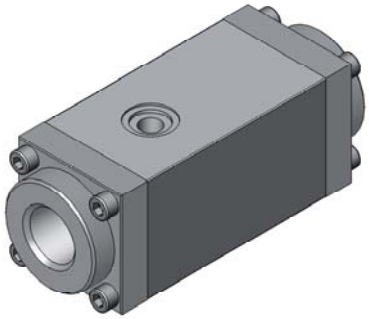
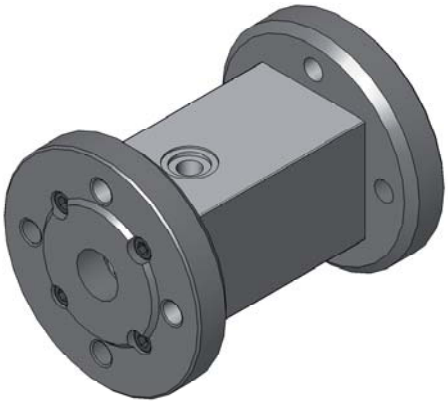
KRAL Volumeter® – OME Series.

Operating Instructions





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Target groups

The operating instructions form part of the volumeter. The operating instructions must be kept for future reference.
Furthermore please observe the operating instructions for the sensors and the evaluation electronics.
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Target groups

Target group	Tasks
Operator-owner	☐ Keep these instructions available at the installation site for future reference. ☐ Ensure that employees read and observe these instructions and the associated documents, in particular the safety instructions and warnings. ☐ Observe additional plant-specific directives and regulations.
Specialist personnel, fitters	☐ Read, observe and follow these instructions and the associated documents, in particular the safety instructions and warnings.

Symbols used

Symbol	Meaning
	Warning
	Mechanical installation procedures
	Electrical installation procedures
	Check or fault table

Danger levels

Warning	Danger level	Consequences of non-observances
Caution	Potentially dangerous situation	Material damage, slight personal injury
Warning	Possible threat of danger	Invalidity, serious personal injury
Danger	Immediate threat of danger	Death, serious personal injury

Further applicable documents

Calibration report
Manufacturer's declaration to EU Directive 98/37/EC and 97/23/EC
Corresponding operating instructions for sensor
Corresponding operating instructions for electronic equipment

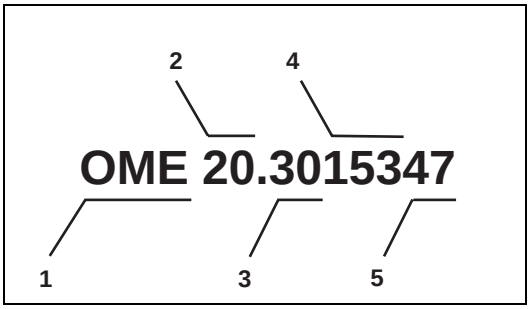
General safety instructions

The following general safety instructions must be observed:

- ☐ No liability is accepted for damage arising through non-observance of the operating instructions.
  - Read the operating instructions carefully and observe them.
  - The operator-owner is responsible for the observance of the operating instructions.
  - Installation, removal and installation work may only be carried out by specialist personnel.
- ☐ Do not use KRAL volumeters outside the performance limitations specified on the rating plate, on the calibration report and in the "Technical data" chapter. In the case of operating data that does not agree with the specifications on the rating plate, contact the manufacturer.
- ☐ Strong changes to the flow rate (e.g. rapid shutdown, pulsations, ...) cause marked pressure differences on the volumeter and can damage the measuring unit.
  - The pressure loss of the volumeter must not exceed the values given in the chapter "Technical data", see "Load-bearing capacity", page 9.
- ☐ Volumeters wear to different degrees depending on the respective operating conditions (pulsations, temperature, etc.).
  - Do not continue to use volumeters that are operated contrary to specifications or after damage.
  - Check the volumeters regularly.
  - Shut down damaged volumeters and replace worn volumeters immediately.
- ☐ In order for the warranty to remain valid, corrective maintenance carried out during the warranty period requires the express permission of the manufacturer.
- ☐ Observe the general regulations for the prevention of accidents as well as the local safety and operating instructions.
- ☐ Observe the valid national and international standards and specifications of the installation location.
- ☐ In case of systems with an increased potential of danger to humans and/or machines the failure of a volumeter may not lead to injuries or damage to property.
  - Always equip systems with an increased potential of danger with alarm equipment and/or bypass.
  - Maintain and check the protective/alarm equipment regularly.
- ☐ The pumped liquid can be dangerous (for example hot, dangerous to health, poisonous, combustible). Observe the safety conditions for handling dangerous materials.
- ☐ Pumped liquid can be subject to pressure and can cause damage and/or personal injury should leaks occur.

Type code

KRAL volumeters are supplied in various types. The type code provides information about the volumeter type.



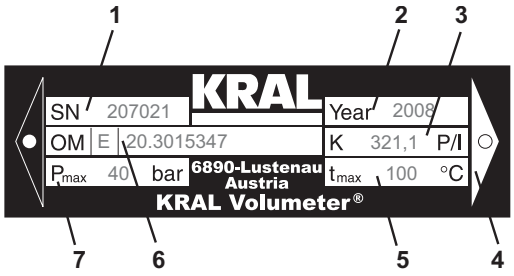
1 Series
2 Size
3 Version index
4 Connection
5 Sensor

Fig. 1 Type code

Item	Designation	Description
1	Series	OME: Economy
2	Size	OME 13: Rated flow 10 l/min
		OME 20: Rated flow 30 l/min
		OME 32: Rated flow 100 l/min
3	Version index	For internal administration
4	Connection	Manufacturer-specific indexing
5	Sensor	56: BEG 56
		47: BEG 47C

Tab. 1 Type code

Rating plate



1 Serial number
2 Construction year
3 K-Factor
4 Flow direction
5 Maximum temperature
6 Type
7 Maximum pressure

Fig. 2 Rating plate

Proper use

KRAL volumeters of the OME series are designed solely for flow measurement of lubricating fluids that are chemically neutral and do not contain any gas or solid contents. The volumeters may only be used within the operational limits described within this chapter.

Improper use

The volumeter is not suitable for measuring the flow of gases or media containing solids. Operating data that deviate from the values on the rating plate and the operational limits specified here can cause damage to the volumeter. If there is any doubt whether deviating operating data can cause damage, please consult the manufacturer.

Operational limits

The values specified on the rating plate and the calibration report apply. The permissible operational limits of individual values influence each other so that every application is checked individually by the manufacturer when selecting the volumeter.
If no operating data are provided by the orderer, standardized substitute operating data are used.

Maximum values

The following table shows the respective maximum values that, however, may not occur simultaneously. In addition, the operational limits of the corresponding connection, of the sealing material and of the sensor are to be observed.

