

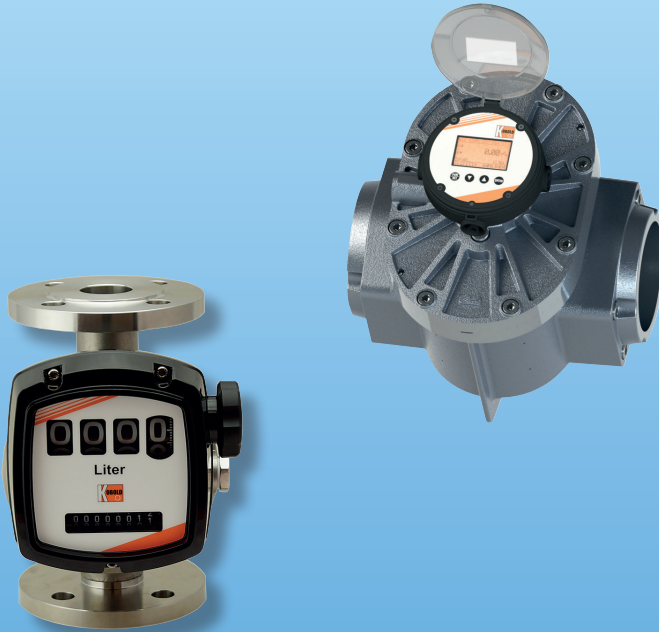
# Oval Gear Flowmeter

for Low and High Viscosity Liquids



measuring  
•  
monitoring  
•  
analyzing

DON



- Measuring Range: 0.13 ... 9.5 GPH to 40 ... 660 GPM
- Viscosity Range: up to 1000 cP (Standard) (Higher Viscosities with Special Cut Rotors)
- Accuracy:  $\pm 0.2\% \dots 1\%$  of Reading
- Material: Aluminum or Stainless Steel
- $p_{max}$ : 1450 PSI;  $t_{max}$ : 302 °F
- Pulse Output, LCD Display, 4...20 mA, Alarms, Mechanical Totalizer
- Bi-directional Measurement
- U-Pace Electronics: IO-Link and Temperature Measurement



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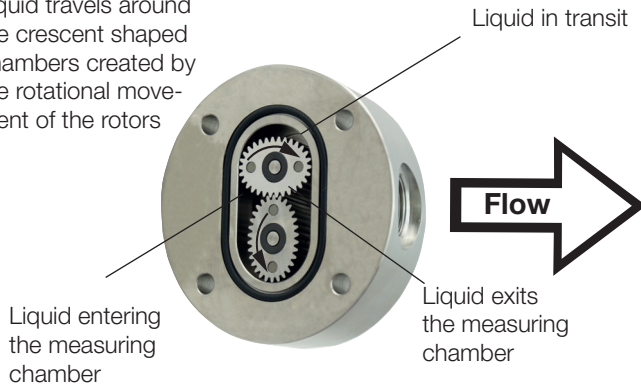
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**Description**

Oval gear flowmeters are categorized as positive displacement flow technology. When liquid flows through this type of positive displacement flowmeter, two oval gear 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 processed externally via a remote display controller or PLC or via a variety of output/display options available as accessories attached to the flowmeters.

**Operation:**

Liquid travels around the crescent shaped chambers created by the rotational movement of the rotors



In addition, our U-PACE electronics (Universal Precision and Control Electronics, is available and features two outputs arbitrarily configurable by the customer. The compact electronics offers various diagnostic functions and the following features:

- Flow and temperature measurement
- Monitoring, batching and transmitter function
- Batch function with external control input
- Colored, multi-parameter configurable TFT-display, rotatable in 90° increments
- Bidirectional measurement
- Intuitive step menu via 4 optical touch keys
- 2 configurable outputs (pulse-/frequency-/alarm- and analog output)
- Grand and resettable totalizer
- IO link function

The positive displacement flow technology allows for precise flow measurement of most clean liquids regardless of the media's 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.

**Areas of Application**

Suitable for viscous, non abrasive, clean liquids like:

- Petroleum
- Oil
- Chemicals
- Grease
- Fuels
- Ink
- Pastes

Aluminum body meters are compatible with fuels, fuel oils, & other lubricating liquids. In addition to lubricating media, stainless steel flowmeters are suitable for most products and chemicals.

**Technical Data**

**Materials**

**DON-1/3**

- Body:** Aluminum
- Gears:** PPS GF30/PTFE, PEEK
- Axles:** 316L Stainless Steel

**DON-2/4**

- Body**
- DON-x04 ... DON-x15:** 316L Stainless Steel
- DON-x20 ... DON-x60:** 316L/301\* Stainless Steel

**Gears**

- DON-x04 ... DON-x40:** 316L Stainless Steel
- DON-x45 ... DON-x60:** 301\* Stainless Steel

**Bearing:** Carbon Graphite

**Axles:** 316L Stainless Steel

\* Closest AISI Equivalent to 1.3955 Stainless Steel



**Materials (Continued)**

**DON-8/9**

**Body**

**DON-x04... DON-x15:** 316L Stainless Steel

**DON-x20... DON-x60:** 316L/301\* Stainless Steel

**Gears:** PPS GF30/PTFE, PEEK

**Axles:** 316L Stainless Steel

**O-Rings (Media Temperature Limits)**

**FKM:** -4 ... 302 °F

**NBR:** -4 ... 212 °F

**FEP with EPDM/FKM core:** 5...248 °F  
(only for DON-x04...DON-x40)

**Fluoroprene®:** -4 ... 302 °F Acc. to Regulation (EC) No. 1935/2004

**FKM Vi 840:** -40...302 °F

**Electrical Cover (for Cable Connection)**

**Standard:** Polyamide PA6 GF35 UL94 HB/VO

**Optional:** 316L Stainless Steel

**Cable Entry\*:** M20 x 1.5 or 1/2" NPT Adapter

**Magnet Encapsulation**

**DON-x04... DON-x10:** PEEK

**DON-x15... DON-x60:** 316L Stainless Steel

**Screw Material**

**for Aluminum Housing:** Stainless Steel (Standard)

(DON-1/3) Steel Coated with GEOMET® 321  
(for DON-125 and DON-325)

**for Stainless Steel Housing:** Stainless Steel (Standard)

(DON-2/4/8/9) Steel Coated with GEOMET®321  
(optional) for Higher Pressure Rating  
(See Order Details)

\* For electronics option "CT" (electrical connection 12x1) the cable entry is plugged with a blanking plug (not used). Electrical connection M12x1 without electronics option "CT" possible with H0/B0/G0/K0/D0/L0

