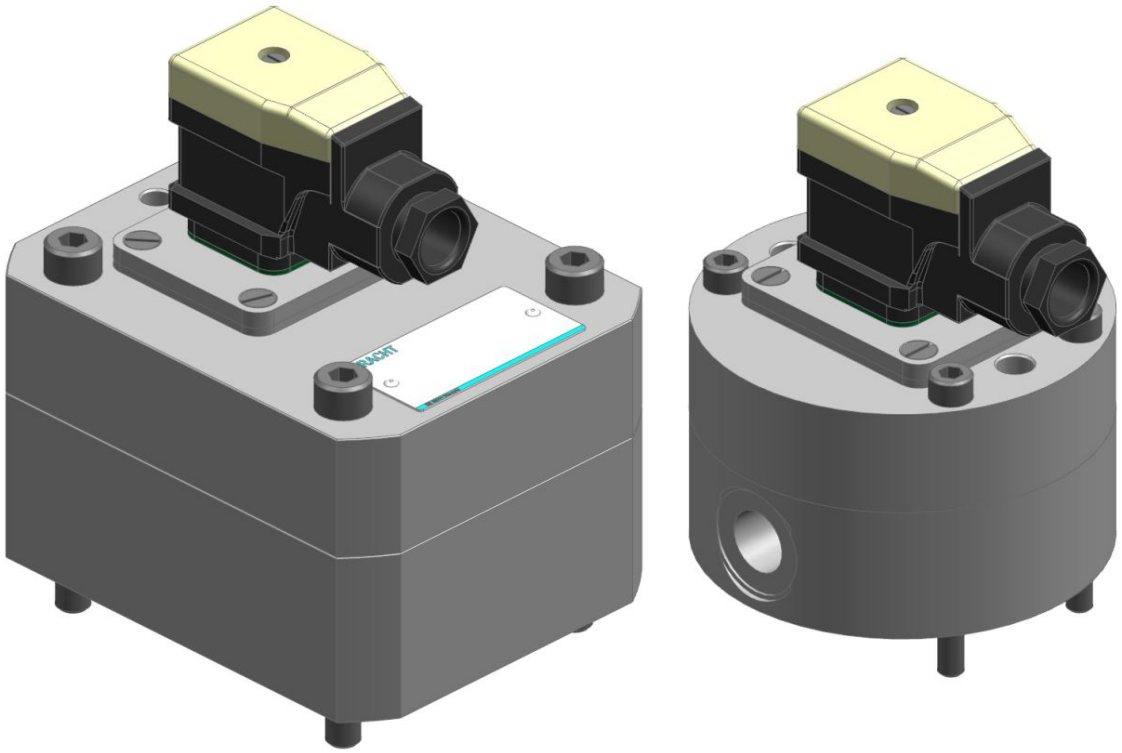
KRACHT

D.0025420002

Operating instructions (Translation)



Gear type flow meter VC 0.025 - 16

English

22 • 19/09/2025

Table of content

1 General

1.1 About the documentation

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

Gear type flow meters VC 0.025 -16

These operating instructions are an integral part of the product and must be kept in the immediate vicinity of the

product and accessible to the personnel at all time.

Different versions of the product are produced. Which version is concerned

is stated on the device's type plate.

If you have any questions about this operating manual, please contact the manufacturer.

1.2 Manufacturer address

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

1.3 Other applicable documents

In addition to these instructions, also comply with the relevant instructions of plants or plant parts available or planned on site.

1.4 Symbols

⚠ DANGER

Identification of an immediate hazard, which can lead to death or severe bodily injury if not avoided.

⚠ WARNING

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

⚠ CAUTION

Identification of a possible low-risk hazard that can result in minor or moderate physical injury if not avoided.

⚠ ATTENTION

Identification of notes to prevent property damage.

NOTICE

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

TIP

Identification of special user tips and other particularly useful or important information

2 Safety

2.1 Intended use

1. The product has been designed for operation with fluids.
   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 Personal qualification

The personnel charged with the assembly, operation and maintenance of the product must have the necessary qualifications.
This can be achieved through training or appropriate instruction.
The personnel must be familiar with the contents of these operating instructions.

NOTICE

Read the operating instructions in full before using the product.

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

Rotating parts

Risk to life due to entanglement or winding of parts of the body, hair or clothing items.

a) Before carrying out any work, disconnect any drives and actuators from the power supply or depressurise them.

b) Safely prevent restarting during the 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) Before carrying out any work, depressurise the product and all connection pipes.

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 splashing fluids.

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.

⚠ 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.

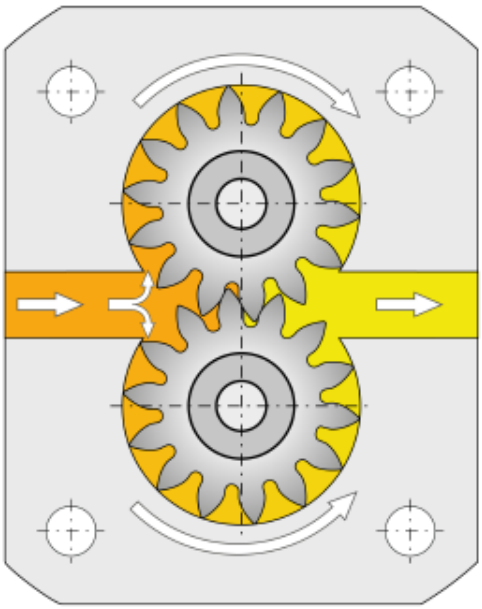
a) In case of the absence of the signal, take the unit or the plant out of service.

3 Device description

3.1 Functional principle

3.1.1 Gear type flow meter

The measuring unit is driven by the flow of fluid based on the principle of a gear motor.



The gears run without contact in the measuring chamber. The bearing elements are low friction ball bearings or plain bearings.

The gear movement is scanned contact-free by the sensors in the cover. There is a pressure-resistant amagnetic separator between the sensor space and the measuring chamber.

When the measuring element turns by one tooth pitch, each sensor generates a signal that corresponds to the so-called geometric tooth volume Vgz. A value stated in technical documents as the nominal volume to identify the device size.

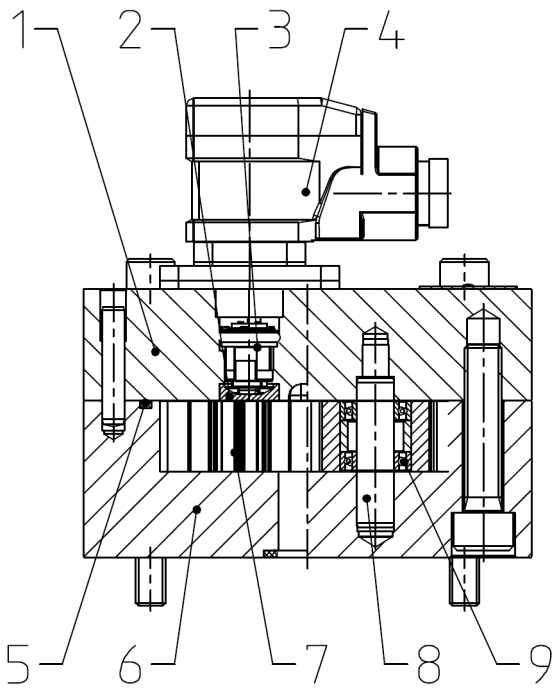
This signal is transmitted from the preamplifier to the evaluation electronics as a rectangular pulse or according to the IO link protocol (IO link mode - process data; SIO mode - rectangular pulse).

The dual-channel scanning enables higher measured value resolution and detection of the direction of flow.

In the gear-type flowmeter, the driving direction of the fluid flow is independent of the direction

3.2 Basic design

Gear type flow meters



1	Cover	6	Housing
2	A-magnetic divider	7	Measuring unit
3	Sensor	8	Bearing journal
4	Equipment plug/socket	9	Bearing
5	O-ring		

3.3 Type key

Ordering example															
VC		**1**		**K**	**1**		**F**	**1**		**P**	**2**		**S**		**H**
1.		2.		3.	4.		5.	6.		7.	8.		9.	10.	11.