	Sizes		
	OME 13	OME 20	OME 32
Flow rate [1/min]			
Q_{max}	15	45	150
Q_{rated}	10	30	100
Q_{min}	0,1	0,3	1
max. pressure [bar]	40	40	40
Temperature [°C]			
min.–max.	-20...+125		
Viscosity [mm^2/s]			
min.–max.	1 – 1.000.000		
Measuring chamber volume [ml/U]	1,65	6,24	25,6
Rotating speed [1/min]			
n (Q_{max})	9120	7260	5850
n (Q_{rated})	6060	4830	3900
n (Q_{min})	61	48	39
Number of poles [p] K1	2	2	2
K-factor [P/l] K1	1214	321	78
Milliliters per pulse [ml/P] K1	0,824	3,12	12,8
Pulse frequency [Hz]			
f1 (Q_{max})	304	242	195
fl (Q_{rated})	202	161	130
fl (Q_{min})	2,0	1,6	1,3

Tab. 1 Maximum values

Substitute operating data

The following table shows standardized values for the flow rate, temperature and viscosity. These values can be used at the same time as maximum values without impairing the service life of the volumeter. In addition, the operational limits of the corresponding connection, of the sealing material and of the sensor are to be observed.

	Sizes		
	OME 13	OME 20	OME 32
Flow rate [1/min]			
Q_{max}	10	30	100
Q_{rated}	10	30	100
Q_{min}	0,2	0,6	2
max. pressure [bar]	40		
Temperature [°C]			
min.–max.	-20...+100		
Viscosity [mm^2/s]			
min.–max.	1 – 50		

Tab. 2 Substitute operating data

Noise levels

KRAL volumeters operate almost silently.

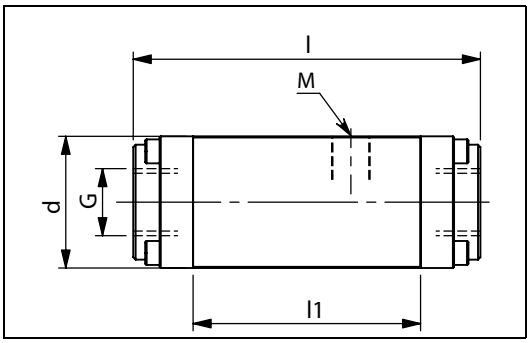
Heating system

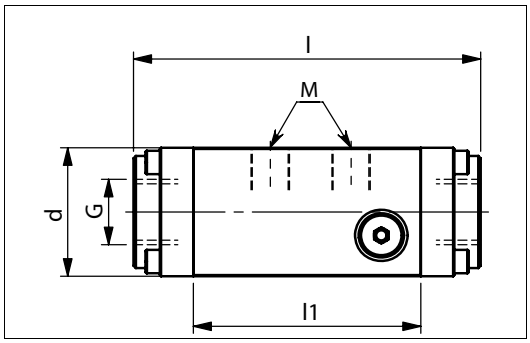
A heating system is not installed at the factory. The customer can optionally fit OME-series KRAL volumeters with an auxiliary heater.
We recommend heaters for high-viscosity media that do not flow sufficiently if not heated.
Contact the manufacturer before installation.

Safety instruction for the heating system

It is essential to observe the following when using a heating system:
➤ Do not heat the sensor and sensor cable above the temperature specified in the sensor operating instructions.

Dimensions and weights of OME with pipe thread connection



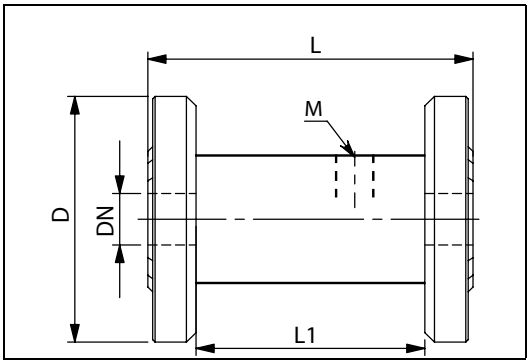


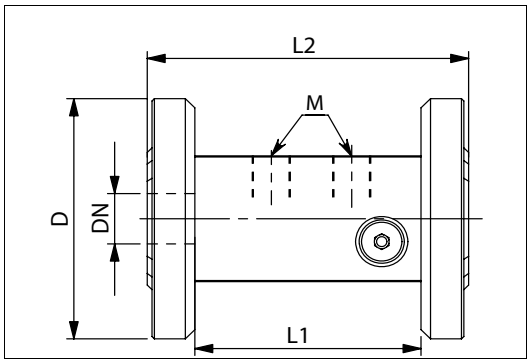
G Pipe thread
M Sensor hole
d Outside diameter
l1 Volumeter length without connections
l Total length

		OME 13	OME 20	OME 32
G	**[inch]**	1/2"	3/4"	1"
Pressure stage	**[bar]**	40	40	40
l	**[mm]**	110	145	200
d	**[mm]**	45 x 45	55 x 55	70 x 70
l1	**[mm]**	65	95	140
Grounding	**[kg]**	0,6	1,1	2,7

Tab. 3 Dimensions and weights, pipe thread connection

Dimensions and weights of OME with flange connection





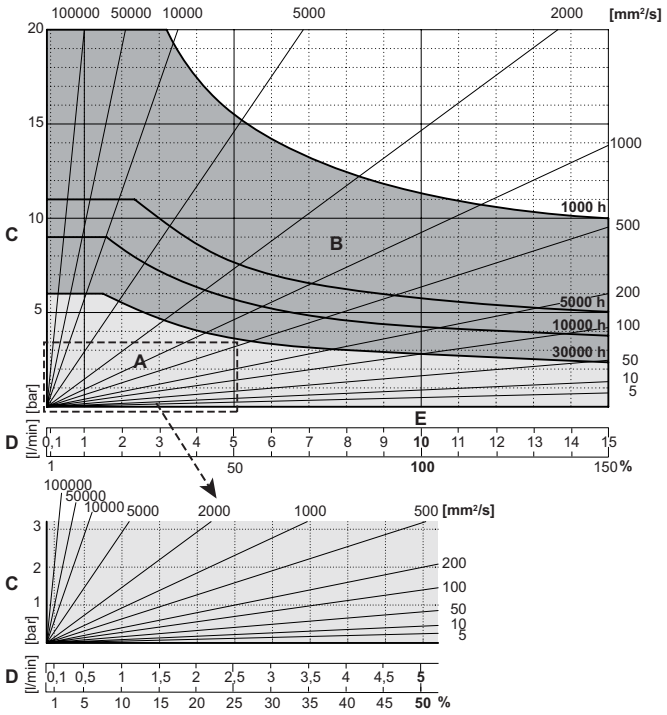
DN Nominal diameter flange
M Sensor hole
D Outer diameter
L1 Volumeter length without connections
L Total length

