Operating Instructions

for

Oval Gear Flow Meter

Model:

DON-...Lx/Hx/Rx/Dx/Gx/Kx/Bx/Zx/M4

1. Contents

Manufactured and sold by: KOBOLD Instruments Inc.
1801 Parkway View Drive
Pittsburgh PA 15205-1422
Tel.: 412-788-2830
Fax: 412-788-4980
E-Mail: info@koboldusa.com
Internet: www.koboldusa.com

2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained, and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

as per PED 2014/68/EU

DON 1 Aluminum-Version

Model DON	DN	P_{max} [bar]	diagram 8 group 1 dangerous liquids	diagram 9 group 2 no dangerous liquids
DON-105	⅛	64	art. 4, par. 3	art. 4, par. 3
DON-110	¼	64		
DON-115	⅜	64		
DON-120	½	64		
DON-125	25	64		
DON-130	40	40		
DON-135	50	40		
DON-140	50	16		
DON-145	80	16		
DON-150	80	16		
DON-155	100	16		
DON-160	100	16		

DON 2/8 Stainless steel version

Model DON 2/8	DN	P_{max} [bar]	diagram 8 group 1 dangerous liquids	diagram 9 group 2 no dangerous liquids
DON-05	⅛	100	art. 4, par. 3	art. 4, par. 3
DON-06	⅛	100	art. 4, par. 3	
DON-10	¼	100	art. 4, par. 3	
DON-15	⅜	100	art. 4, par. 3	
DON-20	½	100	art. 4, par. 3	
DON-25	25	100	category II	
DON-30	40	50	category II	
DON-35	50	50	category II	
DON-40	50	16	category II	
DON-45	80	16	category II	
DON-50	80	16	category II	
DON-55	100	16	category II	
DON-60	100	16	category II	

DON-1 M4 Aluminum version with mechanical totalizer

Option M4 Model DON-1	DN	P_{max} [bar]	diagram 8 group 1 dangerous liquids	diagram 9 group 2 no dangerous liquids
DON-05	⅛	-	-	-
DON-10	¼	-	-	-
DON-15	⅜	-	-	-
DON-20	½	40	art. 4, par. 3	art. 4, par. 3
DON-25	1	40	art. 4, par. 3	
DON-30	1½	40	category II	
DON-35	2	40	category II	
DON-40	2	16	category II	
DON-45	3	16	category II	
DON-50	3	16	category II	
DON-55	4	16	category II	
DON-60	4	16	category II	

DON 2/8 Stainless steel with mechanical totalizer

Option M4 Model DON 2/8	DN	P_{max} [bar]	diagram 8 group 1 dangerous liquids	diagram 9 group 2 no dangerous liquids
DON-05	⅛	-	-	-
DON-06	⅛	-	-	-
DON-10	¼	-	-	-
DON-15	⅜	-	-	-
DON-20	½	40	art. 4, par. 3	art. 4, par. 3
DON-25	1	40	art. 4, par. 3	
DON-30	1½	40	category II	
DON-35	2	30	category II	
DON-40	2	16	category II	
DON-45	3	16	category II	
DON-50	3	16	category II	
DON-55	4	16	category II	
DON-60	4	16	category II	

3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

Scope of delivery:
The standard delivery includes:

- Oval Gear Flow Meter model: DON
- Operating Instructions
- Calibration Certificate

4. Regulation Use

The oval gear meter is a precise positive displacement flowmeter incorporating a pair of oval geared rotors. These meters are capable of measuring the flow of a broad range of clean liquids.

Stainless Steel flowmeters are suited to most water based products and chemicals and aluminium meters are suitable for fuels, fuel oils, & lubricating liquids. It is important to ensure that the medium to be measured is compatible with the materials used in the instrument. (See section 10 “Technical Data”) It is also imperative to comply with the maximum permissible operating parameters specified in the “Technical Data” section.

The flowmeter is available as a measurement transducer with pulse output or with other forms of evaluation electronics. Details of how to operate the electronics are included in a separate instruction manual.

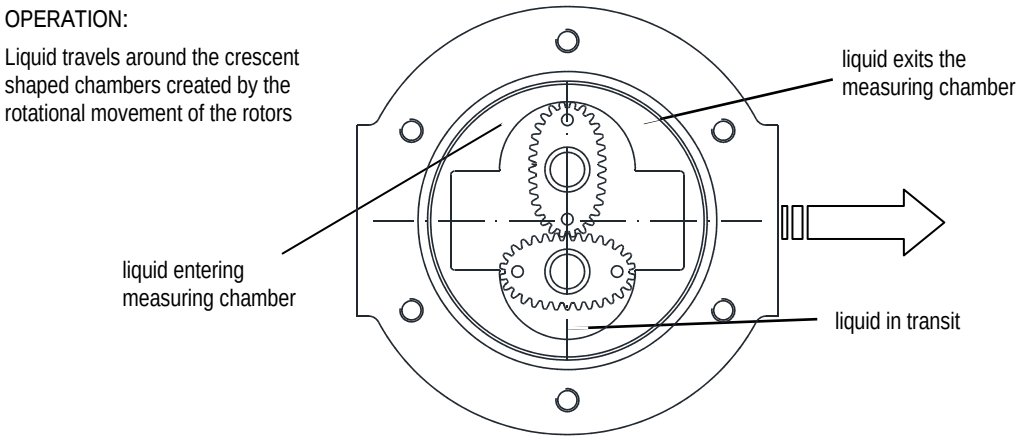
These flowmeters DON can be installed within hazardous areas when ordered with optional Exd approval, or by using the reed switch pulse output in Intrinsically Safe loops or installing Intrinsically Safe certified Instruments.

Any use of the oval gear flow meter model: DON, which exceeds the manufacturer’s specification, may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

5. Operating Principle

Oval gear flowmeters are categorized as positive displacement flow technology. When liquid flows through this type of positive displacement flowmeter, two oval geared rotors measure a constant volume per rotation within a precisely machined measuring chamber. With each rotation, a constant volume of liquid is measured. The rotation of the oval gears is sensed via magnets embedded within the rotors. These magnets transmit a high resolution pulse output. The output signal can be process externally via a remote display controller or PLC or via a variety of output/display options available as accessories attached to the flowmeters.

The positive displacement flow technology allows for precise flow measurement of most clean liquids regardless of the media conductivity. Other liquid properties also have a minimal effect on the performance of this type of meter. Flow profile conditioning is not required as with alternative flow technology options making oval gear installations simple to install in tight spaces and at an economical price.



6. Mechanical Connection

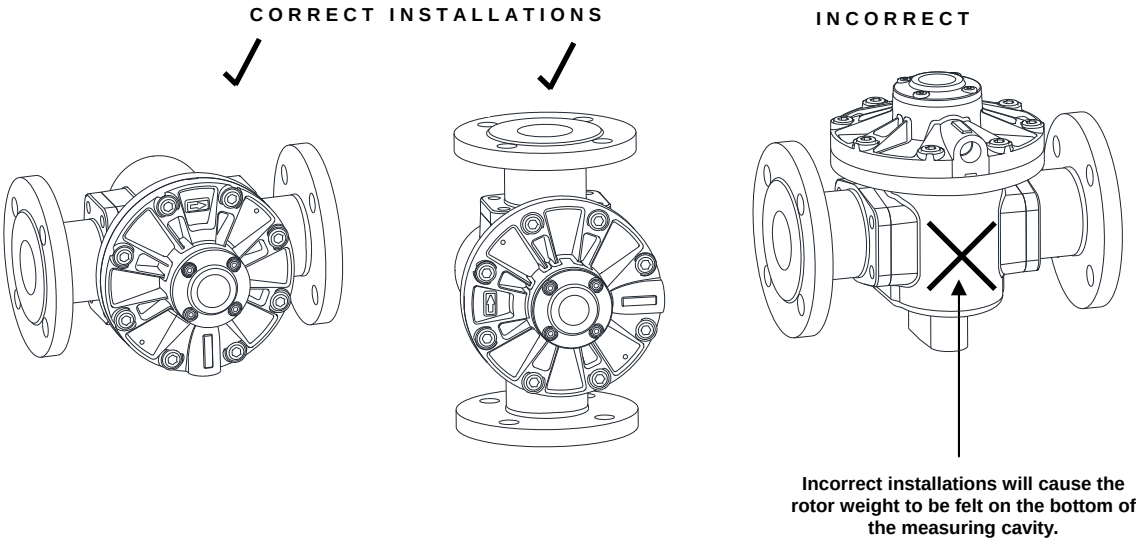
6.1 General

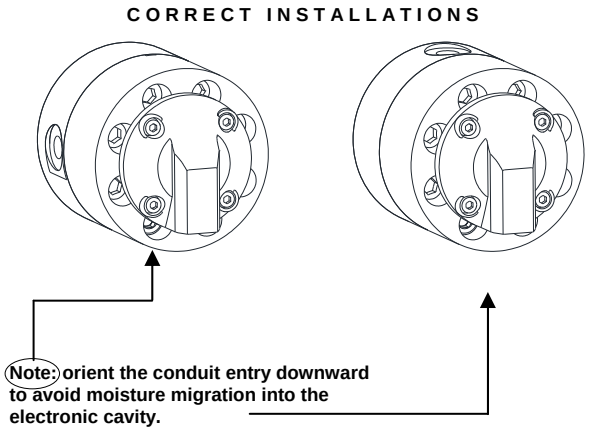
Points to verify before meter installation:

- Chemical compatibility of the liquid. Be sure that all wetted parts are identified and confirmed suitable for use with the media being measured. If unsure, please contact a KOBOLD engineer for guidance in obtaining the proper reference materials.
- Verify that the operational pressure and temperature limits are within capability of the fully specified meter. Verify that the operational flow rates are within the specified flow range. Viscous liquids may limit the maximum allowable flow based on the viscosity. The max allowable flow rate may need to be limited to ensure the differential pressure across the flowmeter does not exceed 1 Bar, (100 kPa, 15 PSIG).
- Be sure that the flowmeter is not subject to any process temperatures and/or pressures that can cause the measured liquid to freeze or flash inside the meter.

6.2 Orientation

When installing the flowmeter, orientation must be considered. The rotor shafts must be in a horizontal plane. To verify that the rotor shafts are in a horizontal plane, electronic cover or optional digital display will be facing in a horizontal direction. For modification in the field, the electronic cover or digital display can be rotated in any 90 degree position. This accommodates access to the electrical entry and allows the electronic display orientation to best suit the installation.





The DON flowmeter accommodates both horizontal and vertical flows. It is recommended that for vertical flow installations that the liquid flow up through the meter *(i.e. bottom to top*). This orientation assists in air or entrained gas removal. The flow meter is bidirectional. To identify the flow direction, in which the flowmeter was calibrated, the flowmeters are marked with arrows. These arrows are placed on the lower side for models DON-x05 .. DON-x15 and on the top side for models DON x20..DON-x60. The flowmeter calibration data refers to this arrow direction. This is also the preferred flow direction.

6.3 Flow Conditioning and Location

It is highly recommended to INSTALL a filter immediately before (prior to) the meter. Filters are available and sold separately.

Recommended Filter:
DON-x05…DON-x15: < 75 µm particle size (200 mesh)
DON-x20…DON-x35: < 150 µm particle size (100 mesh)
DON-x40…DON-x60: < 350 µm particle size (45 mesh)

Flow conditioning: Flow conditions is not required since the DON flowmeter does not require any straight pipe runs before or after the flowmeter.

Location: The recommended installation would be before of any flow control and/or shut off valves, this installation prevents complete emptying of the meter. This minimizes the risk of leakage and/or air entrapment which could result in damage to the flowmeter or inaccurate initial readings.

A by-pass installation is recommended for process or safety critical meters. Isolation valves enable the meter to be isolated from the system and serviced as needed. System purging is also possible with a by-pass arrangement. Accommodate all meter ratings and locate the meter on the discharge side of the process pump.

For outdoor applications, be sure all electrical entries are sealed properly via the proper glands, mounting, sealing or containment. For humid environments, mount the instrument appropriately as to avoid condensation build up. Generally these installations have the conduit connection pointing downward as to drain any condensate away from the electronics.

Liquid State: Liquid within the flowmeter must not freeze. If heat tracing is necessary, please be sure to adhere to the temperature limits of the flow meter. Ensure the liquid does not flash, do not exceed the max DP of the flowmeter.

Hydraulic shock: Surge dampeners or pressure relief valves must be installed if hydraulic shock or pressure spikes are present. Highly pulsating flow can also damage the DON flowmeter. Diaphragm pumps and specific application profiles can cause high frequency pulsating flow. Proper pulsating dampers are highly recommended.

7. Electrical Connection

7.1 Connecting Cable

Proper shielded instrument cable is highly recommended. Low capacitance twisted pair 7 x 0.3 mm (0.5 mm²) for use with the DON and any remote receiving instrumentation. Typical cable would be Belden® 9363 or similar. Connect the cable shield to DC common or designated grounding terminal at the receiving instrument. Remember to only connect the end of the cable shielding at the receiving instrument (not the DON) to ensure proper interference protection.

Please be sure not to run the connecting cable within a common conduit or in close proximity to conduit with high inductive loads or power sources. This could result in noise or inducted errors to the output signal or result in damage to the electronic components. Always run the instrument cables in a separate conduit or within a common conduit with other low power cables. Max cable length should be limited to 3280 ft (1000 m).

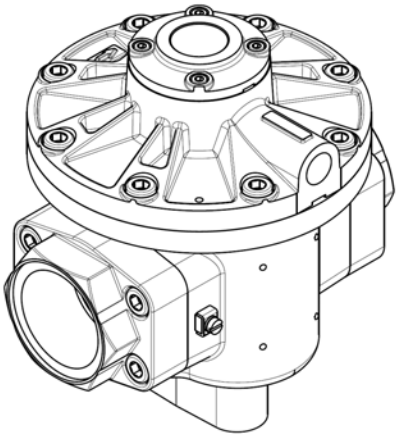
7.2 Hazardous area wiring

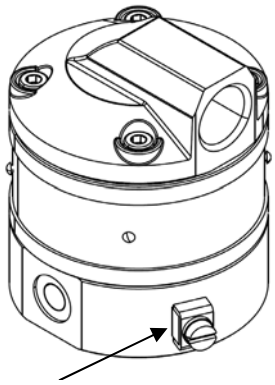
The instrument can only be operated in the ATEX area as “Simple Apparatus” in accordance with ATEX Article 1 §2 and 3 with the “Reed contact” (R0) option and without ATEX labelling. For this purpose, intrinsically safe cabling must be laid between the instrument, the hazardous area and an approved isolation switching unit outside the hazardous area. (See section 17 Manufacturers declaration – Switches for use in Explosive Atmospheres)

Alternatively, the device can be operated using option E1 to E5 with Ex ia IIC T4 Gb approval [see separate operating instructions] or with explosion-protected housing (Exd) option RE, BE, GE, KE, LE, HE or DE. Only Exd-certified cable conduits and cable glands with corresponding temperature limits may be used. Hall-effect sensor output is not possible if the DON flowmeter is operated in an ATEX zone as simple apparatus or using the E1/E3 option.
When operating the electronic options LE, BE, GE, RE, HE and DE, suitable operating materials must be used to ensure that the maximum operating voltage of 28 V_{DC} and the maximum operating current of 200 mA are not exceeded.

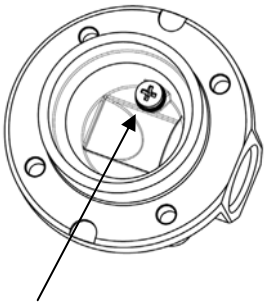
The wiring methods used must be in accordance with the applicable rules, provisions and requirements at the location where the device is installed. The measuring devices may only be connected by qualified personnel who are familiar with the protection classes, provisions and specifications for the device in areas at risk of explosion.

In accordance with the installation regulations, both, the housings and the electronic covers must be grounded using the earthing clamps. The maximum connection cross-section is 4 mm^2.





External earthing clamp



Internal earthing clamp electronics cover

7.3 Electrical connection for integrated electronics options

The electrical connection of the integrated electronics options always requires the electronics cover to be dismantled. Models from size X05 to X20 incorporate the cable inlet into the electronics cover, while models from the X25 size onwards accommodate the cable inlet in the housing cover.
The use of an EXD-certified cable gland is imperative for explosion-protection options HE, GE and LE etc. (M20x1.5 or ½" NPT) (not included in delivery). The connecting cable must be routed through the cable duct and connected in accordance with 7.3.1 to 7.3.4. The connecting terminals are of the plug-in type, and can be taken out of the terminal compartment to facilitate connection.

