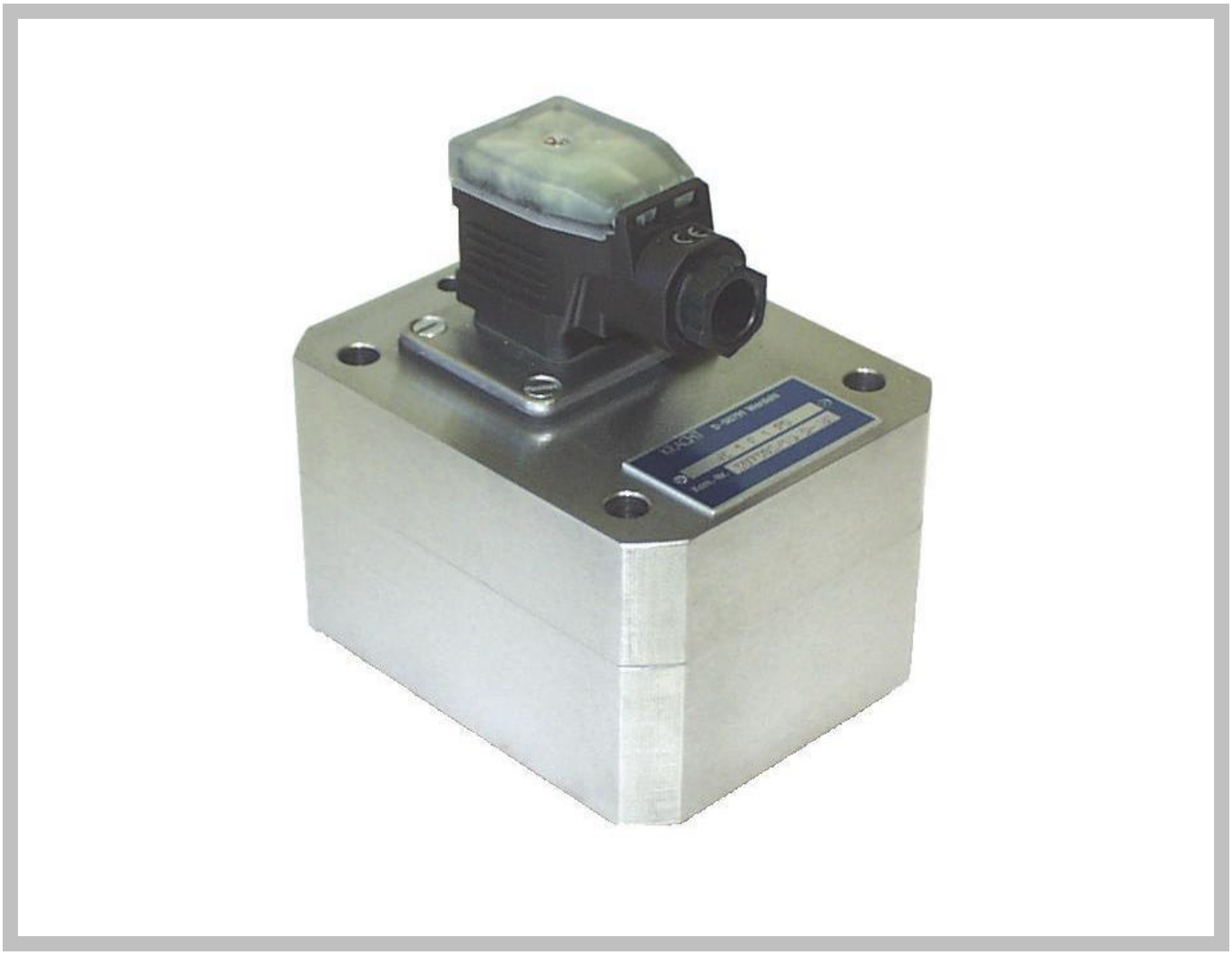
Gear Type Flow Meter VC

Operating and Maintenance Manual BVC0021GB



VC 0,025 ... VC 5

ATEX-design

KRACHT

Volutronic ®

KRACHT

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Safety

Designation of Safety Instructions

The safety instructions provided in this operating manual are designated with the warning symbol. Failure to follow these instructions could lead to personal injury or damage to equipment.

Other instructions that are not hazard warnings, but give tips for better working, are designated by a hand.

Additional safety instructions for explosion protection are designated with the Ex symbol.

General Safety Instructions

Safety in operating the gear type flow meter supplied is only guaranteed if it is operated properly (see chapter entitled "Description of the Equipment". The limit values specified (see also chapter entitled "Technical Specifications") must not be exceeded under any circumstances.

The personnel entrusted with the fitting, operation and maintenance of the device must be suitably qualified; this can be through training or by appropriate instruction. These personnel must be familiar with the instructions provided in this manual.

All work done must conform to the existing national regulations on accident prevention and health and safety at work, and to any existing internal regulations of the customer or operator, even if they are not specified in this manual.

Leaks of hazardous materials that are conveyed must be collected and disposed of in such a way that there is no danger to persons or to the environment. Statutory regulations must be observed in such cases.

The connecting conduits must be de-pressurized for all work on the device and prior to its removal!

The customer or operator must ensure that this operating manual is permanently accessible to the persons concerned.

If the gear type flow meter blocks it acts as in the same way as a closed gate valve. The pressure peaks which occur in such a case and which cannot be controlled can cause damage to the gear type flow meter and to upstream items of equipment. For this reason, it is essential to use pressure control before the gear type flow meter.

If the counter signal disappears in unplanned fashion, e.g. through blocking of the measuring device, the plant equipment must be switched off immediately.

Manufacturer´s address

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The documentation

This manual descibes the construction, operation and maintenance of the gear type flow meters VC in ATEX design manufacturered by KRACHT GmbH.

Different models are available. The model is shown on the name plate of each meter. An explanation of the type code and a more detailed description of the individual series and nominal sizes are given under ”Technical specifications” in the section entitled “Description of the equipment”.

Devices in ATEX design are equipped with the KIS 2 sensor. This sensor is described separately in operating and maintenance instructions BVC0017.

Please contact the manufacturer if you have any further questions.

Description of the equipment

Proper use

The gear type flow meter is a measuring device for continuous measurement of inflammable and non-inflammable fluids. The various series enable it to be used for media of differing viscosities and lubricities.

It must be ensured that the fluid to be measured is compatible with the materials used in the gear type flow meter (see Chapter: "Technical Data"). Chemical knowledge is necessary for this. Care must be taken with ethylene oxide! In case of doubt, refer to the manufacturer.

Any liquid which leaks out must not give rise to ignition or explosion because, for example, of high temperatures or static charge. The liquid may only be heated up to a point which is considerably below the ignition temperature or the flame point (in the case of vapour).

The liquid must not be static charged.