		OME 13	OME 20	OME 32
DN	**[mm]**	15	20	25
Pressure stage	**[bar]**	40	40	40
L	**[mm]**	105	135	185
D	**[mm]**	95	105	115
L1	**[mm]**	65	95	140
Grounding	**[kg]**	1,1	1,6	3,1

Tab. 4 Dimensions and weights, flanged connection

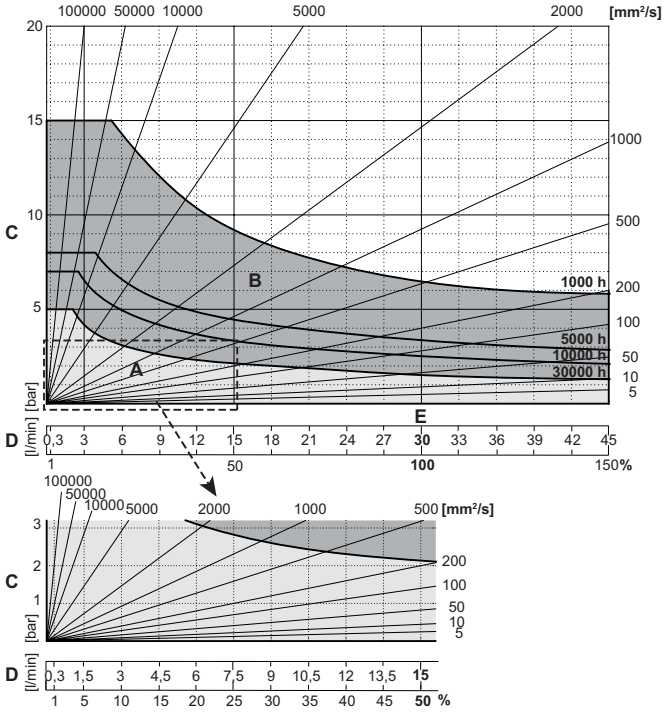
Load-bearing capacity

Load diagram OME 13



A Short-time operation
B Continuous operation
C Pressure loss
D Flow
E Q_{rated}

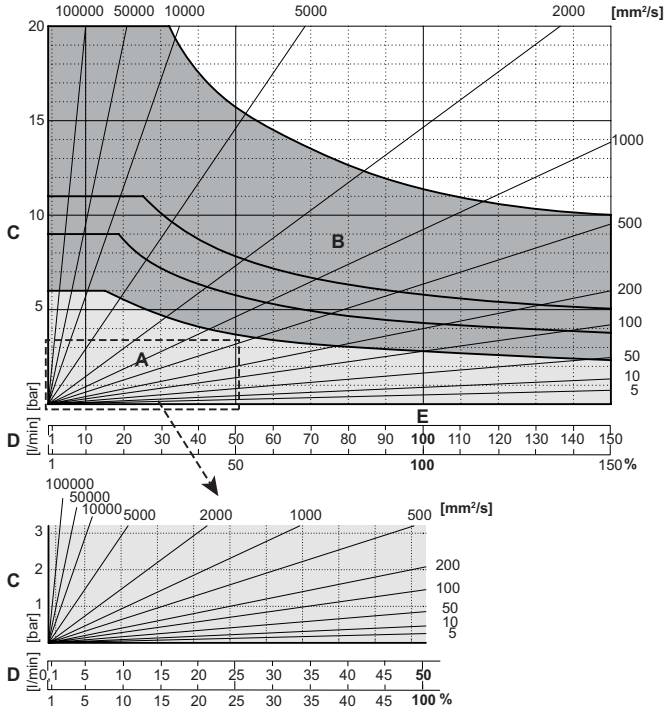
Load diagram OME 20



A Short-time operation
B Continuous operation
C Pressure loss
D Flow
E Q_{rated}

Load-bearing capacity

Load diagram OME 32



A Short-time operation
B Continuous operation
C Pressure loss
D Flow
E Q_{rated}

Description

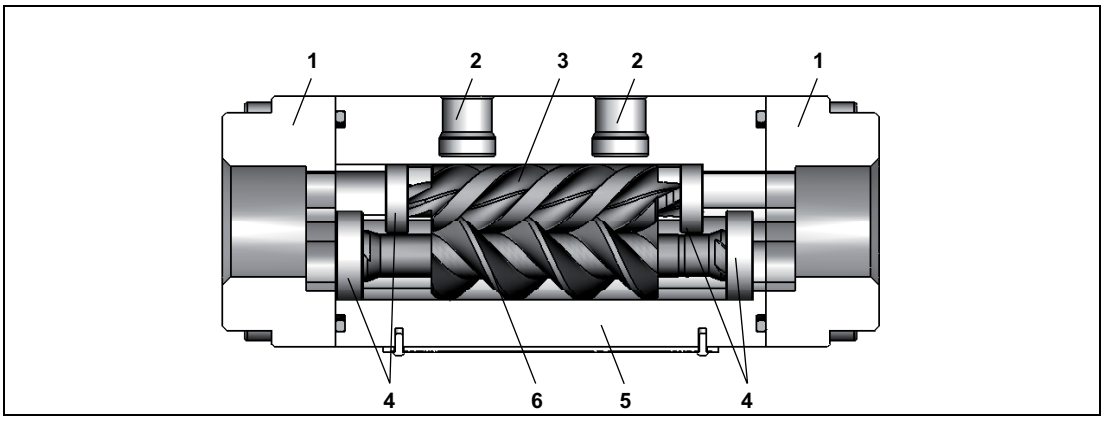


Fig. 1 Volumeter design, Series OME, Version BEG 56

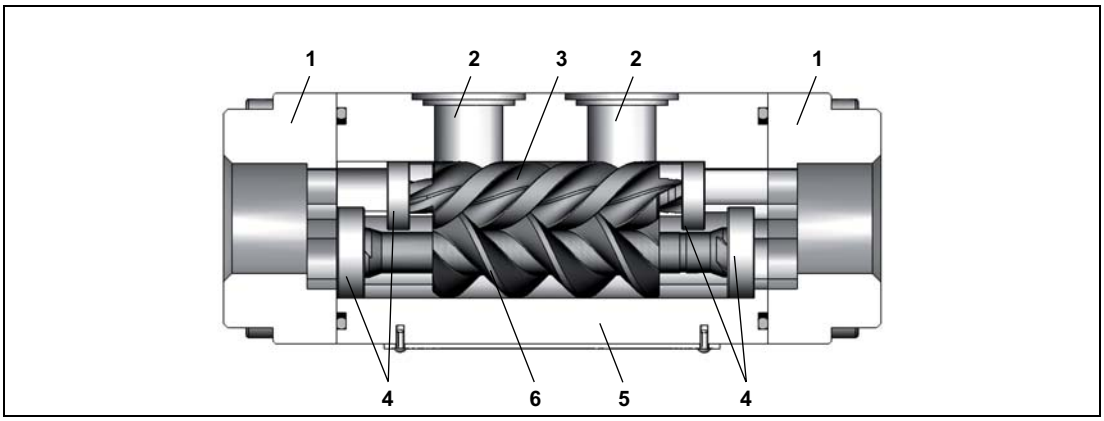


Fig. 2 Volumeter design, Series OME, Version BEG 47C

1 Connection
2 Sensor hole
3 Measuring screw small
4 Ball bearing
5 Measuring casing
6 Measuring screw large

KRAL volumeters belong as worm meters to the group of rotating displacement meters. In a worm meter a special form allows an almost tight engagement of two intermeshing screws **3, 6** to be achieved. Together with the measuring casing **5** that encompasses the measuring unit, closed volumes are achieved by this means. The fluid current makes the measuring unit rotate. The displacement effect results from the continuous filling, axial displacement and discharge of the volumes described above. The free cross-section of the measuring unit is constant throughout its length so that the flow rate can be calculated simply from the product of the free cross-section, rotary speed and pitch of the screws. The measured medium flows around and lubricates all the rotating parts. The medium is supplied and discharges axially and almost without deflection. Thanks to the displacement principle described here, the volumeter does not require inlet and smoothing sections in its supply and discharge. The volumeter can be operated in any installation position and direction of flow. Depending on the customer requirements, the volumeters can be equipped with correspondingly adapted connections various flanges.

Rolling bearings

The measuring unit is maintained without contact and with a low degree of friction in the casing of the KRAL volumeter by means of a precision rolling bearing. Single-row deep-groove ball bearings are used for Series OME KRAL volumeters.

Signal generation

A flow sensor samples the measuring pulses directly on the screw. The flow sensor generates a specific number of pulses per flow volume unit - depending on the size and working point. This device-specific characteristic is called the K-factor (unit: Pulse/Liter) and can be found on the rating plate and the enclosed calibration report. Possible formats of the signals are:

- ☐ PNP
- ☐ NAMUR

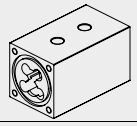
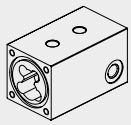
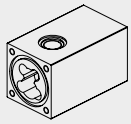
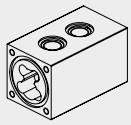
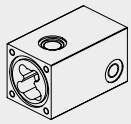
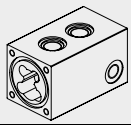
The dry sleeve allows the flow sensor to be mounted without contact to the fluid to be measured. Two different flow sensors are employed, depending on the application (standard, or for use in areas where there is an explosion hazard):

- ☐ Sensors based on the Hall effect
- ☐ Inductive sensor

The rating plate of the KRAL volumeter lists a preferred direction of flow at which the dry sleeve lies on the flow-off end. This preferred direction is based on the desire to position the thin-walled dry sleeve of the low-pressure end for the case that the volumeter is blocked.

Housing variants

A variety of housing variants is available, depending on the application:

Application	Housing variant	Sensors
Standard Signal: PNP		☐ 1 flow sensor or ☐ 1 flow sensor ☐ 1 flow direction sensor
		☐ 1 flow sensor ☐ 1 flow direction sensor ☐ 1 temperature sensor
Use in areas where there is an explosion hazard Signal: Namur		☐ 1 flow sensor
		☐ 1 flow sensor ☐ 1 flow direction sensor
		☐ 1 flow sensor ☐ 1 temperature sensor
		☐ 1 flow sensor ☐ 1 flow direction sensor ☐ 1 temperature sensor

Tab. 1 Housing variants

Linearization

