the measuring setup against unauthorized access.
- Wear specified protective equipment.
- Secure measurement setup against tilting.

If the measurement setup is manufactured using sharp-edged components or has sharp corners, this may result in cuts and impacts. Tilting parts of the test setup (e.g. due to low stability) can cause shock and crush injuries.

4.3 Falling Components

WARNING

Risk of injury from dropping components!

- Keep the workplace tidy:
 - Keep work surfaces free of components for assembly and storage.
 - After use, store components that are not required according to the instructions.
- Handle all components carefully.
- Wear specified personal protective equipment.

Some components of the measurement system are heavy and hard. If force sensors, mounting adapters, transport cases, foil rolls or the special scanner are dropped, severe injuries, including bruising and bone fractures, may result.

4.4 Computer-Viruses and Malware

WARNING

Risk of injury due to data errors caused by computer viruses or malware!

- Only use PCs with up-to-date anti-virus software.
- Perform updates according to the specifications of the operating system manufacturer and the manufacturer of the anti-virus software.

Computer viruses can damage update files and cause Cobo-Safe-Vision to malfunction. Errors in the measurement results can result in personal injury and material damage caused by the evaluated collaborating robot.

4.5 Contained Chemicals

WARNING

Damage to health caused by chemicals contained in rechargeable batteries!

- Never open rechargeable batteries.
- Dispose of damaged rechargeable batteries at the place of use according to instructions. Always wear protective gloves.
- Never put rechargeable batteries in your mouth or swallow them.

The rechargeable batteries in the force sensor contain chemicals which, if swallowed, can cause extremely serious damage to health and poisoning.

5 Significance of the Measurement Results



The evaluation of the measurement results using CoboSafe-Vision is based on normative specifications. During the evaluation, it is checked whether defined limit values for collision forces and pressures are exceeded or undercut in a specific contact-situation. These limits are not set by GTE Industrieelektronik GmbH. The limit values are listed within standards. If the evaluation shows that the measured forces and pressures are below the normatively defined limit values, collision injuries cannot be ruled out. The measurement result only indicates that the measured contact situation is below the limit values specified in the standards.

5.1 Selection of Measuring Points



The significance of the measurement results is limited exclusively to the contact situations measured in each specific case.

The contact situations are illustrated with the choice of the measuring points and the choice of the collision vectors. All collision possibilities must be considered in order to guarantee the safety of workplaces with collaborating robots. Therefore, appropriate measuring points and collision vectors must be selected for all possible collisions in a specific case. Specifications as to which collision possibilities must be measured for a specific application are not possible within these instructions because the specific application is not known. The selection of measurement points and collision vectors must always ensure that all collision possibilities between human and robot are reproduced. For advice in individual cases, contact the official contact person responsible at the location (e.g. employers' liability insurance association).

6 Unpacking

Personnel	Personal Protective Equipment
<ul style="list-style-type: none">■ Laboratory scientists■ System integrators	<ul style="list-style-type: none">■ Protective gloves■ Safety shoes




Fig. 9: Transport packaging

Transport Packaging

Depending on the scope of delivery, the measuring system is delivered on a pallet or packed in a cardboard box. The packed goods must not be damaged during transport and unpacking. Please note the attached handling instructions.


- 1 ▶** Place packages (fig. transport packaging) individually on a flat surface.
- 2 ▶** Carefully open the carton with a short blade (max. 0.5 cm) on the package tape.
- 3 ▶** Remove the filling material.
- 4 ▶** Carefully lift out the transport case and place it on a flat surface.
⇒The measuring system is unpacked.
- 5 ▶** Store pallet or carton and filling material, but do not dispose yet.
⇒The packaging can be used for a return shipment if transport damage has occurred. The packaging can also be used to send the measuring system to the manufacturer for calibration or disposal.


7 Checking the Scope of Delivery




The information on the scope of delivery in the applicable product instructions for use shall in each case represent the standard scope of delivery. Specific deliveries may vary in scope. Take the exact scope of delivery from the packing slip.

Personnel	Personal Protective Equipment
<ul style="list-style-type: none"> ■ Laboratory scientists ■ System integrators 	<ul style="list-style-type: none"> ■ Protective gloves ■ Safety shoes


- 1 ▶** Open the transport case by the buckles on the front.
- 2 ▶** Check that the contents correspond to the  scope of delivery specified in the product instructions.
- 3 ▶** Check all components of the scope of delivery for externally visible damage.
- 4 ▶** If parts of the scope of delivery show visible damage, take clear photos.

⇒ If no visible damage has been found, the measuring system is ready for first use. If any parts of the delivery are damaged, do not use the measuring system. In this case, contact the customer service ( chapter "Customer Service") to coordinate the next steps.

8 Updates and Upgrades

The updating and further development of peripherals and software is necessary due to normative adaptations. These changes are offered in the form of upgrades and updates by the manufacturer. In order to maintain full functionality, updating to the latest version is necessary and must be ensured. When the PC software CoboSafe-Vision is started, the version status is automatically queried online. A more recent version including a description of the changes is displayed in a window and is available for download. If no network connection is available, the operator is obliged to carry out the version check manually at intervals of not more than 1 month or if a normative change is known. For this purpose, a temporary connection to the Internet can be used and the query for existing updates can be started manually. The current versions are available on the manufacturer's website. After updating, the updated operating instructions are also available. They can be accessed online via the query in the CoboSafe-Vision software or on the manufacturer's website. The documentation must be available in printed form ( chapter "About this Manual").

9 Compliance with Test Dates and Calibration Intervals

	The devices belonging to the range of application of these instructions (↗ chapter "Range of Application") are subject to maintenance specifications. Force gauges and some accessories must be regularly checked and calibrated by the manufacturer. Detailed instructions can be found in the respective product operating instructions.
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10 Customer Service

Scope of customer service	<ul style="list-style-type: none"> ■ Mediation 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 from 8:00 to 16:00 (08 AM – 04 PM) Fridays from 8:00 to 14:30 (08 AM – 02:30 PM) +49 2162 3703-0
E-mail	cobosafe@gte.de
Postal address	GTE Industrieelektronik GmbH Customer Service Helmholtzstraße 21, 38 - 40 41747 Viersen, Germany
Further information	www.cobosafe.com

11 Spare Parts

Customer service is available for spare part orders ↗ Chapter "Customer Service". You can also obtain a list of available spare parts from our customer service.

12 Disposal

12.1 Proper Disposal

Proper disposal shall be in accordance with the regulations and procedures in effect in the country of use or disposal.

- ▷ **Dispose of all components at the place of use in accordance with regulations and pay particular attention to proper disposal of the batteries. If removable parts have to be separated from the device during disposal, please refer to the relevant product operating instructions.**

12.2 Improper Disposal

⚠ WARNING

Environmental damage due to improper disposal

- Do not dispose of the measuring system in household waste.

The measuring system contains electronic components and rechargeable batteries which can damage the environment if improperly disposed of. Compression elements and the transport case are not biodegradable

12.3 Disposal by the Manufacturer

The measuring system can be sent in for disposal by the manufacturer at the end of its period of use. Please contact the customer service (📞 chapter "Customer Service") before sending in the system.



Fig. 10: Disposal

