

KRACHT

D.0053770002

Operating instructions (Translation)

Turbine flow meters TM
English

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1 General

1.1 About the documentation

These operating instructions describe the installation, operation and maintenance of the following device:

Turbine flow meters TM

These operating instructions are a component of the device and must be kept accessible for the personnel near the device at all times.

If you have any questions about these operating instructions, please contact the manufacturer.

1.2 Manufacturer address

KRACHT GmbH
Gewerbestraße 20
DE 58791 Werdohl
Tel: +49 2392 935-0
Fax: +49 2392 935-209
E-Mail: info@kracht.eu
Web: www.kracht.eu

1.3 Applicable documents

In addition to these instructions, also observe the corresponding instructions for the existing or planned systems or system parts.

1.4 Symbols



DANGER

Identification of an immediate hazard, which would result in death or severe bodily injury if not avoided.



WARNING

Identification of a potential medium risk hazard, which would lead to death or severe bodily injury if not avoided.



CAUTION

Identification of a low risk hazard, which could lead to minor or medium bodily injury if not avoided.

ATTENTION

Flagging of notices to prevent property damage.



NOTICE

Identification of basic safety instructions.
Non-compliance can lead to hazards for people and the device.



TIPP

Flagging of special user tips and other especially useful or important information.

2 Safety

2.1 Intended use

1. The device has been designed for operation with fluid.
Dry operation is not permitted.
2. The product may only be operated when completely filled.
3. The fluid must be compatible with the materials used in the product. Chemical expertise is required for that. Be careful with ethylene oxide or other catalytically or exothermically reacting or self-decomposing substances. Please consult the manufacturer in cases of doubt.
4. The product may only be used in normal industrial atmospheres.
If there are any aggressive substances in the air, always consult the manufacturer.
5. The product may only be operated in compliance with these operating instructions and the applicable documents.
Deviating operating conditions require the express approval of the manufacturer.
6. Use of the product for purposes other than those for which it is intended invalidates any warranty.

2.2 Personnel qualification and training

The personnel designated to assemble, operate and service the device must be properly qualified.

This can be through training or specific instruction.

Personnel must be familiar with the contents of this operating instructions.



NOTICE

Read the operating instructions thoroughly before use.

2.3 Basic safety instructions



NOTICE

Basic safety instructions

Non-compliance can lead to hazards for people and the unit.

- a) Follow existing regulations for accident prevention and safety at work as well as the internal regulations of the operating company.
- b) Ensure the greatest possible cleanliness.
- c) Wear suitable personal protective equipment.
- d) Do not remove type plates or other information or make them illegible or unrecognisable.
- e) Do not make any technical modifications.
- f) Comply with maintenance intervals.
- g) Only use spare parts approved by the manufacturer.

2.4 Fundamental hazards



DANGER

Hazardous fluids

Danger to life when handling hazardous fluids.

- a) Comply with the safety data sheets and regulations on handling the hazardous fluids.
- b) Collect and dispose of hazardous fluids so that no hazard is created for persons or the environment.



DANGER

Hazardous fluids

Danger to life when handling hazardous fluids.

- a) Defective components and connection lines must be replaced or fixed without delay.
- b) Use only components and connection lines approved for the expected pressure range.



DANGER

Rotating parts!

Danger of death due to body parts, hair or clothing getting trapped or entangled.

- a) Before all work, ensure that existing drives are voltage-free and pressure-free.
- b) Securely prevent restarting during all work.

**⚠ DANGER****Exposed electrical components**

Risk of fatal electric shock.

- a) Adhere to the special safety regulations for all work on electrical systems.
Switch off electrical systems and secure them against being switched on again.
- b) Work on electrical systems may only be carried out by a qualified electrician.
- c) Use only connection lines that are resistant to ambient influences and media.

**⚠ WARNING****Failure of pressure bearing parts due to overload**

Risk of injury from flying parts.

Risk of injury due to splashing fluids.

- a) Depressurize the system before all work.
- b) Securely prevent the pressure from being restored during work.