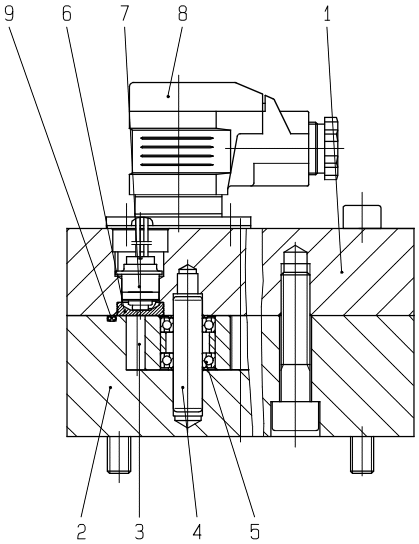
The maximum permissible operation data in the chapter, "Technical Data", is to be observed without exception.

Nameplates or other references on the device may not be removed or made illegible or unrecognizable. In the event of non-compliance, any guarantee and manufacturer responsibility is forfeited.

Construction and function

The principle construction of the individual VC product lines is depicted in the illustration below using the example of Product Lines 1 and 2.

Two gearwheels running on low-friction bearings are located inside the VC housing. These are driven by the fluid current during operation. The movement of the gear wheels is gauged by two non-contact object sensors and converted into electrical signals. A compression-proof, non-magnetic cut-off wheel is located between the sensor space and the measuring chamber. These signals are led onto the display unit which is attached.



1 *Cover*

2 *Housing*

3 *Gearwheel*

4 *Bearing Neck*

5 *Bearing*
Series 1, 2, 6, 7, 8:Ball bearing
Series 3, 4, 5:Plain bearing (not depictedt)

6 *Non-magnetic cut-off wheel*

7 *Sensor*

8 *Connection plug*

9 *O-Ring*

Operational areas

The gear type flow meter described in these operating instructions in ATEX design can be used as follows:

In Zone 2 (Gas-Ex, Category 3G) in explosion groups IIA, IIB and IIC

In Zone 22 (Dust-Ex, Category 3D) with dusts with a minimum ignition energy > 3 mJ

In Zone 1 (Gas-Ex, Category 2 G) in explosion groups IIA, IIB and IIC

In Zone 21 (Dust-Ex, Category 2D) with dusts with a minimum ignition energy of > 3 mJ

In Category I M2

Qualification with regard to surface temperature is T4. For all gases, vapours, mists with an ignition temperature > 135°C, the gear type flow meters are not an ignition source.

In the Dust-Ex area, 125°C is the reference temperature when considering safety distance from the glow or smoulder temperature etc. (only the plant operator can decide).

The permissible temperature range extends from -30°C $\leq T_a \leq$ 80°C.

Identification in accordance with EC Directive RL 94/9/EG

 II 2 GD c IIC T4 IP65 T125°C

and/or  I M2 EEx c I

Special Conditions

Special conditions or restrictions apply for the safe use of the gear type flow meters in a permissible environment. These must be provided by the customer or operator by means of appropriate technical and/or organizational measures.

These instructions for the ATEX gear type flow meter are only valid in combination with operating and maintenance instructions BVC0017 of sensor KIS 2. The rules contained in both sets of instructions have to be observed.

The electrical connection of sensor KIS 2 must be in accordance with instructions BVC0017.

Operation is only permitted within the specified environmental conditions.

The gear type flow meters may only be used if their materials are so resistant to mechanical and/or chemical influences under the given operational conditions that the explosion protection still exists.

The medium must offer a minimum degree of lubricity. At electrostatic chargeable fluids, the details of the manufacturer of the respective fluid have to be observed to avoid an electrostatic charging.

The gear type flow meter is intended for operation with fluids. Dry running is not permitted. Operation which is not within the permitted parameters is not allowed.

A filter should be installed if necessary in order to prevent blocking of the gear type flow meter by foreign bodies.

The gear type flow meter and all attachments must be electrically conductive and included in the eqiupotential bonding system. Direct dangerous static discharge is not permitted.

Cathodic corrosion protection is not permitted.

Dangerous dust deposits >5 mm on the surface must be removed immediately.

The installation, servicing and maintenance provisions specified in the operating instructions are to be complied with without exception.

When used in equipment category I M2 there must be a possiblity of shutting off the equipment in which the gear type flow meter is installed quickly. This is necessary in order to exclude potential risks from ignition if an explosive atmosphere occurs.

All lines and connections must be of suitable, low-spark materials. Aluminium or other light metals must not be used in equipment category I M2.

Flame point and minimum ignition temperature of the medium must be observed by the operator.

The gear type flow meter may only be used in closed condition and may not be exposed to impermissible vibration.

Only original replacement parts may be used in maintenance and repair work.

If necessary an additional housing must be provided to prevent water penetration.

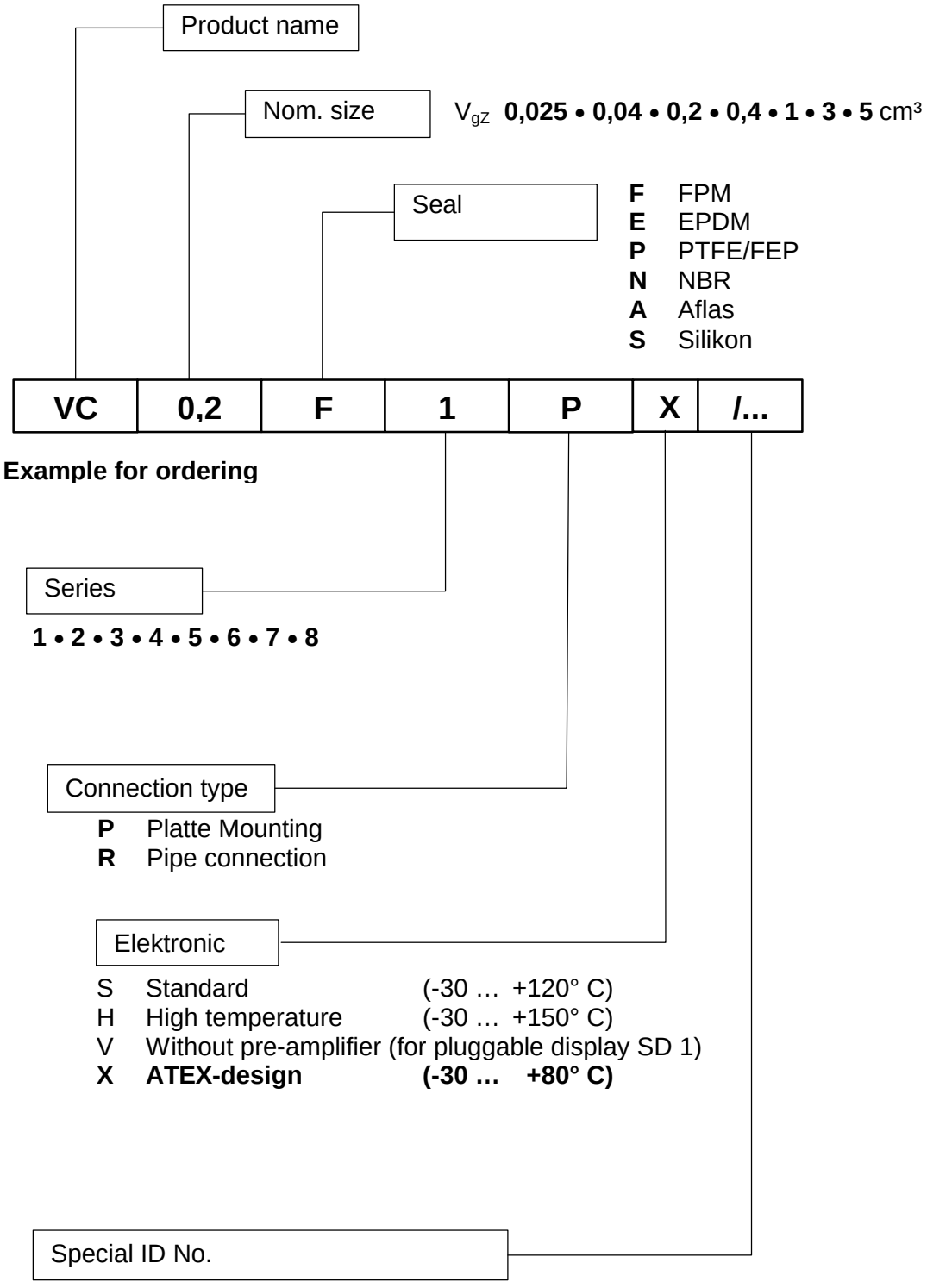
Use of the gear type flow meters in the dust Ex area is only permitted with non-conductive dusts (volume resistance > 1 kΩ permissible).

