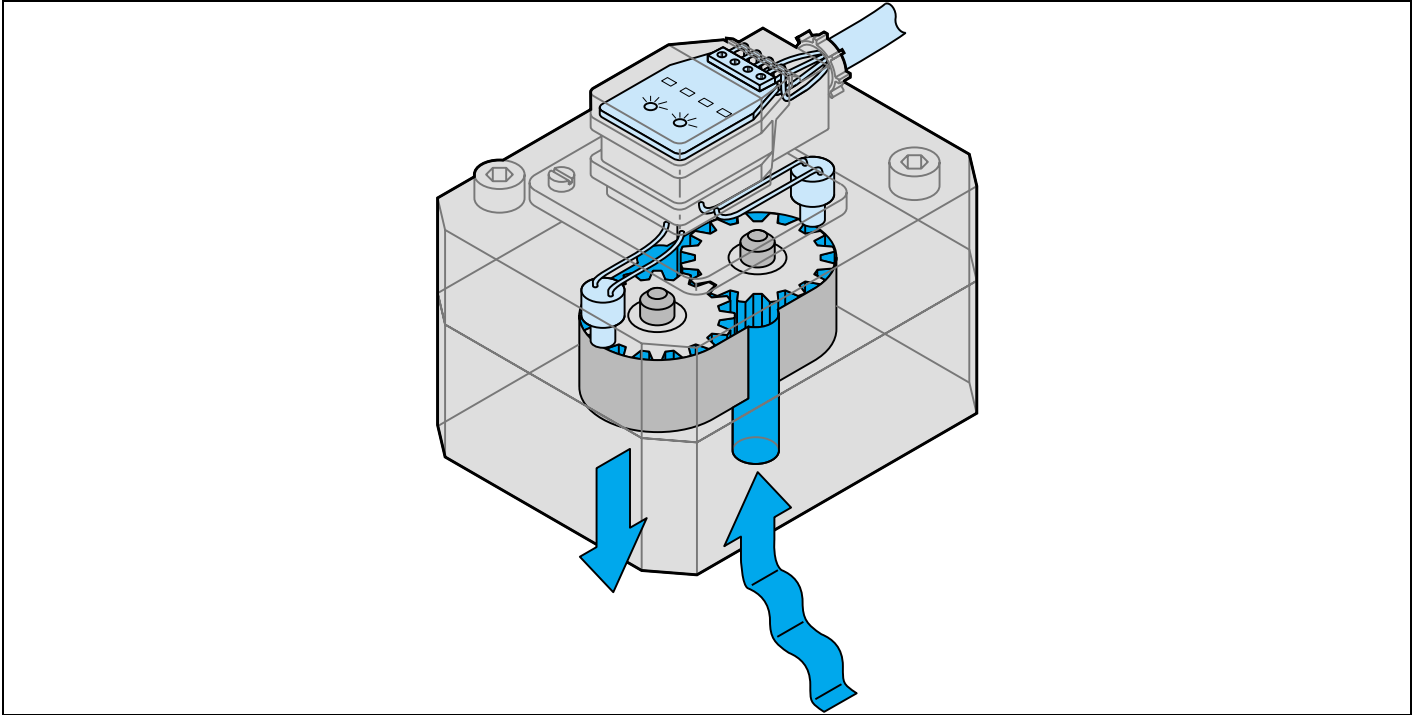


# Volume counter

## Operation and Maintenance Manual





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## Safety

### Identification of safety instructions

The safety instructions given in this operating manual are identified 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 indicated by a hand.



### General safety instructions



**The safety in operation of the equipment supplied is only guaranteed if it is operated properly (see chapter entitled "Description of the equipment"). The limits given (see also chapter entitled "Technical specifications") must not be exceeded under any circumstances.**

**The personnel entrusted with the fitting, operation and maintenance of the volume counter must be suitably qualified; this can be through training or by appropriate instruction. The instructions given in this manual must be made known to these persons.**

**All work done must conform to the existing national regulations on accident prevention and health and safety at work, and to any internal regulations of the operator, even if they are not set out 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 these cases.**

**The connecting leads must be unpressurised for all work on the volume counter and before it is dismantled.**

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

### Manufacturer's address

KRACHT GmbH  
Gewerbestr. 20  
58791 Werdohl

Tel. 02392 / 935-0  
Fax 02392 / 935209

## The documentation

This manual describes the construction, operation and maintenance of the VC volume counters manufactured by KRACHT GmbH.