7.3.1 Hall-effect sensor with active pulse output (H0/HE/B0/BE/G0/GE/HU options)

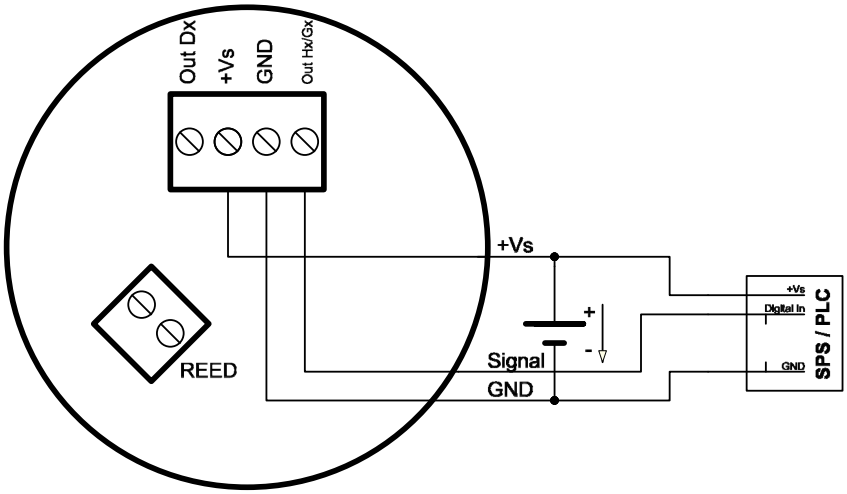
The H0/HE/B0/BE/G0/GE electronics options combine a hall-effect sensor with an active push-pull output stage. The B0/BE options involve combining bipolar Hall sensors with alternating polarised magnets. This option is particularly suitable for pulsating currents, although the pulse rate is halved compared to the H0/HE option. A three-phase electrical connection is used. The output is actively switched, either to the input terminal voltage +Vs or to GND. The external input terminal voltage is 8 to 30 V_{DC}. No additional external wiring is required (e.g. pull-up resistor). The high signal corresponds approximately to the +Vs input terminal voltage and the low signal approximately to 0 V.
The electrical load can be connected to either the input terminal voltage or GND

Max. output current (power source or sink): 100 mA (short-circuit protected).

The hall-effect sensor pulse output is not available if a device is ordered for use in the explosion hazard area as "Simple Apparatus" (e.g. if the "E1" option is ordered).
The HU electronics option provides the NPN output with built-in 4.7 kΩ pull-up resistor. The external supply voltage is 5-30 VDC and the max. switching current is 200 mA (short-circuit protected).

Note!
The electronic options H0/HE/HU are available with reed switch output while options B0/BE are not equipped with reed switch.

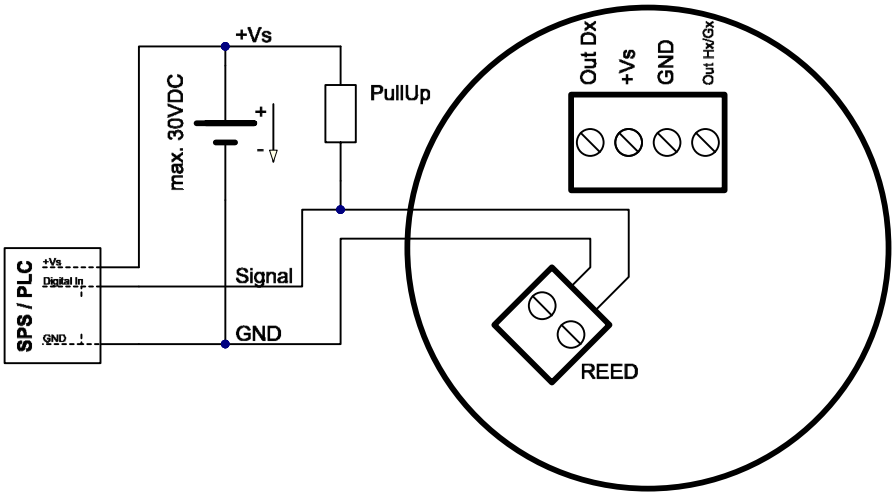
Hall sensor output connection for H0/HE/B0/BE/G0/GE/HU options



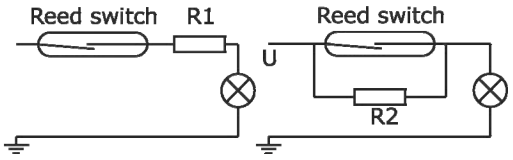
7.3.2 Reed Switch Pulse Output

The DON reed switch output is a SPST potential free N/O 2-wire output. This is a passive output so no power is required. The output may also be used with an appropriate intrinsically safe barrier for use in hazardous locations. If the intention is to operate the dry-reed contact impulse output in ATEX areas as simple apparatus, only the R0 option may be used. Note: when using the reed switch output the liquid temperature must not change at a rate greater than 10 ºC per minute (50 ºF per minute).
Average electrical endurance of switching contact (MTTF – Mean Time To First Failure):
Max. switching voltage (100 V/10 mA) $5x10^5$ switching cycles
Max. current load (20 V/500 mA) $5x10^6$ switching cycles
Min. load (<5 V/10 mA) $5x10^8$ switching cycles

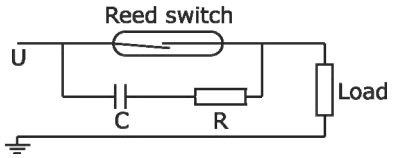
Switching capacity: Max. 30 V_{DC}, max. 200 mA



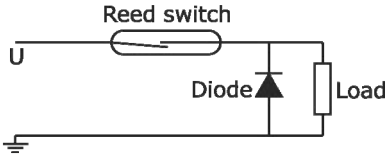
The individually specified maximum electrical values of the reed switch must never be exceeded, even for a moment. Higher switching values may reduce the service life or even destroy the contact.
For capacitive and inductive loads (e.g. via long lines), we recommend the following protective circuits:



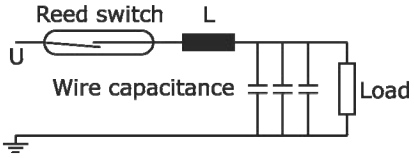
Lamp load with series or parallel resistance to the reed switch.



Protection with a RC suppressor
For a.c. current and inductive load.



Protection with a diode
for d.c. current and inductive load.

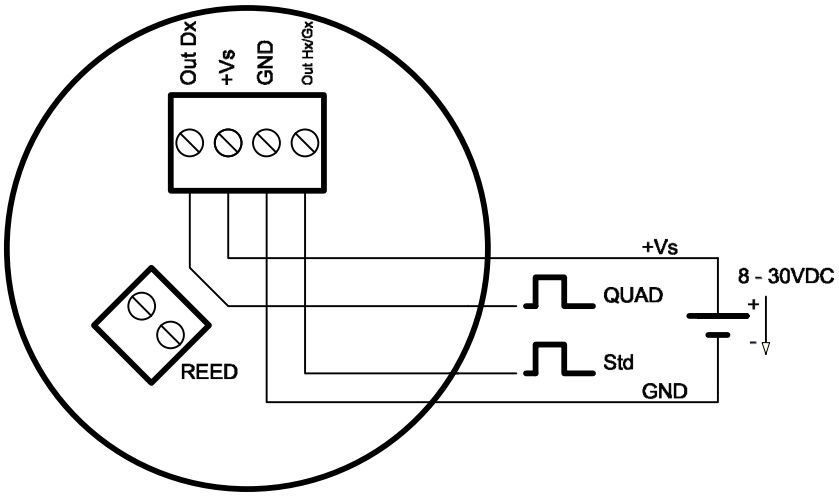


Protection with an inductance or
Resistance for capacitive load.

7.3.3 Quadrature Pulse Output (QUAD, Option D0/DE)

For the D0/DE option, the DON devices come with 2 independent hall-sensor elements. The hall-effect sensors are arranged so that they emit separate phase-shifted signals to one another.
The QUAD output is best-suited for verified use with a redundant signal or for counting bidirectional currents (detecting the current direction).

Max. output current per channel (power source or sink): 100 mA (short-circuit protected).



The current direction of the medium is defined as follows:

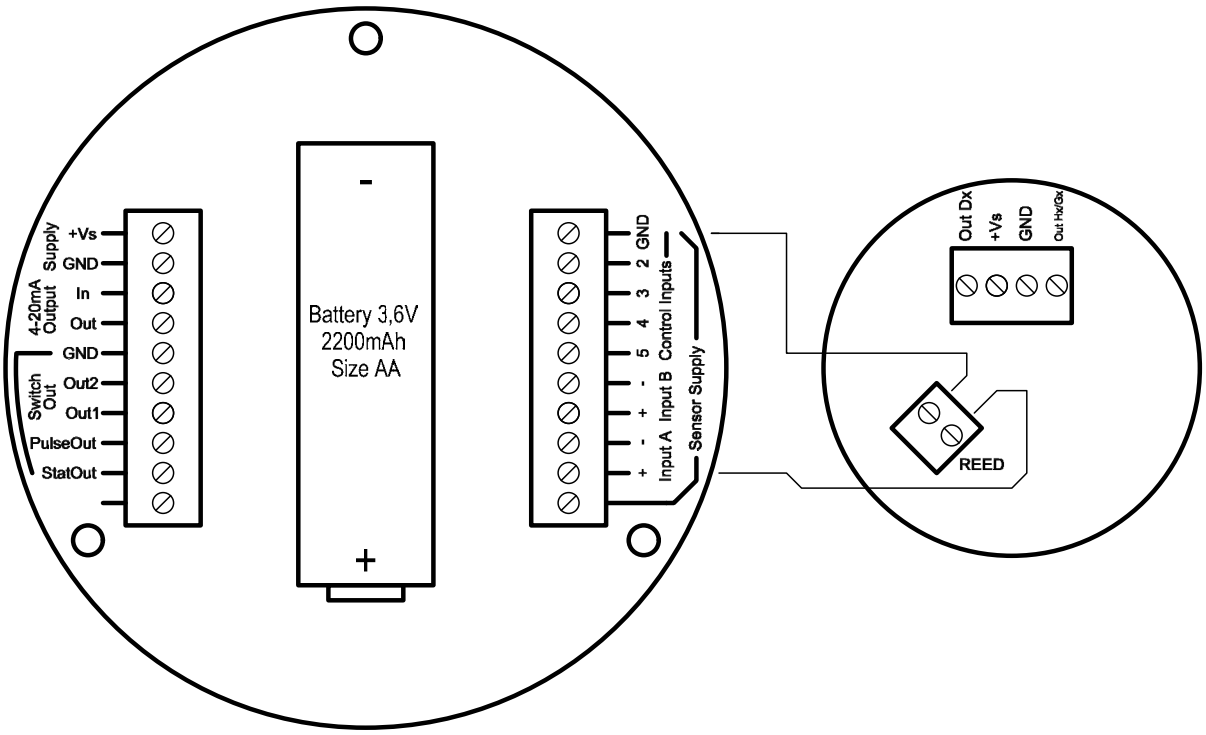
a.) Hx signal leading over Dx signal: Current flowing in the direction of the marked arrow (positive)
b.) Hx signal lagging behind Dx signal: Current flowing against the direction of the marked arrow (negative)

7.4 Internal wiring with electronic options –Ex/Zx

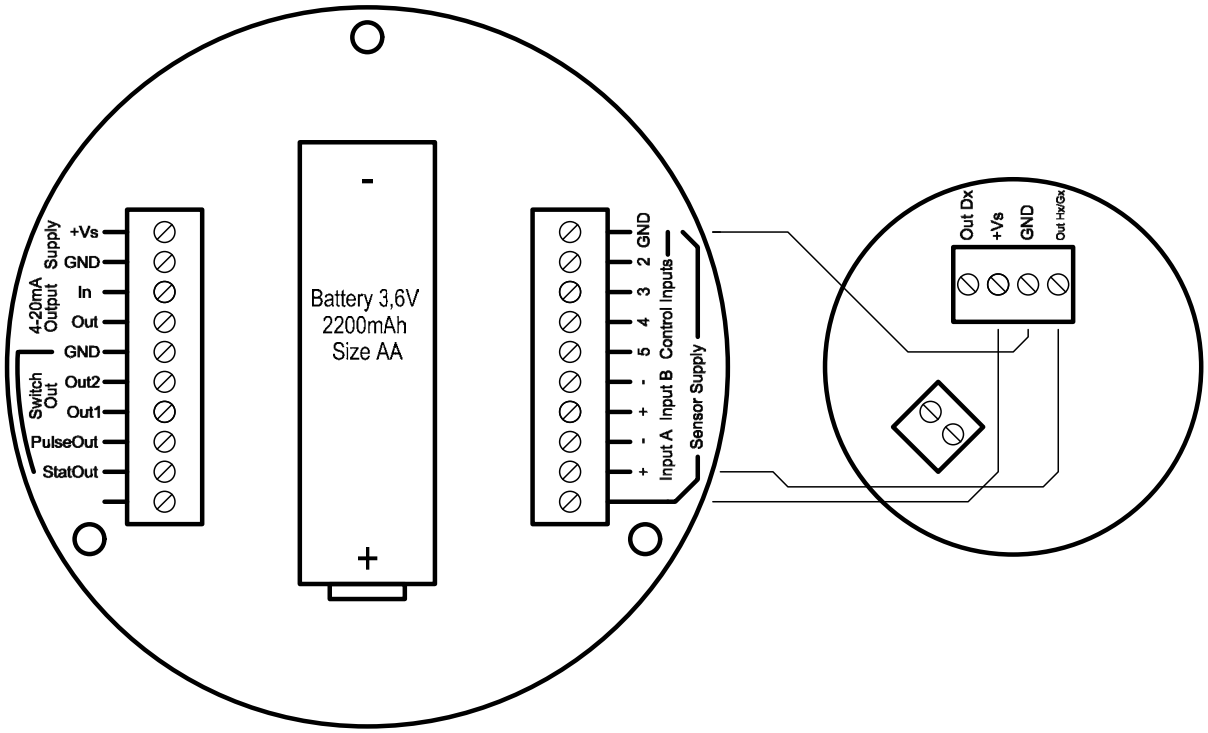
The Ex/Zx electronic options are pre-configured ex works in connection with the sensor boards. Reconfiguration is available on request.

7.4.1 For Z1/Z3 electronic options (reed switch and Hall sensor)

a) Wiring diagram with reed switch (ex works standard)



b) Wiring diagram with Hall sensor (recommended in connection with external supply)



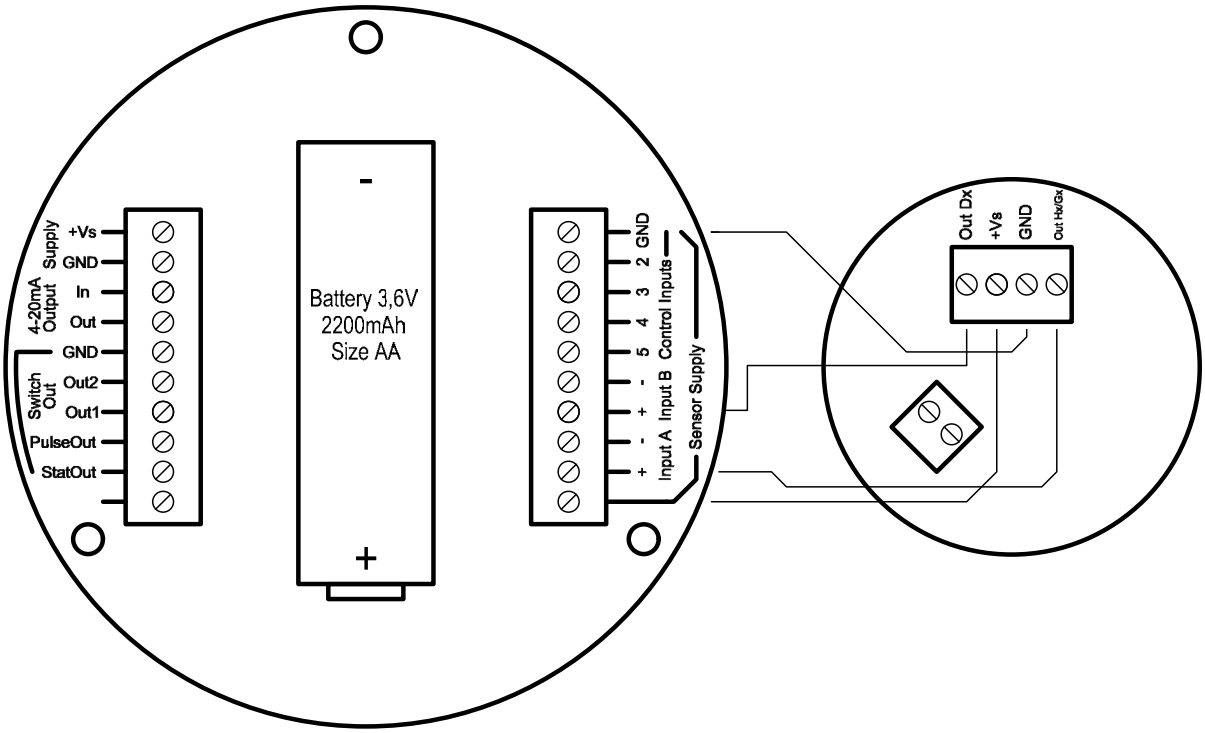
7.4.2 For Z6/Z7 electronics options (bipolar Hall sensor)

The circuitry corresponds to 7.4.1 b.)

