



Temperature sensor

TF with IO-Link

Installation and Operation Instructions

Original instructions





Bühler Technologies GmbH, Harkortstr. 29, D-40880 Ratingen
Tel. +49 (0) 21 02 / 49 89-0, Fax: +49 (0) 21 02 / 49 89-20
Internet: www.buehler-technologies.com
E-Mail: fluidcontrol@buehler-technologies.com

Read this instruction carefully prior to installation and/or use. Pay attention particularly to all advises and safety instructions to prevent injuries. Bühler Technologies can not be held responsible for misusing the product or unreliable function due to unauthorised modifications.

All rights reserved. Bühler Technologies GmbH 2024

Document information

Document No.....BE140016
Version..... 06/2024

Contents

| | | |
|-----|-----------------------------------|----|
| 1 | Introduction | 2 |
| 1.1 | Intended Use | 2 |
| 1.2 | Layout and Functionality | 2 |
| 1.3 | Scope of Delivery | 2 |
| 1.4 | Model key | 2 |
| 2 | Safety instructions | 3 |
| 2.1 | Important advice | 3 |
| 2.2 | General hazard warnings | 4 |
| 3 | Transport and storage | 5 |
| 4 | Installation and connection | 6 |
| 4.1 | Installation | 6 |
| 4.2 | Electrical Connections | 6 |
| 5 | Operation and control | 7 |
| 6 | Cleaning and Maintenance | 8 |
| 7 | Service and repair | 9 |
| 7.1 | Spare parts | 9 |
| 8 | Disposal | 10 |
| 9 | Appendix | 11 |
| 9.1 | Technical Data | 11 |
| 9.2 | Standard pin assignment | 11 |
| 10 | Attached documents | 12 |

1 Introduction

1.1 Intended Use

The TF temperature sensors are used to monitor temperatures inside a tank.

The TF temperature sensors can also be used in piping and cooling matrices. In this case the tube is located inside the tank. According to EN 60079-11, the TF series temperature sensors are simple electrical apparatuses without separate voltage source intended for tank top installation. The temperature sensors must not be used in highly flammable or corrosive liquids. Before installing the temperature sensors, verify the listed technical data meet the application parameters. Also observe the applicable requirements of EN 60079-14. Further check if all contents are complete. Observe the specific values of the temperature sensors when establishing the connection.

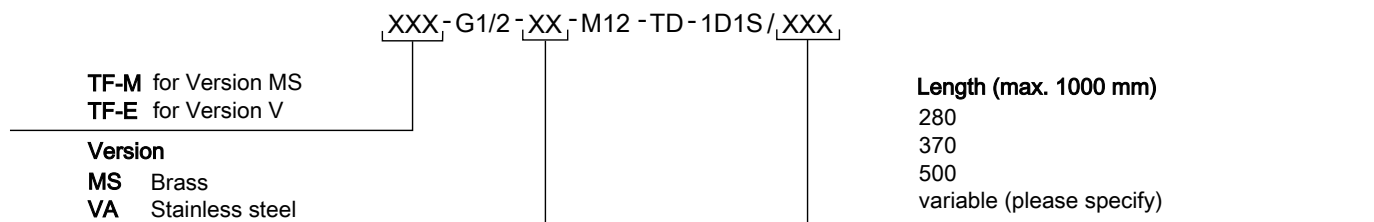
1.2 Layout and Functionality

Type TF temperature sensors use a Pt100 temperature sensor to generate a temperature-dependent resistance signal. The Pt100 sensor is installed at the lowest point of the sensor tube to always ensure sufficient contact with the medium being measured. The electronics of the TF temperature sensor converts this resistance signal into a digital IO-Link signal.

1.3 Scope of Delivery

- Temperature switch/sensor
- Elastic profile gasket G1/2 (NBR): 11 20 101
- Product Documentation

1.4 Model key



Ordering example

You require: Brass temperature sensor with M12 plug, IO-Link output, length L= 520 mm, operating pressure 5 bar

Order: TF-M-G1/2-MS-M12-TD-1D1S/520

2 Safety instructions

2.1 Important advice

Operation of the device is only permitted if:

- the product is used under the conditions described in the installation- and operation instruction, the intended application according to the type plate and the intended use. In case of unauthorized modifications done by the user Bühler Technologies GmbH can not be held responsible for any damage,
- when complying with the specifications and markings on the nameplates.
- the performance limits given in the datasheets and in the installation- and operation instruction are obeyed,
- monitoring devices and safety devices are installed properly,
- service and repair is carried out by Bühler Technologies GmbH,
- only original spare parts are used.