Explanation of type key			
1. Product name			
2. Nominal (Rated volume**)**			
V_{gz}	0.025; 0.04; 0.1; 0.2; 0.4; 1; 3; 5; 12; 16		
3. Bearing			
K	Ball bearing	**C**	Ball bearing (Increased clearance)
H	Hybrid - Ball bearing	**G**	Carbide - Plain bearings
4. Materials			
1	Housing: EN-GJS-400-15 Gears: Steel (St)	**3**	Housing: EN-GJS-600 Gears: Steel (St)
2	Housing: Stainless steel Gears: Stainless steel	**4**	Housing: Aluminium (Al) Gears: Stainless steel (Nominal 0,2)
5. Seal type			
F	FKM	**K**	FFKM
E	EPDM	**Q**	FVMQ
P	FEP		
6. Surface			
1	Standard (painted)	**3**	Without
2	Paint Skydrol resistant		
7. Type of connection			
P	Plate structure	**R**	Pipe connection
8. Sensor system			
2	2 Sensors	**4**	2 Sensors protected against vibration and condensation
1	1 Sensor	**5**	Encoder
3	Without Sensor system		
9. Version of the sensor system			
S	Standard	**KX**	ATEX High temperature PLUS
H	High temperature	**R**	Red. supply voltage
K	High temperature PLUS	**L**	IO-Link
T	Low temperature	**V**	Without Pre amplifier
X	ATEX	**E**	Encoder
10. Cable length			
No specification	Without cable	**5**	With 5 m cable
2	With 2 m cable	**10**	With 10 m cable

Explanation of type key			
11. Electrical connection			
H	Hirschmann plug (Standard)	**E**	Aluminium (Al) - terminal box (M12x1) ext. electronics decoupeable
M	Hirschmann plug (M12x1/-4 pole)	**V**	Without
K	Aluminium (Al) - terminal box (M12x1/-4 pole)	**512**	Encoder 512 Imp/U (M12x1/-4 pole)
C	Aluminium (Al) - terminal box (Cannon- plug)	**2500**	Encoder 2500 Imp/U (M12x1/-4 pole)

3.4 Special numbers

Special number	Description
68	terminal box M12x1 Turck connector
87	Version for high-viscosity and poorly lubricating media (VC 0.4)
101	Housing and fastening screws: with corrosion-resistant coating
112	Version without Hirschmann connector and preamplifier Plug base rotated by 90° **+** Special number **101** (VC 1)
124	Noise-optimised version
126	Hirschmann connector Preamplifer VV12, potted Sensors protected with protective paint
166	Coated gears
169	Terminal box and flowmeter seals: silicone
192	Anodised housing and bearing cap
211	Particularly small design Reduced operating pressure: max. 50 bar High temperature up to 180 °C Housing connection: G 1/4 (VC 0.025)
220	**Special number 169** Potted sensors and terminal box
222	**Special number 209** Cable outlet, top

Special number	Description
223	**Special number 220** Modified PIN assignment
224	For booster systems

4 Technical data

4.1 General

4.1.1 Gear type flow meter

General information		
Design		Gear motor
Housing connection [(1)]		Plate structure / Pipe thread
Mounting position		Any
Flow direction		Any
Viscosity	**ν**	... 2.500.000 mm^2/s
		... 5.000 mm^2/s (Special number **224**)
Operating pressure	**p**	**Operating pressure [▷ 21]**
Permissible pressure loss	**$\Delta p_{max.}$**	16 bar
Fluid temperature	**ϑ_m**	**Permissible temperature range [▷ 22]**
Ambient temperature	**ϑ_u**	
Materials		**Material data [▷ 23]**
Measuring accuracy		**General [▷ 14]**
Permissible size of foreign particles in the medium		
Permissible media		Lubricating and poorly lubricating fluids in the frame of the specified operating parameters (Petrols, solvents, etc. are not permissible) (Please consult the manufacturer in cases of doubt)
[(1)] **Connection sizes [▷ 15]**		

4.1.2 Measuring accuracy

Bearing	Linearized measuring accuracy	Permissible size of foreign particles in the medium [µm]
Ball bearing	± 0.3% from 20 mm^2/s	20
		50 (**Special number 224)**
Ball bearing (Increased clearance)	± 0.5% from 50 mm^2/s	30
Hybrid - Ball bearing	± 1% from 20 mm^2/s	20
Carbide - Ball bearing	± 0.5% from 100 mm^2/s	30
Bronze - Ball bearing	± 1% from 100 mm^2/s	50

4.2 Nominal sizes

Nominal	Measuring range [l/min]				
	Bearing				
	Ball bearing	Ball bearing (Increased clearance)	Hybrid - Ball bearing	Carbide - Plain bearings	Bronze - Plain bearings
0,025	0.008 - 2	-	0.008 – 2	0.02 – 2(1)	-
0.04	0.02 – 4	-	0.02 – 4	-	-
0.1	0.04 - 8	-	0.04 – 8	0.04 - 8	-
0,2	0.16 - 16	0.16 – 16	0.16 – 16	0.16 - 16	-
0.4	0.2 - 40	-	-	0.2 - 30	-
1	0.4 – 80	0.4 – 80	0.4 – 80	0.3 - 60	0.6 - 40
3	0.6 – 160	0.6 – 160	-	0.6 - 100	-
5(2)	1 – 250	1 – 250	-	1 - 160	1.2 - 80
12	2 – 600	-	-	-	-
16	3 - 700	-	-	-	-

(1) Linearized measuring accuracy ± 3 %; Repeatability ± 1.5 %

(2) VC 5 .../224: Measuring range 1 – 160 [l/min]; Linearized measuring accuracy ± 0.5 % ab ≥ 50 mm^2/s; Repeatability ± 0.05 %

4.3 Connection sizes

Nominal	Special number	Type of connection (1)		
		R (Pipe connection)	P (Plate structure)	
			With connection plate	Without connection plate
0.025	-	G 1/8	MVC .. R. B. G 3/8	See "Technical data sheets"
			MVC .. R. C. G 1/2	
0.04	-	G 1/4	MVC .. R. B. G 3/8	
			MVC .. R. C. G 1/2	
0.1	-	G 3/8	MVC ... R. B. G 3/8	
			MVC .. R. C. G 1/2	

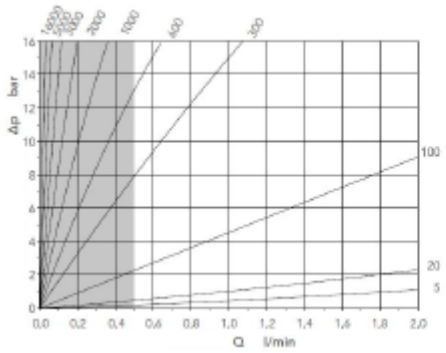
Nominal	Special number	Type of connection [1]		
		R	P (Plate structure)	
		(Pipe connection)	With connection plate	Without connection plate
0.2	-	G 3/8	MVC ... R. B. G 3/8	
			MVC .. R. C. G 1/2	
0.4	-	G 1/2	MVC .. R. C. G 1/2	
			MVC .. R. D. G 3/4	
1	-	G 1/2	MVC .. R. C. G 1/2	
			MVC .. R. D. G 3/4	
			MVC .. R. E. G 1	
3		G 1	MVC .. R. E. G 1	
			MVC .. R. G. G 1 1/2	
			MVC .. V. E. SAE 1" – 6000 psi	
5	-	G1	MVC .. R. E. G 1	
			MVC .. R. G. G 1 1/2	
			MVC .. V. E. SAE 1" – 6000 psi	
			MVC .. V. F. SAE 1 1/4" – 6000 psi	
	224	SAE 1" – 3000 psi	-	
12	-	-	MVC .. V. G. SAE 1 1/2" – 6000 psi	
16	-	-	MVC .. V. G. SAE 1 1/2" – 6000 psi	

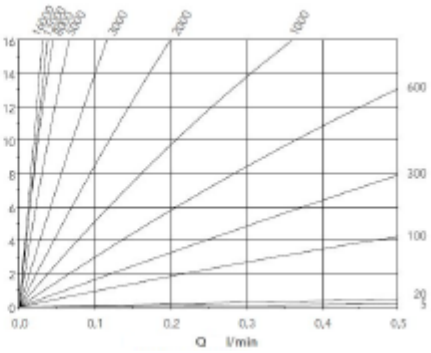
[1] Pipe thread : EN ISO 228-1; Flange connection : ISO 6162-1 (SAE J518)