Local regulations regarding lighting protection must be observed.

Further instructions and more detailed information on the individual points can be found in the relevant chapters of these operating instructions.

Technical Data

Explanation of the Type Code



General Specifications

Type	Gear Motor
Materials	See overview, “Product Lines and Materials”
Branch Circuit Connection	Plate construction or pipe thread
Fitting Position/Flow Direction	Optional
Ambient temperature	-30…+80 °C
Electrical characteristics Sensor KIS 2	See operating and maintenance instructions BVC0017
Permissible media	Inflammable and non-inflammable liquids without abrasive ingredients which are compatible with the materials of which the gear type flow meter is made. The fluid must not be static charged. Flame point and minimum ignition temperature must be observed by the operator. Media-specific characteristics must be taken into consideration.

Permissible operating media temperatures

Sealing Variations	Temperature in °C
F FPM	-15 ... 80
E EPDM	-30 ... 80
P PTFE/FEP	-30 … 80
N NBR	-30 ... 80
A Aflas	-30 ... 80
S Silikon	-30 ... 80

Overview Rated Quantities

Rated Quantity*		0,025	0,04	0,2	0,4	1	3	5
Geom. Tooth Volume cm^3		0,025	0,04	0,245	0,4	1,036	3,000	5,222
Resolution Imp/l		40000	25000	4082	2500	965	333	191,5
Max. Operating Pressure bar		400	400	400	400	400	315	315
Peak Pressure bar		480	480	480	480	480	350	350
Measurement Range** in l/min	Series 1	0,008...2	0,02...4	0,16...16	0,2...40	0,4...80	0,6...160	1...250
	Series 2	-	-	0,16...16	-	0,4...80	-	1...250
	Series 3	-	-	-	-	0,6...40	-	1,2...80
	Series 4	-	-	0,16...16	0,2...30	0,3...60	0,6...100	1...160
	Series 5	0,02...2	-	0,16...16	-	0,3...60	0,6...100	1...160
	Series 6	0,008...2	0,02...4	0,16...16	-	0,4...80	0,6...160	1...250
	Series 7	0,008...2	0,02...4	0,16...16	-	0,4...80	-	-
	Series 8	0,008...2	0,02...4	0,16...16	-	0,4...80	-	-
Sound Pressure Level dB(A)		< 60	< 60	< 60	< 70	< 70	< 70	< 72

** See model designation on device: VC...*
*** Restrictions of the measurement range are possible in the case of higher viscosities in the conveyance medium.*

The max. pressure loss in the gear type flow meter may not exceed **16 bar**.

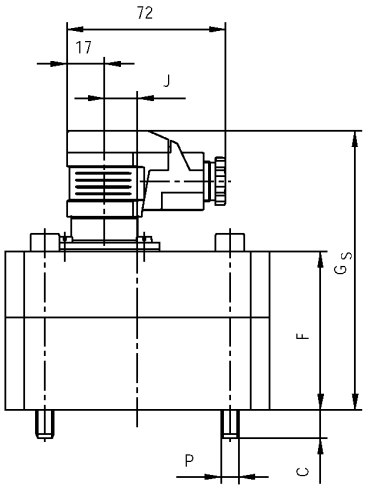
Overview of series and materials

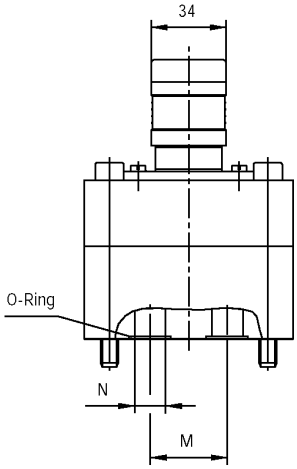
Series		1	2	3	4	5	6	7	8
Material	Housing Cover	EN-GJS-400–15 (GGG 40)				1.4404		EN-GJS-400-15	1.4404
	Measuring gears	1.7139 (Einsatzstahl)				1.4462		1.7139	1.4462
	Bearing	Roller Bearing Steel		Sn-Bronze	Hard Metal		Stainless Roller Bearing Steel	Roller Bearing Steel / Ceramic Balls	
Bearing Type		Roller Bearing		Plain Bearing			Roller Bearing		
Conveyance Medium Viscosity in mm²/s		1 ... 3000	5 ... 5000	200 ... 500000	50 ... 5000	50 ... 5000	1 ... 3000	1 ... 3000	1 ... 3000
Conveyance Medium Lubricity		well			badly		well	badly	
Permissible Foreign Particle Size in the Conveyance Medium in mm		20	30	50	30		20		

Measurements and Weights

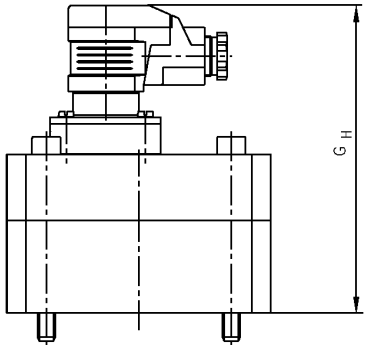
Series 1, 2, 3, 4, 7 – Connection type P