This manual is part of the equipment. The manufacturer keeps the right to modify specifications without advanced notice. Keep this manual for later use.

Signal words for warnings

| | |
|----------------|---|
| DANGER | Signal word for an imminent danger with high risk, resulting in severe injuries or death if not avoided. |
| WARNING | Signal word for a hazardous situation with medium risk, possibly resulting in severe injuries or death if not avoided. |
| CAUTION | Signal word for a hazardous situation with low risk, resulting in damaged to the device or the property or minor or medium injuries if not avoided. |
| NOTICE | Signal word for important information to the product. |

Warning signs

These instructions include the following warnings:

| | | | |
|---|-----------------------------------|---|----------------------------|
|  | General warning sign |  | Unplug from mains |
|  | Voltage warning |  | Wear respiratory equipment |
|  | Warning not to inhale toxic gases |  | Wear a safety mask |
|  | Warning of corrosive substances |  | Wear gloves |
|  | General mandatory sign | | |

2.2 General hazard warnings

The equipment must be installed by a professional familiar with the safety requirements and risks.

Be sure to observe the safety regulations and generally applicable rules of technology relevant for the installation site. Prevent malfunctions and avoid personal injuries and property damage.

The operator of the system must ensure:

- Safety notices and operating instructions are available and observed,
- The respective national accident prevention regulations are observed,
- The permissible data and operational conditions are maintained,
- Safety guards are used and mandatory maintenance is performed,
- Legal regulations are observed during disposal,
- compliance with national installation regulations.

Maintenance, Repair

Please note during maintenance and repairs:

- Repairs to the unit must be performed by Bühler authorised personnel.
- Only perform conversion-, maintenance or installation work described in these operating and installation instructions.
- Always use genuine spare parts.
- Do not install damaged or defective spare part. If necessary, visually inspect prior to installation to determine any obvious damage to the spare parts.

Always observe the applicable safety and operating regulations in the respective country of use when performing any type of maintenance.

3 Transport and storage

Only transport the product inside the original packaging or a suitable alternative.

The equipment must be protected from moisture and heat when not in use. It must be stored in a covered, dry, dust-free room at room temperature.

4 Installation and connection

4.1 Installation

The temperature sensor comes fully assembled and can be mounted to the tank with a screw fitting and seal. Please be sure to leave enough space between the tank wall and add-ons. The maximum torque of the screw-in thread is 25 Nm. When installing, be sure the sealing face is clean and even. Only screw the temperature sensor into the designated thread. Sealed with an elastic sealing ring. No other sealants required.

4.2 Electrical Connections

Electricity is supplied via plug connectors. Please refer to the appendix for installation dimensions, nominal voltage and plug configuration. The switching outputs are PNP transistors. The level- and temperature sensor is powered with 18 - 30 V direct voltage. The sensor connects with a cable and standard M12 plug-in connectors.

5 Operation and control

NOTICE

The device must not be operated beyond its specifications.

Version with IO-Link interface

This unit is equipped with an IO-Link interface, which require an IO-Link master.

The IO-Link interface allows direct access to process and diagnostics data, and allows configuring the unit during operation.

The IODDs required to configure the unit is available at <https://ioddfinder.io-link.com/>.

If the IO-Link interface is not being used (no master or only used to parametrise), the temperature sensor functions as a regular temperature sensor with 2 switching outputs. The default parameters and switching function of the switching outputs, however, can be parametrised via IO-Link master.

For more information please visit: www.io-link.com



6 Cleaning and Maintenance

This device is maintenance-free.

The method for cleaning the devices must be adapted to the IP protection class of the devices. Do not use cleaners which could damage the device materials.

7 Service and repair

This chapter contains information on troubleshooting and correction should an error occur during operation.

Repairs to the unit must be performed by Bühler authorised personnel.

Please contact our Service Department with any questions:

Tel.: +49-(0)2102-498955 or your agent

For further information about our services and customised maintenance visit <http://www.buehler-technologies.com/service>.

If the equipment is not functioning properly after correcting any malfunctions and switching on the power, it must be inspected by the manufacturer. Please send the equipment inside suitable packaging to:

Bühler Technologies GmbH

- Reparatur/Service -

Harkortstraße 29

40880 Ratingen

Germany

Please also attach the completed and signed RMA decontamination statement to the packaging. We will otherwise be unable to process your repair order.