7.4.3 For E1...E5 electronics options

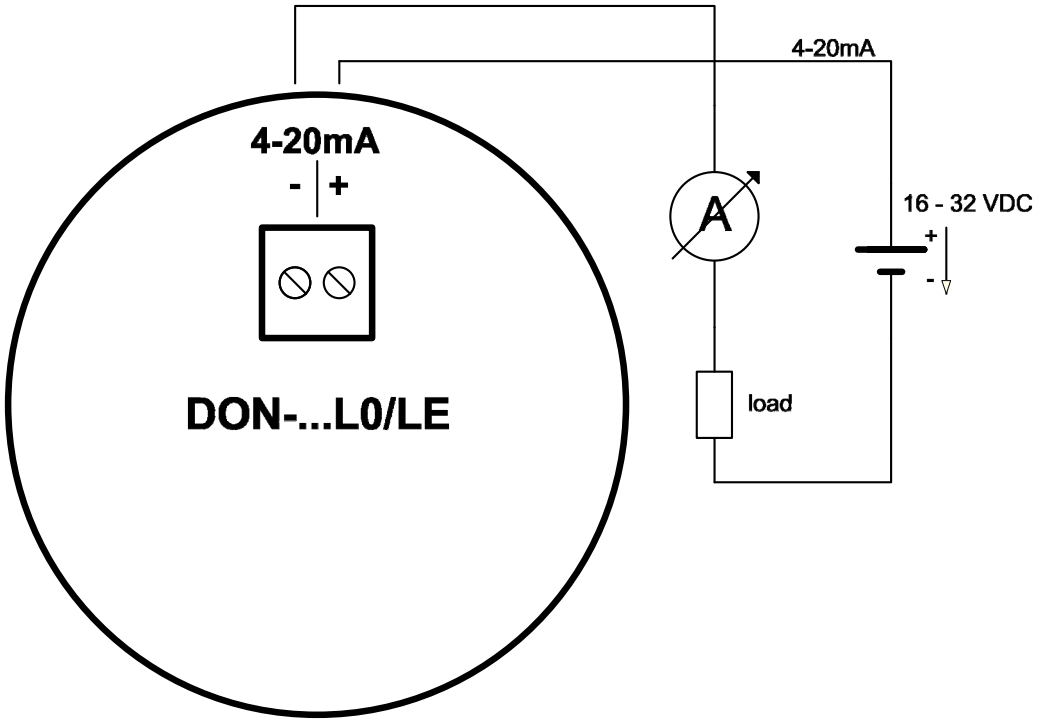
Refer operating instructions supplement ZOK-Ex wiring options E1...E5

7.4.4 For Z2/Z8/Z9 electronics options (2 Hall sensors for direction detection)



7.4.5 Analog output 4-20 mA, 2-line (L0/LE option)

The L0 and LE (explosion hazard) options include a loop-powered 4-20 mA output. The loop is powered by an external voltage source 16 – 32 V_{DC}. The maximum working resistance of loads connected in series (PLC-analogue input / electronic displays) depends on the supply voltage level, namely:
Max. working resistance (ohms) = (+Vs – 9 V_{DC}) / 0.02 A [ohms]
Example: +Vs = 32 V_{DC} => max. working resistance = 1150 ohms
+Vs = 16 V_{DC} => max. working resistance = 350 ohms
The load can be coupled at any point of the current loop, provided the polarity is correct.



All DON devices with L0/LE options are factory-calibrated to the respective measurement range end value. This setting should only be modified by the manufacturer.

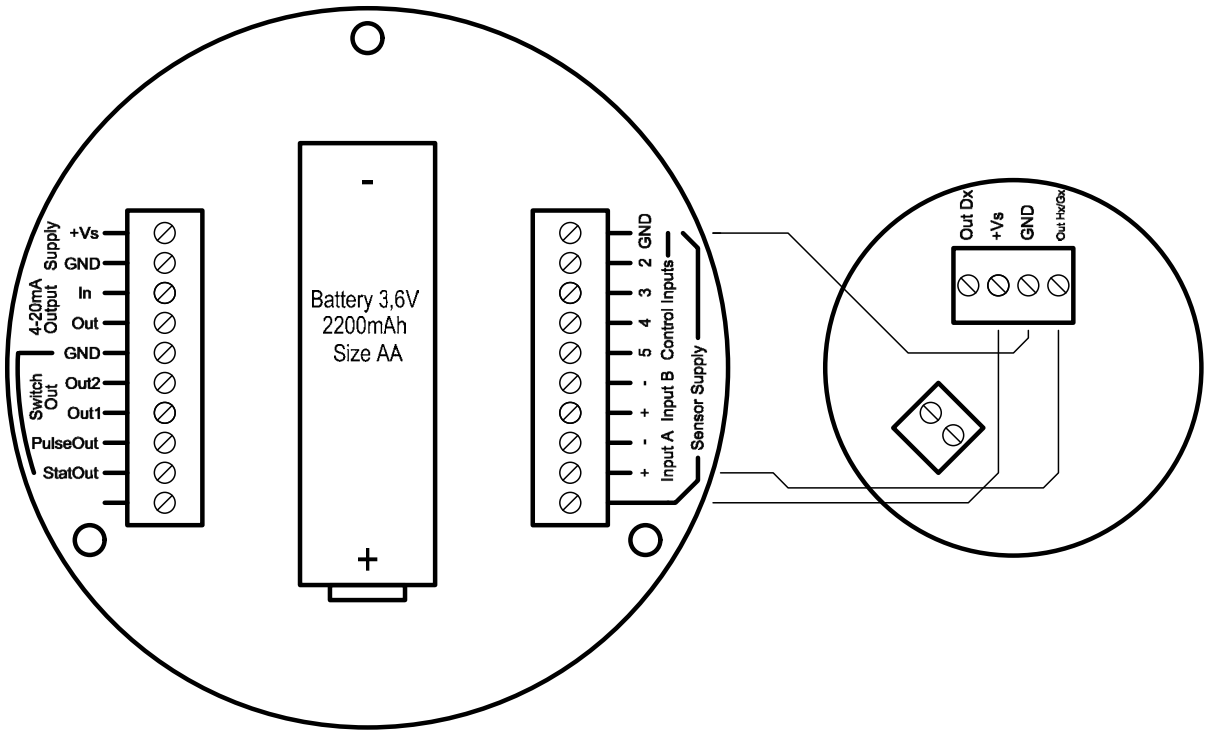
7.4.6 Calibration Factor (scale or K Factor)

The DON flowmeter is delivered with a factory calibration certificate. Within this certificate, a calibration factor is provided. The calibration factor is a specific representation of pulses per unit volume. (i.e. pulses per liter) for that specific meter.
Measurement devices with attached electronics are factory pre-configured to the corresponding calibration factor. Depending on the model, the calibration protocol is based on either the flow rate display or the analog output.
Please reference the appropriate digital display manual for programming details.

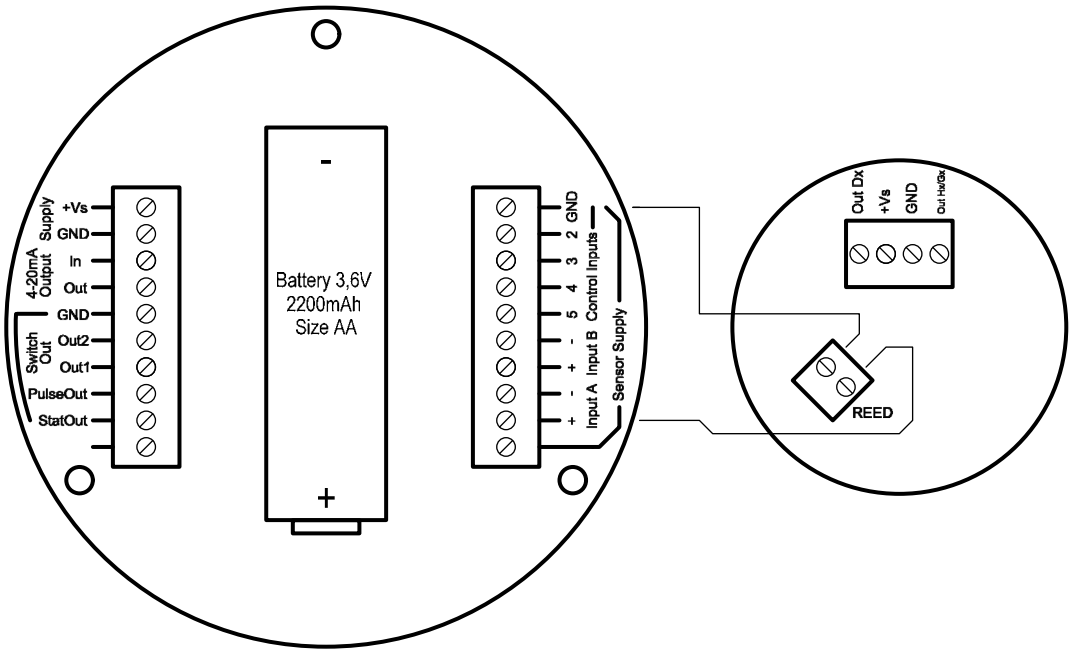
7.5 External wiring with electronic unit ZOK-Zx

7.5.1 Wiring with ZOK-ZxK

a) Circuit with Hall sensor (not for battery operation)

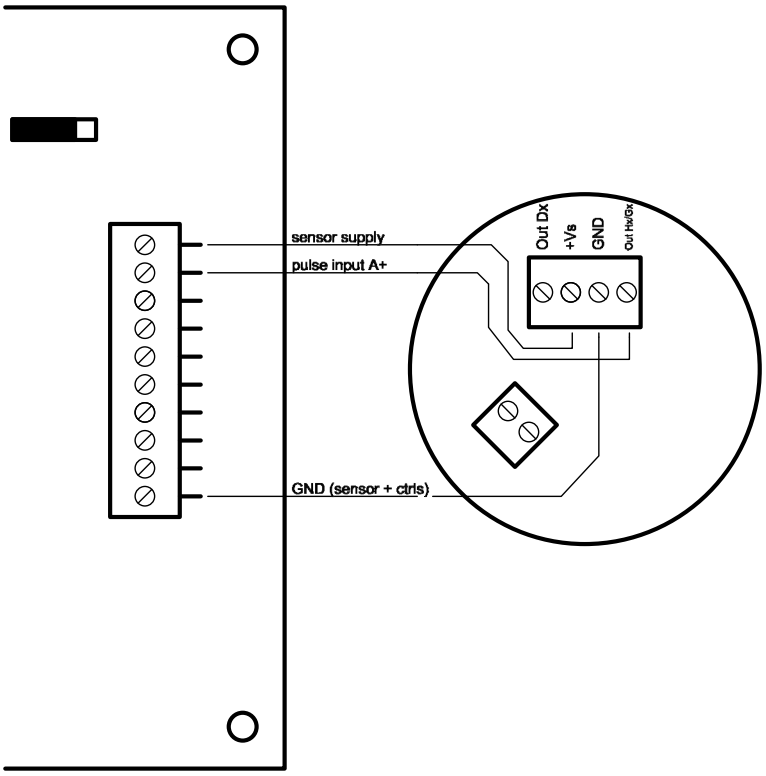


b) Circuit with Reed switch

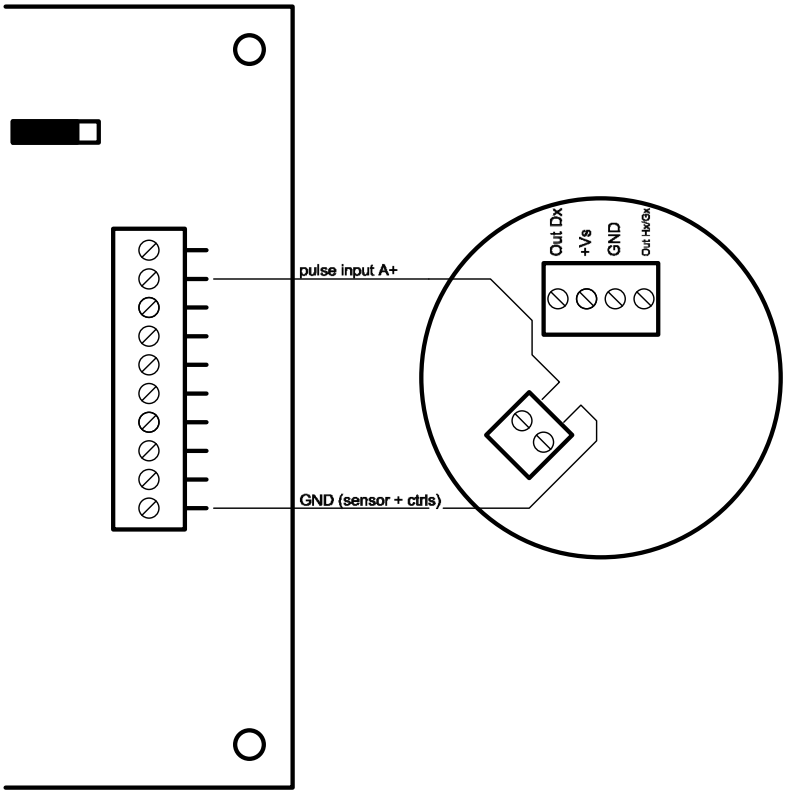


7.5.2 Wiring with ZOK-ZxP

a) Circuit with Hall sensor

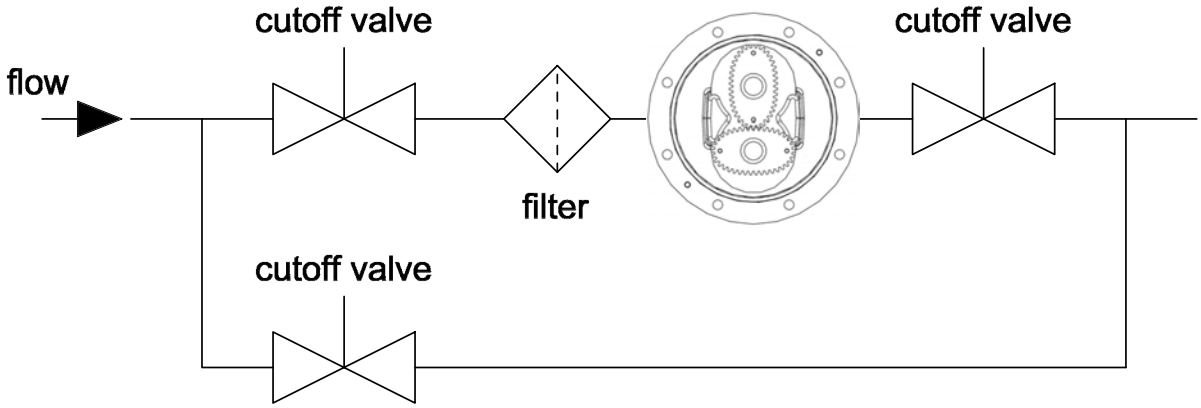


b) Circuit with Reed switch



8. Commissioning

The piping MUST be flushed of debris before installation. Debris such as slag from welding, grinding dust, rust, pipe tape or sealing compound are common within new piping installations and will damage the flowmeter if not flushed or filtered from the process piping before installation and operation.
Before commissioning, the line should be filled slowly and carefully with the medium.
A by-pass system is common for frequent system flushing or frequent meter removal. If a by-pass system is not practical or possible, removal of the gears before flushing is necessary (refer to section 9.1 “Disassembly of Pulse meter”).