The calibration report contains a mean K-factor that has been determined for the flow range 10:1 and that can therefore be used across a wide flow range. However, the K-factor shows slightly different values at different flow rates. These are also documented in the enclosed calibration report. If highest measuring precision is required, it is therefore advisable, especially at strongly varying flow rates, to take these different values into consideration by means of a "Linearization". The K-factors are therefore fed into a suitable evaluation electronic unit across several interpolation values of the flow rate. The K-factor relevant for the flow rate being measured is then determined by means of linear interpolation between the two nearest interpolation values.
The viscosity dependence of the K-factors must also be taken into account. These are determined during calibration at a viscosity of approximately 4,2 mm²/s. The influence of the flow rate on the K-factor decreases at higher viscosities so that the mean K-factor can then also be used in a considerably larger flow range without noteworthy errors.

Temperature compensation

If the KRAL volumeter is additionally equipped with a temperature sensor, the current density of the flowing medium can be calculated from this measured value by means of a density table stored in the evaluation electronic unit. A normalized volume measurement is then possible at which the displayed values are converted to a reference temperature X° that can be selected freely. This ensures that measuring errors caused by changes in the density due to temperature variations are avoided.

Pressure pulse compensation

Systems with a changing direction of flow as well as systems with pressure pulsations - that can also cause a reversal of the direction of flow - require the use of a second sensor (direction-of-flow sensor). This additional signal (90° phase-offset) and the incremental encoding inputs available in the KRAL electronic unit can be used to determine the direction of flow and to take it into consideration when calculating the total values.

Unpacking and checking the state of delivery

1. On delivery unpack the KRAL volumeter and check for damage during transportation.
2. Report damage during transportation immediately to the manufacturer.
3. Store the supplied sensors with the union nuts for the installation.
4. Dispose of packing material in accordance with the locally applicable regulations.

Transportation

Safety instruction for transport

Pay attention to the following when transporting the volumeter:
☐ Lift and transport the volumeter in accordance with the locally applicable regulations.

Transporting the volumeter

Depending on the locally applicable regulations, Series OME volumeters can be transported either manually or using suitable lifting gear.

Storage and preservation

Safety information for storage and preservation

The following instructions must always be observed:
☐ Volumeters can corrode if stored improperly and during longer standstills. ▪ Only store volumeters with screw plugs. ▪ Protect the volumeters against corrosion during long standstills.

Storing volumeters

As a result of the calibration, the internal components of the volumeter are wetted with calibration medium that has a preservative effect. In addition, a special anticorrosive agent is sprayed onto the interior of the devices before being dispatched. Unless otherwise specified, the external parts of the volumeters are anodized. The preservative applied at the factory will protect the volumeter for up to six weeks, if it is stored in a dry and clean location. Adverse ambient conditions, such as high humidity, salty air, etc., will noticeably reduce the possible storage time. If storage over longer periods and in adverse storage conditions is necessary, the volumeter will have to be preserved.

Preserving the volumeter

1. Close a connection of the volumeter pump with a cover plate.
2. Place the volumeter vertically.
3. Pour non-corrosive, resin-free oil until the oil has reached the flange and the air bubbles stop rising. Turn the measuring slowly in the process.
4. Close the upper connection with a cover plate. After about 6 months storage check the oil level in the volumeter and if necessary top up oil.