Nominal size	Available series	Weight kg	Tightening torque Nm	Dimensions in mm										
		m	M_A	A	C	D	F	G_S	G_H	J	K	L	M	N	P
VC 0.025	1	1.8	14	85	10	60	50	101	114	–	70	40	20	6.5	M 6
VC 0.04	1	2	14	85	9	60	56	107	120	–	70	40	20	6.5	M 6
VC 0.2	1, 2, 4, 7	2	14	85	13	60	57	108	121	–	70	40	20	9	M 6
VC 0.4	1, 4	3.7	35	100	17	90	63	114	127	–	80	38	34	16	M 8
VC 1	1, 2, 3, 4, 7	5.2	35	120	13	95	72	123	136	15.5	84	72	35	16	M 8
VC 3	1, 2, 4	9	120	170	18	120	89	140	153	46.5	46	95	50	25	M 12
VC 5	1, 2, 3, 4	13	120	170	22	120	105	156	169	46.5	46	95	50	25	M 12
VC 10	see data sheet VC 10														

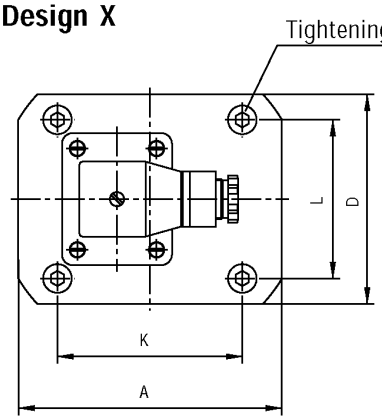


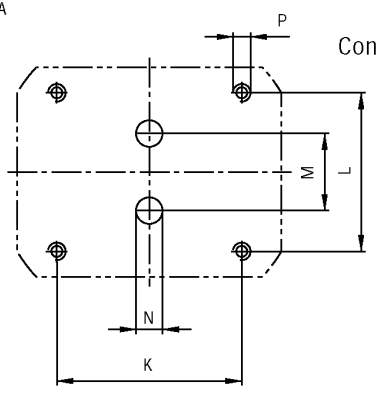


Design S = Standard and Design X



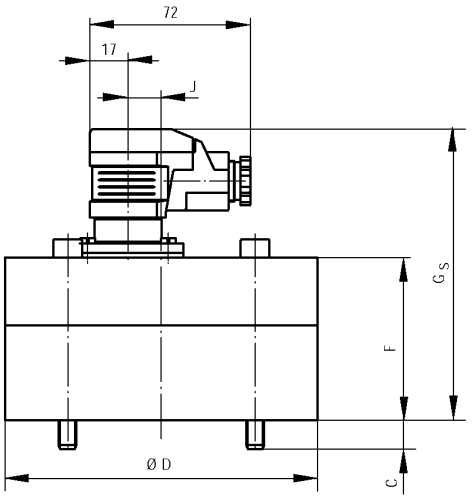
Design H = high temperature

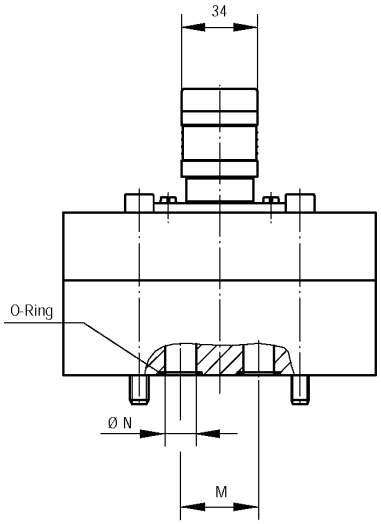




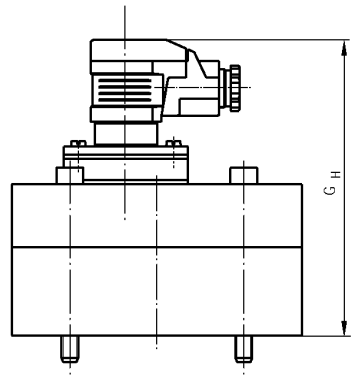
Product Lines 5, 6 und 8 – Connection Type P

Rated Quantity	Available Product Lines	Weight kg	Tightening Moment Nm	Material Mass										
		m	M_A	C	D	F	G_S	G_H	J	K	L	M	N	P
0,025	5, 6, 8	3	14	15	94	55	106	119	-	70	40	20	6,5	M6
0,04	6, 8	3,05	14	14	94	56	107	120	-	70	40	20	6,7	M6
0,2	5, 6, 8	3,1	14	13	94	57	108	121	-	70	40	20	9	M6
1	5, 6, 8	7	35	13	124	72	123	136	15,5	84	72	35	16	M8
3	5, 6	15,9	120	21	170	89	140	153	46,5	46	95	50	25	M12
5	5, 6	18,7	120	25	170	105	156	169	46,5	46	95	50	25	M12