**⚠ WARNING****Failure of pressure bearing parts due to overload**

Risk of injury from flying parts.

Risk of injury due to fluid spurting out.

- a) Use only connections and lines approved for the expected pressure range.
- b) Securely prevent the permissible pressures from being exceeded, e.g. by using pressure relief valves or bursting discs.
- c) Pipelines must be designed in such a way that no tension e.g. caused by changes in length due to fluctuations in temperature can be transferred to the product.

3 Device description

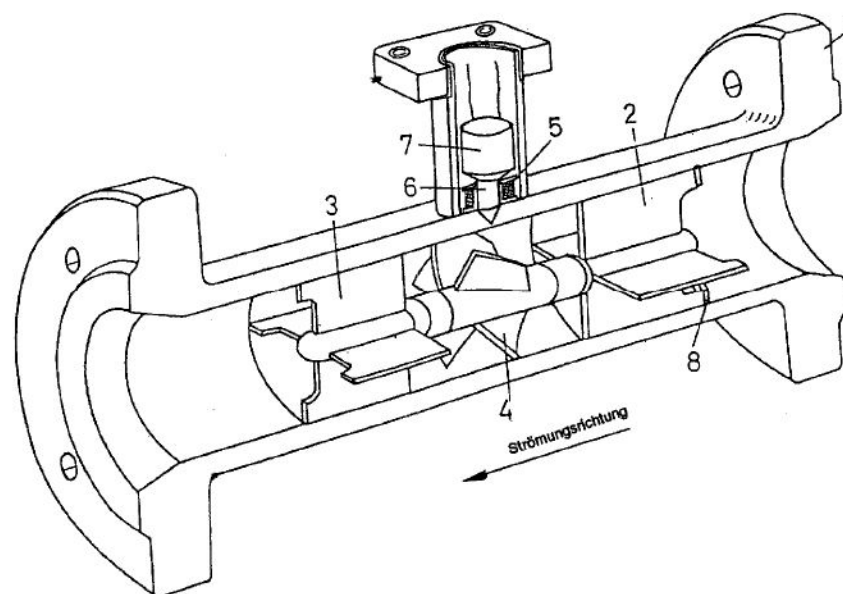
3.1 Functional principle

The product is a measuring device for the continuous measurement of the flow of a fluid. The various types enable it to be used for media of differing viscosities and lubricities. The user must ensure that the medium to be metered is compatible with the materials used in this product.

A turbine rotor is mounted in a stainless steel housing on two rotor shafts. The material of the bearing is either teflon or tungsten carbide. That means even aggressive or slightly can be measured. The medium passes through the turbine blades, causing the rotor wheel to rotate at a speed proportional to the velocity of the fluid. As each rotor blade passes through the magnetic field generated by the transducer a voltage output is created. A preamplifier converts the sinus wave into a square wave signal.

3.2 Basic design

3.2.1 Turbine flow meters



- 1 Housing
- 2 Front mounting
- 3 Back mounting
- 4 Turbine wheel

- 5 Transmitter bobbin
- 6 Iron core
- 7 Magnet
- 8 Locking ring

3.3 Type key

Ordering example								
TM		4		T	R		040	S
1.		2.		3.	4.		5.	6.

Explanation of type key			
1. Product name			
2. Nominal size			
V_{gn}	0.275; 0.55; 1.1; 2.2; 4; 8; 16; 34; 68; 135; 270; 550; 1100; 1900; 2700; 4000		
3.			
H	Carbide	T	PTFE
4 . Type of connection			
R	Pipe connection	FS	Flange (Stainless steel)
FC	Flange (Steel)		
5. Pressure stages			
010	10 bar	160	160 bar
040	40 bar	250	250 bar
064	64 bar	320	320 bar
100	100 bar	400	400 bar
6. Version of the sensor system			
S	Standard	HT 1	High temperature 1
V	Without preamplifier	HT 2	High temperature 2