4.4 Flow resistance Δp

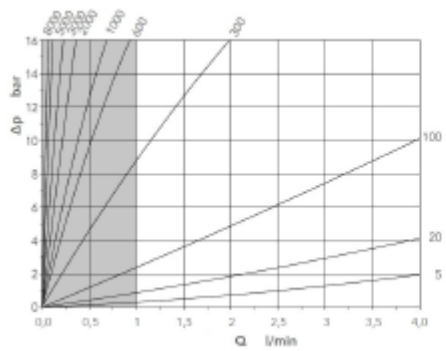
4.4.1 Ball bearing version

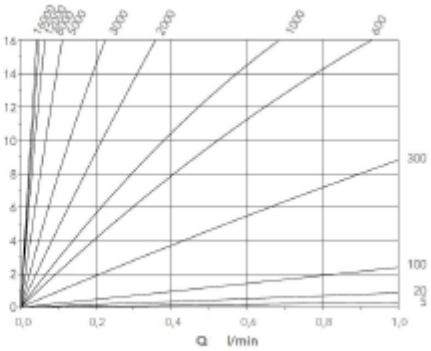
VC 0.025



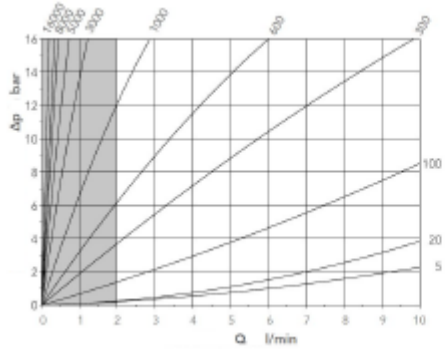


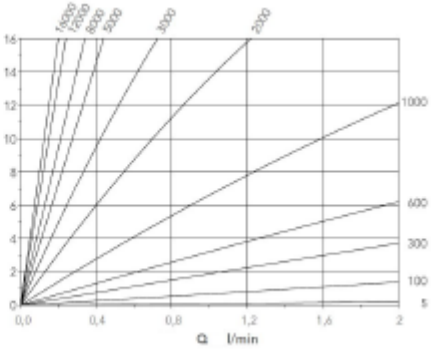
VC 0.04



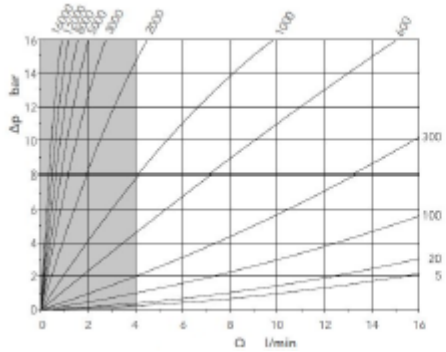


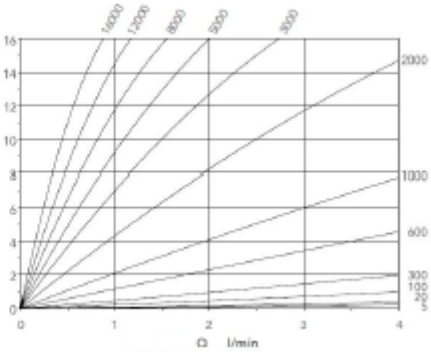
VC 0.1



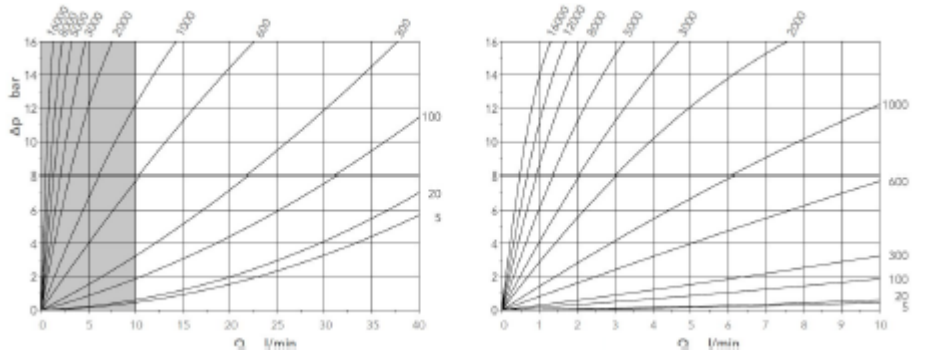


VC 0.2

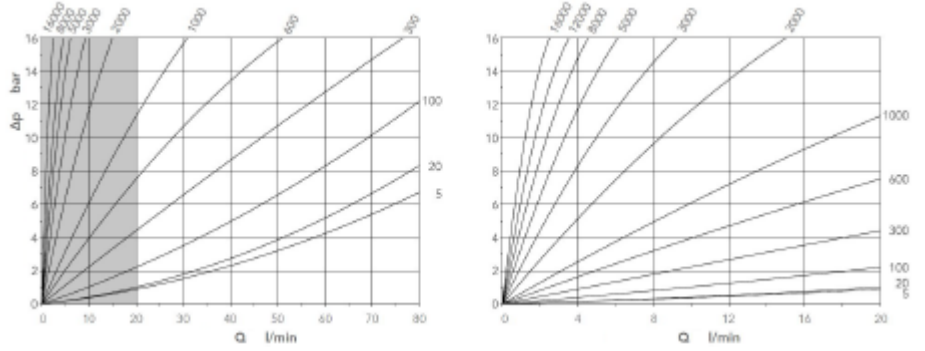




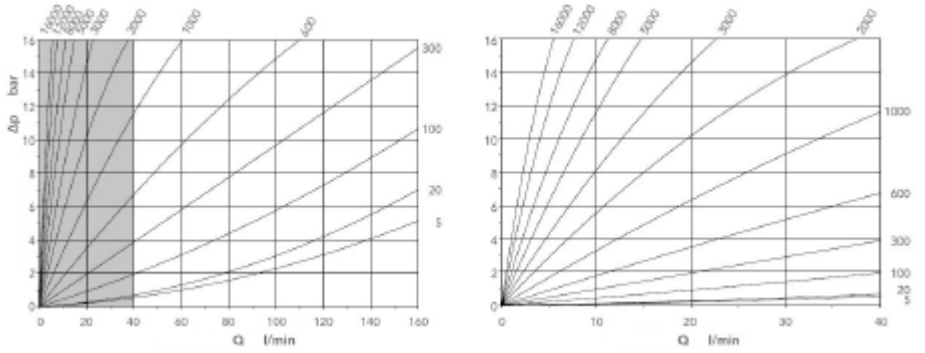
VC 0.4



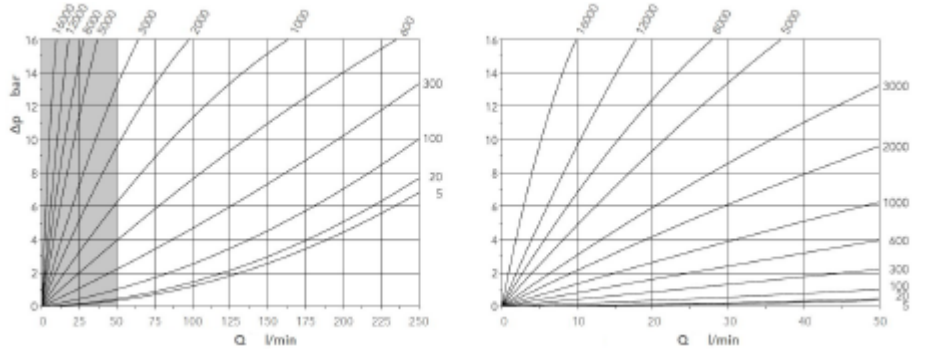
VC 1



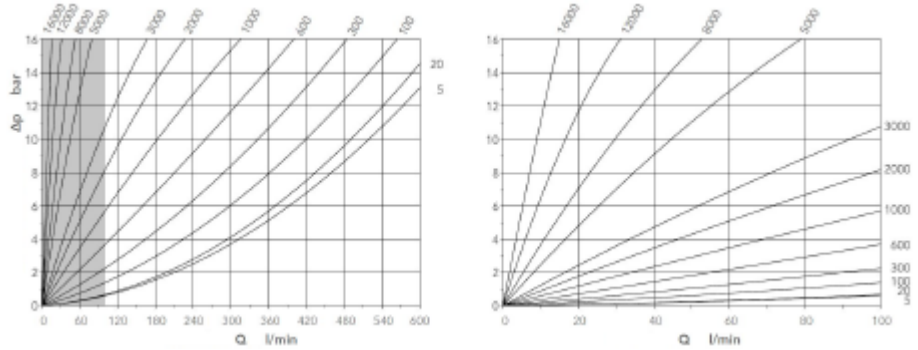
VC 3



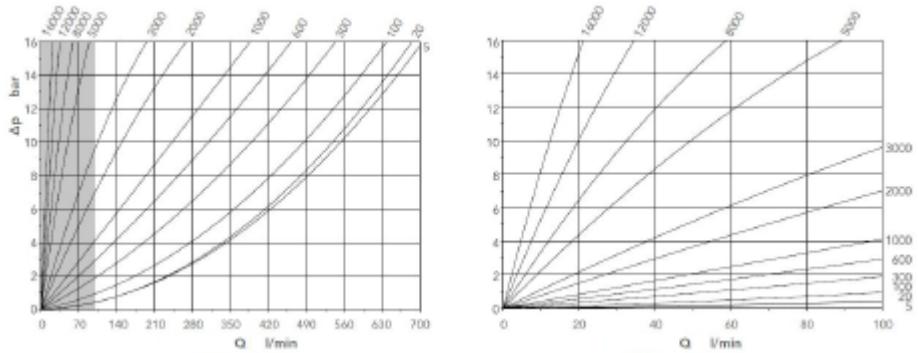
VC 5



VC 12

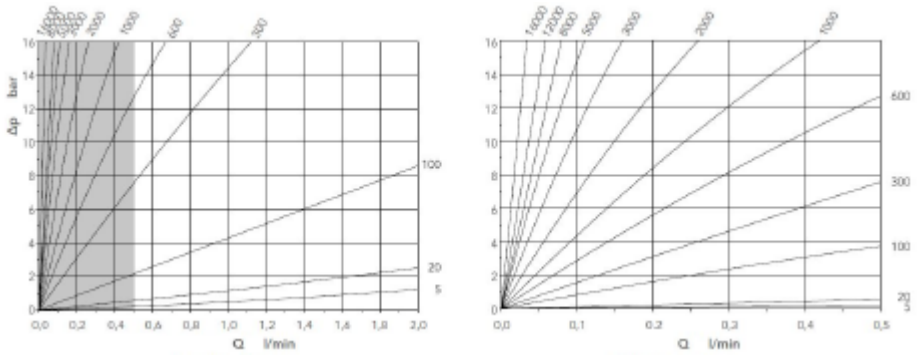


VC 16

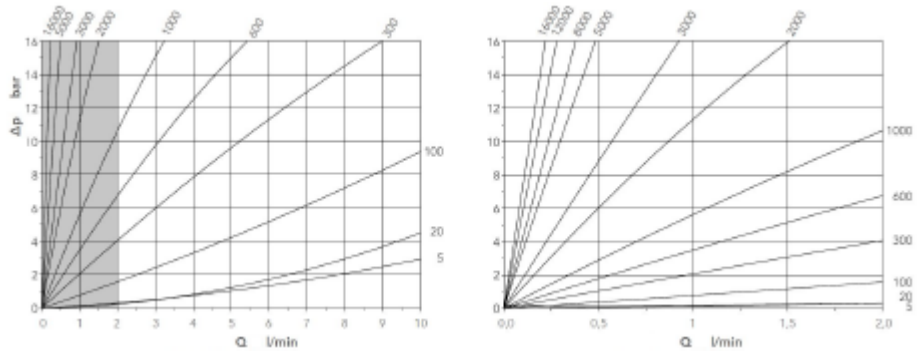


4.4.2 Plain bearing version

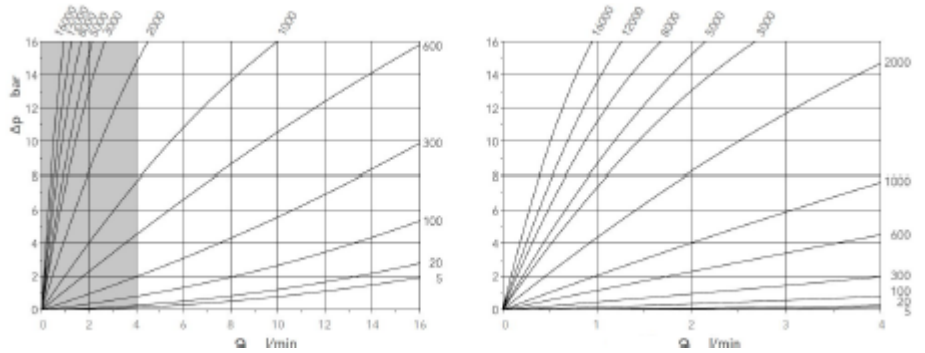
VC 0.025



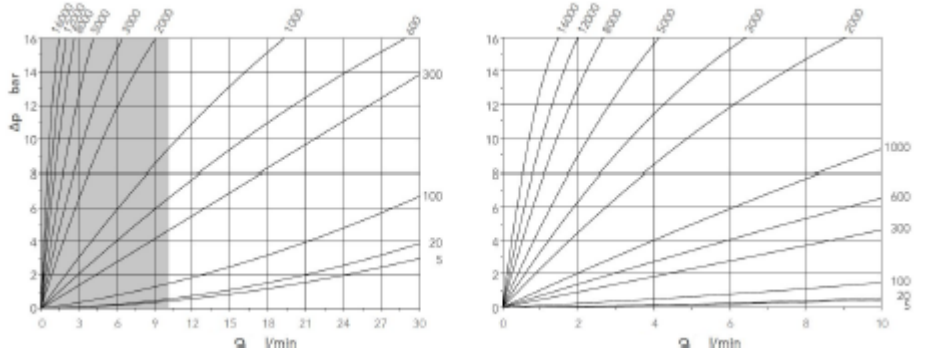
VC 0.1



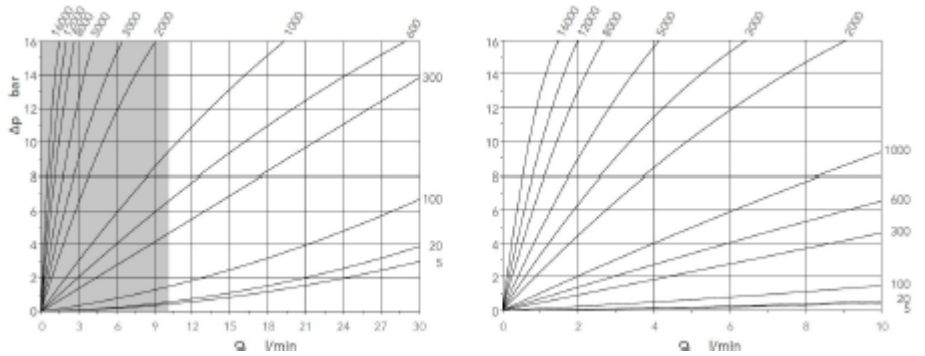
VC 0.2



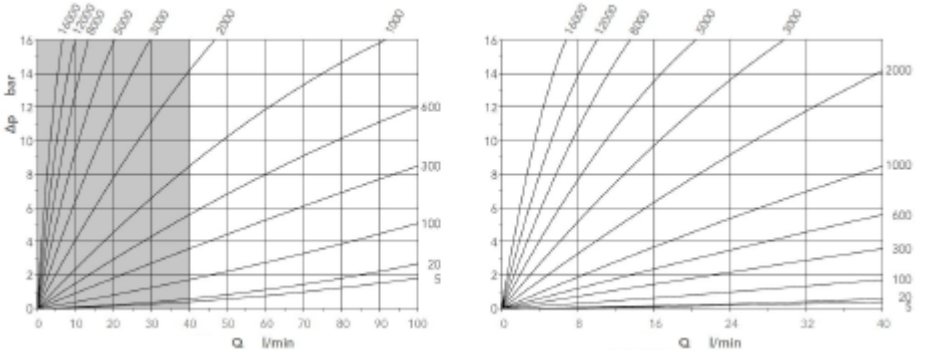
VC 0.4



VC 1



VC 3



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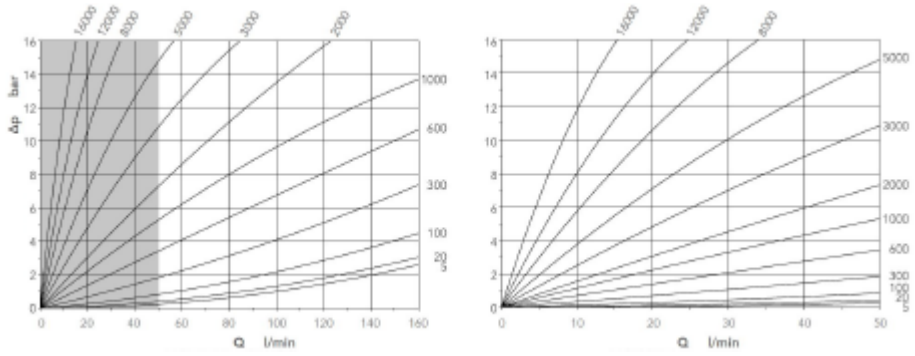


4.5 Operating pressure