For proper operation the flowmeter must be purged of air. During long periods of inactivity or after a flushing, air may be in the piping. Elimination of the air may be achieved by operating the meter at a low flow rate until all the air is eliminated. Damage may occur to the flowmeter if it is run above the maximum rated flow rate or if the maximum differential pressure of 15 psi (1 bar, 100 kPa) is exceeded.

After mechanical and electrical installation according to the guidelines set forth within this user manual, the DON flowmeter is ready for operation.

Warning!
Risk of damage by blocking of measuring mechanism. A missing count signal may indicate a blocked measuring mechanism. The resulting increase in pressure before the device can lead to further damage to the unit and / or the plant. Remove the unit or shut down the plant immediately, if an unplanned absence of the counter signal takes place. Eliminate the cause of the malfunction.

9. Maintenance

Flowmeter maintenance precautions:

- Remove/disconnect power to the flowmeter.
- Ensure that flow supply to the meter is turned off and the system is not under pressure.
- Completely drain the flowmeter
- Confirm that any signal output(s) will not affect the system when de-energized or removed from the circuit.

Oval gear positive displacement flowmeters are mechanical by nature. A periodic maintenance/inspection schedule is suggested for an extended service life. Follow the guidelines within this user manual for the maximum flowmeter performance.

The maintenance/inspection schedule should be determined based off of application factors such as media type (abrasiveness, lubricity, and/or chemical compatibility), flow rate, and operating/maximum temperature and pressure.

9.1 Disassembly of DON with Pulse meter

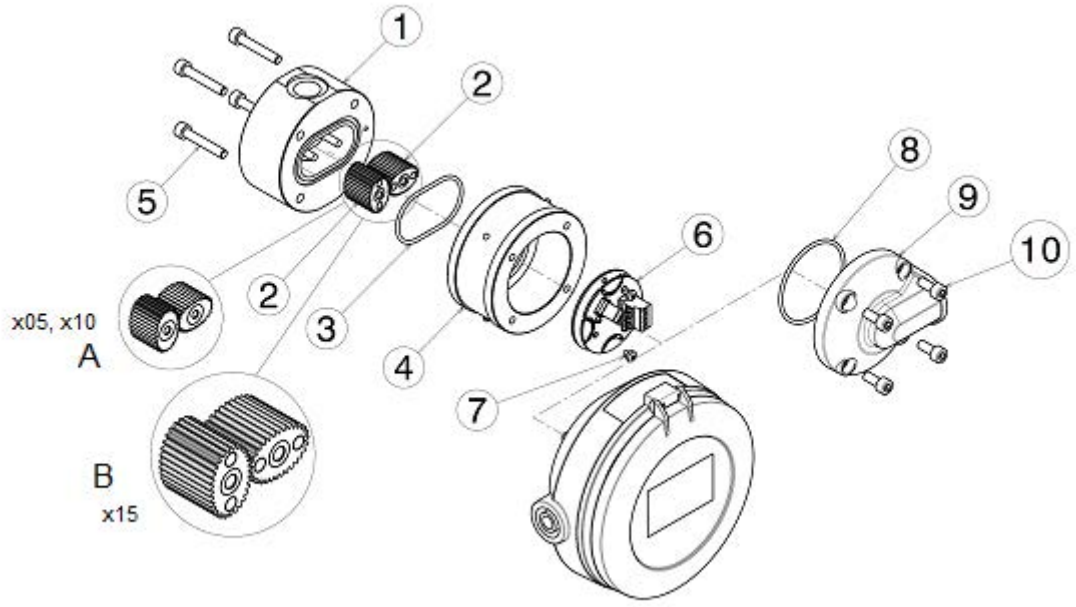
Concerning options Hx, Dx, Gx, Bx, Kx and Rx

9.1.1 Pulse output board removal (refer exploded view diagram)

To remove the pulse output board, remove the 4 electronic cover screws (10), and remove the electronic cover (9). The pulse output board (6) can now be accessed and removed via the removal of the electronic board screws (7).

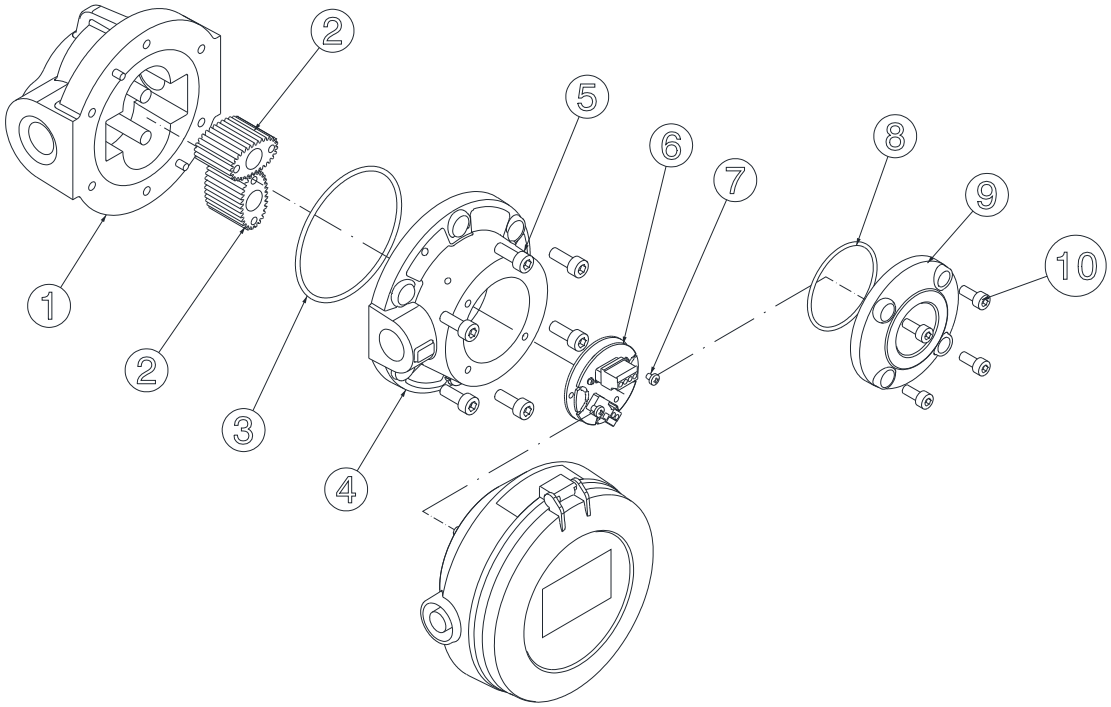
9.1.2 Oval gear removal for DON-x05…DON-x15 (refer exploded view diagram)

For access to the oval wheel, remove the 4 lower meter body screws (5). With care, remove the upper meter body assembly (4) being careful not to damage or misplace the O-ring (3) or changing the positioning of the oval wheels (2) and/or damaging them.
For DON models DON-x05 to DON-x10, when disassembling, please notice the notches located on the meter bodies (1 & 4) face just outside the o-ring groove. These markings must be matched during assembly. Only one oval wheel is equipped with a magnet in these small flow meters. It must be mounted on the bearing shaft opposite to the notch. For these oval wheels, the sides without boring hole for the magnet must face upwards, see detail A. For all other devices (DON-x15 and larger) both gears are equipped with magnets and can be mounted in any position.



9.1.3 Removal of oval gears for DON-x20 (refer exploded view)

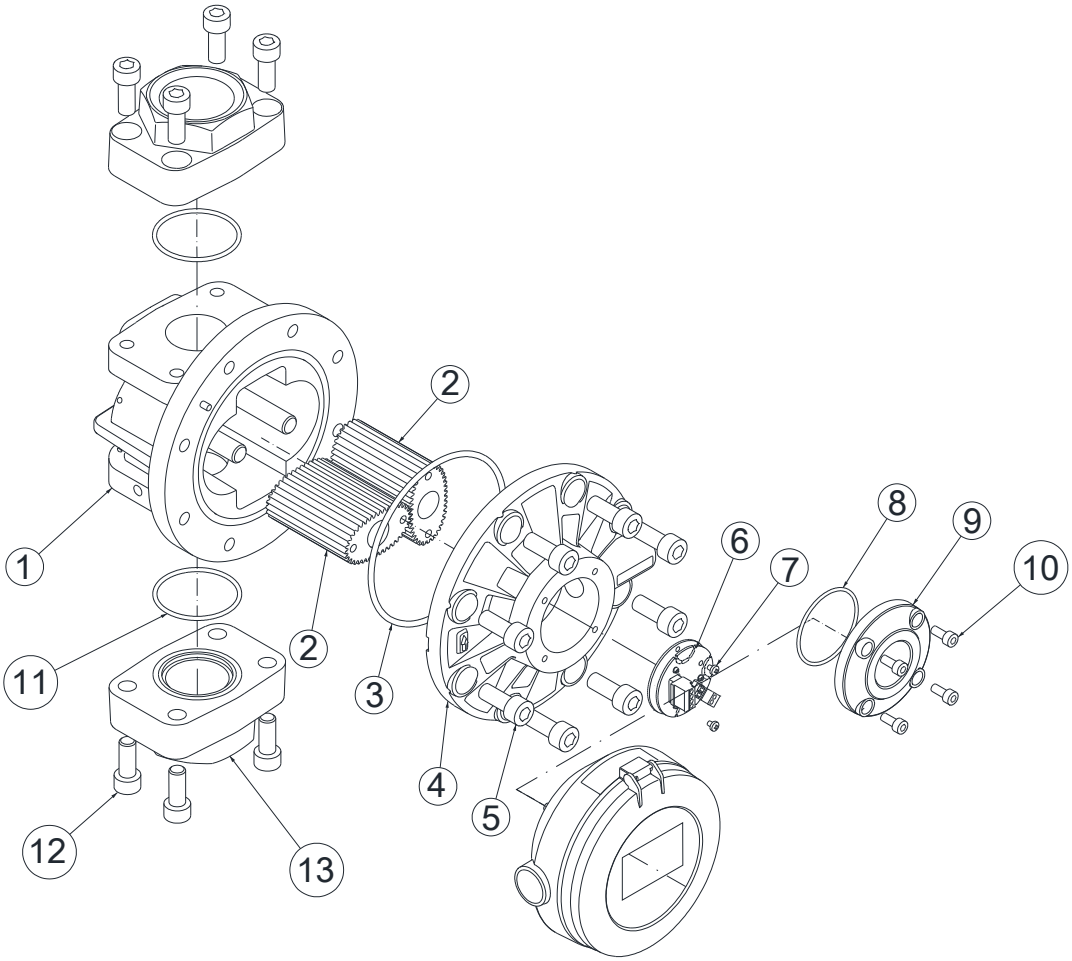
For access to the oval gears, remove the 6 upper meter body screws (5). With care, remove the upper meter body assembly (4) being careful not to damage or misplace the O-ring (3). You can then remove the oval gears (2).



Optional

9.1.4 Removal of oval gears for DON-x25…DON-x40 (refer exploded view)

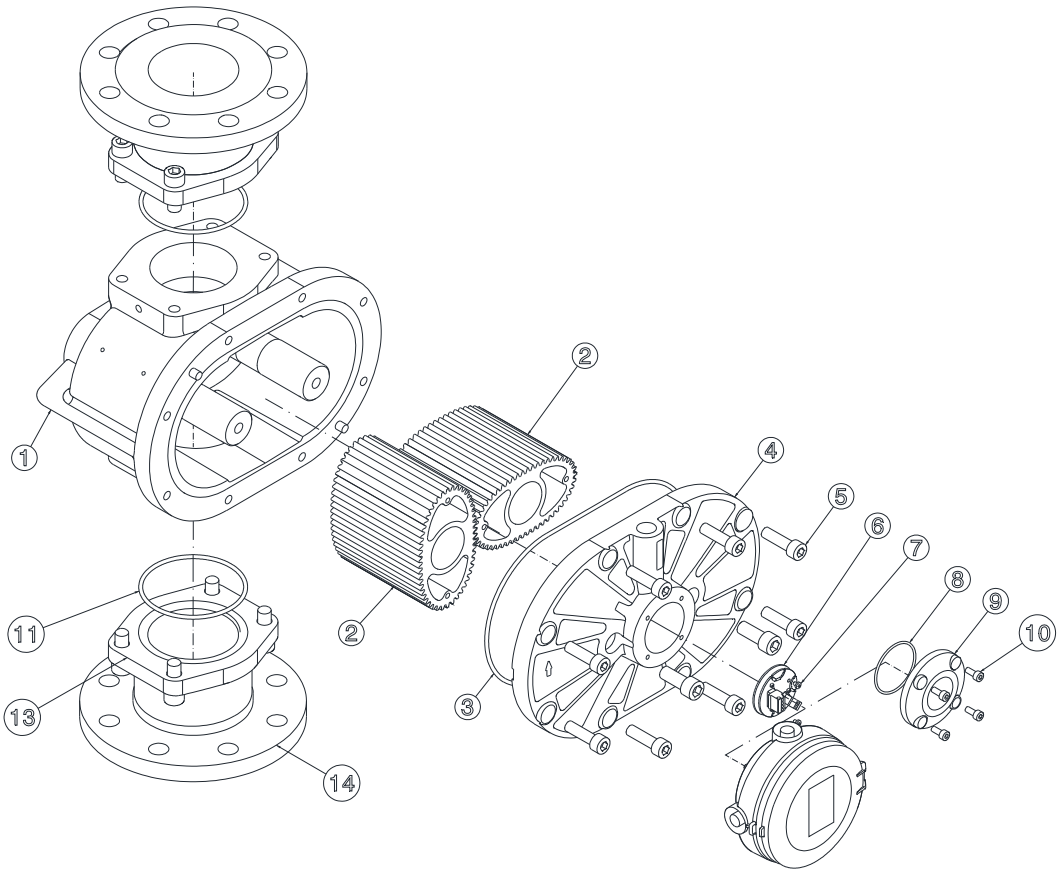
For access to the oval gears, remove the 8 upper meter body screws (5). With care, remove the upper meter body assembly (4) being careful not to damage or misplace the O-ring (3). You can then remove the oval gears (2).



Optional

9.1.5 Removal of oval gears for DON-x45…DON-x60 (refer exploded view)

For access to the oval gears, remove the 8 upper body screws (5). With care, remove the upper body assembly (4) being careful not to damage or misplace the O-ring (3). You can then remove the oval gears (2).