You will find the form in the appendix of these instructions, or simply request it by e-mail:

service@buehler-technologies.com.

7.1 Spare parts

Accessories

| Item no. | Description |
|------------|--|
| 9144050010 | Connecting cable M12x1, 4-pin, 1.5 m, angular coupling and straight plug |
| 9144050046 | Connecting cable M12x1, 4-pin, 3.0 m, angular coupling and straight plug |
| 9144050047 | Connecting cable M12x1, 4-pin, 5.0 m, angular coupling and strands |

8 Disposal

The applicable national laws must be observed when disposing of the products. Disposal must not result in a danger to health and environment.

The crossed out wheelite bin symbol on Bühler Technologies GmbH electrical and electronic products indicates special disposal notices within the European Union (EU).



The crossed out wheelite bin symbol indicates the electric and electronic products bearing the symbol must be disposed of separate from household waste. They must be properly disposed of as waste electrical and electronic equipment.

Bühler Technologies GmbH will gladly dispose of your device bearing this mark. Please send your device to the address below for this purpose.



We are obligated by law to protect our employees from hazards posed by contaminated devices. Therefore please understand that we can only dispose of your waste equipment if the device is free from any aggressive, corrosive or other operating fluids dangerous to health or environment. **Please complete the "RMA Form and Decontamination Statement", available on our website, for every waste electrical and electronic equipment. The form must be applied to the packaging so it is visible from the outside.**

Please return waste electrical and electronic equipment to the following address:

Bühler Technologies GmbH
WEEE
Harkortstr. 29
40880 Ratingen
Germany

Please also observe data protection regulations and remember you are personally responsible for the returned waste equipment not bearing any personal data. Therefore please be sure to delete your personal data before returning your waste equipment.

9 Appendix

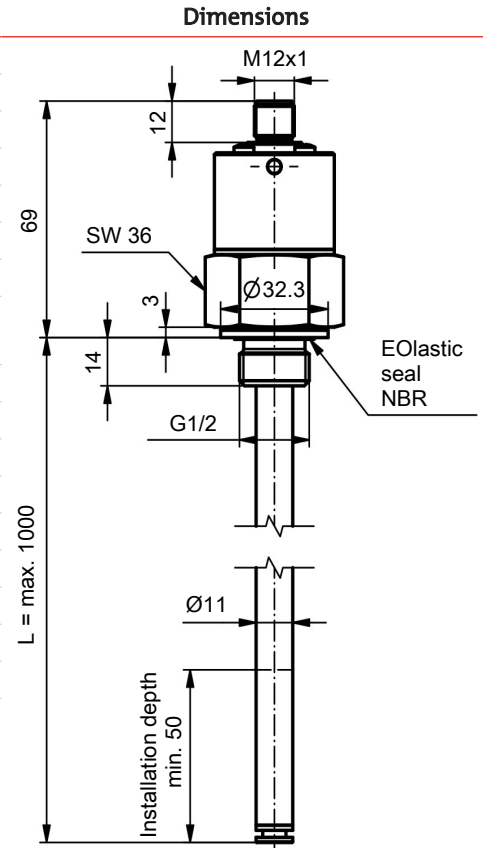
9.1 Technical Data

TF-M-G1/2-xx-M12-TD-1D1S

| | TF-M-G1/2 | TF-E-G1/2 |
|--------------------------|--|-----------|
| Version: | MS | VA |
| Probe material: | Brass | 1.4571 |
| Max. operating pressure: | 5 bar | 10 bar |
| Connection: | G1/2 | G1/2 |
| Medium temperature: | -20 °C to +80 °C | |
| Ambient temperature: | -20 °C to +70 °C | |
| Lengths: | 280, 370, 500 (standard) variable to max. 1000 mm | |

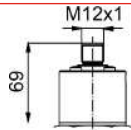
Input value

| | |
|--------------------------------------|----------------------------|
| Sensor element: | Pt100 Class B DIN EN 60751 |
| Tolerance Pt100: | ±0.8 °C |
| Operating voltage (U _b): | 18 - 30 VDC |
| Measuring range: | -20 °C to +120 °C |
| Output: | IO-Link |
| IO-Link | Revision 1.1 |
| Baudrate: | COM3 (230.4 k) |
| SIO Mode: | Yes |
| Min. Time Period | 10 ms |