**Accuracy\*\***

**DON-x04:** ± 3% of Reading (0.13...0.95 GPH),  
± 1% of Reading (0.95...9.5 GPH)

**DON-x05...DON-x15:** ± 1% of Reading

**DON-x20...DON-x60**

**SS Rotors:** ± 0.5% of Reading;  
± 0.2% of Reading w/ Optional Z3/3A  
Electronics w/ Linearization Function

**PPS Rotors:** ± 1% of Reading;  
± 0.5% of Reading w/ Optional Z3/3A  
Electronics w/ Linearization Function

**Option M4:** ± 1% of Reading (Better Accuracy for  
higher viscosities on request)

**Additional Max. Inaccuracy**

**for Elec. Signal Outputs:** analog output 4-20mA for -Lx and  
-Zx electronics: ±0.15% full scale  
Temperature error referenced to  
room temperature:  
analog output -CT: < 200ppm/K  
frequency output -CT: <100ppm/K

**Repeatability:** ± 0.03 % Typical

**Protection Class:** IP 66/67 (IP65 for M4)

**Media Temperature:**

**Options ..Lx, ..Zx, ..M4:** -4...176 °F

**DON-1/3/8/9:** -4...176 °F

**DON-2/4 w/ Pulse Out and  
Option ..Zx w/ Cooling Fins:** -4...248 °F

**Option ..T0:** -4...302 °F

**DON-2/4 w/ Pulse Output  
and O-Ring FKM Vi 840:** -4...248 °F

**Models with  
PPS/PEEK Rotors:** -4... 176 °F

**Ambient Temperature:** -4... 176 °F

**Option M4:** 32...140 °F

**Options 1A to 5A:** -4...140 °F

**Option CT:** -4...140 °F (at Tmedia ≤ 158°F)  
-4...113 °F (at Tmedia ≤ 176°F)

\*\* Reference Conditions: DON-x10...x60 (Calibration Oil, 4.6 cSt, 77 °F, 14.5 PSIG)  
DON-x04, DON-x05 and DON-x15 for high viscosities  
(Calibration Oil, 10 cSt, 68 °F, 72.5 PSIG)  
Accuracy data is valid for given viscosities and higher



**ATEX - Approval**

**Mechanical Explosion Protection:**  $\text{Ex}$  II 2G Ex h IIC T4/T3 Gb

**Options 1A/2A/3A/5A:**

**Intrinsically Safe**

$\text{Ex}$  II 2G Ex ia IIC T4 Gb  
(-20 °C ≤ Ta ≤ +60 °C)

**Options HE, DE, BE, KE, GE, LE:**

**Flameproof Enclosure**

$\text{Ex}$  II 2G Ex db IIC T4/T6 Gb  
 $\text{Ex}$  I M2 Ex db I Mb

**Options HA, DA, BA, KA, GA:**

**Intrinsically Safe**

$\text{Ex}$  II 3G Ex ic IIC T4/T3 Gc

**IECEX - Approval**

**Options HE, DE, BE, KE, GE, LE:**

**Flameproof Enclosure**

Ex db IIC T4 Gb  
Ex db I Mb

**Noise Level (in dB) at Full Scale**

Size	PPS Gears	SS Gears
x25	83	91
x30	84	93.1
x35	83.5	95
x40	85.4	96
x45	87.5	98
x50	86.1	99.4
x55	86.1	98.1
x60	85	99

**Maximum Pressure (Threaded Models)**

Model	Maximum Pressure (PSI)			
	DON-1/3	DON-2/4/8/9	DON-1 (Option-M4)	DON-2/8 (Option-M4)
DON-x04	925	1450	-	-
DON-x05			-	-
DON-x10			-	-
DON-x15			-	-
DON-x20		1000*	580	580
DON-x25	870*			
DON-x30	580	725	435	435
DON-x35				
DON-x40	230	230	230	230
DON-x45				
DON-x50				
DON-x55				
DON-x60				

With flanges: Maximum pressure rating as above or as per flange rating, whichever is lower.

\* Max pressure of 1450 psi possible with steel screws (see order details)

**Recommended Filter (for example model MFR-DO.):**

DON-x04 ... DON-x15 < 75 µm (200 mesh)

DON-x20 ... DON-x35 < 150 µm (100 mesh)

DON-x40 ... DON-x60 < 350 µm (45 mesh)

### Pulse Output (..H0/HE/HA)

Options H0/HE/HA are equipped with a Reed switch pulse output and a Hall sensor pulse output:

#### Reed Switch Pulse Output

The reed switch output is a two wire, normally open, SPST, voltage free contact ideal for installations without power or for use in hazardous area locations where Intrinsically Safe (I.S.) is required.

Note: when using the reed switch output, the liquid temperature must not change at a rate greater than 18 °F per minute.

Average switching life of reed contact (MTTF):  
 Max. Load (30 V / 10 mA)  $5 \times 10^5$  switching cycles  
 Min. Load (<5 V / 10 mA)  $5 \times 10^8$  switching cycles  
 Switching Capacity: Max. 30 V<sub>DC</sub>, Max. 20 mA

#### Hall Sensor Pulse Output

With this signal output, a Hall Effect sensor is combined with an active push-pull output. The signal output is actively switched either to +Vs or to ground. No additional external circuit is required (e.g. pull-up resistor). The "high" signal is approximately equal to the supply voltage +Vs and the "low" signal is approximately 0 V. The electronic utilizes a 3-wire connection with an external supply voltage of 8...30 V<sub>DC</sub>. The electrical load may be optionally connected to the supply voltage or to GND. Maximum output current (current source or sink): 100 mA (short circuit protected).

#### Hall Sensor Pulse Output (..HU)

Like option H0, except an NPN output in place of the push-pull output and a supply voltage of 5-30 V<sub>DC</sub>.

#### Hall Sensor Pulse Output, (..B0/BE/BA)

Like options H0/HE/HA; however with bipolar sensors and alternating polarized magnets. This option is used for pulsating flow, but is not equipped with a Reed switch and has half the k-factor value as compared to H0/HE/HA.

#### High-Resolution Hall Sensor Pulse Output, (..G0/GE/GA, ..K0/KE/KA)

Like options H0/HE/HA; the models DON-x05 and DON-x10 can be supplied with four times the pulse count per volume unit (..G0/GE/GA) and models DON-x05, DON-x10 and DON-x15 with double the amount of pulses (..K0/KE/KA)

(See table «Output Pulse Resolution» on the following pages).

### Quadrature Hall Effect Pulse Output (..D0/DE/DA)

The DON with option D0/DE/DA provides two independent Hall sensors. They are arranged to give separate outputs out of phase with one another.

The QUAD output is mostly suitable for detecting bidirectional flows (detection of flow direction) or where a redundant signal is desirable. Maximum output current per channel (current source or sink): 100 mA (short circuit protected).

### Analog Output (..L0/LE)

The options L0 and LE (Exd) are available with a loop-powered 4-20 mA output. The loop must be powered with an external, 16...32 V<sub>DC</sub> power supply. The maximum resistance of the series loads (PLC analog input/display electronics) depends on the magnitude of the supply voltage and can be calculated as follows:

$$\text{Max. load [Ohm]} = (+Vs - 9 V_{DC}) / 0.02 \text{ A [}\Omega\text{]}$$

Example: +Vs = 32 V<sub>DC</sub> => max. load = 1150 Ω  
 +Vs = 16 V<sub>DC</sub> => max. load = 350 Ω

The load can be inserted at any point in the current loop, observing correct polarity.