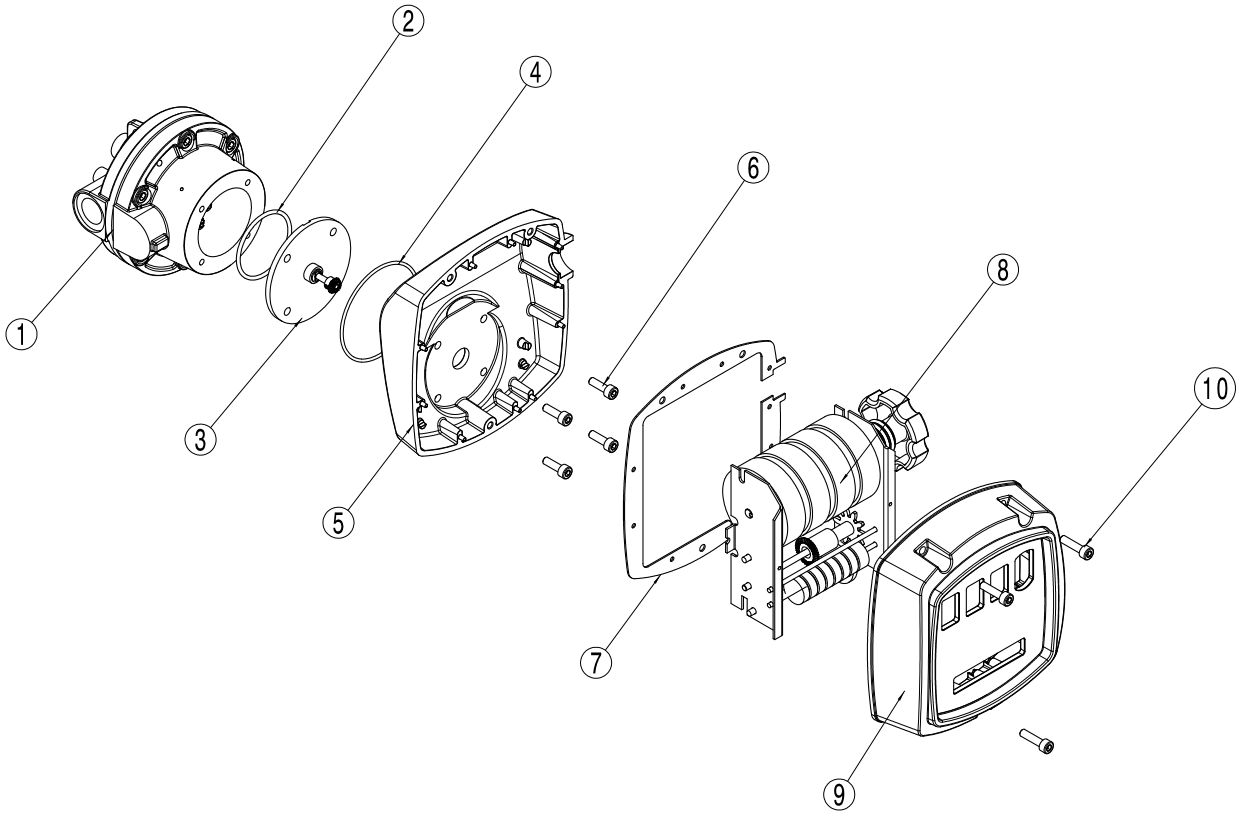
Optional

9.1.6 Structure of the DON-M4 mechanical counting mechanism

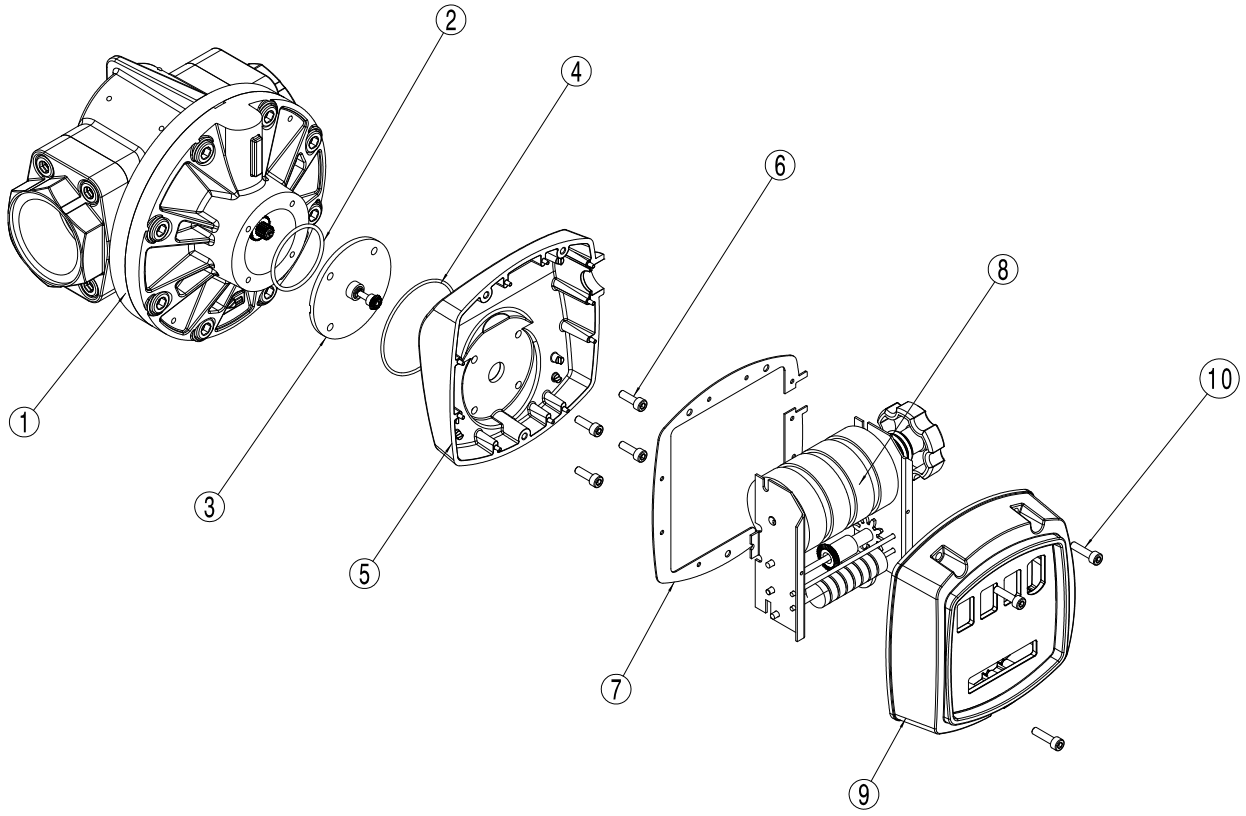
- Loosen three screws (10)
- Remove cover (9)
- Lift out counting mechanism (8)
- Remove seal (7)
- Loosen 4 screws (6)
- Remove lower housing section (5)
- Remove seal (4), washer (3) and seal (2).

When assembling, it is important to ensure the oval gear of (3) is correctly positioned relative to the counting mechanism (8). When mounting the counter mechanism, it is preferable to keep the DON in a horizontal position. This allows the counter mechanism (8) to be mounted distortion-free from above on the cone gear wheel (3).

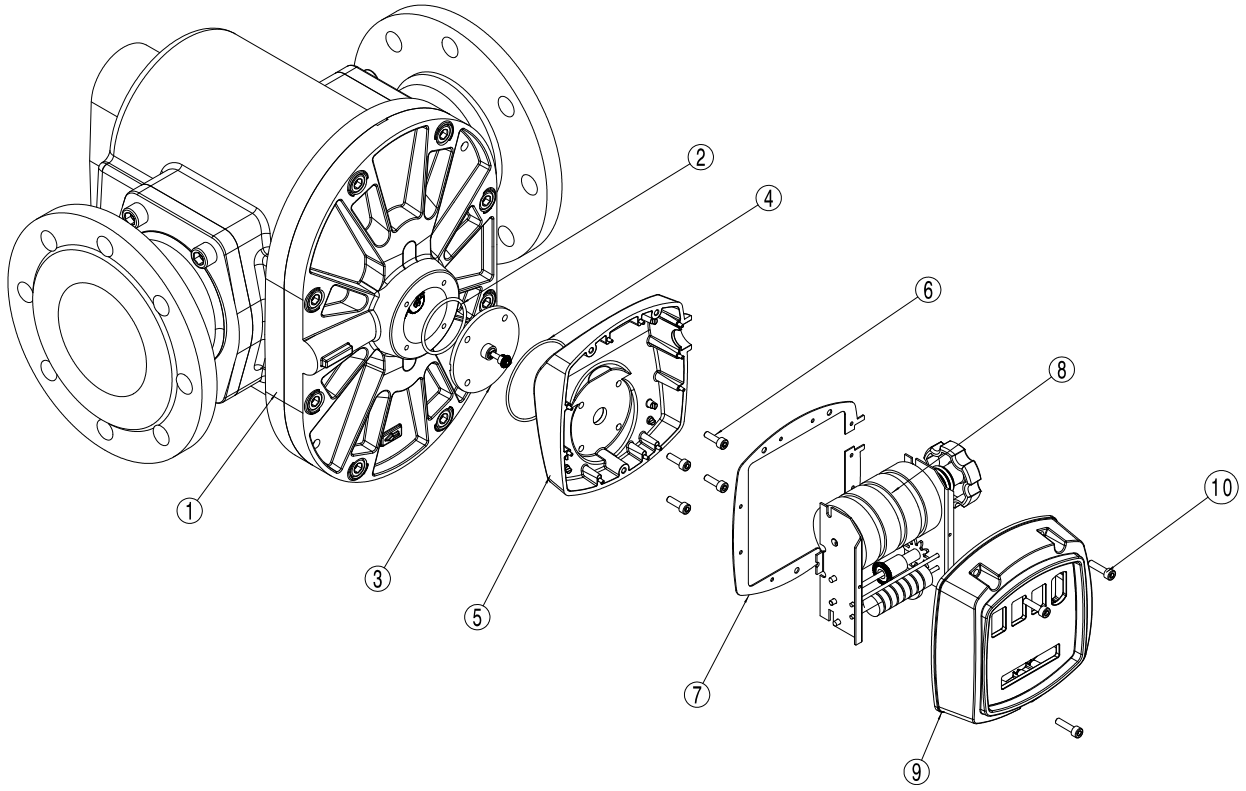
DON-x20



DON-x25 to x40

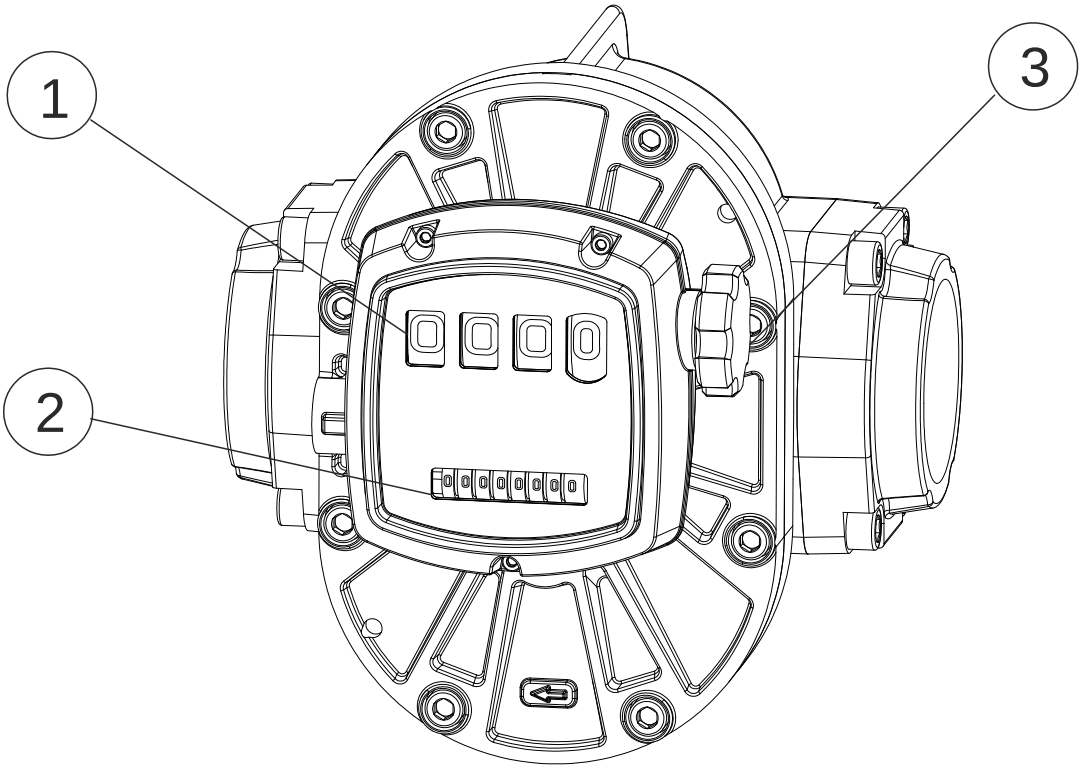


DON-x45 to x60



9.1.7 Adjusting the DON-M4 mechanical counter mechanism

The M4 mechanical counter display comprises a 4-digit mechanical totalizer (1) and an 8-digit sum display (2). Depending on the order option, the display is calibrated in either litres or gallons.
The totalizer display can be reset to zero by turning the function dial (3) in an anti-clockwise direction.



9.2 Demounting of the electronics mounted on a DON with Zx and Ex options

To access the device battery, terminal connections and pulse output board, the electronic cover with display must first be removed in case of flowmeters with built-in electronics. To do this, loosen the 4 screws of the display cover and carefully remove it without pulling out or damaging the connecting cable. During this procedure, be careful not to lose or damage the O ring. The terminal connection, device battery and pulse output board are now freely accessible. To remove the electronics, the screws used to connect the electronics housing to the oval gearbox housing should be loosened.

9.3 Spare Parts

Please consult your closest KOBOLD-Office
Internet: www.kobold.com or www.koboldusa.com

9.4 Inspection (refer Exploded View)

Inspection points will be the following:
O-rings – Inspect for physical or chemical damage or deformation.
Rotors – Inspect for physical damage due to unfiltered media or damage due to chemical attack. Also observe also the magnets, if exposed, for chemical attack.
Measuring Cavity – Inspect for physical damage (scoring) due to improperly filtered media or long term wear and tear.
Axle Shafts – Inspect for physical damage and ensure that the shafts are not loose and do not rotate.

9.5 Re-assembly of DON

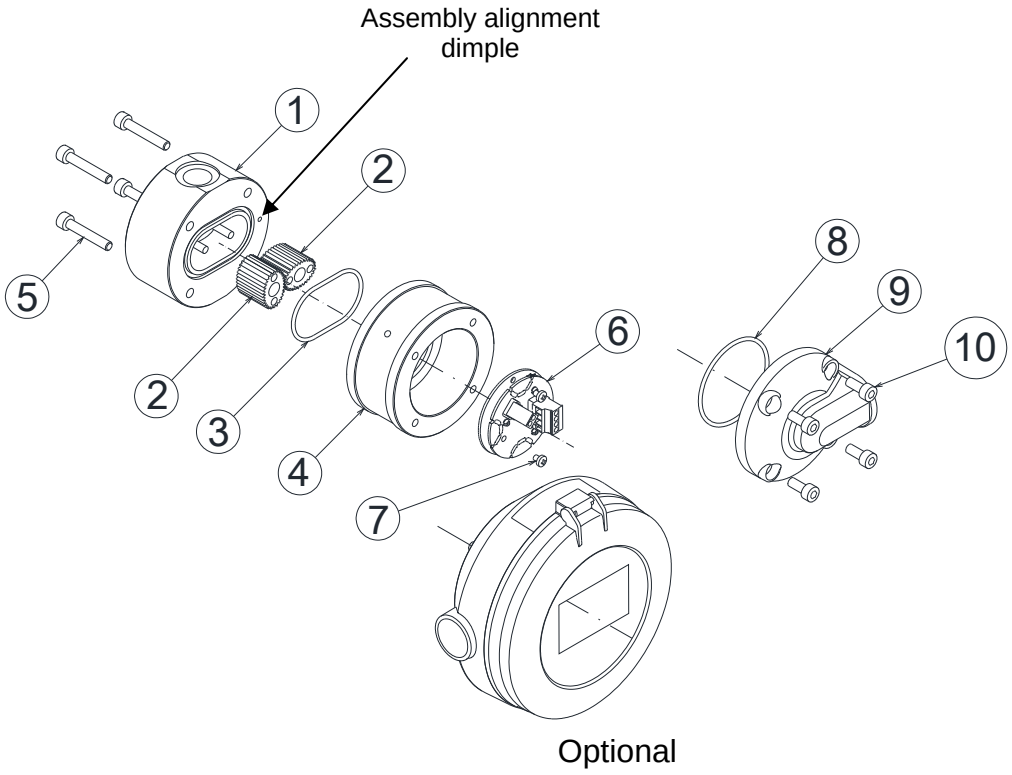
Before re-assembly, please be sure to thoroughly clean all parts.
Care must be taken when reinstalling the rotors such that the magnets should face the pulse output board.

9.5.1 Re-assembly of DON-x05...DON-x15

The small flow meters (DON-x05 and -x10) have notches on both housing parts (1 and 4). These markings must be matched during assembly. Only one oval gear is equipped with magnets in these small flow meters. It must be mounted on the bearing shaft opposite to the notch. For all other devices (DON-x15 and larger) both gears are equipped with magnets and can be mounted in any position.
Both gears are properly mounted when they are at 90 ° to each other. They have to be easy to move.
Check for correct seating, wear of bearing shafts and bearings by slowly turning the gears by hand.

Then insert the O-ring (3) into the groove of the measuring housing (1) and assemble both parts (1 and 4). For the smaller devices (DON-x05 and DON-x10), make sure the markers are in line.

The hexagon socket screws (5) are inserted and alternately tightened crosswise opposite to each other. Afterwards, the screws should be tightened with a torque according to table chapter 9.5.2 in the same order. By following this procedure, the flow casings are evenly mounted.
Then, if necessary, mount the pulse output board, the cover with the cable gland or the attached electronics. Make sure the O-ring (8) is seated correctly.