Removing the preservative

Aids:

☐ Vessel to collect the preservative oil

1. Remove one of the cover plates.
2. Drain the volumeter, collecting the preservative oil in a suitable vessel.
3. Remove the second cover plate.
4. In order to remove the residual oil, rinse the volumeter with the pumped medium.

Disposal

Safety information for disposal

The following safety instructions must be observed for disposal:
☐ Danger of poisoning and environmental damage from the pumped medium! ▪ Wear protective clothing during all the work on the volumeter. ▪ Before disposing of the volumeter collect the discharging pumped medium and dispose of in accordance with the locally applicable regulations. ▪ Before disposing of the volumeter neutralize the residues of the pumped medium in the volumeter.

Disposing of the volumeter

Aids:

☐ Solvents or industrial cleaners suitable for the pumped medium

1. Disassemble the volumeter.
2. Clean residues of the pumped medium from the individual parts.
3. Separate sealing elements made of elastomer from the volumeter and dispose of them in the residual waste.
4. Recycle aluminum and steel parts.

Safety instructions for installation and removal

The following safety instructions must be observed:
☐ KRAL volumeters are precision measuring devices. ▪ Ensure cleanliness and take care during installation and removal. ▪ Do not take apart the volumeter. ▪ Do not remove the protective caps from the dry bushes during installation. Put the protective caps on the dry bushes during removal. ▪ Installation: Only remove the screw plugs in order to insert the sensors. ▪ Removal: Screw in the screw plugs again after the sensors have been removed.

Installation

KRAL volumeters can be operated in any installation position.

Note:

Both directions of flow are possible. The preferred direction of flow is indicated on the rating plate by means of a bright arrow, see Fig. 2, page 5.

Filtration

The volumeter must be protected by a filter to prevent the ingress of dirt particles. The mesh width of the filter is relevant to the size of the volumeter.

Volumeter size	Max. mesh width
OME 13	0,1 mm
OME 20	0,1 mm
OME 32	0,34 mm

Tab. 1 Mesh width of the filter

Pipe thread connection

The screw-in length of the piping may not exceed the threaded length of the volumeter, since the flow cross-section is narrowed and internal components can be damaged.

Flanged connection

The volumeter connections to the piping system must be stress-free, as otherwise there is no guarantee that the volumeter will operate safely. The following drawings show how a flange is connected stress-free to the volumeter.

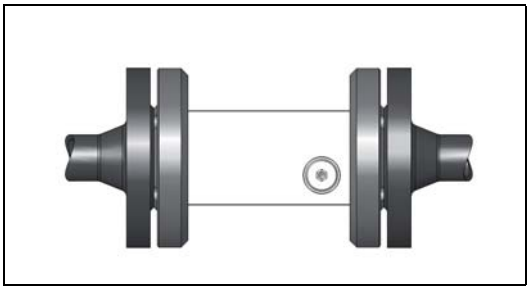
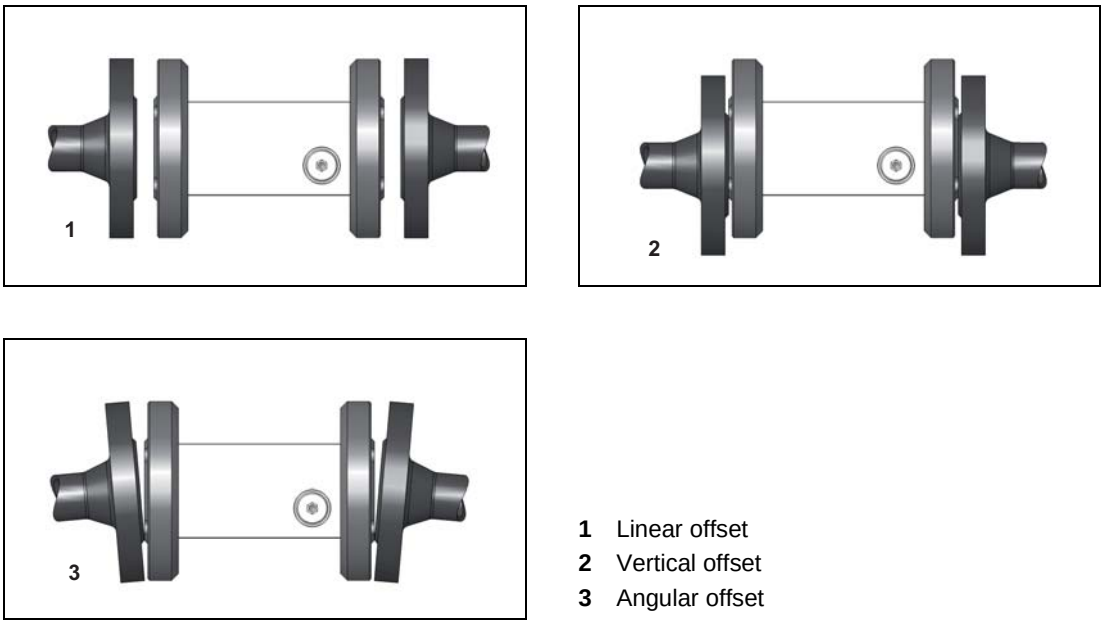


Fig. 1 Correct flange connection



1 Linear offset
2 Vertical offset
3 Angular offset

Fig. 2 Incorrect flange connections

Installing the volumeter

CAUTION!
Damage to the volumeter through impurities in the piping system.

- ➤ Ensure that the piping system has been cleaned carefully.
- ➤ During welding work attach cover plates in front of the connecting flanges.
- ➤ Ensure when welding that welding beads and abrasive dust cannot get into the piping system and the volumeter.
- ➤ Ensure that a pressure relief valve or bypass of the volumeter is installed.
- ➤ Before operating the volumeter rinse the piping system via the bypass. Under no circumstances may water or superheated steam be used!
- ➤ Observe the mesh width of the start-up filter, see "Filtration", page 16.

CAUTION!
Danger of damage to the device or impaired functionality through mechanical stresses.

- ➤ Ensure that the volumeter mounting on the piping system is free of mechanical stress.

CAUTION!
Damage to volumeter when the pipe threading is screwed in too far.

- ➤ Observe the thread length of the volumeter.
- ➤ Use standard cutting ring screwed connections.

1. Remove the protective covers and store them.
2. Install the volumeter stress-free in the circular pipeline. Take the preferred direction of flow into consideration.
3. Ensure that the sensor connections remain accessible.

Electrical connection

Safety instructions for electrical installation

The following safety instructions must be observed during the electrical installation:
☐ The following qualifications are required for the electrical connection: ▪ Practical electrotechnical training ▪ Knowledge of the safety guidelines at the workplace ▪ Knowledge of the electrotechnical safety guidelines ☐ The connecting lines of the sensor connections are to be shielded and laid separately from the supply and measuring lines. ☐ Ensure that the supply voltage is correct.