### Mechanical Totalizer (..M4)

The DON-x20.. through DON-x60.. are available with a 4-digit resettable totalizer and indication of accumulated total value.

The motion of the rotors is transmitted to the mechanical register totalizer via an interfacing reduction gear train and dynamic seal assembly.

Option M4 is available in liters and gallons for DON-x20.. through DON-x40..., and in 10 liters and 10 gallons for DON-x45.. through DON-x60..

Body Material: Enameled Die-cast Aluminum, Powder-coated

Protection: IP 65

Ambient Temp: 32...140 °F

Media Temp: -4...176 °F



## Oval Gear Flowmeter Model DON

### Electronic with LCD Display

Model	..Z1	..Z2	..Z3	Z5	..ZE	..ZB	..1A	..2A	..3A	..5A
Function	Dual Totalizer	Batching Unit	Rate/Totalizer			Dual Totalizer	Batching Unit	Rate/Totalizer	Rate/Totalizer	
<b>Power Supply</b>										
External	5 - 28 V <sub>DC</sub>	12 - 28 V <sub>DC</sub>	5 - 28 V <sub>DC</sub>		9 - 28 V <sub>DC</sub>	-	$U_i = 28 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 0.7 \text{ W}$			
Battery-Operation (Outputs Inactive) <sup>2)</sup>	yes	no	yes	no	yes	yes	yes	no	yes	no
Battery Included in Shipment <sup>3)</sup>	yes	-	yes	-	yes	yes	yes	-	yes	-
<b>LCD Display</b>										
Selectable Units	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Decimal Point	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Accumulative Total	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Resettable Total	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Linearization	yes	no	yes	yes	yes	yes	yes	no	yes	yes
Rate Display	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Backlighting	yes	yes	yes	yes	yes	no	no	no	no	no
<b>Input</b>										
Sensors	Hall Sensor / Reed Switch									
<b>Outputs</b>										
4-20 mA	no	no	yes	yes	no	no	no	no	yes	yes
Flow Rate Alarm Min./Max.	no	no	NPN/PNP/ Push-Pull	NPN/PNP/ Push-Pull	no	no	no	no	no	with Solid State Relay Board
Batch End & Control	no	yes	no	no	no	no	no	yes	no	no
Pulse Output	no	no	Push-Pull	Push-Pull	Push-Pull	no	no	no	no	with Solid State Relay Board
2 x SPDT Relays <sup>1)</sup>	no	yes	no	yes	no	no	no	with Solid State Relay Board	no	
<b>Installation</b>										
IP 65	yes	yes	yes	yes	IP 66/67	IP 66/67	yes	yes	yes	yes
Cable Entries	M20x1.5 or ½" NPT									
Media Temperature Range (Cooling Fin Option: Max. 250 °F)	-4...176 °F									
Ambient Temperature Range	-4...176 °F					32...140 °F				
Housing Material	PA6 GF35 UL94 HB/VO/PC UL94 V-2									
ATEX Approval	no					yes				

<sup>1)</sup> Replaces solid state outputs, for details see ZOK Datasheet

<sup>2)</sup> Battery operation only applicable with the reed switch sensor option of electronics options H0/HE/HA

<sup>3)</sup> Options Z5, Z6, Z7, Z8, and Z9 are shipped without batteries (Options Z6, Z7, Z8 and Z9 which are not shown in the above table are combinations of options Z1 or Z3 with electronic options B0 or D0. Z6 = Z1+B0, Z7=Z3+B0, Z8 = Z1+D0, Z9 = Z3+D0)

**U-PACE electronics (...CT)**

The universal U-PACE electronics (Universal Precision and Control Electronics, order code C3T0) features two outputs arbitrarily configurable by the customer. In addition, the U-PACE electronics offers various diagnostic functions and the following features:

- Flow and temperature measurement
- Monitoring, batching and transmitter function
- Batch function with external control input
- Colored, multi-parameter configurable TFT-display, rotatable in 90° steps
- Bidirectional measurement
- Intuitive setup menu via 4 optical touch keys
- 2 configurable outputs (pulse-/frequency-/alarm- and analog output)
- Grand and resettable totalizer
- IO link function

**Materials**

**Housing:** aluminum for DON-1 and DON-3  
316L SS for DON-2,4,8,9

**Display:** PC

**Housing Screw Cap:** PA6

**Electrical Details U-PACE**

**Supply voltage:** 19-30 V<sub>DC</sub>, internal power consumption max. 200mA

**Display:** TFT display, 128 x 128 pixels, 1.4" display orientation in 90° steps adjustable

**Display repetition rate:** 0.5... 10s, adjustable

**Pulse output:** Push-Pull, freely scalable, configurable for partial and accumulated totalizer

**Frequency output:** Push-Pull, freely scalable, 2kHz @ overflow  
f<sub>min</sub> @ FS = 50 HZ  
f<sub>max</sub> @ FS = 1000 HZ

**Alarm output:** NPN, PNP, Push-Pull configurable max. 30 V<sub>DC</sub> max. 200mA short-circuit proof

**Analog output:** active, 3 wire, 0(4)-20 mA, max. load 500 or 0(2)-10 V<sub>DC</sub>, (R<sub>i</sub> = 500Ω)  
factory calibrated with R<sub>L</sub> = 1M)

**Control input:** active signal U<sub>high</sub> max. 30 V<sub>DC</sub>  
0 < Low < 10 V<sub>DC</sub>  
15 V<sub>DC</sub> < High < V<sub>s</sub>

**Batching function:** Batching output OUT2: Push-Pull, High active  
Control input OUT 1: START/STOP 0.5 s < t<sub>high</sub> < 4 s  
RESET t<sub>high</sub> < 5 s

**Response time electrical outputs:** Size X05 to X20 and X45 to X60: < 1.5 s  
Size Z25 to X40: < 0.5 s

**Temperature measurement**

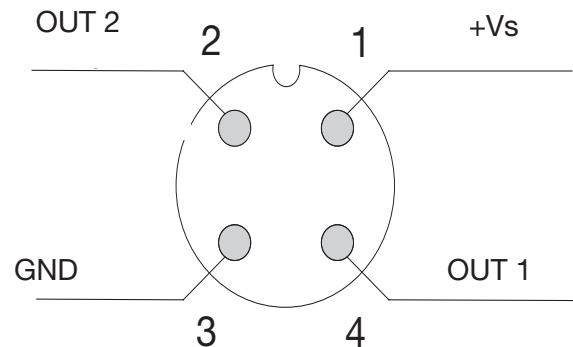
**Meas. range:** -4...176°  
**Accuracy:** ± 1.8° F  
**Response time t<sub>90</sub> (Sensor)** < 30 sec