Nominal	Special number	Maximum allowable pressure	Sound pressure level (1)
		p_{max} [bar]	L_{pA} [dBA]
0.025	-	480	≤ 60
0.04	-		
0.1	-		
0.2	-		
0.4	-		≤ 70
1	-		
3	-	350	
5	-		≤ 72
	224	240	
12	-	480	≤ 80
16	-		

(1) ν= 34 mm²/s; p= 5-15 bar

4.6 Permissible temperature range

		Fluid temperature	
		$\vartheta_{m\ min}$ [°C]	$\vartheta_{m\ max}$ [°C]
Sealing material	**FKM**	-40	150
	EPDM		
	FEP		210
	FFKM	-15	
	FVMQ	-60	200
Bearing	**Carbide - Plain bearings**	-40	80
	Bronze - Plain bearings		
	Ball bearing	-60	210
	Ball bearing (Increased clearance)		
	Hybrid - Ball bearing		
Housing material	**Ductil cast iron**	-40	210
	Stainless steel	-60	
	Aluminium (Al)	-15	80
Electronics	**Standard**	-40	120
	Without Pre amplifier		
	IO-Link		80
	High temperature		150
	High temperature PLUS		210

Sealing material	Ambient temperature	
	$\vartheta_{u\ min}$ [°C]	$\vartheta_{u\ max}$ [°C]
FKM	-15	80 - 150 (with remote electronics)
EPDM	-30	
FFKM	-15	
FEP with FKM-core (up to 2019)	-30	
FEP with silicone-core (from 2020)		
FVMQ	-40	

NOTICE

Note media-specific properties.