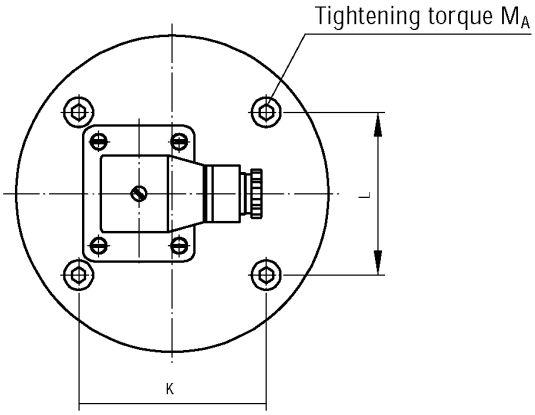


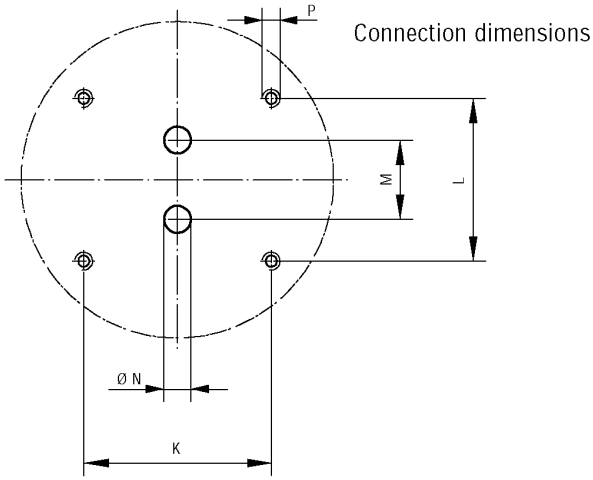


Design S and Design X



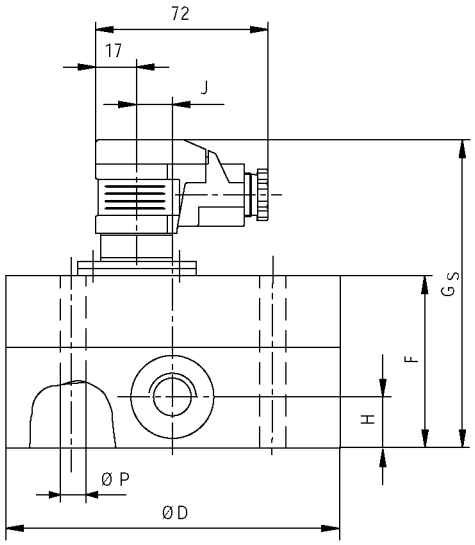
Design H

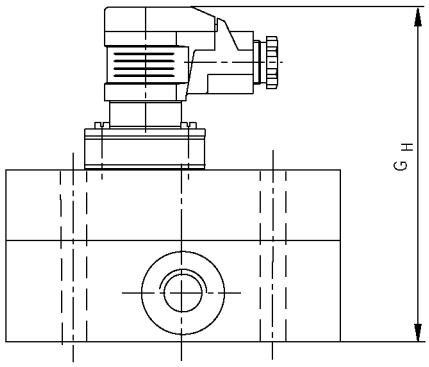




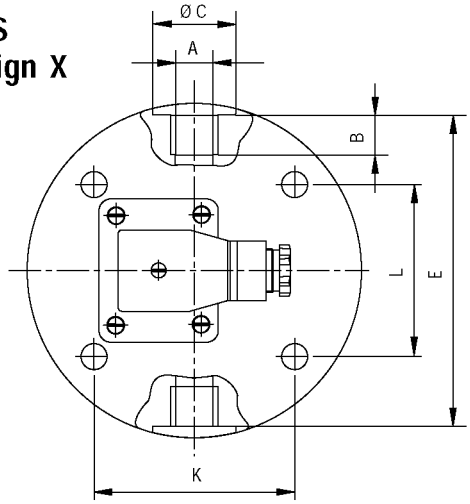
Product Lines 5, 6 und 8 – Connection Type R

Rated Quantity	Available Product Lines	Weight kg	Tightening Moment Nm												
		m	A	B	C	D	E	F	G_S	G_H	H	J	K	L	P
0,025	5, 6, 8	3	G ?	9	17	94	90	55	106	119	15	-	70	40	6,7
0,04	6, 8	3,05	G ¼	13	21	94	90	56	107	120	15	-	70	40	6,7
0,2	5, 6, 8	3,1	G ?	13	25	94	90	57	108	121	16	-	70	40	6,7
1	5, 6, 8	7	G ½	15	29	124	120	72	123	136	22	15,5	84	72	9
3	5, 6	15,9	G 1	19	42	170	162	89	140	153	30	46,5	46	50	13
5	5, 6	18,7	G 1	19	42	170	162	105	156	169	30	46,5	46	50	13





Design S and Design X



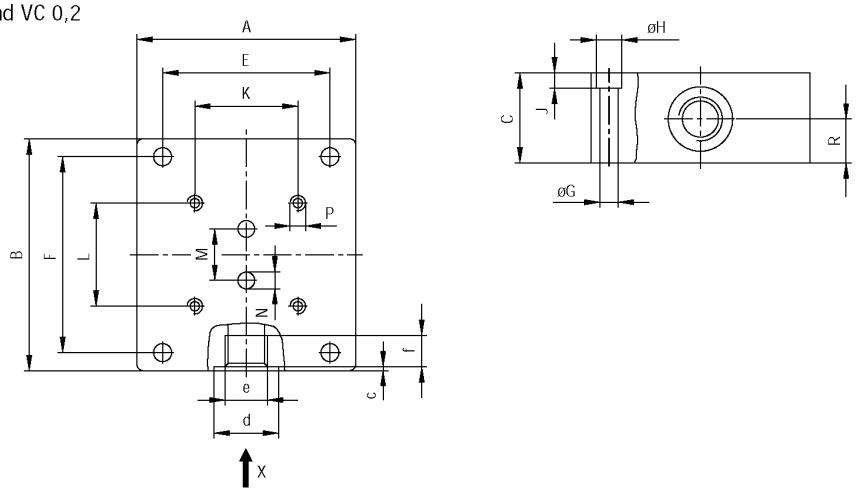
Design H

Connection Plates

with side threaded connection

Order designation	Weight kg	Dimensions in mm																	
	m	A	B	C	E	F	G	H	J	K	L	M	N	P	R	c	d	e	f
MVC 0,2 R 3 B 05*	1.8	85	90	35	65	76	7	11	7	70	40	20	6.5	M 6/14 t	17	0.7	25	G 3/8	13
MVC 0,2 R 3 C 05*	1.7	85	90	35	65	76	6.6	11	6.8	70	40	20	6.5	M 6/14 t	17.5	0.7	29	G 1/2	15
MVC 0,4 R 1 C 09	2.7	100	110	37	86	96	7	11	7	80	38	34	16	M 8/18 t	18.5	0.7	29	G 1/2	15
MVC 0,4 R 1 D 09	2.9	100	110	42	86	96	7	11	7	80	38	34	16	M 8/18 t	21	1	36	G 3/4	17
MVC 1 R 2 C 05	2.9	100	120	37	80	106	7	11	7	84	72	35	12	M 8/18 t	17.5	0.7	29	G 1/2	15
MVC 1 R 2 E 05	4.9	100	120	65	80	106	7	11	8	84	72	35	13	M 8/18 t	32.5	1	42	G1	19
MVC 5 R 2 E 05**	14	160	165	80	140	145	9	15	9	46	95	50	25	M12/24 t	28	1	42	G1	19
MVC 5 R 2 G 09**	17.8	170	165	100	140	145	9	15	9	46	95	50	25	M12/24 t	58	1	58	G1 1/2	23
MVC 10 R 2 G 05	28	200	215	100	176	191	11	18	11	64	125	70	38	M16/25 t	35	1	58	G1 1/2	23