**Configuration of outputs**

Output 1 (OUT1, PIN4)	Output 2 (OUT2, PIN2)
Analog output 4-20 mA	Analog output 4-20 mA
Analog output 0-20 mA	Analog output 0-20 mA
Analog output 2-10 V	Analog output 2-10 V
Analog output 0-10 V	Analog output 0-10 V
Switching output NPN/PNP/PP	Switching output NPN/PNP/PP
Pulse output PP	Pulse output PP
Frequency output PP	Frequency output PP
Communication mode KofiCom	
Communication mode IO-Link	
Control Input	
Control input batching function	Batching output

**IO-Link specification**

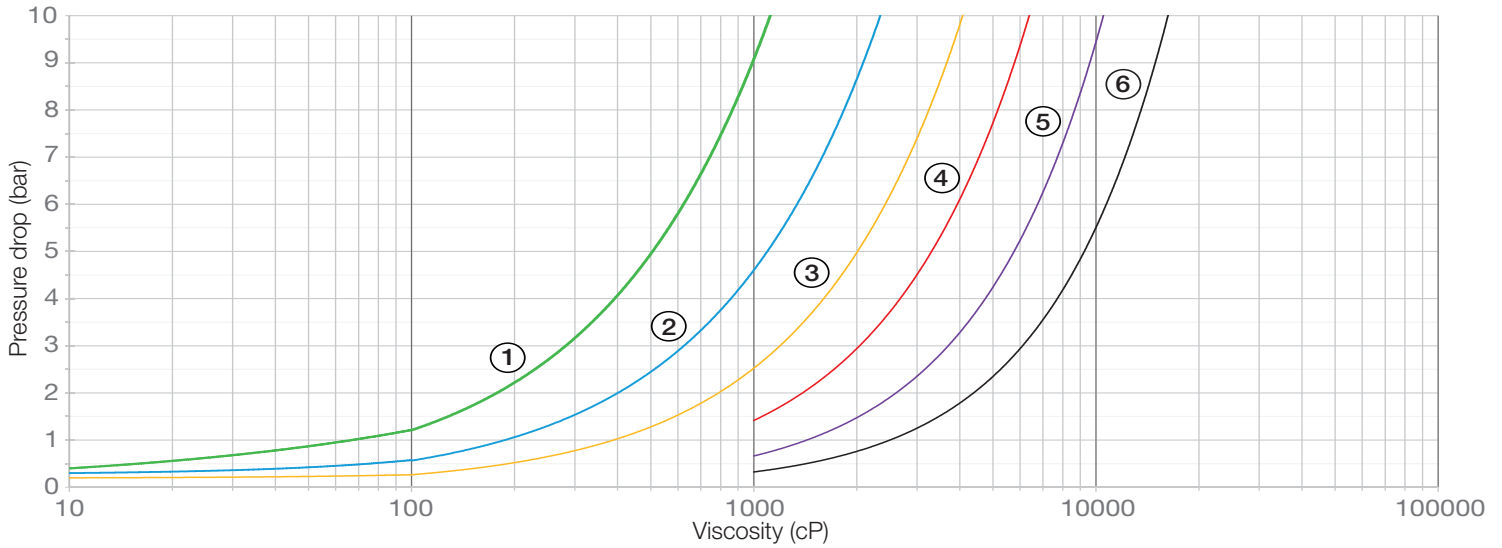
Manufacturer ID: 1105 (decimal), 0 x 0451 (hex)  
Manufacturer name: Kobold Messring GmbH  
IO-Link specification: V1.1  
Bitrate: COM3  
Minimal cycle time: 1.1 ms  
SIO-Mode: yes (OUT1 in configuration IO-Link)  
Block parameterization: yes  
Operational readiness: 10 s  
Max. cable length: 20 m





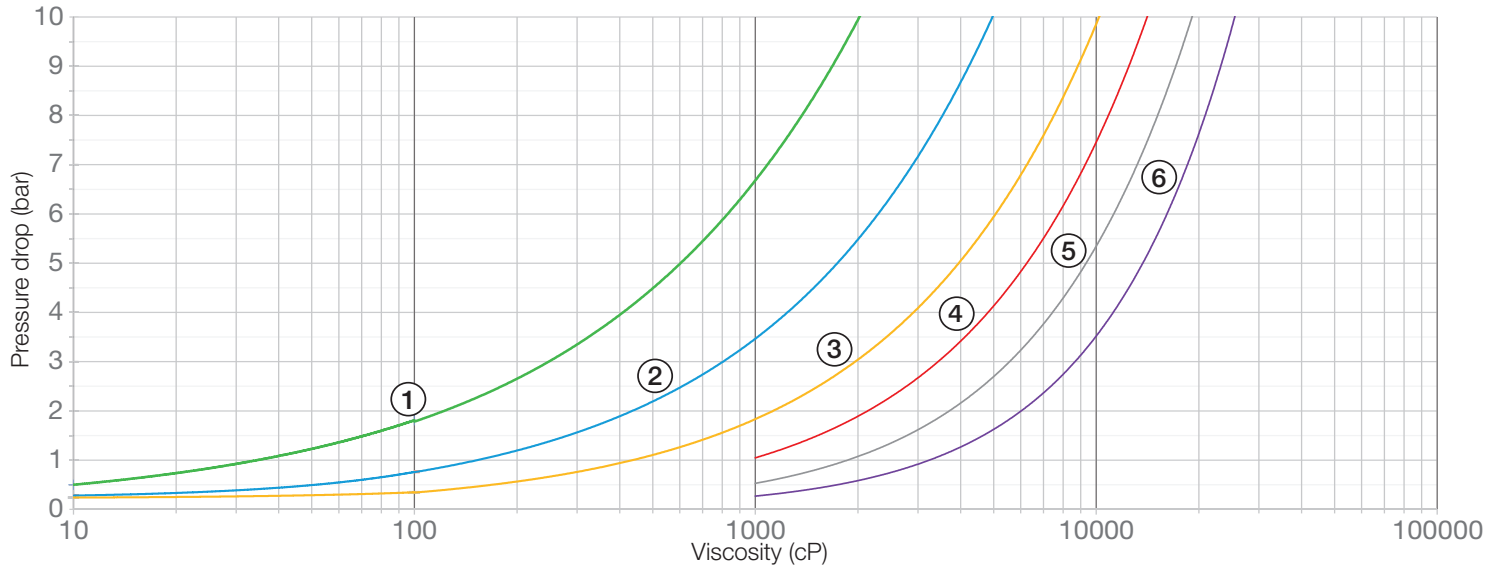
## Oval Gear Flowmeter Model DON

### DON Pressure Drop Versus Viscosity Curves DON x04...x15



- |  |   |
|--|---|
| ① Standard Rotors 100% of Full Scale   | ④ Standard rotors 12.5 % of full scale<br>Special cut rotors 25 % of full scale |
| ② Standard Rotors 50% of Full Scale<br>Special Cut Rotors 100% of Full Scale | ⑤ Standard rotors 5 % of full scale<br>Special cut rotors 10 % of full scale    |
| ③ Standard Rotors 25% of Full Scale<br>Special Cut Rotors 50% of Full Scale  | ⑥ Standard rotors 2.5 % of full scale<br>Special cut rotors 5 % of full scale   |

### DON x20...x60



- |  |   |
|--|---|
| ① Standard Rotors 100% of Full Scale   | ④ Standard rotors 12.5 % of full scale<br>Special cut rotors 25 % of full scale |
| ② Standard Rotors 50% of Full Scale<br>Special Cut Rotors 100% of Full Scale | ⑤ Standard rotors 5 % of full scale<br>Special cut rotors 10 % of full scale    |
| ③ Standard Rotors 25% of Full Scale<br>Special Cut Rotors 50% of Full Scale  | ⑥ Standard rotors 2.5 % of full scale<br>Special cut rotors 5 % of full scale   |

### Pressure Drop Limit Versus Flowrate

The curves above represent the pressure drop for standard cut oval rotors. Special cut rotors of DON-3/4/9 have alternate tooth relief which effectively reduces the pressure drop by 50%.