9.5.2 Re-assembly of DON-x20...DON-x40

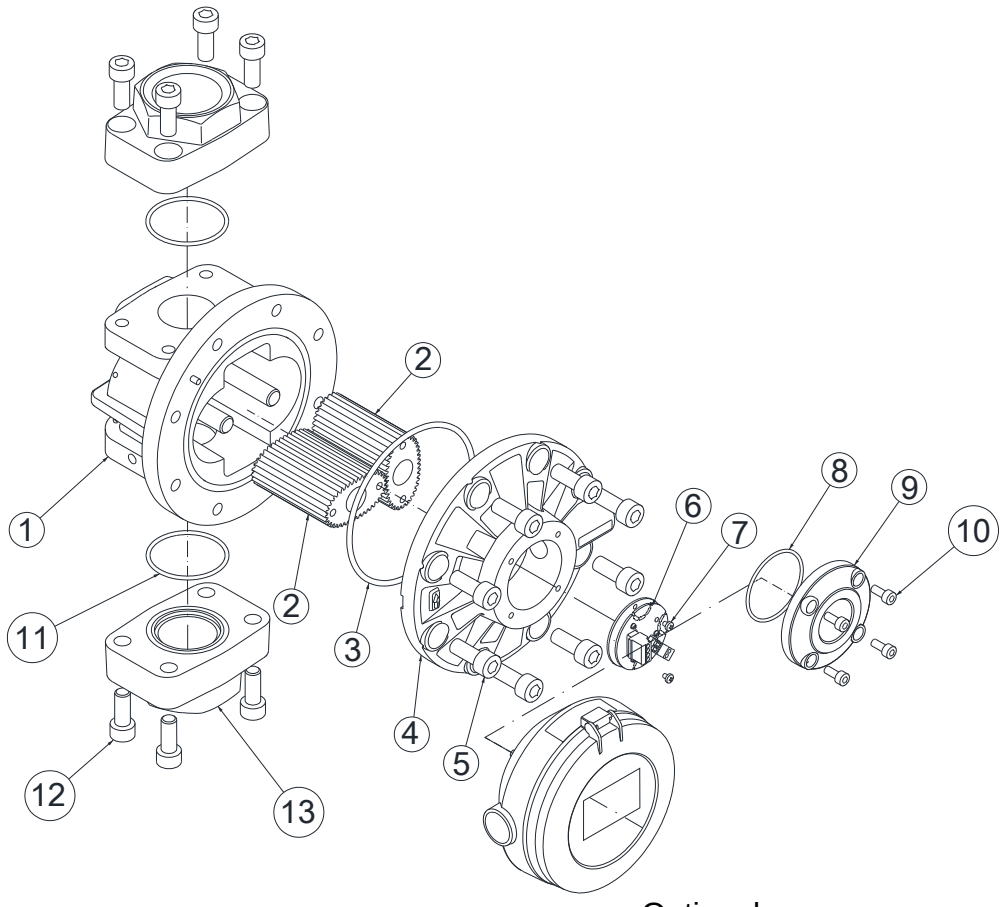
Both oval gears are placed on the axle shafts with the magnets oriented towards the upper meter body (4). Verify that the axle shafts are not loose. Both oval gears are equipped with embedded magnets, allowing them to each be mounted on either axle.
Install the rotors exactly perpendicular from each other (90° in orientation). They will only work if installed precisely. Manually test full rotation after installation as the rotors will not completely rotate freely unless installed precisely 90° from each other.

Proper placement of the O-ring within the groove is necessary for leak free operation. After placement, items (1 & 4) will then require assembly.

Tighten the upper meter body to the lower meter body (1 & 4) with the screws (5) in an alternating pattern (1, 3, 2, 4). Tighten to each to a torque according to table chapter 9.5.2. The alternating tightening procedure is preferred for proper and even assembly.

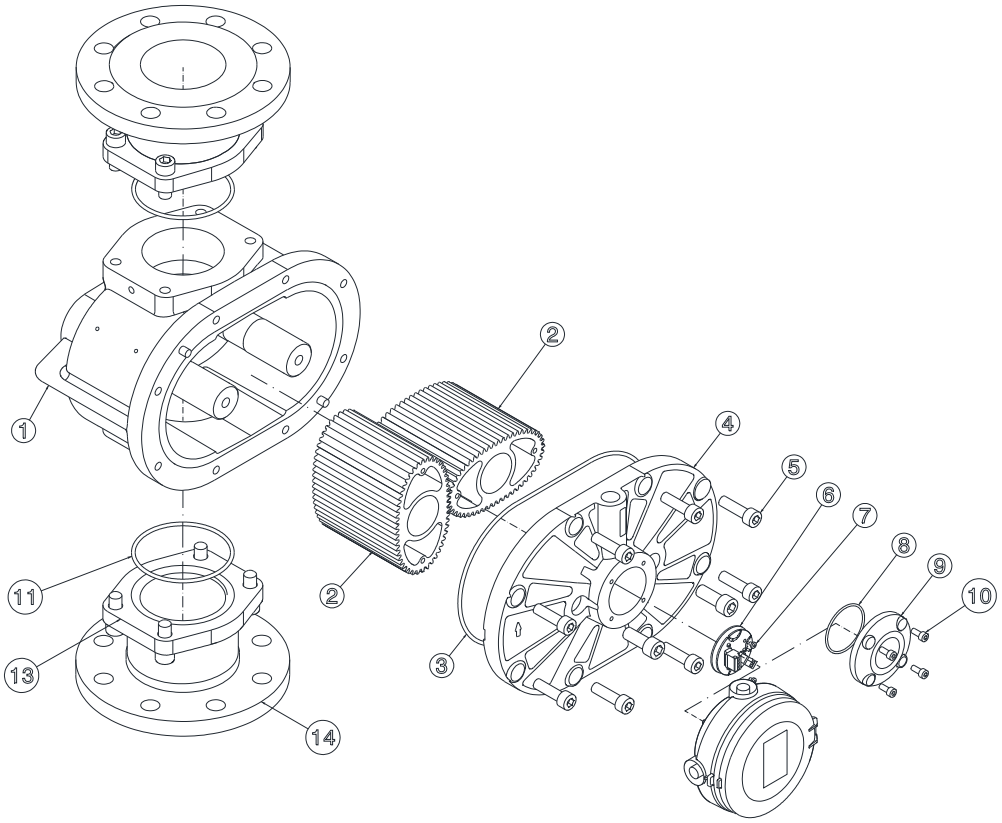
Install the pulse detector board, the o-ring into the provided groove, and then install either the electronic cover (9) or optional electronic assembly.

Exploded view of DON-x25...DON-x40



Optional

Exploded view of DON-x45...DON-x60



Optional

Table tightening torque

Model	Housing screws		Connections and axes	
	Thread	Torque [Nm]	Thread	Torque [Nm]
x05...x15	M5	6	-	-
x20...x25	M6	10	M8	16
x20...x25*	M6	20	M8	16
x30...x40	M10	32	M10	32
x45...x60	M10	32	M12	56

* Steel screws with Geomet coating for high pressure version

10. Technical Data

Material:

DON-1		
	Body:	aluminium
	Oval gears:	PPS GF 30/PTFE
	Axes:	stainless steel 1.4404
DON-2		
	Body:	stainless steel 1.4404 DON-x05…DON-x15 stainless steel 1.4404/1.3955 DON-x20…DON-x60
	Oval gears:	stainless steel 1.4404 DON-x05…DON-x40 stainless steel 1.3955 DON-x45…DON-x60
	Bearing:	carbon graphite
	Axes:	stainless steel 1.4404
DON-8		
	Body:	stainless steel 1.4404 DON-x05…DON-x15 stainless steel 1.4404/1.3955 DON-x20…DON-x60
	Oval gears:	PPS GF 30/PTFE
	Axes:	stainless steel 1.4404
O-Rings:		medium temperature FKM: -20..+120 °C NBR: -20..+100 °C FEP-O-seal/FKM: -15…+130 °C
Cover for cable connection:		polyamide PA6 GF35 UL94 HB/VO DON-1 stainless steel 1.4404 DON-2 und DON-8
Accuracy:		± 1 % of reading (DON-x05..DON-x15) ± 0.5 % of reading (DON-x20..DON-x60) ± 0.2 % of reading (DON-x20..DON-x60); with optional Z3/E3-electronics based on linearization function ± 1 % of reading (option M)
Additional max. inaccuracy for analog outputs:		± 0,15 % ME
Repeatability:		typ. ± 0.03 %
Protection class:		IP 66/67 (IP65 for M4)
Medium temperature:		-20...+80 °C for options –L0, Z, M4 and -20 °C…+120 °C for pulse output and options Z with cooling fins
Ambient temperature:		-20...+80 °C, option M4 0 °C…+60 °C
Cable entry:		M20x1.5, ½“ NPT

ATEX marking	
(option E1/E3):	⟨Ex⟩ II 2G Ex ia IIC T4 Gb
(option HE, BE, DE, KE, GE, LE, RE):	⟨Ex⟩ II 2G Ex db IIC T4/T6 Gb ⟨Ex⟩ I M2 Ex db I Mb
IECEx marking	
(option E1...E5):	Ex ia IIC T4 Gb
(option HE, BE, DE, GE, LE, RE):	Ex db IIC Ex db I Mb

R0/RE electronics options:	max. switching voltage:	30 V_{DC}
(Reed switch pulse output)	max. switching current:	200 mA
	max. switching capacity:	10 W
	Service life:	> 2*10^6 switching cycles (at 5 V_{DC} and 10 mA)

H0/HE/B0/BE electronics options:

	Supply voltage:	8 to 30 V_{DC}
(Hall sensor + reed switch pulse output)	Supply current:	max. 5 mA (without load)
	Hall pulse output:	active push-pull, max. 100 mA, short-circuit-proof HIGH level: Min. +Vs – 1.3 V LOW level: max. 1.3 V
	Reed pulse output:	as for R0/RE

HU electronics option:

	Supply voltage:	5 to 30 V_{DC}
(Hall sensor + reed switch pulse output)	Hall pulse output:	NPN output, int. pullup 4.7 kΩ
	max. switching current:	200 mA
	Reed pulse output:	as for R0/RE

G0/GE and K0/KE electronics options:

	Supply voltage:	8 to 30 V_{DC}
(Pulse output hall sensor High resolution)	Supply current:	max. 8 mA (without load)
	Hall pulse output:	like H0/HE

D0/DE electronics options:	Supply voltage:	8 to 30 V_{DC}
(2x Pulse output hall sensor)	Supply current:	around 8 mA
	Hall pulse output:	like H0/HE
	Current direction:	positive: Hx leading over QUAD negative: QUAD leading over Hx

L0/LE electronics options:	Supply voltage:	16 to 32 V_{DC}
(Current output 4-20mA)	Analog output:	4 20 mA, 2-wire
	Max. working resistance:	750 ohms (at 24 V_{DC})

Z1/Z2/Z3 electronics options (common properties):

Supply voltage:	8 to 32 V_{DC}
Battery operation (only Z1/Z3)	
Battery:	3.6 V/2200 mA AA size
Display:	LCD, graphic 128x64 Backlighting adjustable
Operation:	4 buttons
Housing:	plastic, PA6, GF-reinforced
Cable inlet:	3x M20x1.5, prepared
Electrical connection:	plug-in terminals

Z1 electronics option:	Signal inputs:	2x, configurable
(Dual counter)	Daily/overall counter:	1x per input
	Signal outputs:	none

Z2 electronics option:	Signal inputs:	1x, configurable
(Batching device)	Batching function:	2-stage
	Signal outputs:	relay output

Z3 electronics option:	Signal inputs:	2x, configurable
(Flow controller)	Signal outputs:	current output 4-20 mA 2-wire / 3-wire pulse output, scalable status output
	Max. working resistance of current output:	750 ohms (at 24V_{DC})

M4 mechanical counter:	4-digit quantity indication in litres or gallons 8-digit sum display

Electronic options –E1/E2/E3/E4/E5: see operating instructions supplement ZOK-Ex

Maximum Pressure (threaded version)

<table>
<tr><th rowspan="2">Model</th><th colspan="4">Maximum pressure (bar)</th></tr>
<tr><th>DON-1</th><th>DON-2/8</th><th>DON-1.. (option – M4)</th><th>DON-2/8 (option – M4)</th></tr>
<tr><td>DON-x05</td><td rowspan="6">64</td><td rowspan="6">100</td><td>-</td><td>-</td></tr>
<tr><td>DON-x06</td><td>-</td><td>-</td></tr>
<tr><td>DON-x10</td><td>-</td><td>-</td></tr>
<tr><td>DON-x15</td><td>-</td><td>-</td></tr>
<tr><td>DON-x20</td><td rowspan="3">40</td><td rowspan="2">40</td></tr>
<tr><td>DON-x25</td></tr>
<tr><td>DON-x30</td><td rowspan="2">40</td><td rowspan="2">50</td><td rowspan="2">30</td></tr>
<tr><td>DON-x35</td></tr>
<tr><td>DON-x40</td><td rowspan="5">16</td><td rowspan="5">16</td><td rowspan="5">16</td><td rowspan="5">16</td></tr>
<tr><td>DON-x45</td></tr>
<tr><td>DON-x50</td></tr>
<tr><td>DON-x55</td></tr>
<tr><td>DON-x60</td></tr>
</table>

with flanges, maximum pressure rating is above or as per flange rating, whichever is lower

Max. Flowrate Multiplier (for higher viscosities)

Viscosities (cP)	**Standard rotor**	**Special cut rotor**
≤ 1000	1	1
≤ 2000	0,5	1
≤ 4000	0,42	0,84
≤ 6000	0,33	0,66
≤ 8000	0,25	0,5
≤ 30000	0,15	0,3
≤ 60000	0,12	0,25
≤ 150000	0,1	0,2
≤ 250000	0,05	0,1
≤1000000	0,025	0,05

Special cut rotors for higher viscosities
For viscosity > 1000 cP, special cut rotors option „S“ should be used to reduce pressure drop. This applies to DON-x15 and larger sizes. For higher viscosities, the flowmeter max. flowrate is de-rated according to the attached chart.
Example: DON-x25 measuring oil at 8 000 cP,
max. flow 150 LPM x 0.5 = 75 LPM new maximum flow rate.

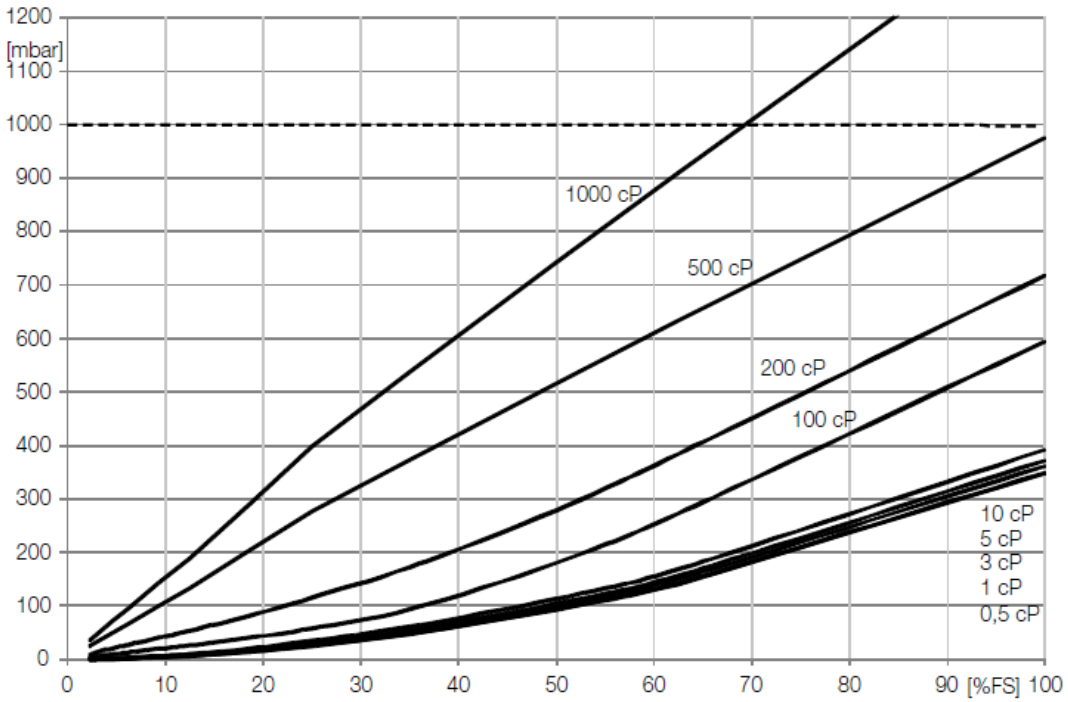
Output Pulse Resolution

Model	Measuring range [l/min]	Pulse / liter					
		Reed switch Rx	Hall sensor Hx	Hall sensor Bx	Quadr. hall sensor Dx	Hall sensor high resolution Gx	Hall sensor high resolution Kx
DON-X05	0.5 - 36 L/h	*2670*	*2670*	-	*2670*	*11320*	*5340*
DON-X06	2 - 36 L/h	*2670*	*2670*	-	-	-	-
DON-X10	2 - 100 L/h	*1062*	*1062*	-	*1062*	*4248*	*2124*
DON-X15	15 – 550 L/h	*351*	*702*	*351*	*702*	-	*1404*
DON-X20	1-40	*82*	*163*	*82*	*163*	-	-
DON-X25	10 - 150	*26*	*104*	*26*	*52*	-	-
DON-X30	15 - 250	*13.5*	*55*	*13.5*	*27*	-	-
DON-X35	30 - 450	*6.4*	*25.5*	*6.4*	*13.5*	-	-
DON-X40	50 - 580	*4.9*	*19.6*	*4.9*	*9.8*	-	-
DON-X45	35 - 750	*2.57*	*10.3*	*2.57*	*5.15*	-	-
DON-X50	50 - 1000	*1.5*	*5.9*	*1.5*	*3*	-	-
DON-X55	75 - 1500	*1.05*	*4.2*	*1.05*	*2.1*	-	-
DON-X60	150 - 2500	*0.56*	*2.3*	*0.56*	*1.15*	-	-