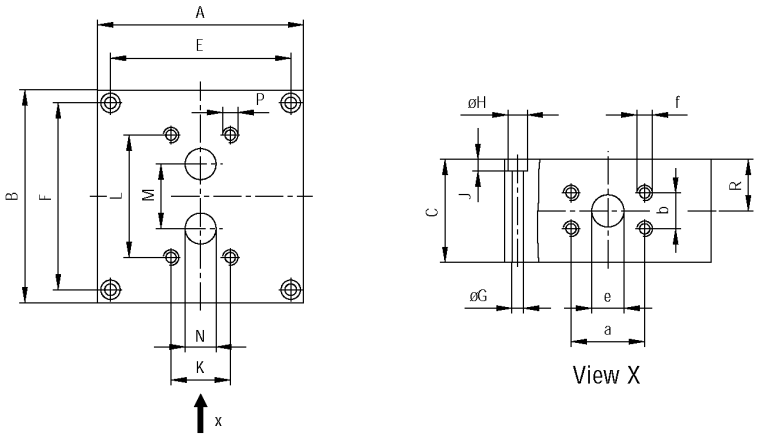
* fits for VC 0.025, VC 0.04 and VC 0,2
** fits forVC 3 and VC 5



with side SAE flange connection

Order designation	Weight kg	Dimensions in mm																	
	m	A	B	C	E	F	G	H	J	K	L	M	N	P	R	a	b	e	f
MVC 5 V 2 E 05**	14	160	165	80	140	145	9	15	9	46	95	50	25	M12/24 t	40	57.2	27.8	25	M12/24 t
MVC 10 V 2 G 05	29	200	215	100	176	191	11	18	11	64	125	70	38	M16/25 t	50	79.4	36.5	32	M16/25 t

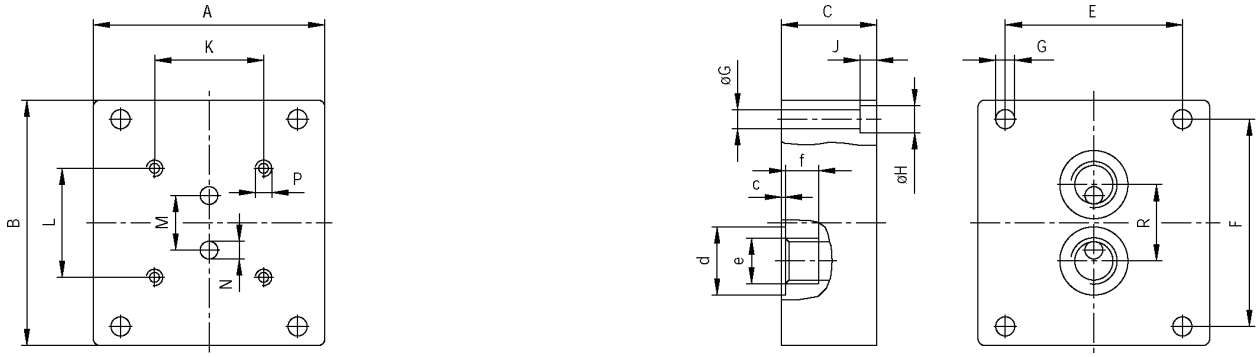
** fits for VC 3 and VC 5



with rear threaded connection

Order designation	Weight kg	Dimensions in mm																	
	m	A	B	C	E	F	G	H	J	K	L	M	N	P	R	c	d	e	f
MVC 0,2 R 3 B 04*	1.6	85	90	35	65	76	7	–	–	70	40	20	6.5	M 6/14t	28	0.7	25	G 3/8	12
MVC 0,4 R 1 C 08	2.5	100	110	37	86	96	7	11	7	80	38	34	16	M 8/18t	46	0.7	29	G 1/2	15
MVC 0,4 R 1 D 08	2.9	100	110	42	86	96	7	11	7	80	38	34	16	M 8/18t	52	1	36	G 3/4	17
MVC 1 R 2 C 04	2.7	100	120	37	80	106	7	–	–	84	72	35	12	M 8/18t	50	0.7	29	G 1/2	14
MVC 5 R 2 E 04**	9.6	160	165	55	140	145	9	15	9	46	95	50	25	M12/24t	55	1	42	G1	18
MVC 10 R 2 G 04	15	200	215	55	176	191	11	18	11	64	125	70	38	M16/25t	72	1	58	G1 1/2	22

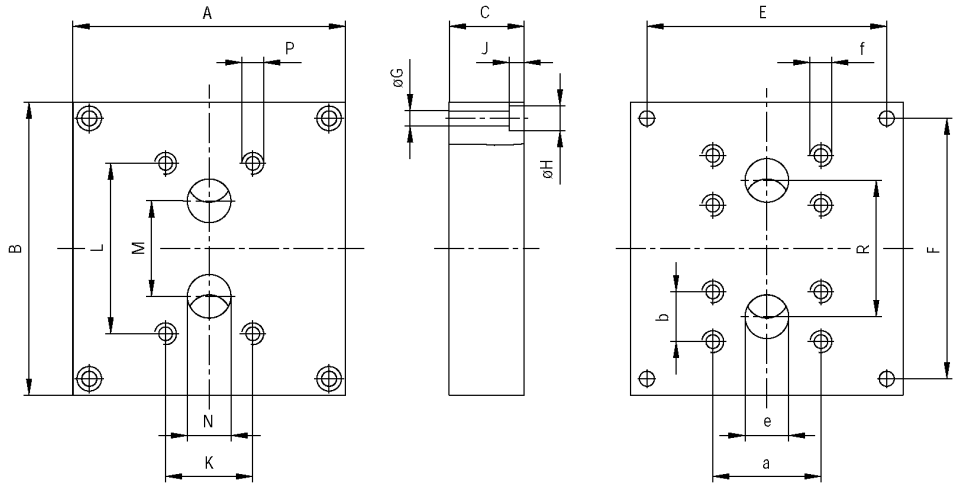
* fits for VC 0.025, VC 0.04 and VC 0.2 ** fits for VC 3 and VC 5



with rear SAE flange connection

Order designation	Weight kg	Dimensions in mm																	
	m	A	B	C	E	F	G	H	J	K	L	M	N	P	R	a	b	e	f
MVC 5 V 2 E 04**	9.5	160	165	55	140	145	9	15	9	46	95	50	25	M12/24t	80	57.2	27.8	25	M12/24t
MVC 10 V 2 G 04	16	200	215	55	176	191	11	18	11	64	125	70	38	M16/25t	100	79.4	36.5	32	M16/25t

** fits for VC 3 and VC 5



Paint

The gear type flow meters of series 1, 2, 3, 4 and 7 are finished with 2-component paint as standard (layer thickness 30...70 µm). This fulfils the requirements of DIN EN 13463-1 and is suitable for use in ignition protection group IIC. If the device is painted over again, characteristics may change and the ATEX approval may no longer apply.
The customer or plant operator is responsible for ensuring that any base coats or paint specified or applied by himself fulfils the requirements of DIN EN 13463-1 for use in the relevant ignition protection class group. There is no designation of the ignition protection group on the rating plate in these cases.

Protection against brush discharge and sliding brush discharge acc. DIN 13463-1:2001		
Ignition protection or appliance class	**Max. permissible thickness of coatings subject to electrical charge**	**Max. permissible breakdown voltage for layers**
IIA	2 mm	< 4 kV, if sliding brush discharge **cannot** be excluded
IIB	2 mm	
IIC	0,2 mm	
II 2D	no limitation with dusts with a minimum ignition energy > 3 mJ	

Installation and Removal of the Gear Type Flow Meter

Prior to delivery, the gear type flow meter was inspected in the factory and is functional immediately following installation and connection of the electrical conduits.
The space required for the installed device is specified in the chapter "Technical Data". The integrated measuring device should also be accessible for visual inspection without hazard at all times during operation.