Different models are available. The model is shown on the rating 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".

## Description of the equipment

### Proper use

The volume counter is a measuring device for the continuous measurement of the flow of a fluid. The various series enable it to be used for media of differing viscosities and lubricities.

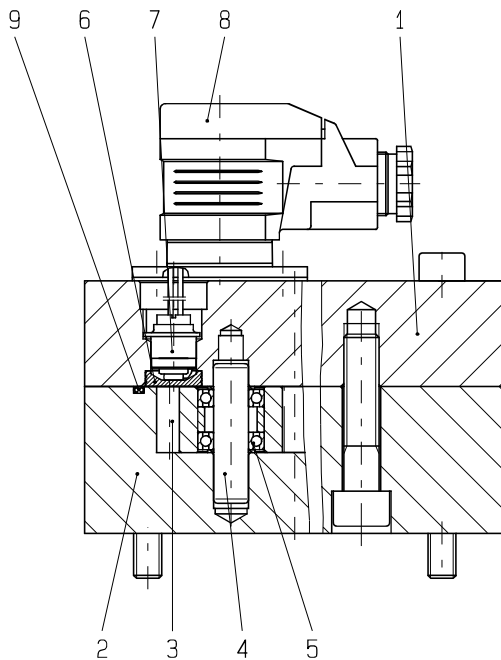
The user must ensure that the medium to be metered is compatible with the materials used in the VC (see under "Technical specifications").

The maximum permissible operating conditions given under "Technical specifications" must on no account be exceeded.

### Construction and function

The figure below is an example of types 1 and 2 and shows the basic construction of the individual VC series

Inside the housing are two gear wheels and their low-friction bearings. During operation these are driven by the moving fluid. The movement of the gear wheels is sampled by two contactless sensors and converted into electrical signals. Between the sensor cavity and the measuring chamber there is a pressure-resistant non-magnetic insulation plate. The signals are conveyed via a preamplifier to the display unit that is connected to the meter.



- 1 Cover
- 2 Housing
- 3 Gear
- 4 Journal
- 5 Bearing  
Series 1 and 2: ball bearing  
Series 3 and 4: plain bearing (not shown)
- 6 Non-magnetic insulation plate
- 7 Sensor
- 8 Connector socket with preamplifier and LED display
- 9 O-Ring

## Technical specifications

### The type code explained

<b>Example:</b>	<b>VC 0,2 F 1 P S /...</b>	
Product name	VC	VC volume counter
Nominal capacity	0,2	Nominal capacity may be 0,2 / 1 / 3 / 5
Seals	F	F = FPM, E = EPDM, P = PTFE/FEP
Series	1	May be series 1, 2, 3, 4
Connection type	P	P = plate connection, R = pipe connection
Electronics	S	S = standard (-30 bis +120 °C) H = high temperature (-30 bis +150 °C)
Special identifier	...	Identifier for special versions

### General specifications

Type	Geared motor
Materials	See "survey of series"
Connection of leads	Plate construction or pipe thread
Installed position/direction of flow	any
Permissible ambient temperature	0 to +80 °C

### Permitted temperature of operating medium

Type of seal	Model	S standard °C	H high temperature °C
F		-15 ... 120	-15 ... 150
E		-30 ... 120	-30 ... 130
P		-30 ... 120	-30 ... 150

## Series

Series	1	2	3	4
Housing / cover material	GGG 40			
Measuring unit material	Case hardened steel (1.7139)			
Bearing	Rolling bearing	Rolling bearing	Plain bearing	Plain bearing
Material	Bearing steel	Bearing steel	Sn-bronze	Hard metal
Measuring accuracy from viscosity mm <sup>2</sup> /s	± 0,3 % 20	± 0,5 % 50	± 1 % 100	± 0,5 % 100
Viscosity of the medium conveyed mm <sup>2</sup> /s	1...3000	50...5000	200...50000	50 ... 5000
Lubrication characteristic of the medium conveyed	good			poor
Max. size of foreign matter in medium conveyed μm	20	30	50	30