Please note: Pressure surges are not permitted when starting up the system. Pressure surges > 3 bar can lead to blocking of the gears, especially with sizes x04 ... x15



**Maximum Flowrate Multiplier (for Higher Viscosities)**

Viscosity (cPs)	Standard Rotor	Special Cut Rotor
≤ 1,000	1	1
≤ 2,000	0.5	1
≤ 4,000	0.42	0.84
≤ 6,000	0.33	0.66
≤ 8,000	0.25	0.5
≤ 30,000	0.15	0.3

**Special Cut Rotors for Higher Viscosities**

For viscosities > 1000 cP, special cut rotors of DON/3/4/9 are normally required to keep the maximum pressure drop from exceeding acceptable levels. This option applies to DON-x15 and larger sizes. For higher viscosities, the flowmeter max. flowrate is derated according to the table above. At viscosities < 1000 cP these special rotors are less accurate

Example:

DON-x25G measuring viscous oil at 8000 cP:

max. flow of 40 GPM x 0.5 = 20.0 GPM new max. flow rate.

**Nominal Output Pulse Resolution\***

Model	Flow Range (GPM)	Pulse per Gallon					
		Reed Switch Hx	Hall Sensor	Hall Sensor Bx	Quadrature-Hall Sensor Dx	Hall Sensor, High-Resolution Gx	Hall Sensor, High-Resolution Kx
DON-x04	0.13...9.5 GPH	10107	10107	---	10093	42851	20214
DON-x05	0.13...9.5 GPH	10107	10107	---	10093	42851	20214
DON-x10	0.5...27 GPH	4020	4020	---	4020	16080	8040
DON-x15	4...145 GPH	1329	2657	1329	2657	---	5315
DON-x20	0.26...10.6	310	617	310	617	---	---
DON-x25	2.6...40	98	394	98	197	---	---
DON-x30	4.0...66	51	208	51	102	---	---
DON-x35	8.0...120	24.2	96.5	24.2	51.1	---	---
DON-x40	13...150	18.5	74.2	18.5	37.1	---	---
DON-x45	10...200	9.7	39.0	9.7	19.5	---	---
DON-x50	13...260	5.7	22.3	5.7	11.4	---	---
DON-x55	20...400	3.97	15.9	3.97	7.95	---	---
DON-x60	40...660	2.12	8.71	2.12	4.35	---	---

\*The output resolution values listed in the above table are only approximate values. The exact output resolution value is noted within the calibration certificate delivered with each flowmeter.

**\*Additional Information Required for Order:**

To ensure proper operation, this product requires a completed application guide form to be submitted with any order. Please refer to the end of this datasheet in order to obtain the correct form. You can also contact your KOBOLD representative for this form.



Oval Gear Flowmeter Model DON

**Order Details** (Example: DON-105G N1 1 L0 N 0) **Please specify flow direction of meters configured with M4, ZOK, or ZOE electronic options. See flow direction diagram on pg. 15 for details.**