➤ Observe the operating instructions for the sensors and electronic equipment.

Removing the volumeter

Prerequisite:
☐ Plant switched off

Aids:
☐ Vessels for leaking pumped medium

DANGER!
Risk of injury through emitted hot, poisonous or corrosive pumped medium when removing the volumeter.

➤ Observe the safety regulations for handling dangerous liquids.
➤ Ensure that the volumeter is not under pressure.

1. In case of operation at higher temperatures wait until the device has cooled down to the ambient temperature.
2. Drain the closed circular pipeline and divert the medium via a bypass.
3. Dismantle the volumeter.
4. Apply the protective covers.
5. Observe the sections "Storage" and "Preserving the volumeter" on the subject of storing the volumeter.

Function test

Check	Procedure
Installation	➤ Check the installation position of the volumeter with regard to the direction of flow. ➤ Check the installation and installation position of the sensors. ➤ Check the pipe threading/flange and the temperature sensors for leaks under operating pressure.
Electrical installation	➤ Observe the operating instructions for the sensors and electronic equipment.
Power supply	➤ Observe the operating instructions for the sensors and electronic equipment.

Tab. 1 Test table

Commissioning

Prerequisite:

- ☐ The ambient conditions correspond to the operating data, see "Technical data", page 6
- ☐ Volumeter connection to the piping system is free of mechanical stress
- ☐ Piping system contains no pollutants or particles of dirt
- ☐ Piping system deaerated
- ☐ Any shut-off devices in the supply and discharge lines opened

CAUTION!
Measuring error when pressure drops below the minimum pressure at the outlet.

➤ Before commissioning the volumeter, observe these operating instructions.
➤ Ensure that the pressure at the volumeter outlet > 0,1 bar.
➤ Ensure that the medium does not flow freely out of the volumeter.

CAUTION!
Measuring error through gas inclusion in the piping system.

➤ Before you start it, make sure that the volumeter is filled.
➤ Deaerate the piping system.

➤ Switch on the system.

The volumeter measures when the flow sensor generates a signal.

Switching off the volumeter

Safety instruction for switching off the volumeter

Pay attention to the following when switching off the volumeter:

- ☐ Strong changes to the flow rate (e.g. rapid shutdown, pulsations ...) cause marked pressure differences on the volumeter and can damage the measuring unit.
  - The pressure loss of the volumeter must not exceed the values given in the chapter "Technical data", see "Load-bearing capacity", page 9.
  - The limits shown in the following table must not be exceeded even for a short time.

	Size		
	OME 13	OME 20	OME 32
Max. pressure loss [bar]	20	20	20

Tab. 2 Limits

Switching off the volumeter

When the flow through the volumeter is stopped, the generation of the signal stops automatically. No further measures are required to switch off.

Resuming volumeter operation

Prerequisite:

☐ The requirements for commissioning are met, see "Commissioning", page 19.

CAUTION!
Damage to device through hard, gummy or crystallized medium in the volumeter.

➤ Before commissioning, ensure that there is no hard, gummy or crystallized medium in the volumeter.

1. Disassemble and clean the volumeter before resuming operation
   - or -
   ➤ Heat up the medium during standstill by means of a heating system, see "Heating system", page 7.
2. Switch on the system.
   Under the requirements mentioned above, the volumeter is ready for operation at any time.

Re-calibration of the volumeters

KRAL volumeters are fundamentally maintenance-free. However, despite the robust design volumeters, as mechnical meters, are also subject to a certain wear as time passes. In order to maintain the high degree of precision, KRAL recommends carrying out the first recalibration after about one year of operation in order to ensure the technical functionality. Further specifications can be made in your quality management system. The results of the recalibration reveal the wear starting at the measuring unit.

The interval at which recalibration is actually required depends strongly on the operating conditions of the device. Under favorable conditions no significant change in the characteristics could be established even after years of use in many cases. Conditions lying clearly above the rated flow rate can, however, result in excessive wear. Changes in the cross-section due to deposits or corrosive/abrasive wear at the elements coming into contact with the flow are further factors that can result in a change to the characteristics.

Recalibration and maintenance of your KRAL volumeter ensures its measuring precison and technical functionality. Please also take our information about ÖKD and factory calibration into account.

General information about mounting instructions

The following information is to be observed:
☐ Any mounting work may only be carried out by qualified personnel. ☐ Replacement of the measuring unit consisting of the set of screws, rolling bearings and rotor may only be carried out in the factory. ☐ The volumeter has to be recalibrated after the measuring casing or the rolling bearing has been replaced. ☐ Observe the sensor operating instructions when replacing the sensor. ☐ Do not twist the dry sleeve during the mounting work. The guarantee for the KRAL volumeter expires if the red sealing point is damaged.