4.7 Material data

4.7.1 Gear type flow meter

Nominal	Special number	Materials			
		Seal	Housing / Cover	Measuring unit	Bearing
0.025	-	FKM - - - EPDM - - - FFKM - - - FEP with FKM-core (up to 2019) FEP with silic-one-core (from 2020) - - - FVMQ	EN-GJS-400-15 - - - Stainless steel (1.4404)	Casehardened steel (1.7139) - - - Stainless steel (1.4462)	Ball bearing: Roller bearings steel - Stainless steel - - - Plain bearings: GC-CuS-n7ZnPb - HM-90%WC/10%Ni - - - Hybrid - Ball bearing: Roller bearings steel /Ceramic-spheres
0.04	-				
0.1	-				
0.2	-				
0.4	-				
1	-				
3	-				
5	-				
12	-		EN-GJS-600		
16	-		EN-GJS-600		

4.8 Weight

Nominal	Special number	Weight [kg]		
		Pipe connection	Plate structure	
			Stainless steel	EN-GJS-400-15
0.025	-	3.0	3.0	1.8
0.04	-	3.0	3.0	2.0
0.1	-	3.0	3.0	2.5
0.2	-	3.1	3.1	2.0
0.4	-	4.8	4.8	3.7
1	-	7.0	7.0	5.2
3	-	15.9	15.9	9.0
5	-	18.7	18.7	13.0
	224	9.9	-	-
12	-	-	-	53.5
16	-	-	-	57.4

Nominal	Connection plate	Added weight
		[kg]
0.025 **- - -** **0.04** **- - -** **0.1** **- - -** **0.2** **- - -** **0.4**	MVC ... B04	1.6
	MVC ... B05	1.8
	MVC ... C05	1.7
	MVC ... B11	1.7
	MVC ... C08	2.5
	MVC ... C09	2.7
	MVC ... D08	2.9
	MVC ... D09	2.9
1	MVC ... C04	2.7
	MVC ... C09	2.9
	MVC ... C11	3.2
	MVC ... D11	3.5
	MVC ... D05	4.0
	MVC ... E05	4.9
3	MVC .V. 04	9.5
	MVC .R. E04	9.6
	MVC . R. E11	13.9
	MVC .R. E05	14.0
	MVC .V. E05	14.0
	MVC .V. E09	14.2
	MVC .R. G09	17.8
	MVC .R. G11	17.9
5	MVC .V. 04	9.5
	MVC .R. E04	9.6
	MVC .R. E11	13.9
	MVC .R. E05	14.0
	MVC .V. E05	14.0
	MVC .V. E09	14.2
	MVC .V. F09	15.1
	MVC .R. G09	17.8
	MVC .R. G11	17.9
12 **- - -** **16**	MVC .V. G09	41.2

4.9 Dimensions

The dimensions of the product are given in the technical data sheets.

5 Transport and storage

5.1 General

a) After receiving the delivery, check the product for transport damage.

b) If transport damage is found, the manufacturer and the transport company must be notified immediately. The product must then be replaced or repaired.

c) Dispose of packaging materials and used parts according to local regulations.

5.2 Transport

⚠ WARNING

Falling or toppling loads

Risk of injury during transport of large and heavy loads.

a) Use only suitable means of transport and lifting gear with sufficient load-bearing capacity.

b) Attach lifting gear only to suitable places on the load.

c) Attach the lifting gear so that it cannot slip.

d) Note the centre of gravity of the load.

e) Avoid sudden, jerky movements, impacts and strong vibrations during transport.

f) Do not step under overhead loads, do not work under overhead loads.

NOTICE

The eyebolt in the cover can be used to transport the gear-type flow meters VC 12 and VC 16. Eyebolts in the existing threaded holes can be used to transport the connection plates.

5.3 Storage

The product's function is tested in the factory with mineral hydraulic oil. The connections are then closed. The remaining residual oil preserves the internal parts for up to 6 months.

Bright metallic external parts are also protected against corrosion by suitable preservation measures for up to 6 months.

During storage, ensure a dry, dust-free and low-vibration environment. The product must be protected from weather, moisture and large temperature fluctuations. Comply with the recommended storage conditions.

Below the permissible ambient temperature ϑ_U, elastomer seals lose their elasticity and mechanical loading capacity, as the temperature is below the glass transition temperature. This process is reversible. Avoid the application of force on the product during storage below the permissible ambient temperature ϑ_U.

Products with EPDM seals are not mineral oil resistant and their function is not tested. The internal parts are not preserved. If the product is not put into operation immediately, all surfaces exposed to corrosion must be protected by suitable preservation measures. The same applies to products that are not tested for other reasons.

In case of storage for a longer period (> 6 months), all surfaces exposed to corrosion must be retreated with suitable preservatives.

If high humidity or an aggressive atmosphere is to be expected, additional suitable corrosion prevention measures must be taken.

NOTICE

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

⚠ ATTENTION

Corrosion/chemical attack

Improper storage can make the product unusable.

a) Use suitable preservation measures to protect exposed surfaces.

b) Comply with the recommended storage conditions.

5.4 Storage conditions

TIP

Recommended storage conditions

a) Storage temperature: 5 °C – 25 °C

b) Relative humidity: < 70 %

c) Protect elastomer parts from light, particularly direct sunlight.

d) Protect elastomer parts from oxygen and ozone.

e) Note the maximum storage period of elastomer parts:

⇨ 5 years: AU (polyurethane rubber)

⇨ 7 years: NBR, HNBR, CR

⇨ 10 years: EPM, EPDM, FEP/PFTE, FEPM, FKM, FFKM, VMQ, FVMQ

6 Installation

6.1 Safety instructions for installation

⚠ 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

Risk to life due to entanglement or winding of parts of the body, hair or clothing items.

a) Before carrying out any work, disconnect any drives and actuators from the power supply or depressurise them.

b) Safely prevent restarting during the 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

Exposed gears

Gearwheels can trap and crush fingers and hands.

a) Do not engage gearwheels.

⚠ WARNING

Failure of pressure bearing parts due to overload

Risk of injury from flying parts.

Risk of injury due to splashing fluids.

a) Before carrying out any work, depressurise the product and all connection pipes.

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 splashing fluids.

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

Burns of the skin on contact.

a) Take measures to prevent accidental touching of hot surfaces (< 60 °C).

6.2 Mechanical installation

6.2.1 Preparation

a) Check the product for transport damage and contamination.

b) Remove any preservative present.

c) Clean all lines.

⇨ Only use cleaning agents that are compatible with the materials used.

⇨ Do not use cleaning wool.

d) Compare the environmental and ambient conditions at the place of use with the permissible conditions.

⇨ Expose the product only to low vibrations, see IEC 60034-14.

⇨ Ensure sufficient accessibility for maintenance and repair.

e) Die hydraulischen Anschlüsse herstellen.

⇨ Comply with the manufacturer's instructions.

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

f) Remove existing protective plugs.

6.2.2 Plate connection

⚠ CAUTION

Hot surfaces

Burns of the skin on contact.

a) Take measures to prevent accidental touching of hot surfaces (< 60 °C).

⚠ ATTENTION

Contamination or small parts

Damage or malfunctions of the product and the system caused by dirt or small parts.

a) Before installing, check the connection surfaces for dirt or small parts and clean if necessary.

a) Position the housing on the connection plate.

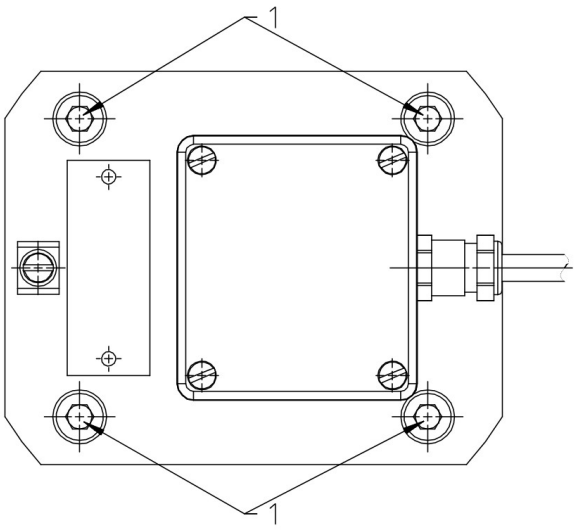
⇨ Make sure that the seal fits correctly.