Measuring Range	Housing/Rotor Material <sup>4)</sup>			Connection	O-ring Material	Electronic/Display	Cable Entry	Option
	Aluminum with PPS/PEEK <sup>12)</sup> Rotor	Stainless Steel	St. Steel with PPS/PEEK <sup>12)</sup> Rotor					
0.13...9.5 GPH	DON-104G..	DON-204G..	DON-804G..	..N1.. = 1/8" NPT ..R1.. = G 1/8	..1.. = FKM  ..3 <sup>14)</sup> .. = FEP with EPDM/ FKM Core  ..4.. = NBR  ..5 <sup>13)</sup> .. = Fluoroprene®  ..8 <sup>16)</sup> .. = FKM Vi 840  ..9.. = Special Materials (not for ATEX)	..HO.. = Pulse Output Hall Sensor (Push-Pull)/ Reed Switch ..HU <sup>14)</sup> .. = Pulse Output Hall Sensor (NPN)/Reed Switch, Supply 5-30 V <sub>DC</sub> ..BO <sup>9)</sup> .. = Pulse Output Hall Sensor (Push-Pull) for Pulsating Flow ..TO <sup>9)</sup> .. = Pulse Output Hall Sensor (Push-Pull), High-Temp 300 °F Max. ..KO <sup>9)</sup> .. = Pulse Output Hall Sensor (Push-Pull), High Resolution (x2) ..GO <sup>9)</sup> .. = Pulse Output Hall Sensor (Push-Pull), High Resolution (x4) ..DO.. = Quad. Hall Sensor 2 Phased Outputs (Push-Pull) ..LO.. = 4...20 mA Loop Powered, Analog Output  ..Z1.. = LCD Dual Totalizer with Battery Supply, Outputs Deactivated (ZOK-Z1) ..Z2.. = LCD Batching Unit (ZOK-Z2) ..Z3.. = LCD Totalizer, Rate, Outputs: 4-20 mA, Alarm, Pulse (ZOK-Z3) (Impulses not for Battery Supply) ..Z5.. = Z3 + 2 SPDT Relays ..Z6.. = Z1 + B0 ..Z7.. = Z3 + B0 ..Z8.. = Z1 + D0 ..Z9.. = Z3 + D0  ..ZE.. = LCD Rate/Total (ZOE with External Supply/with Battery) ..ZB <sup>11)</sup> .. = LCD Rate/Total (ZOE without External Supply/with Battery)  ..HE.. = H0 + ATEX (Exd) ..BE <sup>9)</sup> .. = B0 + ATEX (Exd) ..KE <sup>9)</sup> .. = K0 + ATEX (Exd) ..GE <sup>9)</sup> .. = G0 + ATEX (Exd) ..DE.. = D0 + ATEX (Exd) ..LE.. = L0 + ATEX (Exd)  ..HA.. = H0 + ATEX (Exi) ..BA <sup>9)</sup> .. = B0 + ATEX (Exi) ..KA <sup>9)</sup> .. = K0 + ATEX (Exi) ..GA <sup>9)</sup> .. = G0 + ATEX (Exi) ..DA.. = D0 + ATEX (Exi)  ..1A.. = ZOK-E1 + HA ATEX (Exi) ..2A.. = ZOK-E2 + HA ATEX (Exi) ..3A.. = ZOK-E3 + HA ATEX (Exi) ..5A.. = ZOK-E5 + HA ATEX (Exi) ..CT <sup>15)</sup> .. = U-PACE, TFT display, 2 outputs (current/voltage/pulse/frequency/alarm output/IO link configurable), M12x1 plug ..M4 <sup>9)</sup> .. = Mech. Totalizer	..M.. = M20  ..N.. = 1/2" NPT  ..S <sup>7)</sup> .. = M20 with Cooling Fin  ..T <sup>7)</sup> .. = 1/2" NPT with Cooling Fin  ..P <sup>17)</sup> .. = Electrical Connection M12x1	..0 = Without  ..N = Without Battery  ..Y = Special Request, not for ATEX. (Specify in clear text, e.g. check valve)
0.13...9.5 GPH	DON-105G..	DON-205G..	DON-805G..	..N1.. = 1/8" NPT ..R1.. = G 1/8				
0.5...27 GPH	DON-110G..	DON-210G..	DON-810G..	..N2.. = 1/4" NPT ..R2.. = G 1/4				
4...145 GPH	DON-115G..	DON-215G..	DON-815G..	..N3.. = 3/8" NPT ..R3.. = G 3/8				
0.26...10.6 GPM	DON-120G..	DON-220G..	DON-820G..	..N4.. = 1/2" NPT ..R4.. = G 1/2 ..P4 <sup>9)</sup> .. = 1/2" NPT (1450 psi) ..H4 <sup>9)</sup> .. = G 1/2 (1450 psi)				
2.6...40 GPM	DON-125G..	DON-225G..	DON-825G..	..N6.. = 1" NPT ..R6.. = G 1 ..A6.. = 1" 150 lb ANSI Flange ..B6.. = 1" 300 lb ANSI Flange ..F6.. = DN25 PN40 DIN Flange ..P6 <sup>9)</sup> .. = 1" NPT (1450 psi) ..H6 <sup>9)</sup> .. = G 1 (1450 psi)				
4.0...66 GPM	DON-130G..	DON-230G..	DON-830G..	..N8.. = 1 1/2" NPT ..R8.. = G 1 1/2 ..A8.. = 1 1/2" 150 lb ANSI Flange ..B8.. = 1 1/2" 300 lb ANSI Flange ..F8.. = DN40 PN40 DIN Flange				
8.0...120 GPM	DON-135G..	DON-235G..	DON-835G..	..N9.. = 2" NPT ..R9.. = G 2 ..A9.. = 2" 150 lb ANSI Flange ..B9 <sup>1)</sup> .. = 2" 300 lb ANSI Flange				
13...150 GPM	DON-140G..	DON-240G..	DON-840G..	..F9.. = DN50 PN16 DIN Flange ..C9 <sup>9)</sup> .. = DN50 PN40 DIN Flange				
10...200 GPM	DON-145G..	DON-245G..	DON-845G..	..NB.. = 3" NPT ..RB.. = G 3 ..AB.. = 3" 150 lb ANSI Flange				
13...260 GPM	DON-150G..	DON-250G..	DON-850G..	..FB.. = DN80 PN16 DIN Flange				
20...400 GPM	DON-155G..	DON-255G..	DON-855G..	..NC.. = 4" NPT ..RC.. = G 4				
40...660 GPM <sup>10)</sup>	DON-160G..	DON-260G..	DON-860G..	..AC.. = 4" 150 lb ANSI Flange ..FC.. = DN100 PN16 DIN Flange				

<sup>1)</sup> Only for DON-235 and DON-835 <sup>2)</sup> Only for DON-x04, -x05 and -x10 <sup>3)</sup> Not for DON-x04, -x05 and -x10 <sup>4)</sup> Replace 'G' with 'H' to order LPM (LPH) <sup>5)</sup> With steel screws, only for DON-2.. and DON-8.. <sup>6)</sup> Only for DON-x20...DON-x60. <sup>7)</sup> Not for electronic options 1A to 5A, not for DON-1.. and DON-8.. <sup>8)</sup> Only for DON-2 <sup>9)</sup> Only for DON-x04, -x05, -x10, -x15 without reed switch <sup>10)</sup> Calibrated up to 580 GPM. Higher flow rate calibration on request <sup>11)</sup> Without backlighting <sup>12)</sup> For DON-x04...DON-x15 Peek Rotor, for DON-x20...DON-x60 PPS Rotor <sup>13)</sup> Only for DON-x04...DON-x20, this version is not calibrated (no calibration certificate). Use k-factor values from the datasheet <sup>14)</sup> Only for DON-x04...DON-x40 <sup>15)</sup> l/min-package (nameplate (l/min or ml/min, °C, bar)), calibrated range and temperature °C, GPM-package (nameplate (GPM or GPH, °F, PSI)), calibrated range and temperature °F) <sup>16)</sup> Only for DON-215...DON-230, not for ATEX, only for pulse output <sup>17)</sup> Only possible with electronics H0/B0/G0/K0/D0/L0



**Order Details** (Example: DON-105G N1 1 L0 N 0) **Please specify flow direction of meters configured with M4, ZOK, or ZOE electronic options. See flow direction diagram on pg. 15 for details.**