## Nominal capacities

Nominal capacities *		0,2	1	3	5
Geometric tooth volume	cm <sup>3</sup>	0,245	1,036	3,000	5,222
Resolution	Imp/l	4082	965	333	191
Max. operating pressure	bar	400	400	315	315
Peak pressure	bar	480	480	350	350
Measuring range**	Series 1+2 l/min	0,16...16	0,4...80	–	1...250
	Series 3 l/min	–	0,6...40	–	1,2...80
	Series 4 l/min	0,16...16	0,3...60	0,6...100	1...160
Sound pressure level	dB(A)	< 60	< 70	< 70	< 72

\* see rating plate: VC ..

\*\* With high-viscosity media the measuring range may be restricted

The max. pressure loss in the volume counter must not exceed 16 bar.



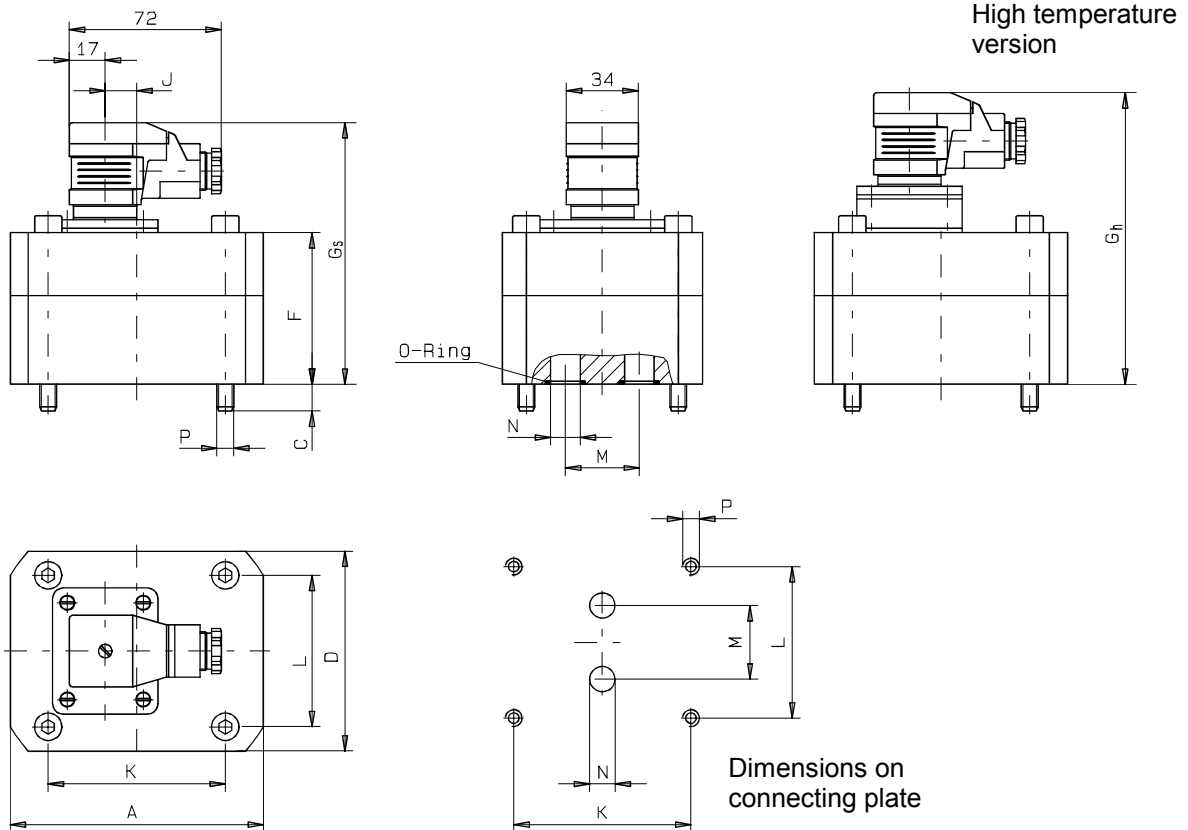
The electrical specifications are given in the section entitled "Electrical connection".