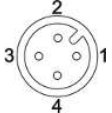


9.2 Standard pin assignment

Connector

| | M12 |
|----------------|---|
| Dimensions |  |
| Number of pins | 4-pin |
| DIN EN | 61076-2-101 |
| IP rating | IP67* |

*with IP67 cable box attached

| Version | 1D1S |
|----------------------|---|
| Plug | M12 4-pin |
| Connection schematic |  |
| Pin | |
| 1 | +24 V DC |
| 2 | S2 (PNP max. 200 mA) |
| 3 | GND |
| 4 | C/Q (IO-Link) |

10 Attached documents

- Declaration of Conformity KX110021
- IO-Link HX00002 manufacturer declaration
- RMA decontamination statement

EU-Konformitätserklärung
EU-declaration of conformity



Hiermit erklärt Bühler Technologies GmbH,
dass die nachfolgenden Produkte den
wesentlichen Anforderungen der Richtlinie

*Herewith declares Bühler Technologies GmbH
that the following products correspond to the
essential requirements of Directive*

2014/30/EU
(Elektromagnetische Verträglichkeit / *electromagnetic compatibility*)

in ihrer aktuellen Fassung entsprechen.

in its actual version.

Wir bestätigen die Konformität der Produkte nach **RoHS-Richtlinie**
*We confirm the conformity of the products according to the **RoHS Directive***

2011/65/EU und/and 2015/863/EU

Produkt / products: Temperatursensoren / *Temperature sensors*
Temperaturtransmitter / *Temperature transmitters*
Typ / types: TF...
MK2, EK2

Das Betriebsmittel dient zur Überwachung der Temperatur in Fluidsystemen.
The equipment is intended for monitoring the temperature in fluid systems.

Das oben beschriebene Produkt der Erklärung erfüllt die einschlägigen
Harmonisierungsrechtsvorschriften der Union:
*The object of the declaration described above is in conformity with the relevant Union harmonisation
legislation:*

EN 61326-1:2013

EN IEC 63000:2018

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller.
This declaration of conformity is issued under the sole responsibility of the manufacturer.

Dokumentationsverantwortlicher für diese Konformitätserklärung ist Herr Stefan Eschweiler mit
Anschrift am Firmensitz.
*The person authorised to compile the technical file is Mr. Stefan Eschweiler located at the company's
address.*

Ratingen, den 27.05.2024

Stefan Eschweiler
Geschäftsführer – *Managing Director*

Frank Pospiech
Geschäftsführer – *Managing Director*

UK Declaration of Conformity



The manufacturer Bühler Technologies GmbH declares, under the sole responsibility, that the product complies with the requirements of the following UK legislation:

Electromagnetic Compatibility Regulations 2016
S.I. 2016 No. 1091

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
S.I. 2012 No. 3032

Products: Temperature sensors
Temperature transmitters
Types: TF...
MK2, EK2

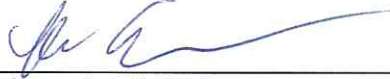
The equipment is intended for monitoring the temperature in fluid systems.

The object of the declaration described above is in conformity with the relevant designated standards:

EN 61326-1:2013

EN IEC 63000:2018

Ratingen in Germany, 27.05.2024



Stefan Eschweiler
Managing Director



Frank Pospiech
Managing Director

**Herstellereklärung
Manufacturer Declaration**



Die Firma Bühler Technologies GmbH erklärt in alleiniger Verantwortung, dass die Produkte

The company Bühler Technologies GmbH declares under their sole responsibility, the products

**Produkttyp/
product type:**

IO-Link Device

Niveau- und Temperaturschalter / *Level- and temperature switch*
NT 67-XP, NV 77-XP, NT M-XP, NT 63-LTD, NT M-LTD

Anzeige- und Steuereinheit / *Display and control unit*
TT-77W, Multitronik, BCM-XD

Drucksensor/Druckschalter / *Pressure sensor/pressure switch*
PT-77x

Ölfeuchtesensor / *Oil moisture sensor*
BCM-WS, BCM-WD, BCM-WR

Verschmutzungsanzeiger / *Clogging indicator*
BCI24-Dx-3x7

Geberrohr / *Transducer tube*
BLT-AMx-LD

Temperaturfühler mit IO-Link / *Temperature sensor with IO-Link*
TF, TT-77F

folgenden Spezifikationen entsprechen/*meet the following specifications:*

IO-Link Interface and System Specification, V1.1, July 2013, (Note 1,2)
IO Device Description, V,1.1, August 2011