Measuring Range <sup>18)</sup>	Housing/Rotor Material <sup>4)</sup>			Connection	O-ring Material	Electronic/Display	Cable Entry	Option
	Aluminum with PPS/PEEK <sup>12)</sup> Rotor for High Viscosities	Stainless Steel for High Viscosities	St. Steel with PPS/PEEK <sup>12)</sup> Rotor for High Viscosities					
0.13...9.5 GPH	-	-	-	..N1.. = 1/8" NPT ..R1.. = G 1/8				
0.13...9.5 GPH	-	-	-	..N1.. = 1/8" NPT ..R1.. = G 1/8		..H0.. = Pulse Output Hall Sensor (Push-Pull)/Reed Switch ..HU <sup>14)</sup> .. = Pulse Output Hall Sensor (NPN)/Reed Switch, Supply 5-30 V <sub>DC</sub>		
0.5...27 GPH	-	-	-	..N2.. = 1/4" NPT ..R2.. = G 1/4		..B0 <sup>9)</sup> .. = Pulse Output Hall Sensor (Push-Pull) for Pulsating Flow ..T0 <sup>9)</sup> .. = Pulse Output Hall Sensor (Push-Pull), High-Temp 300 °F Max.		
4...145 GPH	DON-315G..	DON-415G..	DON-915G..	..N3.. = 3/8" NPT ..R3.. = G 3/8		..K0 <sup>9)</sup> .. = Pulse Output Hall Sensor (Push-Pull), High Resolution (x2) ..G0 <sup>2)</sup> .. = Pulse Output Hall Sensor (Push-Pull), High Resolution (x4)		
0.26...10.6 GPM	DON-320G..	DON-420G..	DON-920G..	..N4.. = 1/2" NPT ..R4.. = G 1/2 ..P4 <sup>9)</sup> .. = 1/2" NPT (1450 psi) ..H4 <sup>9)</sup> .. = G 1/2 (1450 psi)		..D0.. = Quad. Hall Sensor 2 Phased Outputs (Push-Pull) ..L0.. = 4...20 mA Loop Powered Analog Output		
2.6...40 GPM	DON-325G..	DON-425G..	DON-925G..	..N6.. = 1" NPT ..R6.. = G 1 ..A6.. = 1" 150 lb ANSI Flange ..B6.. = 1" 300 lb ANSI Flange ..F6.. = DN25 PN40 DIN Flange ..P6 <sup>9)</sup> .. = 1" NPT (1450 psi) ..H6 <sup>9)</sup> .. = G 1 (1450 psi)	..1.. = FKM ..3 <sup>14)</sup> .. = FEP with EPDM/FKM Core	..Z1.. = LCD Dual Totalizer with Battery Supply, Outputs Deactivated (ZOK-Z1) ..Z2.. = LCD Batching Unit (ZOK-Z2) ..Z3.. = LCD Totalizer, Rate, Outputs: 4-20 mA, Alarm, Pulse (ZOK-Z3) (Impulses not for Battery Supply) ..Z5.. = Z3 + 2 SPDT Relays ..Z6.. = Z1 + B0 ..Z7.. = Z3 + B0 ..Z8.. = Z1 + D0 ..Z9.. = Z3 + D0	..M.. = M20 ..N.. = 1/2" NPT	..0 = Without ..N = Without Battery
4.0...66 GPM	DON-330G..	DON-430G..	DON-930G..	..N8.. = 1 1/2" NPT ..R8.. = G 1 1/2 ..A8.. = 1 1/2" 150 lb ANSI Flange ..B8.. = 1 1/2" 300 lb ANSI Flange ..F8.. = DN40 PN40 DIN Flange	..4.. = NBR ..5 <sup>13)</sup> .. = Fluoro-prene <sup>®</sup>	..ZE.. = LCD Rate/Total (ZOE with External Supply/with Battery) ..ZB <sup>11)</sup> .. = LCD Rate/Total (ZOE without External Supply/with Battery)	..S <sup>7)</sup> .. = M20 with Cooling Fin ..T <sup>7)</sup> .. = 1/2" NPT with Cooling Fin ..P <sup>17)</sup> .. = Electrical Connection M12x1	..Y = Special Request, not for ATEX. (Specify in clear text, e.g. check valve)
8.0...120 GPM	DON-335G..	DON-435G..	DON-935G..	..N9.. = 2" NPT ..R9.. = G 2 ..A9.. = 2" 150 lb ANSI Flange ..B9 <sup>1)</sup> .. = 2" 300 lb ANSI Flange	..8 <sup>16)</sup> .. = FKM Vi 840 ..9.. = Special Materials (not for ATEX)	..HE.. = H0 + ATEX (Exd) ..BE <sup>9)</sup> .. = B0 + ATEX (Exd) ..KE <sup>9)</sup> .. = K0 + ATEX (Exd) ..GE <sup>2)</sup> .. = G0 + ATEX (Exd) ..DE.. = D0 + ATEX (Exd) ..LE.. = L0 + ATEX (Exd)		
13...150 GPM	DON-340G..	DON-440G..	DON-940G..	..F9.. = DN50 PN16 DIN Flange ..C9 <sup>9)</sup> .. = DN50 PN40 DIN Flange		..HA.. = H0 + ATEX (Exi) ..BA <sup>9)</sup> .. = B0 + ATEX (Exi) ..KA <sup>9)</sup> .. = K0 + ATEX (Exi) ..GA <sup>2)</sup> .. = G0 + ATEX (Exi) ..DA.. = D0 + ATEX (Exi)		
10...200 GPM	DON-345G..	DON-445G..	DON-945G..	..NB.. = 3" NPT ..RB.. = G 3 ..AB.. = 3" 150 lb ANSI Flange		..1A.. = ZOK-E1 + HA ATEX (Exi) ..2A.. = ZOK-E2 + HA ATEX (Exi) ..3A.. = ZOK-E3 + HA ATEX (Exi) ..5A.. = ZOK-E5 + HA ATEX (Exi)		
13...260 GPM	DON-350G..	DON-450G..	DON-950G..	..FB.. = DN80 PN16 DIN Flange				
20...400 GPM	DON-355G..	DON-455G..	DON-955G..	..NC.. = 4" NPT ..RC.. = G 4 ..AC.. = 4" 150 lb ANSI Flange ..FC.. = DN100 PN16 DIN Flange		..CT <sup>15)</sup> .. = U-PAGE, TFT display, 2 outputs (current/voltage/pulse/frequency/alarm output/IO link configurable), M12x1 plug ..M4 <sup>9)</sup> .. = Mech. Totalizer	..0.. = Without	
40...660 GPM <sup>10)</sup>	DON-360G..	DON-460G..	DON-960G..					

<sup>1)</sup> Only for DON-435 and DON-935 <sup>2)</sup> Only for DON-x04, -x05 and -x10 <sup>3)</sup> Not for DON-x04, -x05 and -x10 <sup>4)</sup> Replace 'G' with 'H' to order LPM (LPH) <sup>5)</sup> With steel screws, only for DON-3.. and DON-9..  
<sup>6)</sup> Only for DON-x20...DON-x60. <sup>7)</sup> Not for electronic options 1A to 5A, not for DON-3.. and DON-9..  
<sup>8)</sup> Only for DON-4 <sup>9)</sup> Only for DON-x04, -x05, -x10, -x15 without reed switch <sup>10)</sup> Calibrated up to 580 GPM. Higher flow rate calibration on request <sup>11)</sup> Without backlighting <sup>12)</sup> For DON-x15 Peek Rotor, for DON-x20...DON-x60 PPS Rotor <sup>13)</sup> Only for DON-x04...DON-x20, this version is not calibrated (no calibration certificate). Use K-factor values from the datasheet <sup>14)</sup> Only for DON-x04...DON-x40 <sup>15)</sup> l/min-package (nameplate l/min or ml/min, °C, bar), calibrated range and temperature °C, GPM-package (nameplate (GPM or GPH, °F, PSI)), calibrated range and temperature °F) <sup>16)</sup> Only for DON-415...DON-430, not for ATEX, only for pulse output <sup>17)</sup> Only possible with electronics H0/B0/G0/K0/D0/L0 <sup>18)</sup> Refer to the "Maximum Flowrate Multiplier (for Higher Viscosities)" table for the actual max. flow rate