4 Technical data

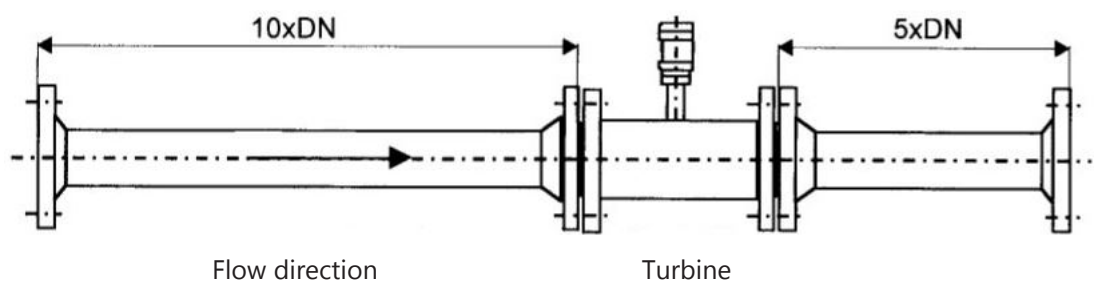
4.1 General

General information	
Design	Turbine flow meters
Type of connection	Overview connection sizes [▶ 12]
Mounting position	horizontal ±5°
Flow direction	shown by the flow direction arrow on each s. turbine flow meters
Viscosity	v_{min} 1 mm ² /s
	v_{max} 50 mm ² /s
Operating pressure	p Operating pressure [▶ 13]
Fluid temperature	ϑ_m Permissible temperature range [▶ 13]
Ambient temperature	ϑ_u Permissible temperature range [▶ 13]
Material	Material data [▶ 14]
Measuring accuracy	Overview nominal sizes [▶ 12]
Measuring range	
Density range	500 ... 1500 kg/m ³
Permissible Contamination content of the fluid to be measured	50 g/m ³
Max. size of foreign matter in medium conveyed	80% of solid pollutants < 50 µm 20% of solid pollutants < 0.5 mm
Max. hardness of pollutants	100 HB

4.1.1 Measuring section

Using of the above measuring section is recommended in order to meet the specified accuracy.

For high standard application the Turbine Meter should be calibrated together with its measuring section.



4.2 Overview nominal sizes

Nominal size V_{gn}	Type of bearing			
	Carbide		PTFE	
	Flow capacity [l/min]	Linearity	Flow capacity [l/min]	Linearity
0.275	0.92 - 4.58	± 1%	0.92 - 4.58	± 1%
0.55	1.83 - 9.17		1.83 - 9.17	
1.1	3.67 - 18.3		3.67 - 18.3	
2.2	7.33 - 36.7	±0.5%	7.33 - 36.7	±0.5%
4	13.3 - 66.7		13.3 - 66.7	
8	26.6 - 133		13.3 - 133	
16	53.4 - 267		26.7 - 267	
34	113 - 567		56.7 - 567	
68	227 - 1133		113 - 1133	
135	450 - 2250	± 0.4%	225 - 2250	± 0.4%
270	900 - 4500		720 - 4500	
550	1833 - 9167		1464 - 9167	
1100	3667 - 18333		2933 - 18333	
1900	6333 - 31667		5067 - 31667	
2700	9000 - 45000		7200 - 45000	
4000	13333 - 66667		10667 - 66667	

4.3 Overview connection sizes

Nominal size	R (Pipe connection) [Ø]	F (DIN flange)
0.275	6	DN10
0.55		
1.1	12	DN15
2.2		
4	15	DN20
8		
16	25	DN25
34	-	DN40
68	-	DN50
135	-	DN80
270	-	DN100
550	-	DN150
1100	-	DN200
1900	-	DN250
2700	-	DN300
4000	-	DN400

4.4 Operating pressure

Nominal size	Type of connection		
	R (Pipe connection) [Ø]	F (DIN flange)	
	Available pressure stages PN [bar]		
0.275	320	40/160/250/320/400	
0.55			
1.1			
2.2			
4			
8			40
16			40/160/250/320/400
34			40/160/250/320/400
68	-	40/64/100/160/250/320/400	
135		10/40/64/100/160/250/320/400	
270		10/40/64/100/160/250	
550		10/40/64/100/160	
1100		10/16/25/40/64	
1900			
2700			
4000			