⇨ The contact surface must be free from dirt, paint residues, etc.

b) Tighten the fastening screws to the specified torque.

⇨ Prevent stressing of the product.

⇨ Make sure the fastening screws have sufficient depth of engagement.



1 Fastening screws

Tightening torques fastening screws					
Nominal	**0.025 – 0.2**		**0.4 - 1**	**3 - 5**	**12 - 16**
Screw size	M6		M8	M12	M20
Property class	8.8	10.9 - 12.9	10.9 – 12.9	10.9 – 12.9	8.8 – 10.9 – 12.9
Tightening torques	10 Nm	14 Nm	35 Nm	EN-GJS-400-15: 120 Nm EN-GJS-600: 145 Nm	400 Nm

External manufacturer connection plate/valve block

Nominal		**0.025**	**0.04**	**0.1**	**0.2**	**0.4**	**1**	**3**	**5**	**12**	**16**
Evenness	**[µm]**	10					20				
Roughness height R_t	**[µm]**	10					10				

NOTICE

Use only connection plates or valve blocks from external manufacturers with specified surface and shape tolerances.

6.2.3 pipe connection

a) Clean all lines.

⇨ Do not use cleaning wool.

⇨ Pickle and rinse welded pipes.

b) Remove existing protective plugs.

c) Install the lines.

⇨ Comply with the manufacturer's instructions.

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

6.3 Electrical connection

6.3.1 Preamplifier (S, H, K)

Electrical data		**Pre amplifier**	
		24 V	**12 V**
Number of measuring channels		2	2
Operating voltage		UB = 24 V DC ± 20 % Reverse-polarity protection	UB = 12 V DC ± 20 % Reverse-polarity protection
Impulse amplitude		UA ≥ 0,8 UB	UA ≥ 0,8 UB
Impulse shape with symmetrical output signal		Rectangular / Pulse duty factor / Channel 1:1 ±15 %	Rectangular / Pulse duty factor / Channel 1:1 ±15 %
Impuls offset between the two channels		90° ± 30°	90° ± 30°
Power requirement	$\mathbf{p}_{b\ max}$	0,9 W	0,9 W
Power requirement / Channel	$\mathbf{p}_{a\ max}$	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)
Special numbers [▸ 12]			

TIP

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.

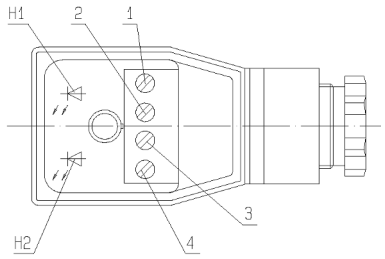
b) Please consult the manufacturer in cases of doubt.

⚠ ATTENTION

The power supply line must match the used preamplifier.

6.3.1.1 Connection plug arrangement

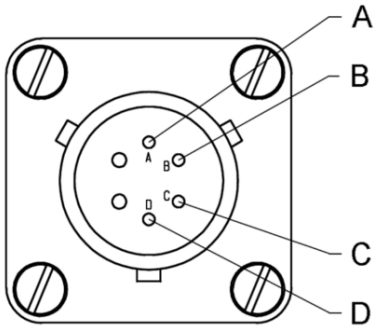
The terminal assignment for channel 1 and channel 2 influences the direction of rotation displayed by the measuring element.



1	U_B	Brown
2	channel 1	Green
3	channel 2	Yellow
4	0 Volt	White
H1	Signal generator, channel 1	Red
H2	Signal generator, channel 1	Red

6.3.1.2 PIN assignment

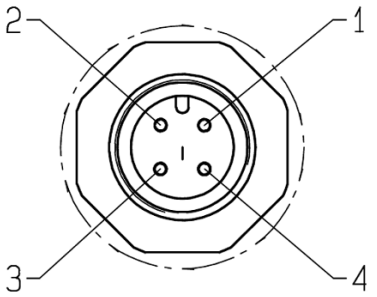
Cannon-plug



A	U_B
B	Channel 1
C	Channel 2
D	GND

Circular plug connector M12x1/-4 pole

(High temperature PLUS**)**



1	U_B
2	Channel 1
3	GND
4	Channel 2

6.3.2 IO-Link

6.3.2.1 General

IO-Link overview	
Name	VC IO-Link
Vendor ID	0x0524
Device ID	0x000001
Vendor Name	KRACHT GmbH
Communication parameters	
IO-Link Revision	V1.1
Bit rate	COM3
Minimum cycle time	500 µs
Standard I/O mode (SIO) supported	Yes
ISDU (Indexed Service Data Unit) used	Yes
DS data storage usable	Yes

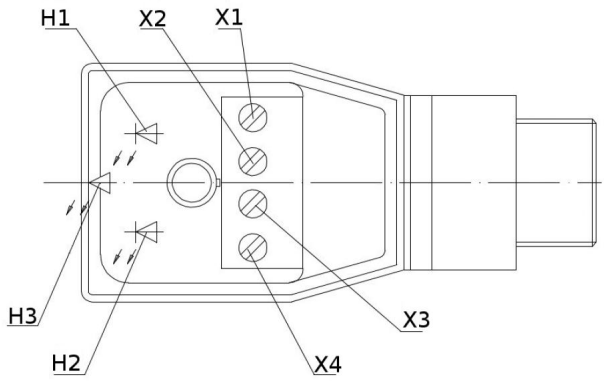
NOTICE

With currents of max. 200 mA between the IO-Link device and the IO-Link master, core cross-sections of min. 0.35 mm² up to a maximum cable length of 20 m are permissible.
The design of the supply line of the IO-Link master from the power supply unit is not affected by this and is the responsibility of the installer/operating company.

Electrical data		**IO-Link Mode**	**SIO-Mode**
Number of measuring channels		1 or 2	
Operating voltage	**U_B**	10 ... 30 V DC	
Impulse amplitude		$Min_{High} \geq U_B - 2$ V	
		$Max_{Low} \leq 2$ V	
Impulse shape with symmetrical output signal		-	Rectangular, Pulse duty factor/ Channel 1:1±15%
Signal output		active pull ± 200 mA	
Impuls offset between the two channels		-	90° ± 30°
Power requirement	**$P_{b\ max}$**	1 W	
Protection class		IP 65	

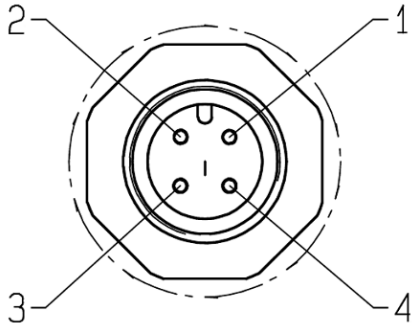
6.3.2.1.1 Terminal layout

The terminal assignment for channel 1 and channel 2 influences the direction of rotation displayed by the measuring element.



		IO-Link Mode	SIO-Mode
X1[1)]	Blue	0 Volt	
X2[1)]	Brown	U_B	
X3[1)]	White	I/Q	Channel 1
X4[1)]	Black	C/Q	Channel 2
H1	Red	Signal generator, channel 1	
H2	Red	Signal generator, channel 2	
H3	Green	Flashing, at one second intervals	Continuously lit, ready for operation
[1)] Colours according to IEC 60947-5-2			

6.3.2.1.2 Pin assignment (M12x1/-4 pins)



	IO-Link Mode	SIO-Mode
1	U_B	
2	I/Q	Channel 1
3	0 Volt	
4	C/Q	Channel 2
According to IEC 61076-2-101 A-coded		

6.3.2.2 IO-Link mode process data

6.3.2.2.1 Input process data

PD input (input process data): total length 32 bit Can be set via the variable: output unit (index 64)					
Name	**Description**	**Data type**	**Length**	**Value range**	**Unit**
PDIN_ Pulses	Selected by "output unit (64)" the tooth pulses are output directly	IntegerT	32 Bit	−2.147.483.648 till 2.147.483.647	
PDIN_ Volume	Selected by "output unit (64)" the flowed volume is calculated and output	Float32T	32 Bit	1.175494351E-29 till 3.402823466E+38	l (Litres)
PDIN_ Weight	Selected by "output unit (64)" the calculated weight is output	Float32T	32 Bit	1.175494351E-29 till 3.402823466E+38	kg (Kilogram)
PDIN_ FlowRate	Selected by "output unit (64)" the flow is output	Float32T	32 Bit	1.175494351E-29 till 3.402823466E+38	l/min (Litres per minute)
PDIN_ MassFlow	Selected by "output unit (64)" the mass flow rate is output	Float32T	32 Bit	1.175494351E-29 till 3.402823466E+38	kg/min (Kilo-gram)