NOTE 1 Relevant Test specification is V1.1, July 2014

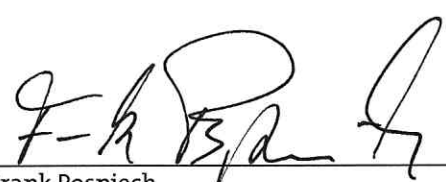
NOTE 2 Additional validity in Corrigendum Package 2015

Testberichte/Test reports:

| | | | |
|----------------------|--------------------------------------|--------|---|
| NT M/NV 77/NT 67/-XP | Nr.: 551181146, 652794735, 652804397 | BCM-WS | Nr.: 652882526, 652889383, 652891264, 729607577 |
| NT 63-LTD | Nr.: 626365019 | BCM-WD | Nr.: 550681423, 652956776 |
| NT M-LTD | Nr.: 652543964 | BCM-WR | Nr.: 559215021, 652967675 |
| TT-77W | Nr.: 554892517 | BCM-XD | Nr.: 653046280 |
| TT-77F | Nr.: 554831228 | BCI | Nr.: 633691152, 762527595 |
| Multitronik | Nr.: 629292046 | BLT | Nr.: 638462056 |
| PT-77 | Nr.: 555674138, 652534541, 740585522 | | |
| TF | Nr.: 638464804 | | |

Ratingen, den 18.03.2024


Stefan Eschweiler
Geschäftsführer – *Managing Director*


Frank Pospiech
Geschäftsführer – *Managing Director*

RMA-Formular und Erklärung über Dekontaminierung

RMA-Form and explanation for decontamination



RMA-Nr./ RMA-No.

Die RMA-Nr. bekommen Sie von Ihrem Ansprechpartner im Vertrieb oder Service. Bei Rücksendung eines Altgeräts zur Entsorgung tragen Sie bitte in das Feld der RMA-Nr. "WEEE" ein./ You may obtain the RMA number from your sales or service representative. When returning an old appliance for disposal, please enter "WEEE" in the RMA number box.

Zu diesem Rücksendeschein gehört eine Dekontaminierungserklärung. Die gesetzlichen Vorschriften schreiben vor, dass Sie uns diese Dekontaminierungserklärung ausgefüllt und unterschrieben zurücksenden müssen. Bitte füllen Sie auch diese im Sinne der Gesundheit unserer Mitarbeiter vollständig aus./ This return form includes a decontamination statement. The law requires you to submit this completed and signed decontamination statement to us. Please complete the entire form, also in the interest of our employee health.

Firma/ Company

Firma/ Company

Straße/ Street

PLZ, Ort/ Zip, City

Land/ Country

Gerät/ Device

Anzahl/ Quantity

Auftragsnr./ Order No.

Ansprechpartner/ Person in charge

Name/ Name

Abt./ Dept.

Tel./ Phone

E-Mail

Serien-Nr./ Serial No.

Artikel-Nr./ Item No.

Grund der Rücksendung/ Reason for return

- Kalibrierung/ Calibration Modifikation/ Modification
 Reklamation/ Claim Reparatur/ Repair
 Elektroaltgerät/ Waste Electrical & Electronic Equipment (WEEE)
 andere/ other

bitte spezifizieren/ please specify

Ist das Gerät möglicherweise kontaminiert?/ Could the equipment be contaminated?

- Nein, da das Gerät nicht mit gesundheitsgefährdenden Stoffen betrieben wurde./ No, because the device was not operated with hazardous substances.
 Nein, da das Gerät ordnungsgemäß gereinigt und dekontaminiert wurde./ No, because the device has been properly cleaned and decontaminated.
 Ja, kontaminiert mit:/ Yes, contaminated with:



explosiv/
explosive



entzündlich/
flammable



brandfördernd/
oxidizing



komprimierte
Gase/
compressed
gases



ätzend/
caustic



giftig,
Lebensgefahr/
poisonous, risk
of death



gesundheitsge-
fährdend/
harmful to
health



gesund-
heitsschädlich/
health hazard



umweltge-
fährdend/
environmental
hazard

Bitte Sicherheitsdatenblatt beilegen!/ Please enclose safety data sheet!