4.5 Permissible temperature range

Material	Fluid temperature	
	$\vartheta_{m \min}$ [°C]	$\vartheta_{m \max}$ [°C]
Steel KL 7D (Version FC)	-20	120
Stainless steel X12 CrNiTi 18.9 (Version R, H, FS)	-30	120

Material	Ambient temperature	
	$\vartheta_{m \min}$ [°C]	$\vartheta_{m \max}$ [°C]
Steel KL 7D (Version FC)	-20	60
Stainless steel X12 CrNiTi 18.9 (Version R, H, FS)	-30	60

4.6 Material data

Material			
Housing / Other materials	Flange	Turbine wheel	Type of bearing
Stainless steel (1.4541)	Stainless steel (1.4541)	Stainless steel X6 CrNiTi 18.10	PTFE
	---		---
	Steel (1.0566)		Carbide

4.7 Weight

Nominal size	Weight [kg]		
	R (Pipe connection) [Ø]	F (DIN flange)	
		min. pressure stage	max. pressure stage
0.275	0.2	1.6	2
0.55			
1.1	0.25	2	2.4
2.2			
4			
8			
16	0.4	3.7	4.5
34	-	6.2	10
68		8.3	12
135		16	20
270		25	35
550		40	50
1100		65	78
1900		76	91
2700		83	100
4000		132	158

5 Transport and storage

5.1 General

- a) After receipt, check the device for transport damages.
 - b) If transport damage is noticed, report this immediately to the manufacturer and the carrier. The device must then be replaced or repaired.
 - c) Dispose of packing material and used parts in accordance with the local stipulations.
-

5.2 Transport



WARNING

Falling or overturning loads!

Danger of injury while transporting large and heavy loads.

- a) Use only suitable means of conveyance and lifting tackle with sufficient load-bearing capacity.
 - b) Attach lifting tackle only to suitable load points.
 - c) Attach the lifting tackle in such a manner that it cannot slip.
 - d) Pay attention to the load balance point.
 - e) Always avoid jerks, impacts and strong vibrations during transportation.
 - f) Never walk under suspended loads, never work under suspended loads.
-

5.3 Storage

The device's function is tested in the plant with mineral hydraulic oil. Then all connections are closed. The remaining residual oil preserves the interior parts for up to 6 months.

Metallic exposed exterior parts are protected against corrosion by suitable conservation measures, also up to 6 months.

In case of storage, a dry, dust-free and low-vibration environment is to be ensured. The device is to be protected against influences from weather, moisture and strong fluctuations of temperature. The recommended storage conditions are to be adhered to.

Below the permissible ambient temperature ϑ_U elastomer seals lose their elasticity and mechanical loading capacity, since the glass transition temperature is fallen below. This procedure is reversible. A force action on the device is to be avoided in case of storage below the permissible ambient temperature ϑ_U .

Devices with EPDM seals are not mineral-oil resistant and are not tested for their function. There is no preservation of the interior parts. If the device is not taken into operation immediately, all corrosion-prone surfaces are to be protected by suitable conservation measures. The same applies for devices which are not tested for other reasons

When storing for a long period of time (> 6 months), treat all surfaces at risk of corrosion again with suitable preserving agents.

If high air humidity or aggressive atmospheres are expected, take additional corrosion-preventing measures.



NOTICE

Storage in corrosion protection bags (VCI) maximum of 6 months.

⚠ ATTENTION

Corrosion/chemical impact

Improper storage can render the device useless.

- a) Protect endangered surfaces by means of suitable conservation measures.
- b) Comply with recommended storage conditions.