Mounting instructions

General drawing

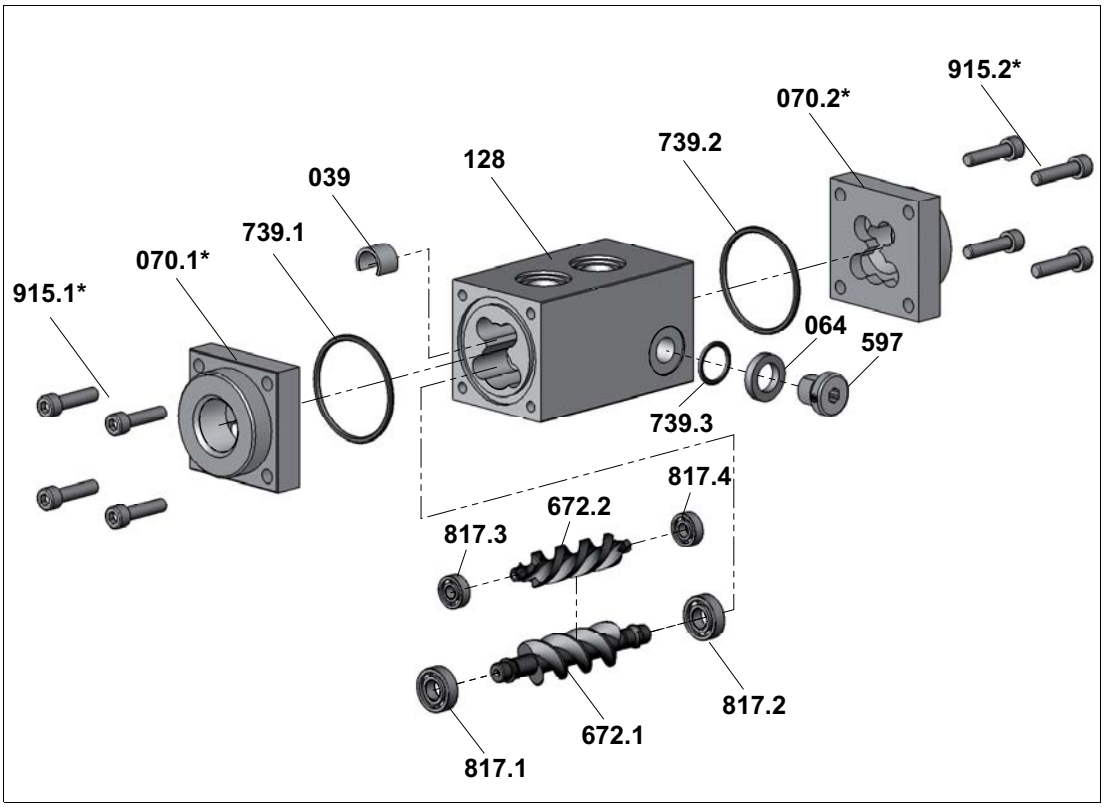


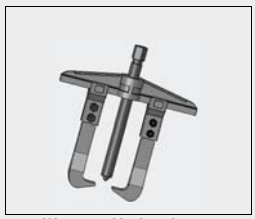
Fig. 1 Exploded view OME 13 / 20 / 32

039	Distance sleeve	**739.2**	O-ring
064	Support ring	**739.3**	O-ring
070.1*	End cover	**817.1**	Deep-groove ball bearing
070.2*	End cover	**817.2**	Deep-groove ball bearing
128	Measuring casing	**817.3**	Deep-groove ball bearing
597	Screw plug	**817.4**	Deep-groove ball bearing
672.1	Measuring screw large	**915.1***	Socket screws
672.2	Measuring screw small	**915.2***	Socket screws
739.1	O-ring		

* Parts for pipe threading or flange connection alternatively

Required mounting tools

Allen key



Pulling-off device

Hexagon socket torque wrench

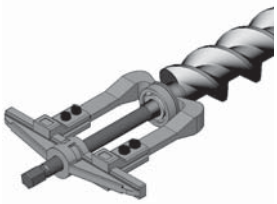
Removing seals and bearings

Prerequisites:

- ☐ Volumeter removed from plant
- ☐ Sensor inserts removed

1. Remove the socket screws **915.1**, then remove the end cover **070.1** and O ring **739.1.**

2. Pull the screw set with the ball bearings and distance sleeve **039** out of the measuring casing **128**, paying attention to the configuration for later assembly. Remove the distance sleeve.



3. Pull the ball bearings **817.1 + 817.3** and **817.2 + 817.4** off the measuring screw (large and small), using the pull-off device to do so.

4. Remove the socket screws **915.2** , then remove the end cover **070.2** and O-ring **739.2.**
5. Clean all the parts using a suitable detergent.

Installing seals and bearings

Prerequisites:

- ☐ Replacement parts available

1. Insert the O-ring **739.2** into the measuring casing **128**. Place on the end cover **070.2**, tighten the socket screws **915.2** with torque, see Tab. 2, page 27.

2. Press the ball bearings **817.1 + 817.3** and **817.2 + 817.4** onto the large and small measuring screw. **Note**: Press on only over the inner ring!

3. Push the screw set into the measuring casing **128**, paying attention to the configuration. Slide the distance sleeve **039** flush into the hole of the small measuring screw **672.2**.

4. Insert the O-ring **739.1** into the measuring casing, place on the end cover **070.1**. Tighten the socket screws **915.1** with torque, see Tab. 2, page 27.

Possible faults

Faults can have different causes. The following tables lists the symptoms of a fault, the possible causes and measures for elimination.

Possible faults

Fault	Cause / Elimination
☐ Volumeter leaks	1, 2, 8
☐ No flow	3, 9, 10, 22, 24, 25
☐ Negative flow rate	5, 17, 19
☐ Volumeter does not generate a pulse	3, 5, 6, 7, 8, 10, 13, 20, 22, 24, 25
☐ Pressure loss too high	11, 14, 22, 23
☐ Measured values not plausible	3, 5, 6, 7, 9, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23

Tab. 1 Possible faults

Troubleshooting

No.	Cause	Remedy
1	Seal pretension too low	➤ Pretension the screws.
2	Seal damaged	➤ Replace the seal. ➤ Check the chemical resistance of the seal.
3	Foreign bodies in the medium and/or volumeter	➤ Disassemble the volumeter and clean it. ➤ Use the start-up filter.
5	Flow sensor not connected correctly	➤ Check the connection of the flow sensor. ➤ Check the supply voltage for the flow sensor, observing the sensor operating instructions.
6	Flow sensor defective	➤ Check the function of the flow sensor, observing the sensor operating instructions.
7	Dry sleeve not adjusted correctly	➤ Set the dry sleeve correctly, observing the sensor operating instructions.
8	Dry sleeve destroyed	➤ Replace dry sleeve, contact KRAL for information.
9	Medium lubricates too little	➤ Use the OMK series.
10	Inlet pressure too low	➤ Increase the supply line pressure.
11	Viscosity of the medium too high	➤ Increase the temperature while observing the permissible temperature range.
12	Viscosity of the medium too low	➤ Use the OMK series.
13	Flow rate too low	➤ Increase the flow rate - or - ➤ Use a suitable volumeter size - or - ➤ Use linearization, observing the electronic operating instructions.
14	Flow rate too high	➤ Reduce the flow rate - or - ➤ Use a suitable volumeter size.
15	Airlocks	➤ Deaerate the system and check for leaks.
16	Outgassing	➤ Increase the system pressure. ➤ Reduce the temperature.

No.	Cause	Remedy
17	Pulsations too high	➤ Use another feed pump. ➤ Carry out changes to the system. ➤ Use the OMG series.
18	Back pressure too low	➤ Increase the back pressure.
19	Flow rate fluctuations too high	➤ Ensure a continuous flow rate by taking suitable measures (use of a different pump. valve, damper, etc.) - or - ➤ Smoothen the indication, while observing the electronic operating instructions.
20	Filling amount too low	➤ Use a suitable volumeter size. ➤ Use the OMG series.
21	Strongly deviating operating data	➤ Use a suitable volumeter. ➤ Adapt the operating data to the volumeter.
22	Wear at the measuring unit and bearing	➤ Renew the measuring unit. ➤ Renew the bearing. ➤ Filter out the abrasive materials.
23	Sluggishness through deposits	➤ Disassemble the volumeter and clean it carefully.
24	Flow impaired at the system end	➤ Check whether the medium flows in the plant (pump in operation, slide valve opened, etc.). ➤ Check whether shut-off devices before and after the volumeter are opened.
25	Volumeter switched to bypass	➤ Switch the volumeter to through-flow.