It must be observed that the gear type flow meter is only held by the housing during assembly and transport and never by the attached plug!

All risks of explosion must be eliminated during and after all work on gear type flow meters.

Corrosion Protection

All gear type flow meters are inspected in the factory for their functionality with mineral hydraulic oil. Afterwards the connections are closed with a stopper so that the interior parts **are not** protected against corrosion for a longer period of time.

During transport and storage, the gear type flow meters may not be exposed to any weather influences and significant temperature fluctuations, and they must be stored in dry conditions.

Should the gear type flow meters be stored for a longer period of time, then they are to be treated in the interior and externally with a suitable corrosion protection oil. Furthermore, exposure of the gear type flow meters to moisture is to be prevented with an absorbent medium.

Appropriate corrosion-preventative measures are to be undertaken if high humidity or an aggressive atmosphere is anticipated during transport.

Preservatives used in preservation are to be examined for their compatibility with the materials and elastomers used in the gear type flow meter. Furthermore, compatibility with the conveyance medium must be guaranteed.

Mechanical Installation

According to the connection type, the device is connected to the system either through a connection plate or by means of pipe threading located within the housing.

Only connections and pipe conduits that are approved for the anticipated pressure area may be used. The regulations of the respective manufacturer must be observed!

During operation in accordance with the regulations there may be no mixture in the inside of the gear type flow meter which is capable of explosion, as there can be zone displacement. This must be ensured by the operator.

All conduits, connections and attached parts must be made of appropriate, low-spark materials and be permissible for the application. Aluminium or other light metals must not be used in equipment category I M2.

For machines of category 2G, 2D, 3G and 3D use of aluminium or other light metals is permitted. However, the proportion of magnesium may not amount to more than 5 % (mass proportion).

If there is danger of sparks from shock or impact, machines or components with outer parts of light metal have to be build in so as to be protected.

All suction lines and connections must be electrically conductive and must be included in the equipotential bonding system. This also applies to hoses.

The device must be installed so that it is not subjected to impermissible vibration.

It is not permitted to build in the machine above hot parts, as any leaking liquids may ignite.

During commissioning the device must be checked for leakage under operating conditions.

Plate Connection

- The conduit system must be adequately cleaned prior to assembly of the gear type flow meter.
- Fasten the connection plate to its foreseen position in the system.

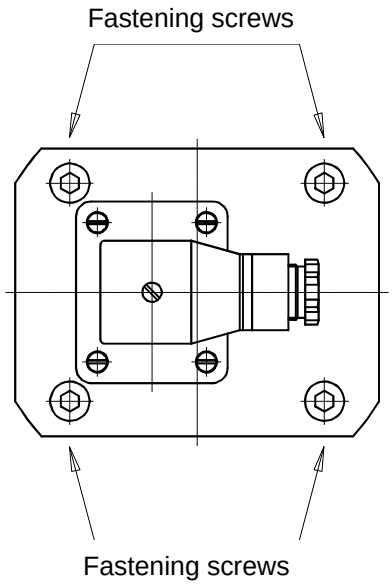
Correct fit of the seals must be observed! The connection surface must be free of soiling and paint residue, etc.!

- Set the housing onto the connection plate so that the bore holes are aligned with one another.
- Screw the housing to the connection plate.

Tighten the VC / connection plate fastening screws crosswise. Observe the specified tightening moments in the process!

For screwing torque, see "Dimensions and weights", table column "screwing torques" in Chapter "Technical Data".

- Inspect all connections of the system for impermeability following start-up.



Mounting onto Extraneous Connection Plates or Valve Blocks

The following values for flatness and surface roughness are to be complied with for the mounting surface.

Rated Quantity*	0,025 ... 1	3 ... 5
Flatness µm	0,01	0,02
Surface Roughness R_t µm	10	10

**See Model designation on device: VC...*

Mounting of the gear type flow meter must be conducted analogous to the above-described “Plate Connection".

Pipe Connection

- The conduit system must be adequately cleaned prior to assembly of the gear type flow meter.
- Connect the pipe conduits to the feed and exhaust of the measuring device. Observe the instructions of the respective manufacturer in this process.
- Pay attention in the installation that no sealing agent finds it way into the interior of the pipe conduit.

The gear type flow meter may not be deformed during assembly!

- Inspect all connections of the system for impermeability following start-up.

Elektrical Connection

See operating and maintenance instructions BVC0017 "Sensor KIS 2"

Removal of the Gear Type Flow Meter

It must be ensured that the conduits have been de-pressurized and the electrical connection is free of voltage. The device and the conduits can still be filled with the conveyance medium or a cleaning agent. All regulations regarding handling of the medium last conveyed must be observed without exception! Sufficiently large collection containers must be provided. If necessary, sufficient ventilation of the workplace must be provided.

- Loosen the fastening screw on the plug.
- Pull the plug out of the housing.
- *Plate Connection:*Remove the screws fastening the gear type flow meter to the plate.
- *Pipe Connection:*Disengage the pipe conduit connections from the housing, and if necessary dismantle the housing from the holder.

In the event of hardening mediums, clean the gear type flow meter as quickly as possible with a suitable cleaning agent!

Operation

The gear type flow meter may only be used within the specified limiting values (for values, see chapter “Technical Data”).

It must be assured that the medium to be measured does not corrode the materials of the gear type flow meter (see “Overview Product Lines and Materials”).

The medium may not contain any abrasive particles. If in doubt, consult the manufacturer.

The gear type flow meter is intended for operation with fluids. Presence of this fluid is vital for lubrication, cooling, extinguishing or prevention of explosions. The equipment must not run dry.

Prior to delivery, the gear type flow meter was inspected in the factory It can be set into operation as soon as the mechanical and electrical connections have been made. During operation, both LED displays illuminate in the Switch Amplifier as long as a continuous fluid current flows through the meter. Measures to be taken in the event of disruption can be read in the chapter, “Recognizing and Eliminating Disruptions”. In the event of an unplanned breakdown of the counter signal, the system must be shut down immediately.

Permissible Limiting Values for Operation

The flow resistance of Δp may not exceed 16 bar, since this leads to mechanical damages.

The limiting values specified in Technical Data for the environmental conditions must be complied with.

Maintenance

gear type flow meters are fundamentally maintenance-free. If however fluids are conveyed that can lead to deposits in the measuring device, then cleaning of the device can be required. Otherwise, the device can be cleaned within the framework of normal system cleaning. An indication of wear can be a change in the measurement precision. The customer is recommended to inspect this on a regular basis.

In the event of hardening mediums, clean the gear type flow meter as quickly as possible with a suitable cleaning agent.

Check the fastening screws regularly for a firm fit and retighten them if necessary (observe the screw tightening moment, see chapter, “Installing and Removing the gear type flow meter”).