Das Gerät wurde gespült mit:/ The equipment was purged with:

Diese Erklärung wurde korrekt und vollständig ausgefüllt und von einer dazu befugten Person unterschrieben. Der Versand der (dekontaminierten) Geräte und Komponenten erfolgt gemäß den gesetzlichen Bestimmungen.

This declaration has been filled out correctly and completely, and signed by an authorized person. The dispatch of the (decontaminated) devices and components takes place according to the legal regulations.

Falls die Ware nicht gereinigt, also kontaminiert bei uns eintrifft, muss die Firma Bühler sich vorbehalten, diese durch einen externen Dienstleister reinigen zu lassen und Ihnen dies in Rechnung zu stellen.

Should the goods not arrive clean, but contaminated, Bühler reserves the right, to commission an external service provider to clean the goods and invoice it to your account.

Firmenstempel/ Company Sign

Datum/ Date

rechtsverbindliche Unterschrift/ Legally binding signature



Vermeiden von Veränderung und Beschädigung der einzusendenden Baugruppe

Die Analyse defekter Baugruppen ist ein wesentlicher Bestandteil der Qualitätssicherung der Firma Bühler Technologies GmbH. Um eine aussagekräftige Analyse zu gewährleisten muss die Ware möglichst unverändert untersucht werden. Es dürfen keine Veränderungen oder weitere Beschädigungen auftreten, die Ursachen verdecken oder eine Analyse unmöglich machen.

Umgang mit elektrostatisch sensiblen Baugruppen

Bei elektronischen Baugruppen kann es sich um elektrostatisch sensible Baugruppen handeln. Es ist darauf zu achten, diese Baugruppen ESD-gerecht zu behandeln. Nach Möglichkeit sollten die Baugruppen an einem ESD-gerechten Arbeitsplatz getauscht werden. Ist dies nicht möglich sollten ESD-gerechte Maßnahmen beim Austausch getroffen werden. Der Transport darf nur in ESD-gerechten Behältnissen durchgeführt werden. Die Verpackung der Baugruppen muss ESD-konform sein. Verwenden Sie nach Möglichkeit die Verpackung des Ersatzteils oder wählen Sie selber eine ESD-gerechte Verpackung.

Einbau von Ersatzteilen

Beachten Sie beim Einbau des Ersatzteils die gleichen Vorgaben wie oben beschrieben. Achten Sie auf die ordnungsgemäße Montage des Bauteils und aller Komponenten. Versetzen Sie vor der Inbetriebnahme die Verkabelung wieder in den ursprünglichen Zustand. Fragen Sie im Zweifel beim Hersteller nach weiteren Informationen.

Einsenden von Elektroaltgeräten zur Entsorgung

Wollen Sie ein von Bühler Technologies GmbH stammendes Elektroprodukt zur fachgerechten Entsorgung einsenden, dann tragen Sie bitte in das Feld der RMA-Nr. „WEEE“ ein. Legen Sie dem Altgerät die vollständig ausgefüllte Dekontaminierungserklärung für den Transport von außen sichtbar bei. Weitere Informationen zur Entsorgung von Elektroaltgeräten finden Sie auf der Webseite unseres Unternehmens.

Avoiding alterations and damage to the components to be returned

Analysing defective assemblies is an essential part of quality assurance at Bühler Technologies GmbH. To ensure conclusive analysis the goods must be inspected unaltered, if possible. Modifications or other damages which may hide the cause or render it impossible to analyse are prohibited.

Handling electrostatically conductive components

Electronic assemblies may be sensitive to static electricity. Be sure to handle these assemblies in an ESD-safe manner. Where possible, the assemblies should be replaced in an ESD-safe location. If unable to do so, take ESD-safe precautions when replacing these. Must be transported in ESD-safe containers. The packaging of the assemblies must be ESD-safe. If possible, use the packaging of the spare part or use ESD-safe packaging.

Fitting of spare parts

Observe the above specifications when installing the spare part. Ensure the part and all components are properly installed. Return the cables to the original state before putting into service. When in doubt, contact the manufacturer for additional information.

Returning old electrical appliances for disposal

If you wish to return an electrical product from Bühler Technologies GmbH for proper disposal, please enter "WEEE" in the RMA number box. Please attach the fully completed decontamination declaration form for transport to the old appliance so that it is visible from the outside. You can find more information on the disposal of old electrical appliances on our company's website.