5.4 Storage conditions



TIPP

Recommended storage conditions

- a) Storage temperature: 5 °C – 25 °C
- b) Relative air humidity: < 70 %
- c) Protect elastomer parts from light, especially direct sunlight.
- d) Protect elastomer parts from oxygen and ozone.
- e) Comply with maximum storage times of elastomeric parts:
 - ⇒ 5 Jahre: AU (Polyurethan-Kautschuk)
 - ⇒ 7 Jahre: NBR, HNBR, CR
 - ⇒ 10 Years: EPM, EPDM, FEP/PFTE, FEPM, FKM, FFKM, VMQ, FVMQ

6 Installation

6.1 Important notes about explosion protection



DANGER

Hazardous fluids

Danger to life when handling hazardous fluids.

- a) Comply with the safety data sheets and regulations on handling the hazardous fluids.
- b) Collect and dispose of hazardous fluids so that no hazard is created for persons or the environment.



DANGER

Rotating parts!

Danger of death due to body parts, hair or clothing getting trapped or entangled.

- a) Before all work, ensure that existing drives are voltage-free and pressure-free.
- b) Securely prevent restarting during all work.



DANGER

Exposed electrical components

Risk of fatal electric shock.

- a) Adhere to the special safety regulations for all work on electrical systems.
Switch off electrical systems and secure them against being switched on again.
- b) Work on electrical systems may only be carried out by a qualified electrician.
- c) Use only connection lines that are resistant to ambient influences and media.



WARNING

Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

- a) Depressurise the device and all connection lines before doing any work.
- b) Securely prevent the restoration of pressure while working on the device.



⚠ WARNING

Failure of pressure bearing parts due to overload

Risk of injury from flying parts.
Risk of injury due to fluid spurting out.

- a) Use only connections and lines approved for the expected pressure range.
- b) Securely prevent the permissible pressures from being exceeded, e.g. by using pressure relief valves or bursting discs.
- c) Pipelines must be designed in such a way that no tension e.g. caused by changes in length due to fluctuations in temperature can be transferred to the product.



⚠ CAUTION

Hot surfaces

Burn injury to skin if touched.

- a) Take measures against accidental touching of hot surfaces (> 60 °C).

6.2 Mechanical installation

6.2.1 Preparation

- a) Check the device for transport damage and dirt.
- b) Remove existing preservatives.
 - ⇒ Use only those cleaning agents that are compatible with the materials used in the device.
 - ⇒ Do not use cleaning wool.
- c) Compare the environmental and ambient conditions at the place of installation to the permissible conditions.
 - ⇒ Expose the device only to small vibrations, see IEC 60034-14.
 - ⇒ Secure sufficient access for maintenance and repair.
 - ⇒ Comply with the manufacturer's information.
 - ⇒ Do not use any sealing materials such as hemp, Teflon tape or putty.

6.2.2 Pipe connection

- ⇒ Do not use cleaning wool.
 - ⇒ Pickle and flush welded pipes.
- a) Remove the protective plugs.
 - b) Mount the lines.
 - ⇒ Comply with the manufacturer's information.

⇒ Do not use any sealing materials such as hemp, Teflon tape or putty.

6.3 Electrical connection

6.3.1 Preparation

Electrical data	preamplifier	
	24 V	12 V
Number of measuring channels	1	1
Operating voltage	$U_B = 24 \text{ V DC} \pm 20 \%$ Reverse-polarity protection	$U_B = 12 \text{ V DC} \pm 20 \%$ Reverse-polarity protection
Impulse amplitude	$U_A \geq 0.8 U_B$	$U_A \geq 0.8 U_B$
Impulse shape with symmetrical output signal	Rectangular, Pulse duty factor / Channel 1:1 $\pm 15 \%$	Rectangular, Pulse duty factor / Channel 1:1 $\pm 15 \%$
Impuls offset between the two channels	$90^\circ \pm 30^\circ$	$90^\circ \pm 30^\circ$
Power requirement $p_{b \text{ max}}$	0.9 W	0.9 W
Output power/Channel $P_{a \text{ max}}$	0.3 W Short-circuit proof	0.3 W Short-circuit proof
Protection class	IP 65 (DIN 40050)	IP 65 (DIN 40050)
Signal output	PNP/NPN (Automatic detection)	PNP/NPN (Automatic detection)



TIPP

Shielded cable, LIYCY C-grey 4 x 0.25 mm²

⚠ ATTENTION

Damage by overvoltage

Excessive voltage can cause damage and dysfunction to the product.