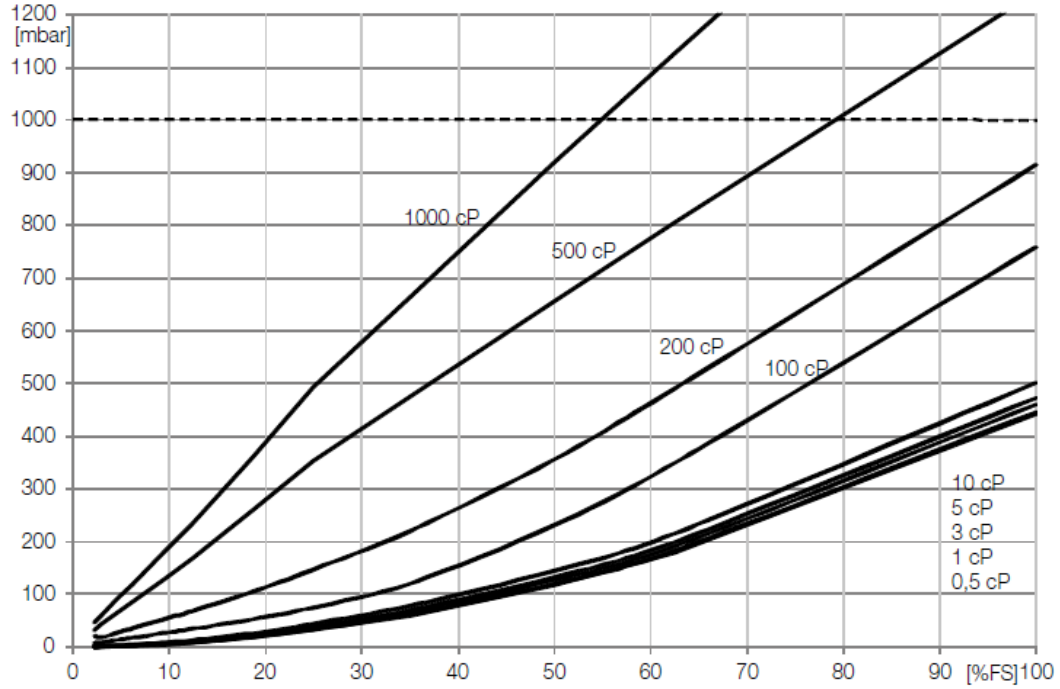
The values in above mentioned table are only approximate guidelines. The actual value for pulse rate can deviate from the values in this table and is mentioned in calibration certificate delivered with the flowmeter.

11. Pressure drop curves

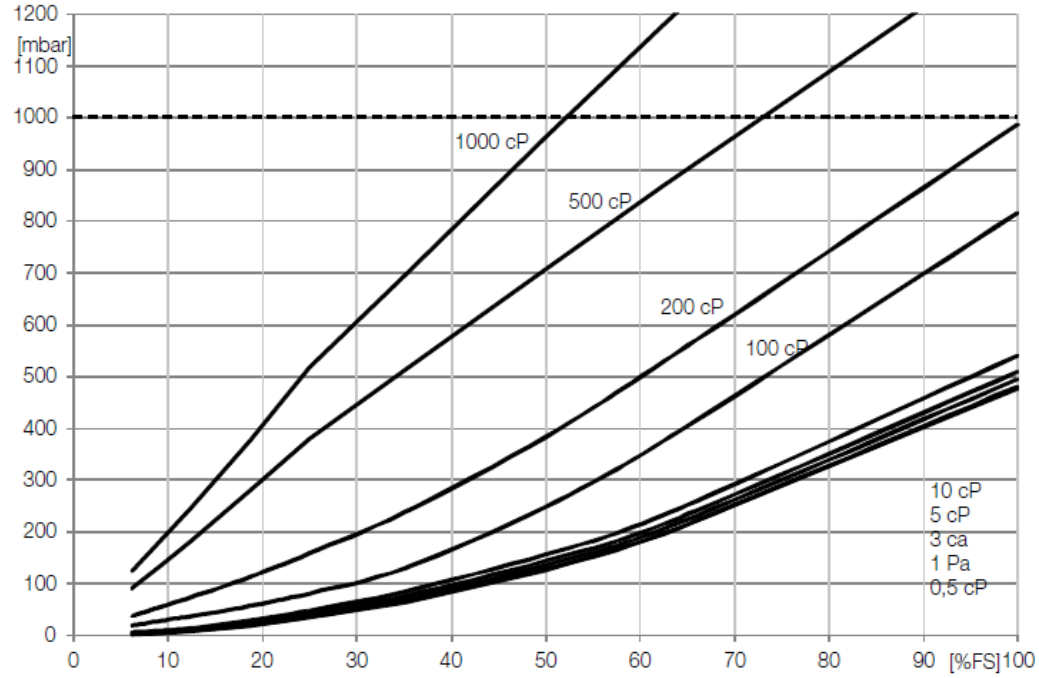
x05/x06/x10



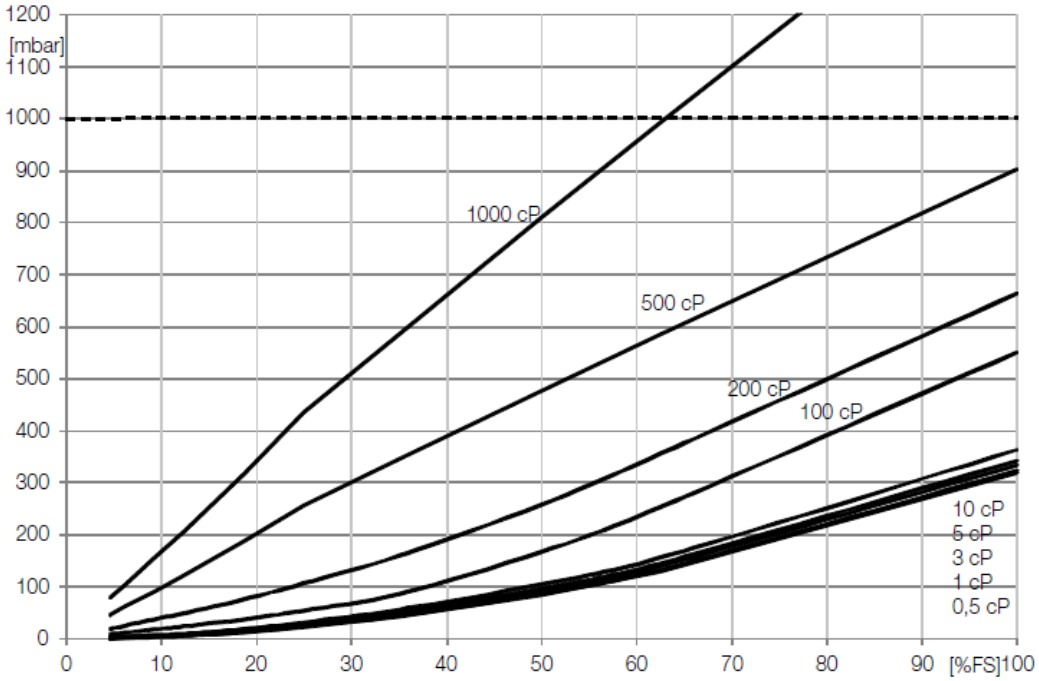
x15/x20



x25/x30/x35/x40



x45/x50/x55/x60



12. Order codes

Note: See KOBOLD USA Datasheet for USA Order Codes

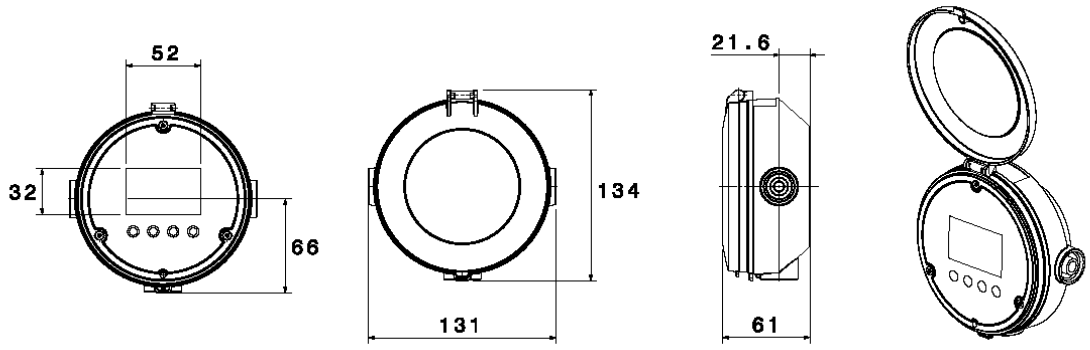
Example: DON-105H R1 1 L0 M 0

Measuring range	Housing material[4]			Connection	O-Ring Material	Electronics	Cable entry	Option
[l/min]	Aluminium with PPS Rotor	Stainless steel	St. st. with PPS rotor					
0.5 – 36 l/h	**DON-105H**	**DON-205H**	**DON-805H**	**R1** = G ⅛ **N1** = ⅛" NPT	**1** = FKM **3** = FEP-O-ring **4** = NBR	**R0** = Reed switch pulse output **RE** = reed switch pulse output ATEX (Exd) **H0** = hall sensor (Push-Pull)/ reed switch, pulse output **HE** = H0 + ATEX **HU** = NPN pulse output (Hall/Reed), supply 5-30 V_{DC} **B0**[3] = for pulsating flow **BE**[3] = B0 + ATEX (Exd) **T0**[8] = Hall sensor (Push-Pull), +150 °C, pulse output **K0**[9] = high resolution (x2) Hall sensor (Push pull) **KE**[9] = K0 + ATEX (Exd) **G0**[2] = high resolution (x4) Hall sensor (Push pull) **GE**[2] = G0 + ATEX (Exd) **D0**[11] = Quad. Hall sensor 2 phased outputs (Push-Pull) **DE**[11] = D0 + ATEX (Exd) **L0** = 4…20 mA loop powered analogue output **LE** = L0 + ATEX (Exd) **Z1** = dual LCD totalizer **Z2** = Dosing unit LCD **Z3** = LCD totalizer/ rate, outputs: 4-20 mA, alarm, pulse (ZOK-Z3) (impulses not for battery supply **Z6** = Z1 + B0 **Z7** = Z3 + B0 **Z8** = Z1 + D0 **Z9** = Z3 + D0 **E1**[12] = Z1 + ATEX/IECEx (Exi) **E2**[12] = Z2 + ATEX/IECEx (Exi) **E3**[12] = Z3 + ATEX/IECEx (Exi) without switching or pulse outputs **E4**[12] = E3 + HART **E5**[12] = E3 + pulse or switching outputs 4-20 mA	**M** = M20 **N** = ½" NPT **S**[7] = M20 + cooling fin **T**[7] = ½" NPT + cooling fin	**0** = without **Y** = special option, (specify in clear text) e.g. **Y** = check valve (from DON-x30) **Y**[3] = special cut rotor for higher viscosities
2-36 l/h		**DON-206H**	**DON-806H**	**R1** = G ⅛ **N1** = ⅛" NPT				
2 – 100 l/h	**DON-110H**	**DON-210H**	**DON-810H**	**R2** = G ¼ **N2** = ¼" NPT				
15 – 550 l/h	**DON-115H**	**DON-215H**	**DON-815H**	**R3** = G ⅜ **N3** = ⅜" NPT				
1 – 40	**DON-120H**	**DON-220H**	**DON-820H**	**R4** = G ½ **N4** = ½" NPT **H4**[5] = G ½ (100 bar) **P4**[5] = ½" NPT (100 bar)				
10 – 150	**DON-125H**	**DON-225H**	**DON-825H**	**R6** = G 1 **N6** = 1" NPT **F6** = DIN flange PN 16/40 (DN 25) **A6** = ANSI flange 150 lbs (1") **B6** = ANSI flange 300 lbs (1") **H6**[5] = G 1 (100 bar) **P6**[5] = 1" NPT (100 bar)				
15 – 250	**DON-130H**	**DON-230H**	**DON-830H**	**R8** = G 1½ **N8** = 1 ½" NPT **F8** = DIN flange PN16/40 (DN40) **A8** = ANSI flange 150 lbs (1½") **B8** = ANSI flange 300 lbs (1½")				
30 – 450	**DON-135H**	**DON-235H**	**DON-835H**	**R9** = G 2 **N9** = 2" NPT **F9** = DIN flange PN16 (DN50) **C9**[8] = DIN flange, PN 40 (DN50) **A9** = ANSI flange 150 lbs (2") **B9**[1] = ANSI flange 300 lbs (2")				
50 – 580	**DON-140H**	**DON-240H**	**DON-840H**					
35 – 750	**DON-145H**	**DON-245H**	**DON-845H**	**RB** = G3 **NB** = 3" NPT **FB** = DIN flange PN 16 (DN80) **AB** = ANSI flange 150 lbs (3")				
50 – 1000	**DON-150H**	**DON-250H**	**DON-850H**					
75 – 1500	**DON-155H**	**DON-255H**	**DON-855H**	**RC** = G4 **NC** = 4" NPT **FC** = DIN flange PN16 (DN100) **AC** = ANSI flange 150 lbs (4")				
150 – 2500[10]	**DON-160H**	**DON-260H**	**DON-860H**			**M4**[6] = mech. totaliser 4-digit	**0** = without	

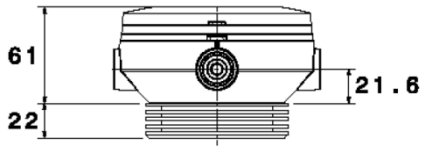
[1] only for DON-x35
[2] only for DON-x05...DON-x10
[3] Not for DON-x05...DON-x10
[4] Replace 'H' with 'G' to order GPH (GPM)
[5] With steel screws, only for DON-2… and DON-8…
[6] Only for DON-x20…DON-x60.
Please specify the flow direction in clear text while ordering (possible flow directions "bottom to top" or "left to right" or "right to left".
Standard flow direction is from bottom to top.
[7] Only for electronic options –Zx, not for DON-1…and DON-8…
[8] Only for DON-2
[9] Only for DON-x05, -x10, -x15 without Reed switch
[10] Calibrated up to 2000 l/h. Higher flow rate calibration on request
[11] Not for DON-x06
[12] Without backlighting

13. Dimensions Electronic Options Ex/Zx

Option -M/-N (standard)



Option -S/-T (with cooling fin)



14. Troubleshooting

Oval gear flowmeters have two clearly distinct portions: one of which is mechanical, wetted areas with the oval gears surrounded by a housing, and the other is the electrical area, which includes the pulse output board.

Details of some key troubleshooting steps will now be provided. Please also refer to the instructions on troubleshooting errors contained on the following page.

Step 1 - Check application, installation and set-up.
Carefully read the section on mechanical installation to ensure full knowledge of all relevant installation and application factors which may affect the operation of the counter. These include pulsation, trapped air or selecting the wrong counter, including incorrect flow rate, temperature or pressure, or material incompatibility. Refer to the section on electrical installation to ensure correct cabling.

Step 2 - Check for blockages.
For new and modified systems in particular, the most frequent cause of error or sub-optimal counter operation is internal system or counter blockages due to foreign particles, such as beads of condensate, sealing tape residues or mixtures of deposits, rust, etc.