## Weights and dimensions

Nominal capacity*	Weight kg	Dimensions mm											
		A	C	D	F	G <sub>s</sub>	G <sub>h</sub>	J	K**	L**	M**	N**	P**
0,2	2	85	13	60	57	108	121	–	70	40	20	9	M6
1	5,2	120	13	95	72	123	136	15,5	84	72	35	16	M8
3	9	170	18	120	89	140	153	46,5	46	95	50	25	M12
5	13	170	22	120	105	156	169	46,5	46	95	50	25	M12

\* see rating plate: VC..

\*\* connecting dimensions





## Fitting and removing the volume counter

Before delivery the volume counter was tested in the factory and is ready to use as soon as it has been fitted and the electrical leads connected. The space required for the fitted unit is given in the section entitled "Description of the unit/Dimensions". Safe access to the integral measuring unit for visual inspection should be provided at all times, including while the unit is in operation.



**When fitting and transporting the volume counter, make sure that it is secured by the housing only and not by the plug-in unit above it.**

### Mechanical construction

Depending on the type of connection, the unit is connected to the plant via a connection plate or via pipe connectors located in the centre of the housing.



**Only piping and connectors that are permitted for the anticipated pressure range may be used.**

**The specifications of the manufacturer concerned must be complied with.**

### Plate connection

- Before mounting the volume counter, thoroughly clean the pipes.
- Secure the connecting plate to its intended position on the plant.



**Make sure that the seals are properly seated. The connecting surface must be free of contamination, residues of colour etc.**

- Place the housing on the connection plate, aligning the fastening holes.
- Screw the housing firmly to the connecting plate.



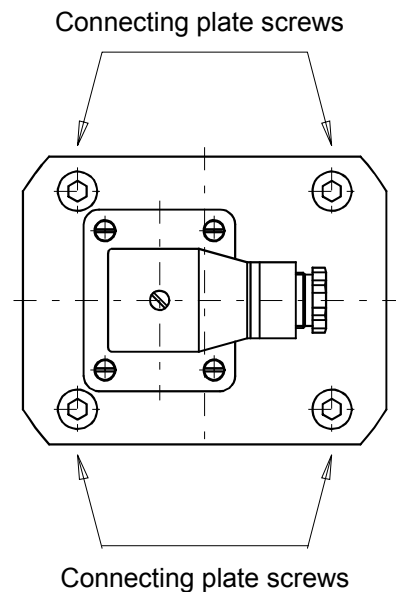
**Tighten the VC / connecting plate screws crosswise. Keep to the correct tightening torque.**

### Tightening torque for connecting plates

Nominal capacity*	0,2	1	3	5
Tightening torque	14	35	120	120

\*see rating plate: VC..

- After starting the plant up, check all connestions for leaks



### Mounting onto other connecting plates or valve blocks

The required flatness and roughness values for the mounting surface are given below.

Nominal capacity*	0,2	1	3	5
Flatness $\mu\text{m}$	0,01	0,01	0,02	0,02
Depth of roughness $R_t$ $\mu\text{m}$	10	10	10	10

\*see rating plate: VC ..

The volume counter must be mounted as described above under "Plate connection".

### Pipe connection

- Before mounting the volume counter, thoroughly clean the piping system.
- Connect the pipes to the inlet and outlet of the meter unit, observing the manufacturer's instructions.
- When installing, ensure that no sealant enters the pipes.



**The volume counter must not be distorted during installation.**

- After starting the plant up, check all connections for leaks.