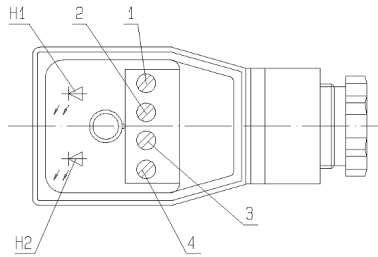
- a) Use the product only with the correct voltage.
- b) Please consult the manufacturer in cases of doubt.

⚠ ATTENTION

The power supply line must match the used preamplifier.

6.3.2 Plug assignment

The terminal assignment for Channel 1 and 2 influences the displayed direction of rotation of the measuring unit.



1	U_B	Brown
2	Channel 1	Green
3	Channel 2	Yellow
4	0 Volt	White
H1	Transmitter Channel 1	Red
H2	Transmitter Channel 2	Red

7 Operation start-up

7.1 Safety instructions for start-up



DANGER

Hazardous fluids

Danger to life when handling hazardous fluids.

- a) Comply with the safety data sheets and regulations on handling the hazardous fluids.
- b) Collect and dispose of hazardous fluids so that no hazard is created for persons or the environment.



CAUTION

Hot surfaces

Burn injury to skin if touched.

- a) Wear protective gloves at temperatures $\geq 48^{\circ}\text{C}$.

7.2 Preparation

- a) Before starting the product, make sure that a sufficient quantity of the service fluid is extant to avoid dry running. This must be taken into account especially with large line volumes.
- b) Check all fastening screws on the product.
- c) Fill the unit with media.

7.3 Further operation start-up

- a) Open existing shut-off elements upstream and downstream of the device.
 - b) Run the device for a few minutes depressurised or with low pressure.
 - c) Vent the system at the highest possible point.
 - d) Gradually increase the pressure load up to the desired operating pressure.
 - e) Operate the system for so long until the final operating state is achieved.
 - f) Check the operating data.
 - g) Document the operating data of the initial start-up for later comparison.
 - h) Check the level of the operating medium in the system.
 - i) Check the device for leaks.
 - j) Check all threaded connections for leaks and retighten if necessary.
-

During operation, the two LED displays in the equipment plug flash as long as there is a continual flow of fluid through the measuring unit.



TIPP

A lack of signalling can point to a blocked measuring unit.

ATTENTION

Pressure increase due to blocked measuring unit

Pressure increase in front of the unit can lead to damage to the unit and/or plant.

- a) In case of the absence of the signal, take the unit or the plant out of service.
-

8 Removal

8.1 Safety instructions for removal



⚠ DANGER

Hazardous fluids

Danger to life when handling hazardous fluids.

- a) Comply with the safety data sheets and regulations on handling the hazardous fluids.
- b) Collect and dispose of hazardous fluids so that no hazard is created for persons or the environment.



⚠ DANGER

Rotating parts!

Danger of death due to body parts, hair or clothing getting trapped or entangled.

- a) Before all work, ensure that existing drives are voltage-free and pressure-free.
- b) Securely prevent restarting during all work.



⚠ DANGER

Exposed electrical components

Risk of fatal electric shock.

- a) Adhere to the special safety regulations for all work on electrical systems.
Switch off electrical systems and secure them against being switched on again.
- b) Work on electrical systems may only be carried out by a qualified electrician.
- c) Use only connection lines that are resistant to ambient influences and media.



⚠ WARNING

Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

- a) Depressurise the device and all connection lines before doing any work.
- b) Securely prevent the restoration of pressure while working on the device.



⚠ CAUTION

Hot surfaces

Burns of the skin on contact.

- a) At temperatures $\geq 48^{\circ}\text{C}$ the product must be allowed to cool down first.

 **ATTENTION****Blocking of the product due to curing media**

Curing media can mechanically block the product and make it unusable.