Step 3 - Guarantee flow rate.
Flow stopping or a flow rate declining below the usual limit may be attributable to a blocked screen, flowmeter rotors which are stuck or damaged, a defective pump, closed valves or an insufficient liquid level in the storage tank.

Step 4 - The oval gears in the counter must revolve.
This rotation is audible: try holding a screwdriver blade against the counter housing and push the handle right against your earlobe. Test the counter as required with flow switched on and off, to ensure you are familiar with the audible sound of rotation.

Step 5 - Ensure that pulses are generated when liquids flow.
Here, a multimeter is often not fast enough to capture the pulse sequence of the reed switch or the Hall Effect sensor. However, an oscilloscope will allow you to observe the output pulse sequence. When testing the reed switch pulse, a pull-up resistor must be installed between the single connection of the reed switch and the supply voltage, while the other connection must be connected to the reference potential of the measurement device (oscilloscope) (see electrical installation).

Step 6 - Confirm device operation.
If a mounted electronic component is connected to the DON, check the functions by simulating a pulse input. A reed switch pulse input can be simulated by a swift and pulse-driven short-circuiting of the input terminals.

Problem	Possible cause	Solution
Counter values too high	1. Disruption of the output signal	1. Ground shielding of the signal cable
		2. Re-lay the cable away from sources of high current
	2. Air or gas pockets	1. Eliminate the source of the air or gas pocket
		2. Install an upstream air separator
	3. Pulsating flow from the piston pump	1. Increase back-pressure to the pump
		2. Install a quick-response one-way check valve
		3. Install a pulsation damper between the pump and the counter
		4. Recalibrate the counter on site, to compensate for pulsations
		5. Replace the pump type for a pump allowing smooth supply
Counter values are too low	1. Damaged or worn rotors	1. Check, repair, clear or replace rotors
	2. Damaged or worn measurement chamber	1. Check measurement chamber for damage - repair as required
		2. Check concentricity of the rotor shafts in the chamber
	3. Disruption of the output signal	1. Ground shielding of the signal cable
		2. Re-lay the cable away from sources of high current
		3. Check all electrical connections and wires for the presence of current.
No output from counter	1. Soiled rotors	1. Check whether the rounded teeth at the base of the chamber are visible
		2. Check for any obstructing foreign particles
		3. Clear, repair or replace rotors
	2. Counter incorrectly mounted	1. See instructions for re-mounting the counter, focusing on the positioning of rotors and magnets above all
	3. No output from the output board	1. Check screw terminal connections and soldering joints
		2. Ensure the presence of DC voltage at +Vs and 0V/GND and that the analytical electronics connected include a pull-up resistor when using the reed switch
		3. Replace output plate
No flow signals indicated on the analytical device	1. Defective analytical electronics	1. Check settings and parameter data in the set-up menu
		2. Check screw terminal connections and the presence of electrical current
		3. Repair/replace analytical electronics

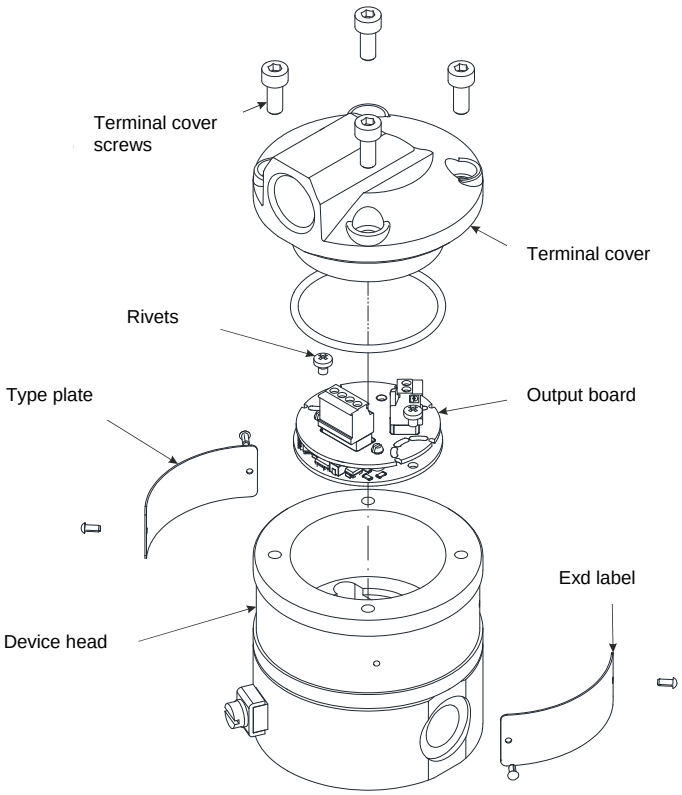
15. ATEX Exd version

Concerning electronic options RE / BE / HE / DE / GE / KE / LE)

Products which were ordered with the optional encapsulated pressure-proof connector housing (Exd) are marked with an ATEX label (see figure). The label includes details relating to explosion group and temperature class. Before installing and operating the device, the label should be checked to ensure it contains all the required details.
The relevant explosion groups and temperature classes are as follows:

Ex I: Devices for use in mining with mine gas accumulation. Mine gas refers to the methane gas naturally generated from coal and coal seams in the coal mining industry. **Only stainless steel devices** are suitable for use in explosion group I (in accordance with IEC 60079-0, section 8.1.1). Aluminium devices are not permitted for explosion group I. If the flowmeter includes the label for group I, the surface temperature of the process fluid must not exceed 150 °C.

Ex IIC T4/T6: Devices for use in areas with potentially explosive atmospheres outside the mining field, but with mine gas accumulation. Either aluminium or stainless steel devices may be used in explosion group II. For T4 temperature class applications, the surface temperature of the process fluid must not exceed 120 °C, and for T6 temperature class applications, the surface temperature of the process fluid must not exceed 70 °C.



Operating instructions:

The Exd device must be removed from the explosive zone before the terminal cover can be opened.

The maximum permissible annular gap between the terminal cover and the measuring device must not exceed 0.15 mm. If the annular gap exceeds 0.15 mm due to corrosion or wear and tear, the worn out parts must be replaced.

The product does not meet the requirements of the Exd protection class unless the terminal cover is completely snapped into place and screwed down. No other screw sizes or lengths may be used than the ones of the original screws.

Each DON volume counter has been calibrated to function with mineral oil, which means the remainder of the calibration oil still remains in the device.
The oil used
for measurement ranges X05 to X20: SHELL Morlina 10
for measurement ranges X25 to X60: EXXSOL D120

16. EU Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

Oval Gear Flow Meter **Model: DON-...**

to which this declaration relates is in conformity with the directives noted below:

2014/68/EU **PED**

- Category III (IV) Diagram 1, vessel, group 1 dangerous fluids
- Module D, marking CE0575
- Notified body: DNV GL
- Certificate No. PEDD000000R

2011/65/EU **RoHS**
2015/863/EU Delegated Directive (RoHS III)

All devices with electronic are in conformance with:

2012/19/EU **WEEE** (Waste Electrical & Electronic Equipment)
2014/30/EU **EMC** Directive

EN 61326-1:2013 **Electrical equipment for measurement, control** and laboratory use - EMC requirements – Part 1: General requirements

All models: DON.....E.. agree with the following certifications and directives:

DEKRA 17ATEX0004 X
ATEX Equipment Certificate – Flameproof
Issued by DEKRA - NL

2014/34/EU
ATEX Directive
Notified body 0158 BVS (DEKRA EXAM, Bochum)

EN 60079-0: 2012 + A11: 2013
Explosive atmospheres - Part 0: Equipment – General requirements

EN 60079-1: 2014
Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"

Hofheim, 05 Nov. 2019

H. Peters
General Manager

M. Wenzel
Proxy Holder

17. Manufacturers declaration – Switches for use in Explosive Atmospheres

Background

a) Simple apparatus such as Mechanical contact switches, Reed switches, Thermocouples, Resistive sensors & LED's may be employed in a hazardous area without certification provided that the device does not generate or store more than 1.2 V, 0.1 A, 20 µJ and 25 mW. This IEC definition is also now used in the USA & Canada.

b) The surface temperature of simple apparatus under normal or fault conditions must not exceed the ignition temperature of the gas, subject to the following very valuable exception.

c) Because the ability of hot surfaces to cause ignition depends on their size, simple apparatus having a surface area between 20 mm² and 100 mm² will be classified T4 when the matched output power of the interface device does not exceed:

1.3W into 40 ºC ambient
1.2W into 60 ºC ambient
1.0W into 80 ºC ambient

The 1.3 W / 40 ºC element of this European dispensation is now accepted in the USA and Canada. Switches (mechanical & reed switches) and junction boxes dissipate no power and are normally classifies T6 (85 ºC).

These simple apparatus can be installed freely in I.S. circuits, no certification is required.

Reed switch | Thermocouples | Resistive sensors | LED

Declaration

We, Kobold Messring GmbH, hereby declare that the reed contacts installed in the H0, HU and R0 DON electronics options come within the scope of "Simple Apparatus" pursuant to European, American and Canadian guidelines, although no special labelling is included to this effect.

Hofheim, 31. July 2018

H. Peters
General Manager

M. Wenzel
Proxy Holder

18. Exd Certificate

CERTIFICATE

(1) EU-Type Examination

(2) **Equipment or protective systems intended for use in potentially explosive atmospheres - Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number: **DEKRA 17ATEX0004 X** Issue Number: **0**

(4) Product: **Oval Gear Flowmeter Type DON-.....E..**

(5) Manufacturer: **Kobold Messring GmbH**

(6) Address: **Nordring 22-24, 65719 Hofheim, Germany**

(7) This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) DEKRA Certification B.V., Notified Body number 0344 in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential test report number NL/DEK/ExTR17.0002/00.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0 : 2012 + A11 : 2013 **EN 60079-1 : 2014**

(10) If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

(12) The marking of the product shall include the following:

II 2 G Ex db IIC T4/T6 Gb
I M 2 Ex db I Mb

Date of certification: 21 April 2017

DEKRA Certification B.V.

T. Pijpker
Certification Manager

Page 1/3

PRODUCTS RvA C 001

DEKRA Certification B.V. Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands
T +31 88 96 83000 F +31 88 96 83100 www.dekra-certification.com Registered Arnhem 09085396

DEKRA

(13) **SCHEDULE**

(14) **to EU-Type Examination Certificate DEKRA 17ATEX0004 X** Issue No. **0**

(15) **Description**

The oval gear flowmeter type DON-.....E.. are positive displacement flowmeters where the passage of liquid causes two oval gears to rotate within a measuring chamber and with each rotation a fixed volume of liquid passes through the meter. Magnets embedded within the gears initiate a pulse train output. The pulse output can be wired directly to process control and monitoring equipment or can be used as an input to instruments supplied with or fitted directly onto the meter. The flowmeters can be made from aluminium or stainless steel for group II and are only stainless steel for group I.

The -RE option (reed switch) has no additional parts and is suitable to be used as "simple apparatus" in Ex i applications.

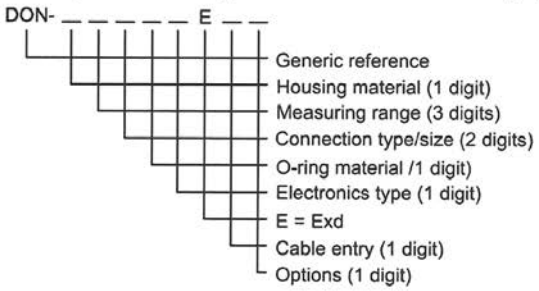
Ambient temperature range:
-20 °C to +70 °C for Ex db IIC T6 Gb,
-20 °C to +120 °C for Ex db IIC T4 Gb,
-20 °C to +150 °C for Ex db I Mb.

The minimum ambient temperature is -15 °C for the option IP67.

Electrical data

Umax : 28 Vdc, Imax : 100 mA

The oval gear flowmeter type DON-.....E.. has the following options:



Housing material:	**1**	Aluminium
	2/8	Stainless Steel
Electronic types:	**LE**	4-20mA "loop powered" analogue output
	RE	Reed switch pulse output
	HE	Hall sensor and reed switch pulse output
	BE	Hall sensor (bipolar) pulse output
	GE	Hall sensor (high resolution X4) pulse output
	DE	Quad hall sensor pulse output
	KE	Hall sensor (high resolution X2) pulse output
Cable entry options:	**M**	M20
	N	½" NPT

(13) **SCHEDULE**

(14) **to EU-Type Examination Certificate DEKRA 17ATEX0004 X** Issue No. **0**

Installation instructions

The instructions provided with the product shall be followed in detail to assure safe operation.

(16) **Report Number**

No. NL/DEK/ExTR17.0002/00.

(17) **Specific condition of use**

Contact the manufacturer for information on the dimensions of the flameproof joints.

(18) **Essential Health and Safety Requirements**

Covered by the standards listed at item (9).

(19) **Test documentation**

As listed in Report No. NL/DEK/ExTR17.0002/00.

(20) **Certificate history**

Issue 0 - project no. 218403500 initial certificate

Form 227A
Version 1 (2016-04)

19. IECEx Certificate

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:	IECEx DEK 15.0046X	Issue No: 0	Certificate history: Issue No. 0 (2017-04-21)
Status:	**Current**	Page 1 of 4	
Date of Issue:	**2017-04-21**		
Applicant:	**KOBOLD Messring GmbH** Nordring 22-24 65719 Hofheim/Ts. **Germany**		
Equipment:	**Oval Gear Flowmeters, types DON-.....E..**		
Optional accessory:			
Type of Protection:	**Ex db IIC, Ex db I Mb**		
Marking:	Ex db IIC T4/T6 Gb, Ex db I Mb		

Approved for issue on behalf of the IECEx Certification Body: T. Pijpker

Position: Certification Manager

Signature:
(for printed version)

Date: 2017-04-21

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

Certificate issued by:

DEKRA Certification B.V.
Meander 1051,
6825 MJ Arnhem
The Netherlands

IECEx Certificate of Conformity

Certificate No:	IECEx DEK 15.0046X	Issue No: 0
Date of Issue:	**2017-04-21**	Page 2 of 4
Manufacturer:	**KOBOLD Messring GmbH** Nordring 22-24 65719 Hofheim/Ts. **Germany**	

Additional Manufacturing location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:

A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report:

NL/DEK/ExTR17.0002/00

Quality Assessment Report:

DE/BVS/QAR09.0001/08

IECEx Certificate of Conformity

Certificate No:	IECEx DEK 15.0046X	Issue No: 0
Date of Issue:	**2017-04-21**	Page 3 of 4

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

The oval gear flowmeter Type DON-....E.. are positive displacement flowmeters where the passage of liquid causes two oval gears to rotate within a measuring chamber and with each rotation a fixed volume of liquid passes through the meter. Magnets embedded within the gears initiate a pulse train output. The pulse output can be wired directly to process control and monitoring equipment or can be used as an input to instruments supplied with or fitted directly onto the meter.

The flowmeters can be made from aluminium or stainless steel for Group II and are only stainless steel for Group I.

The -RE option (reed switch) has no additional parts and is suitable to be used as "simple apparatus" in Ex i applications.

Ambient temperature range:

-20 °C to +70 °C for Ex db IIC T6 Gb,

-20 °C to +120 °C for Ex db IIC T4 Gb,

-20 °C to +150 °C for Ex db I Mb.

The minimum ambient temperature is -15°C for the option IP67.

Electrical data: Umax = 28 Vdc, Imax = 100 mA.

SPECIFIC CONDITIONS OF USE: YES as shown below:

Contact the manufacturer for information on the dimensions of the flameproof joints

IECEx Certificate of Conformity

Certificate No:	IECEx DEK 15.0046X	Issue No: 0
Date of Issue:	**2017-04-21**	Page 4 of 4

Additional Information:

See 218403500-Annex

Annex:

218403500-Annex .pdf

20. State of safeness

State of safeness

KOBOLD Messring GmbH, D-65719 Hofheim

FO41903E
Rev. 02/15

Explanation for our customers:

In case of returning please take into account the following details and enclose this state of safeness

Address of the customer:

Contact person:

E-Mail-Address:

KOBOLD-Product:

KOBOLD- Order No.:

To be completed by customer

- **Description of defect:**

kind of medium:

trade name: supplier:

- **Operation conditions:**

temperature: _____ °C

pressure: _____ bar

flow rate: _____

- **Statement of safeness**

We hereby certify that there are no noxious substances whatsoever (including detergents) in the instruments returned and that there is no hazard to employees handling the instruments.

_____

Stamp, date, signature