### Electrical connection



**This work may only be done by a qualified electrician.**

### Electrical specifications

Number of measuring channels	2
Operating voltage	$U_B = 24 \text{ V DC} \pm 20\%$ , polarised
Pulse amplitude	$U_A \geq 0,8 U_B$
Pulse shape for symmetrical output signals	Square wave, sampling ratio/channel $1:1 \pm 15\%$
Pulse displacement between the two channels	$90^\circ \pm 30^\circ$
Power requirement	$P_{b \text{ max}} = 0,9 \text{ W}$
Output per channel	$P_{a \text{ max}} = 0,3 \text{ W}$ , short-circuit proof
Normal protection type	IP 65 (DIN 40500)

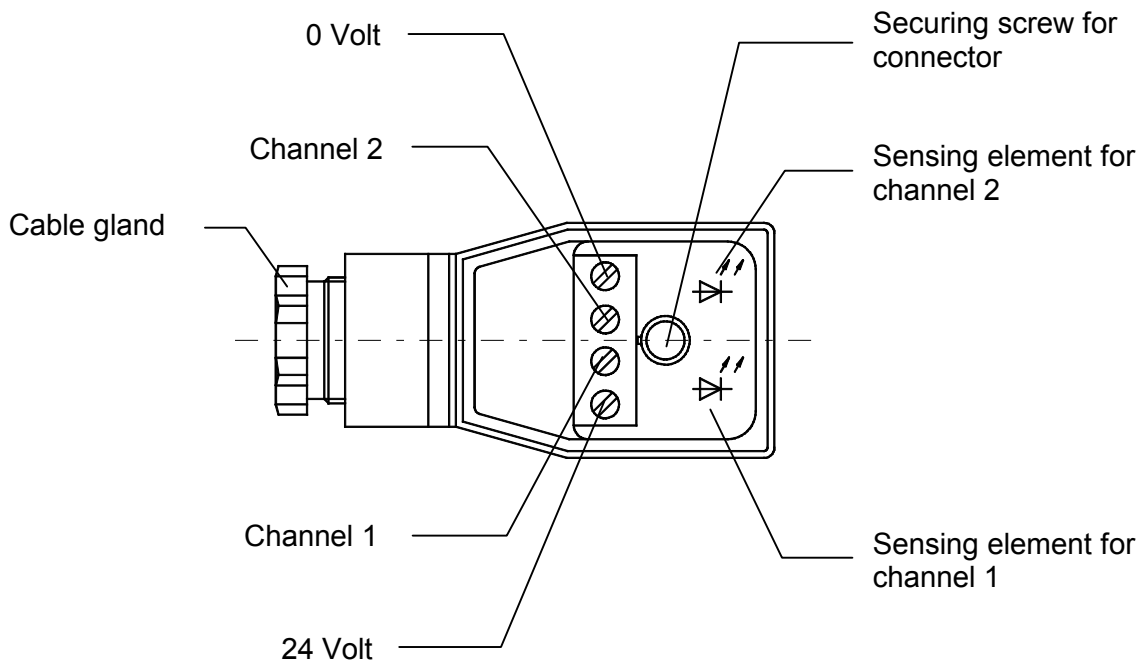
Requirements: A 24V (DC) supply lead must be provided for the preamplifier.

- The electrical connections must conform to the terminal connection diagram below.



The connector may be removed from the housing cover to facilitate the job of connecting the cable. Remember to replace it afterwards.

The allocation of the terminals for channels 1 and 2 has an effect on the direction of rotation shown for the gear wheels and therefore on the sign (+ or -) of the measured volume flow display on the analysing unit.



**Once mounting is completed the securing screw and the cable gland must be tightened. Only tighten the securing screw lightly.**

### Removing the volume counter



**Ensure that the conduits are unpressurised and the electrical connection is off-circuit.**

**The equipment and conduits can still contain the conveyed medium or a cleaning agent. All regulations concerning this medium must be complied with. Sufficiently large collecting containers should be placed in readiness.**

- Release the securing screw on the connector.
- Remove the connector from the housing.
- *Plate connection* : Remove the screws fastening the meter to the plate.
- *Pipe connection* : Release the cable glands from the housing and if necessary remove the housing from the holding device.