The connecting leads must be depressurized for all work on the device and before it is removed.

Dust deposits on the gear type flow meter which are greater than > 5 mm must be avoided at all costs. Regular cleaning is therefore absolutely necessary. The cleaning interval depends on local conditions and must therefore be laid down by the customer or the operator.

The static seals at the joints of the gear type flow meter have to be checked for leakage at the beginning of the shift. If leaks are seen, the equipment must be decommissioned immediately.

A weekly check must be made to ensure the device is correctly earthed.

At the start of the shift the gear type flow meter and sensor including connector

and cable must be checked for damage. if damage is discovered, the equipment must be returned to the manufacturer for repair.

Premature wear of the gear type flow meter can only be recognised if the measuring accuracy changes. Regular checking of the measuring accuracy is therefore recommended. The inspection interval is dependent on the conditions of use and must be laid down by the plant operator.

Cleaning

Devices from Product Lines 1, 2, 6, 7 and 8: Never open these devices yourself, since they can only be reassembled in working order by a specialist.

Devices from Product Lines 3, 4 and 5: With appropriate care, these can be opened and cleaned.

It must be ensured that the conduits have been depressurized and the electrical connection is free of voltage. The device and the conduits can still be filled with the conveyance medium or a cleaning agent. All regulations regarding handling of the medium last conveyed must be observed without exception! Sufficiently large collection containers must be provided. If necessary, sufficient ventilation of the workplace must be provided.

- Remove the gear type flow meter (see chapter, “Installation and Removal of the Gear Type Flow Meter”).
- Empty the measuring device.
- Loosen the fastening screws holding together the two halves of the housingdie.
  The hexagonal Allen screws (4 or 8) are accessible from the underside of the housing.

No screwdrivers or similar tools may be used for prying in the mould seams of the upper part of the gear type flow meter.
The gearwheels may not be removed from the housing with pliers.

- Clean with interior of the housing, the gearwheels and the bearings with a suitable cleaning agent.

In the event of mechanical damages in the interior to the housing or the gearwheels, then the entire device must be sent to the manufacturer for repair.

- Insert both gearwheels with bearings into the lower part of the housing.
- Insert the O-ring into the housing groove.
- Position the upper part of the housing onto its lower part (use alignment pins).
- Firmly tighten all screws crosswise that hold the housing together with the specified tightening moment (see below).

All parts must be free of dirt for assembly. It must be assured that no foreign particles remain in the interior of the gear type flow meter from assembly.

Housing Connection Tightening Moments, Series 3, 4 and 5

Rated Quantity*	0,025	0,04	0,2	0,4	1	3	5
Tightening Moment Nm	40	40	40	65	65	145	145

**See model designation on device: VC...*

- Reassemble the housing into the system as described in the chapter, “Installation and Removal of the gear type flow meter.

Repairs

A repair comprises:

- Error diagnostics, i.e. isolation of the error. Determining and localising the cause of the error.
- Elimination of damages, i.e. replacement or repair of defective components and elimination of the primary cause.

Error diagnostics

Lack of adequate sealing is a frequent source of failure. If this occurs at the pipeline connections, it may be eliminated by simply tightening the screwed fittings.
In case of a lack sealing on the gear type flow meter, the respective seals must be replaced (see spare lists).

Elimination of damages

The elimination of the damage takes place on site, predominantly through exchange of the defective component/s. Their repair is generally done by the manufacturer.

Repairs are only to be done by trained specialist personnel. Only original replacement parts may be used.

Given the appropriate know-how and adequate equipment, the repair may also be done by the end user or the initial equipper. Assistance on this is available in form of spare lists and repair instructions.

Return

The device must be appropriately packed in the event of repair or inspection at the manufacturer factory. Furthermore, a safety specification sheet on the medium used must accompany the device. In the case of recognized mineral oils, at lest the precise type designation is required.
The device must be rinsed out in the event of hardening or adhesive mediums.

Disposal

The packaging and the used parts have to be dísposed of in accordance with the regulations of the country where the equipment is installed.

Recognizing and Eliminating Disruptions

In the event that the gear type flow meter does not work properly, then the electrical components should be examined first. The measuring device must remain in operation for this.

This work may only be conducted by qualified electricians.

If there is no analytical evaluation software, then defect analysis should proceed according to the following Defect Search Chart.

Defect	Possible Cause	Elimination
Both LED displays on the disconnection switch amplifier are lighting, but displaying incorrect values.	The connection between the gear type flow meter and the evaluation device is disrupted.	Inspect the connection and replace the cable or plug is necessary.
One LED display is not lighting during operation.	The wiring between the sensor and circuit board or between individual soldering joints and the circuit board are damaged.	Send the measuring device to the manufacturer for repair.
	The affiliated sensor is defective.	
Both LED displays are not lighting during operation.	Electricity supply breakdown	Examine the mains cable and fuses.
	Since it is improbable that both sensors break down, it is to be assumed that the meter is stuck.	**Shut down operation of the gear type flow meter immediately!** Send devices from the Product Lines 1, 2, 6, 7 and 8 to the manufacturer for repair. Devices from Product Lines 3, 4 and 5 can be dismantled and cleaned (see chapter, "Maintenance").
Leakage, medium leaks	Leaky o-ring in the housing.	Send devices from the Product Lines 1, 2, 6, 7 and 8 to the manufacturer for repair and consult with the manufacturer. Inspect devices from Product Lines 3, 4 and 5 for seal compatibility, consult the manufacturer if necessary and install a new set of seals (purchase from manufacturer).
	The O-ring between the gear type flow meter and the connection plate is leaky.	Inspect for seal compatibility, install new O-rings.
Reduction in measuring accuracy	Wear	Check measuring device or return to manufacturer for repair.

KRACHT

Declaration of Conformity

EC Declaration of Conformity in accordance with Directive 94/9/EC

Herewith, Kracht GmbH
Gewerbestr. 20
D-58791 Werdohl

as the manufacturer, declares that the following device fulfils the requirements laid down in Annex II of Directive 94/9/EC for conception and construction of devices for use in accordance with the specification and regulations in areas at risk from explosion:

Gear Type Flow Meter VC

This only applies when the particular conditions in operating and maintenance manual "BVC0021" are observed.

The basic safety and health requirements are fulfilled through agreement with EN 1127-1:1997, EN 1127-2:2002, EN 13463-1:2001, EN 13463-5:2003, prEN 1710:2003 and BGR132:2003.

The machines bear the following identification marking:

Ⓔx II 2GD c IIC T4 IP65 T125°C

and/or Ⓔx I M2 EEx c I

The technical documents in accordance with Directive 94/9/EC Annex VIII are filed with the Tech. File. Ref. 04.03X at the notified body BVS (EXAM BBG, Bochum).

Werdohl, 26 August 2004

Heiko Zahn
Chief Executive