Tab. 2 Troubleshooting

General drawings

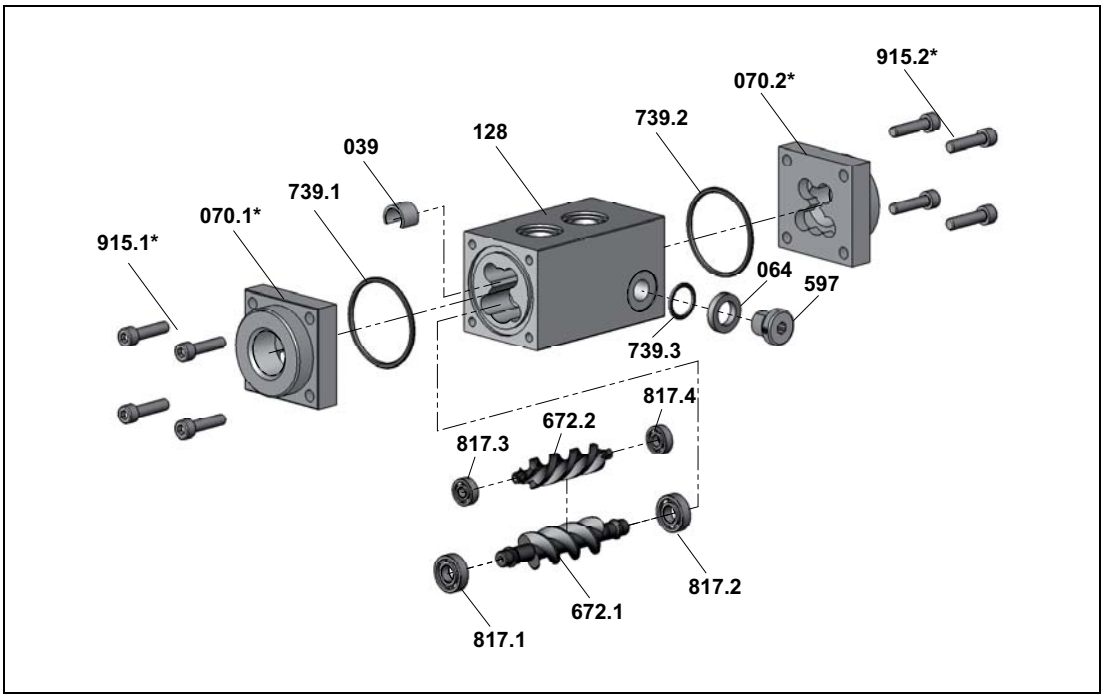


Fig. 1 Exploded view OME 13 – 32 Pipe thread connection

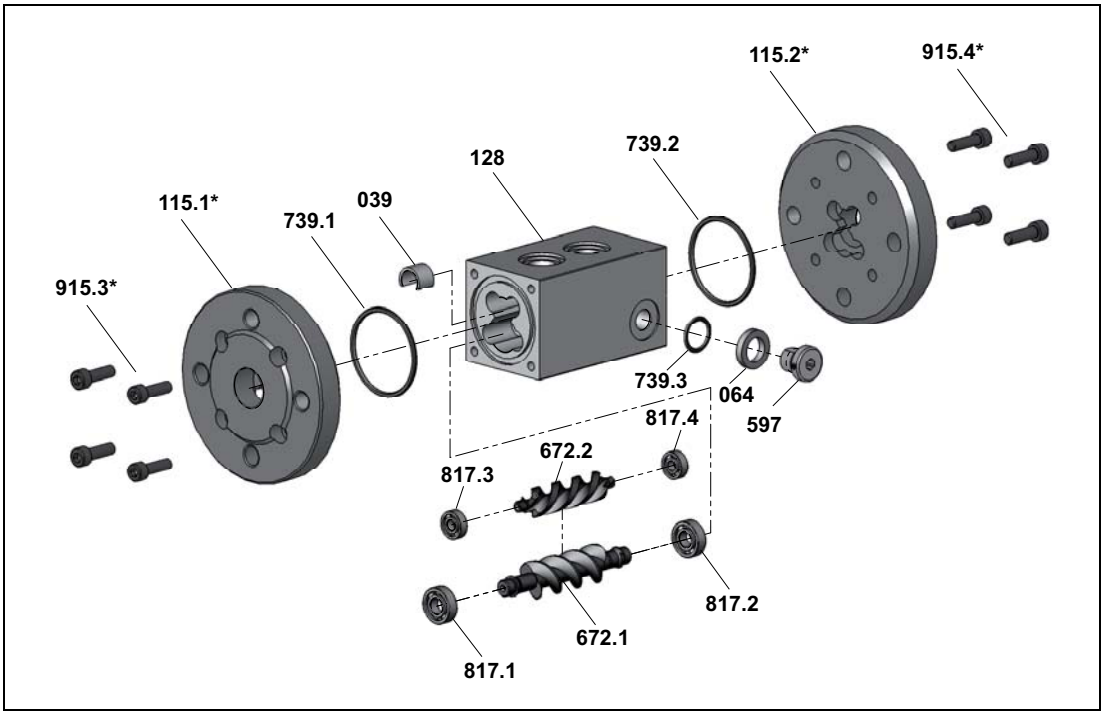


Fig. 2 Exploded view OME 13 – 32 Flange connection

Spare parts

Spare part no.	Part	Spare part no.	Part
039	Distance sleeve	**739.2**	O-ring
064	Supporting washer	**739.3**	O-ring
070.1*	End cover	**817.1**	Deep-groove ball bearing
070.2*	End cover	**817.2**	Deep-groove ball bearing
115.1*	Flange	**817.3**	Deep-groove ball bearing
115.2*	Flange	**817.4**	Deep-groove ball bearing
128	Measuring casing	**915.1***	Socket screws
597	Screw plug	**915.2***	Socket screws
672.1	Measuring screw large	**915.3***	Socket screws
672.2	Measuring screw small	**915.4***	Socket screws
739.1	O-ring		
*	Parts for pipe threading or flange connection alternatively		

Tab. 1 Spare part numbers

Tightening torques

Table of tightening torques

Tightening torque [Nm] for						
Thread	Screws with metric threads and head contact surfaces (DIN 931, 934, 912)		Wedge lock washers		Stainless steel screws A2 and A4	
	Material quality		Material quality		Material quality	
	8.8	8.8 + aluminum*	8.8	Rust-proof screws A4-70	Property class 70	Property class 80
M 3	1.5	1.2	1.5	1.1	–	–
M 4	2.9	2.3	3	2	–	–
M 5	6.0	4.8	6.0	3.9	3.5	4.7
M 6	9.5	7.6	10.3	6.9	6	8
M 8	23.1	18.4	25	17	16	22
M 10	46	36.8	47	33	32	43
M 12	80	64	84	56	56	75
M 14	127	101	133	89	–	–
M 16	194	155	204	136	135	180
M 18	280	224	284	191	–	–
M 20	392	313	399	267	280	370
M 24	675	540	687	460	455	605
* reduced tightening torque when screwing into aluminum						

Tab. 2 Tightening torques

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