6.3.2.2.2 Output process data

PD output (output process data): total length 1 bit Can be set via the variable: output unit (index 64)					
Name	**Description**	**Data type**	**Length**	**Value range**	**Unit**
PDOUT_ Pulses	"Reset activated" resets the PDIN_pulses process data of the pulse measurement to value "0" until "Reset deactivated" is set.	BooleanT	1 Bit	true / false	true: reset activated false: reset deactivated
PDOUT_ Volume	"Reset activated" resets the PDIN_Volume process value of the volume measurement to value "0" until "Reset deactivated" is set.	BooleanT	1 Bit	true / false	true: reset activated false: reset deactivated
PDOUT_ Weight	"Reset activated" resets the PDIN_Weight process data of the weight measurement to "0" until "Reset deactivated" is set	BooleanT	1 Bit	true / false	true: reset activated false: reset deactivated
PDOUT_ FlowRate	No effect on the measurement	BooleanT	1 Bit	true / false	
PDOUT_ MassFlow	No effect on the measurement	BooleanT	1 Bit	true / false	

6.3.2.3 IO-Link variables

Name	Index	Sub-bindex	Data type	Length	Access	Factory setting	Value range	Factor	Unit	Description
Identification Menu										
Vendor Name	16	0	StringT	11 Byte	ro	Kracht GmbH				
Vendor Text	17	0	StringT	52 Byte	ro	Gear Pumps / Flow Measurement / Hydraulics / Valves				
Product name	18	0	StringT	16 Byte	ro	Flow Meter				
Product ID	19	0	StringT	2 Byte	ro	VC				
Product Text	20	0	StringT	32 Byte	ro	VC XXX				
Serial Number	21	0	StringT	10 Byte	ro	See type plate				
Hardware Version	22	0	StringT	8 Byte	ro					
Firmware Version	23	0	StringT	8 Byte	ro	Description of the firmware status **Firmware versions and changes (Index 23) [▶ 39]**				
Application Specific Tag	24	0	StringT	32 Byte	rw	***				

Name	Index	Subindex	Data type	Length	Access	Factory setting	Value range	Factor	Unit	Description
Observation Menu										
Pulses	110	0	IntegerT	32 Byte	ro		–2.147.483.648 till 2.147.483.647			Impulses can be queried in each setting of pocess data
FlowRate	111	0	Float32T	32 Byte	ro		1.175494351E-29 till 3.402823466E+38		l/min	Flow rate can be queried in each setting of process data
Parameter Menu										
Output unit	64	0	IntegerT	8 Byte	rw	0	(0) Pulses (15) Litres (52) Kilogram (101) Litres per minute (154) Kilogram			Setting content of process data
V_{gz} Factor	80	0	Float32T	4 Byte	rw	1	0.5 till 1.5			Factor for adjusting Vgz **Calibration of the tooth volume (Index 80) [▶ 39]**
Density	81	0	Float32T	4 Byte	rw	1	0.5 till 15			Density of medium **Calibration of the weight calculation (Index 81) [▶ 39]**
Diagnose Menu										
Operating hours	100	0	UIntegerT	2 Byte	ro	0	0 till 65534	1		Operating hours since initial commissioning
Total impulses	101	0	UIntegerT	4 Byte	ro	0	0 till 4.294.967.294	1000		Total impulses since initial commissioning

6.3.2.3.1 Calibration of the tooth volume (Index 80)

If necessary, the Vgz factor can be calibrated.

Such a calibration may be necessary due to deviating viscosity, temperature or other external influences and is taken into account in the measurement as follows:

Calculation of the Vgz factor:

Vgz factor = measured volume / PDOUT_volume

Example:

1. Vgz factor = 1
2. Measured volume = 100 l
3. Output evaluation electronics PDOUT_Volume = 98 l
4. Calculation of the Vgz factor:
   Vgz = 100 l / 98 l = 1.02
5. Set the Vgz factor and transmit it to the IO link device
6. Measured volume = 100 l
   Output evaluation electronics PDOUT_Volume = 100 l

6.3.2.3.2 Calibration of the weight calculation (Index 81)

The weight determination of the flow of fluid is calculated via the flow volume and density.

The density value is set in the factory to 1 kg/L.

6.3.2.3.3 Firmware versions and changes (Index 23)

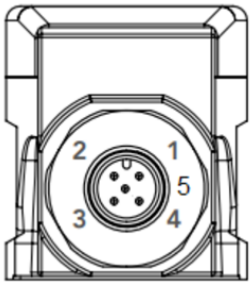
Firmware Version	Information	Date
FW-V0.56	Initial as-delivered version	First customer version
FW-V0.58	Processing frequency extended	from 11/01/2022
FW-V0.60	Internal production changeover	from 17/02/2022
FW-V0.64	Processing frequency extended once again and communication revised	from 23/05/2022
FW-V1.03	Stack update to V1.1.3 Hardware redesign	from 01/09/2023
FW-V1.07	Adjustments to the volume and weight output as a Float32T value	from 16/12/2024

6.3.3 Analogue VC

Technical data		Analogue VC
Number of measuring channels		1 or 2
Operating voltage	**U_B**	10 ... 30 V DC (Reverse polarity protection up to 30 V DC)
Analogue output (flow rate)		3.6mA till 24mA
Permissible load analogue output		833Ω @ 24 V DC
Digital output (direction)		Aktiv push pull100 mA High > +Ub – 3V Low < 3V
Power requirement	**$p_{b\ max.}$**	1.4 W (Without analogue and digital output)
Protection class		IP 65
Ambient temperature		-40 till 80°C

6.3.3.1 Electrical connection

Circular plug connector M12x1 metallic/5-pin



1 U_B
2 Analogue output
3 0 volt (GND)
4 Digital output
5 without function

TIP

Shielded cable.

7 Commissioning

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

Burns of the skin on contact.

a) Wear protective gloves at temperatures ≥48°C.

7.2 Preparation

a) Before starting the system 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 product with medium.

7.3 Additional commissioning

a) Open existing shut-off elements in front of and behind the product.
b) Set pressure relief valves installed in the system to the lowest opening pressure.
c) Run the product pressureless or at low pressure for a few minutes.
d) Vent the system at the highest possible point.
e) Gradually increase the pressure up to the required operating pressure.
f) Operate the system until the final operating condition is reached.
g) Check the operating data.
⇨ **Maintenance table [▷ 48]**
h) Document the operating data of the initial commissioning for later comparison.
i) Check the level of the operating medium in the system.
j) Check the product for leaks.
k) Check all fittings 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.

TIP

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 disassembly

⚠ 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

Risk to life due to entanglement or winding of parts of the body, hair or clothing items.

a) Before carrying out any work, disconnect any drives and actuators from the power supply or depressurise them.

b) Safely prevent restarting during the 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

Exposed gears

Gearwheels can trap and crush fingers and hands.

a) Do not engage gearwheels.

⚠ WARNING

Failure of pressure bearing parts due to overload

Risk of injury from flying parts.

Risk of injury due to splashing fluids.

a) Before carrying out any work, depressurise the product and all connection pipes.

b) Securely prevent the pressure from being restored during work.

⚠ CAUTION

Hot surfaces

Burns of the skin on contact.

a) At temperatures ≥ 48 °C allow the product to cool 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 Dismantling

a) Depressurise and de-energise the system.

b) Close existing shut-off elements in front of and behind the product.

c) Open existing drain elements and undo connection lines. Collect and dispose of leaking media so that no hazard is created for persons or the environment.

d) Dismantle the product.

⇨ Den Stecker vom Gehäuse abziehen.

⇨ **Plate structure**: Release the unit from the connection plate.

⇨ **Pipe connection**: Loosen the pipe connections from the unit and, if applicable, take the unit off the holding fixture.

e) Clean the product.

f) Seal the process connections and lines to prevent the ingress of dirt.

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

9.1 Safety instructions for maintenance

⚠ 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

Risk to life due to entanglement or winding of parts of the body, hair or clothing items.

a) Before carrying out any work, disconnect any drives and actuators from the power supply or depressurise them.

b) Safely prevent restarting during the 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) Before carrying out any work, depressurise the product and all connection pipes.

b) Securely prevent the pressure from being restored during work.

⚠ CAUTION

Hot surfaces

Burns of the skin on contact.

a) At temperatures ≥ 48 °C allow the product to cool first.