**When using media that harden, clean the volume counter with a suitable cleansing agent as promptly as possible.**

## Operating



**The volume counter must only be operated within the permitted limits, which are given under "Technical specifications".**

**Ensure that the medium to be measured does not attack the materials of the volume counter (see "Technical specifications"). The medium must not contain any abrasive particles. In case of doubt, consult the manufacturer.**

The volume counter has been factory-tested before delivery. It is ready to use as soon as it has been mounted and the electrical leads connected. When it is in use the two LEDs in the connector light up to indicate a continuous flow of fluid through the measuring unit. Faults are shown on the analysing unit that is connected to it. The section entitled "Recognising and dealing with faults" outlines the action to be taken should a fault occur.

### Permitted operating limits



**The flow resistance  $\Delta p$  must not exceed 16 bar, otherwise the mechanism could be damaged.**

The ambient conditions must comply with the limits given in the technical specifications.

## Maintenance

Volume counters are basically maintenance-free. However, if the fluids conveyed could leave deposits in the measuring unit, it may become necessary to clean it (see below). Otherwise the unit can be cleaned with the rest of the plant at the usual times.



**When using media that harden, clean the volume counter with a suitable cleansing agent as promptly as possible.**

Check that the securing screws are firmly seated at regular intervals and tighten them if necessary. (Observe the correct tightening torque, which is given in the section on mounting and removing the volume counter.)



**Whenever work is done on the volume counter and before removing it, ensure that the conduits are unpressurised.**

## Cleaning

**Series 1 and 2 units:** Never open these units yourself, as they can only be re-assembled in working order by a specialist.



**Ensure that the conduits are unpressurised and the electrical connection is off-circuit.**

**The equipment and conduits may still contain the conveyed medium or a cleaning agent. All regulations concerning this medium must be complied with. Sufficiently large collecting containers should be placed in readiness.**

- Remove the volume counter (see section on mounting and removing the unit).
- Drain the measuring unit.

- Loosen the securing screws that hold the two halves of the housing together. The (4 or 8) hexagon socket screws are accessible from below the housing.



**When removing the upper section of the volume counter, do not use screwdrivers or similar tools as levers.**

**Pliers must not be used to remove the gear wheels from the housing.**

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



**If mechanical damage is found in the interior of the housing or on the gear wheels the complete unit must be returned to the manufacturer for repair.**

- Insert both gear wheels and their bearings in the lower section of the housing.
- Lay the O ring in the groove of the housing.
- Place the upper section of the housing over the lower section (use locating pins).
- Tighten all the screws that hold the housing together, going across from one to the next, using the correct torque (see below).



**All parts must be free of contamination. Ensure that no foreign matter remains inside the volume counter on mounting.**

#### **Tightening torques for securing the housing, series 3 and 4**

Nominal capacity*		0,2	1	3	5
<b>Tightening torque</b>	<b>Nm</b>	40	65	145	145

\*see rating plate: VC...

- Remount the housing in the plant as described above under "Fitting and removing the volume counter".

## Recognising and dealing with faults

If the volume counter is not operating perfectly, first check the electrical components while the unit is operating.



**This work may only be done by a qualified electrician.**

If troubleshooting software is not available, use the following diagnostic table.

Fault	Possible cause	Remedy
Both LEDs on the volume counter are lit but the values displayed are wrong	Faulty connection between the volume counter and the analysing unit	Check the connection and replace the cable or connector if necessary
One LED is dark during operation.	Damaged wiring between sensor and circuit board, or individual soldered points on the board	Renew the defective cable or soldering
	The corresponding sensor is defective	Send the meter to the manufacturer for repair
Both LEDs are dark during operation	Faulty preamplifier	Check preamplifier and replace if necessary
	Power supply failure	Check supply cable and fuses
	Since both sensors are unlikely to fail at once, it can be assumed that the measuring unit has stopped	Switch the volume counter off immediately! Send series 1 and 2 units to the manufacturer for repair. Series 3 and 4 units can be dismantled and cleaned (see under "Maintenance")
Leakage, escaping medium	Faulty O ring in housing.	Send series 1 and 2 units to the manufacturer for repair and consultation. Check the compatibility of the seal on series 3 and 4 units, consult the manufacturer if necessary and fit a new set of seals (obtainable from the manufacturer)
	Faulty O ring between volume counter and connecting plate	Check seal for compatibility, fit new O rings.