- a) Clean the product immediately after operation with curing media.

8.2 Removal

- a) Depressurise and de-energize the system.
- b) Close existing shut-off elements upstream and downstream of the device.
- c) Open existing drain elements and loosen connection lines. Collect and dispose of discharging medium so that no hazard arises for persons or environment.
- d) Dismantle the device.
 - ⇒ Pull the plug off the housing.
 - ⇒ **Pipe connection:** Loosen the pipe connections from the unit and, if applicable, take the unit off the holding fixture..
- e) Clean the device
- f) Close the device connections and lines to prevent dirt penetration.

**NOTICE**

The concrete procedure for cleaning depends on the media being used.

- a) See the safety data sheet of the media in use.

9 Maintenance

The product is maintenance-free.

ATTENTION

Blocking of the product due to curing media

Curing media can mechanically block the product and make it unusable.

- a) Clean the product immediately after operation with curing media.
-

10 Repairs

10.1 Safety instructions for repair



⚠ DANGER

Hazardous fluids

Danger to life when handling hazardous fluids.

- a) Comply with the safety data sheets and regulations on handling the hazardous fluids.
- b) Collect and dispose of hazardous fluids so that no hazard is created for persons or the environment.



⚠ DANGER

Exposed electrical components

Risk of fatal electric shock.

- a) Adhere to the special safety regulations for all work on electrical systems.
Switch off electrical systems and secure them against being switched on again.
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- c) Use only connection lines that are resistant to ambient influences and media.



⚠ DANGER

Rotating parts!

Danger of death due to body parts, hair or clothing getting trapped or entangled.

- a) Before all work, ensure that existing drives are voltage-free and pressure-free.
- b) Securely prevent restarting during all work.



⚠ WARNING

Failure of pressure bearing parts due to overload

Risk of injury from flying parts.

Risk of injury due to splashing fluids.

- a) Depressurize the system before all work.
- b) Securely prevent the pressure from being restored during work.



⚠ CAUTION

Hot surfaces

Burns of the skin on contact.

- a) At temperatures $\geq 48^{\circ}\text{C}$ the product must be allowed to cool down first.

10.2 General

The repairs covers:

1. Troubleshooting
Determination of damage, pinpointing and localisation of the damage cause.
2. Elimination of damage
Elimination of the primary causes and replacement or repair of defective components.
The repair is generally made by the manufacturer.

Repairs by manufacturer

Before returning the device, fill in the return notification form. The form can be filled in on-line and is available as a pdf file download.



NOTICE

Device contains hazardous material

If the device was operated with dangerous liquids, it must be cleaned before the return. If this should not be possible, the safety data sheet of the hazardous material is to be provided beforehand.

Repair by equipment builder/operator

If corresponding expertise and sufficient equipment is available, the equipment builder/operator can also make the repairs. Please consult the manufacturer about this.

- a) If required, request spare parts lists and assembly drawings from the manufacturer.
- b) Use spare parts approved by the manufacturer only
- c) Dispose of packing material and used parts in accordance with the local stipulations.



NOTICE

Warranty

Any warranty will be void if not executed properly.



NOTICE

Protective equipment and notices

After maintenance and/or repair, reattach all protective devices and notices removed in the process to their original position.

10.3 Detecting and eliminating failures



TIPP

If the unit does not function properly, the electrical components should be checked first. The measuring instrument must remain in operation for this.

Fault	Potential causes	Possible measures
LED display		
LED display flash - however, false values are displayed in the overriding controller	Connection between the device plug and the overriding controller is loose/defective	Check the connection and replace the cable or plug if necessary
LED display does not illuminate	Power failure	Check the supply cable Check the fuses
	Measuring unit is blocked	Put the device out of operation immediately! Repairs by manufacturer
	Wire break	Repairs by manufacturer
	Soldering point defective	
	Sensor defective	
Defective values in the overriding controller		
	Wear	Repairs by manufacturer
In case of unidentified faults, request help from the manufacturer or return the unit to the manufacturer for inspection.		