9.2 Maintenance work

TIP

Checking and documentation of the operating data

Regular checking and documentation of all operating data helps to detect faults at an early stage.

- Perform the maintenance work according to specifications.
- Replace defective or worn components.
- If necessary, request spare parts lists and assembly drawings from the manufacturer.
- Document the type and scope of the maintenance work along with the operating data.
- Compare the operating data with the values of the initial commissioning.
  In case of large deviations (> 10 %) determine the cause.
- Dispose of packaging materials and used parts according to local regulations.

NOTICE

Protective devices and notes

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

9.2.1 Cleaning - deposits in the measuring device

⚠ ATTENTION

Device damage

Improper cleaning of the measuring unit can damage the device.

a) Only by the manufacturer:

⇨ Cleaning the measuring element in products with ball bearing

b) Can be carried out by the customer:

⇨ Cleaning the measuring element in products with plain bearing

⇨ Exception: Special numbers

⚠ ATTENTION

Leaks or increased wear

Damaged gasket faces and gears lead to leaks and faults in later operation.

a) When disassembling housing components, do not use screwdrivers or the like as a lever to separate the joints.

b) Do not remove the gears from the housing with pliers.

a) Undo the fastening screws.

b) Remove the cover from the housing.

c) Remove the gears from housing.

d) Remove the bearing journals from the housing.

e) Clean the product.

f) Replace O-ring.

g) Insert bearing journal and gears into the housing.

h) Put the cover on the housing.

i) Tighten the fastening screws to the specified torque.

Tightening torques Housing with threaded connection [Nm]										
Nominal	**0.025**	**0.04**	**0.1**	**0.2**	**0.4**	**1**	**3**	**5**	**12**	**16**
Tightening torques **M_A**	35				65		145		290	
Screws/Nuts with min. strength class 10.9/10										

9.3 Maintenance instructions

The following information provides recommendations for maintenance work and maintenance intervals for the product in use.
Depending on the actual loads occurring during operation, the type, scope and interval of the maintenance work may deviate from the recommendations. A mandatory maintenance plan must be drawn up by the installer/operating company.

TIP

In the course of preventive maintenance, it is advisable to replace wearing parts before the wear limit is reached.

With the appropriate know-how and sufficient equipment, the repair can also be carried out by the installer/operating company.
If necessary, request spare parts lists and assembly drawings from the manufacturer.
Please consult the manufacturer for this purpose.

NOTICE

Warranty

Any warranty will be void if not executed properly.

9.4 Maintenance table

9.4.1 Maintenance table

		First time after max. 24h	Daily	3000 operating hours	6000 operating hours	If necessary	Additional information
9.4.2	**Kontrolle Förderstrom**	2					
9.4.3	**Check the operating pressure**	2					
9.4.4	**Check the media temperature**	2					
9.4.5	**Check the device temperature**	2					
9.4.6	**Check the equipotential bonding**	2					
9.4.7	**Check the condition of the operating fluid**	2					
9.4.8	**Noise test unusual noises**		1				
9.4.9	**Cleaning**		1				
9.4.10	**Visual inspection of leakage**		1				
9.4.2	**Kontrolle Förderstrom**			2			
9.4.3	**Check the operating pressure**			2			
9.4.4	**Check the media temperature**			2			
9.4.5	**Check the device temperature**			2			
9.4.6	**Check the equipotential bonding**			2			
9.4.7	**Check the condition of the operating fluid**			2			
9.4.11	**Visual check of the condition of the measuring element**				3		
9.4.12	**Visual check of the condition of housing parts**				3		
9.4.13	**Visual check of the condition of the bearings**				3		
9.4.14	**Replacing other seals**					4	

		First time after max. 24h	Daily	3000 operating hours	6000 operating hours	If necessary	Additional information
9.4.15	**Cleaning to remove deposits in the measuring device**					4	

1 - 0,1 h; 2 - 0,2 h; 3 - 0,75 h; 4 - 0,5 h

9.4.2 Kontrolle Förderstrom

Der Förderstrom wird über die Durchfluss-Volumenzähler gemessen.
Die Werte zeigt der Einbau-Controller in der elektrischen Steuerung an.

- Bei fehlendem Förderstrom müssen die Einzelkomponenten des Produkts überprüft werden.
- Die produktspezifischen Datenblätter/Betriebsanleitungen sind zu beachten.

9.4.3 Check the operating pressure

The operating pressure is indicated by the pressure gauges.

- If there is no operating pressure, check the individual components of the product.
- Comply with the product-specific data sheets/operating instructions.

9.4.4 Check the media temperature

The media temperature is measured through the temperature sensor.

The values are displayed by the built-in controller in the electrical control system.

- If the media temperature is too high or too low, check the product components.
- Comply with the product-specific data sheets/operating instructions.

9.4.5 Check the device temperature

Measure the surface temperature in the area of the bearing.

9.4.6 Check the equipotential bonding

Check the equipotential bonding for tight fit and proper functioning.

9.4.7 Check the condition of the operating fluid

Pay attention to colour (dark colouring), odour and milky turbidity.

- Replace operating fluid if necessary.

9.4.8 Noise test unusual noises

In this case, attention must be paid to increased noise or uneven operation (pump unit).

- In case of unusual noises, examine the individual components of the product and line fixings and check the operating medium for foaming.
- Comply with the product-specific data sheets/operating instructions.

9.4.9 Cleaning

Remove dust deposits and dirt with a damp, clean cloth.

9.4.10 Visual inspection of leakage

Care must be taken here to ensure that there is no leakage from the connections.

- In the event of leaks in the connections, the glands must be tightened and, if necessary, the seals replaced.

9.4.11 Visual check of the condition of the measuring element

Look for damage to the measuring element.

Cleaning - deposits in the measuring device [▷ 46]

9.4.12 Visual check of the condition of housing parts

Look for damage to the housing.

9.4.13 Visual check of the condition of the bearings

Look for damage to the bearings.

Cleaning - deposits in the measuring device [▷ 46]

9.4.14 Replacing other seals

Cleaning - deposits in the measuring device [▷ 46]

9.4.15 Cleaning to remove deposits in the measuring device

Cleaning - deposits in the measuring device [▷ 46]

10 Repair

10.1 Safety instructions for repairs

⚠ 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

Risk to life due to entanglement or winding of parts of the body, hair or clothing items.

a) Before carrying out any work, disconnect any drives and actuators from the power supply or depressurise them.

b) Safely prevent restarting during the 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) Before carrying out any work, depressurise the product and all connection pipes.

b) Securely prevent the pressure from being restored during work.

⚠ CAUTION

Hot surfaces

Burns of the skin on contact.

a) At temperatures ≥ 48 °C allow the product to cool first.

10.2 General

Corrective maintenance includes:

1. Troubleshooting
   Finding damage, determining and localising the cause of the damage.
2. Damage repair
   Removing the primary causes and replacing or repairing defective components. Repairs are generally carried out by the manufacturer.

Repair by the manufacturer

Before returning the product, fill out the return form. The form can be filled out online and is available to download as a pdf file or can be requested from the manufacturer.

NOTICE

Device contains hazardous substances

If the device has been operated with hazardous fluids it must be cleaned before it is returned. If this is not possible, the safety data sheet of the hazardous material must be provided in advance.

Repair by the installer/operating company

With the appropriate know-how and sufficient equipment, the repair can also be carried out by the installer/operating company. Please consult the manufacturer for this purpose.

a) If necessary, request spare parts lists and assembly drawings from the manufacturer.

b) Only use spare parts approved by the manufacturer.

c) Dispose of packaging materials and used parts according to local regulations.

NOTICE

Warranty

Any warranty will be void if not executed properly.

NOTICE

Protective devices and notes

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

10.3 Fault table

TIP

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

Fault	Potential causes	Possible measures
LED display		
Both LED displays flash -however, false values are displayed in the overrid-ing controller	Connection between the device plug and the overriding control-ler is loose/defective	Check the connection and replace the cable or plug if neces-sary
An LED display does not illuminate	Wire break	Repairs by manufacturer
	Soldering point defective	
	Sensor defective	
No LED display illumin-ates	Power failure	Check the supply cable
		Check the fuses
	Measuring unit is blocked	Put the device out of operation immediately!
		Products with bearings K, C or H:
		Repairs by manufacturer
		Products with bearings G or B:
		Clean the device
Seal failure / Leckage		
	O-ring in the housing is defect-ive	Products with bearings K, C or H:
		Repairs by manufacturer
		Products with bearings G or B:
		Check material compatibility
		Replace O-ring
	O-ring between housing and connection plate defective	Replace O-ring

Defective values in the overriding controller		
	Wear	Products with bearings K, C or H:
		Repairs by manufacturer
		Products with bearings G or B:
		Measuring unit is blocked
Consult the manufacturer in the event of unidentifiable faults		