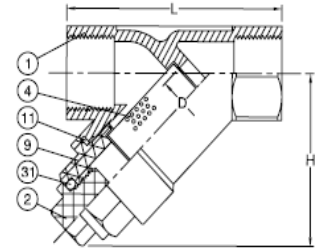


## Oval Gear Flowmeter Model DON

### Technical Details MFR-DO (version stainless steel)

Design:	two part screwed body
Connections:	female thread G ¼...G 3 DIN ISO 228-1
Nominal Pressure:	PN 40
Temperature Range:	
Mesh Size:	200 mesh/75 µm for G ¼, G 3/8 100 mesh/150 µm for G ½, G 1, G 1 ½ 40 mesh/400 µm for G 2, G 3
Mounting position:	cover toward bottom, note specified direction of flow
Materials	
Body (1):	stainless steel 1.4408, EN1503-1
Plug (2):	stainless steel 1.4408, EN1503-1
Screen (4):	stainless steel 316
Bonnet (9):	stainless steel 1.4408, EN1503-1
Body seal (11)	PTFE
O-ring (31):	FPM

### MFR-DO



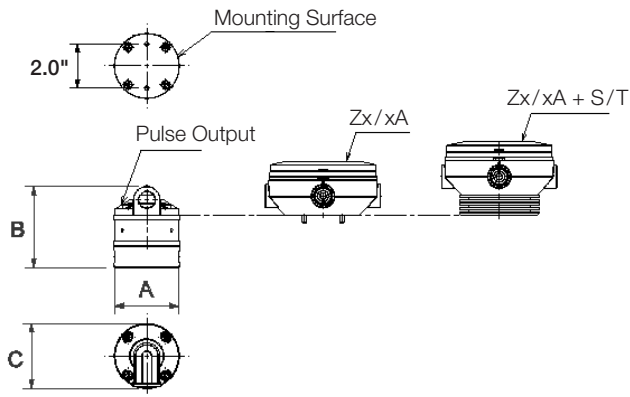
### Dimensions, weight, and Order Details

**MFR-DO stainless steel version**  
(example: MFR-DOR15)

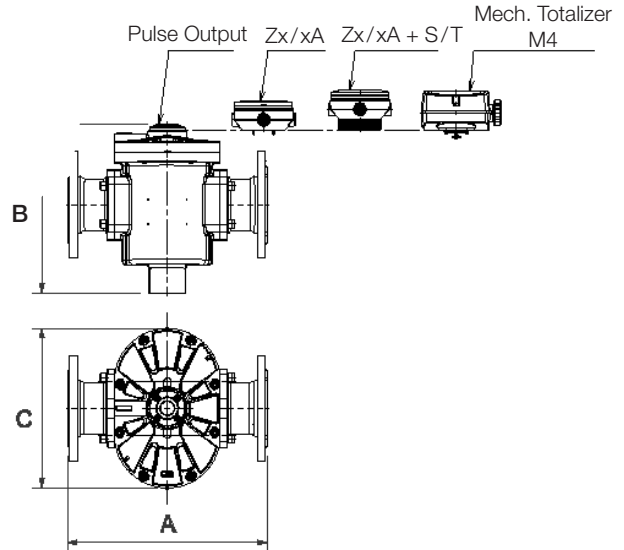
Order No.	Size		L [mm]	H [mm]	D [mm]	Weight [kg]
MFR-DOR10	DN08	¼"	65.0	51.0	10.0	.25
MFR-DOR10	DN10	¾"	65.0	51.0	12.0	.25
MFR-DOR15	DN15	½"	65.0	51.0	15.0	.25
MFR-DOR25	DN25	1"	90.0	72.0	25.0	.70
MFR-DOR40	DN40	1 ½"	120.0	87.0	40.0	1.20
MFR-DOR50	DN50	2"	140.0	103.0	50.0	1.90
MFR-DOR80	DN80	3"	200.0	143.0	80.0	6.16

**Dimensions DON-1/2/3/4/8/9)...**

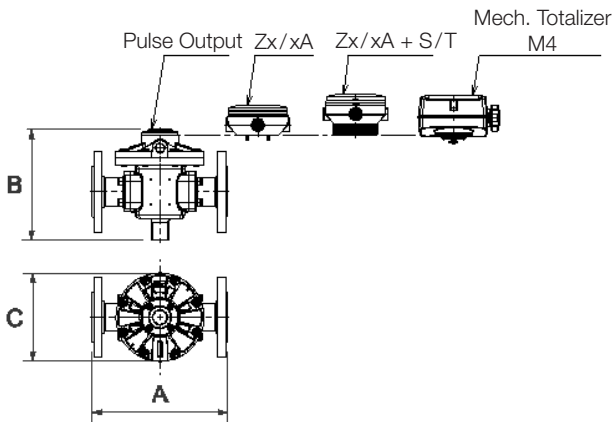
**DON-x04...DON-x15**



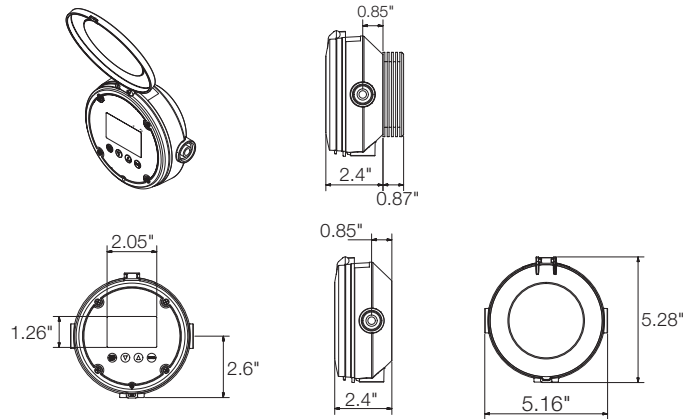
**DON-x45...DON-x60**



**DON-x20...DON-x40**



**Electronic with LCD Display Zx/xA**

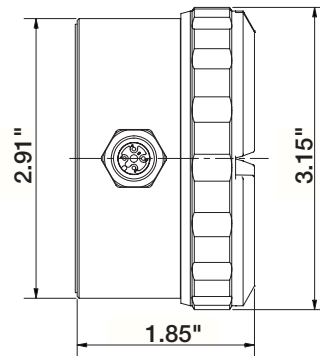
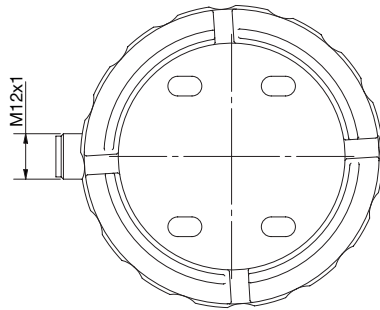
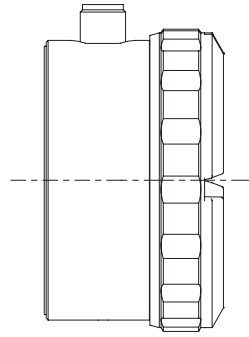
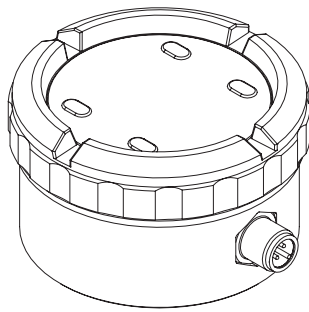


**Dimensions\* DON-1/2/3/4/8/9... (± 0.08")**

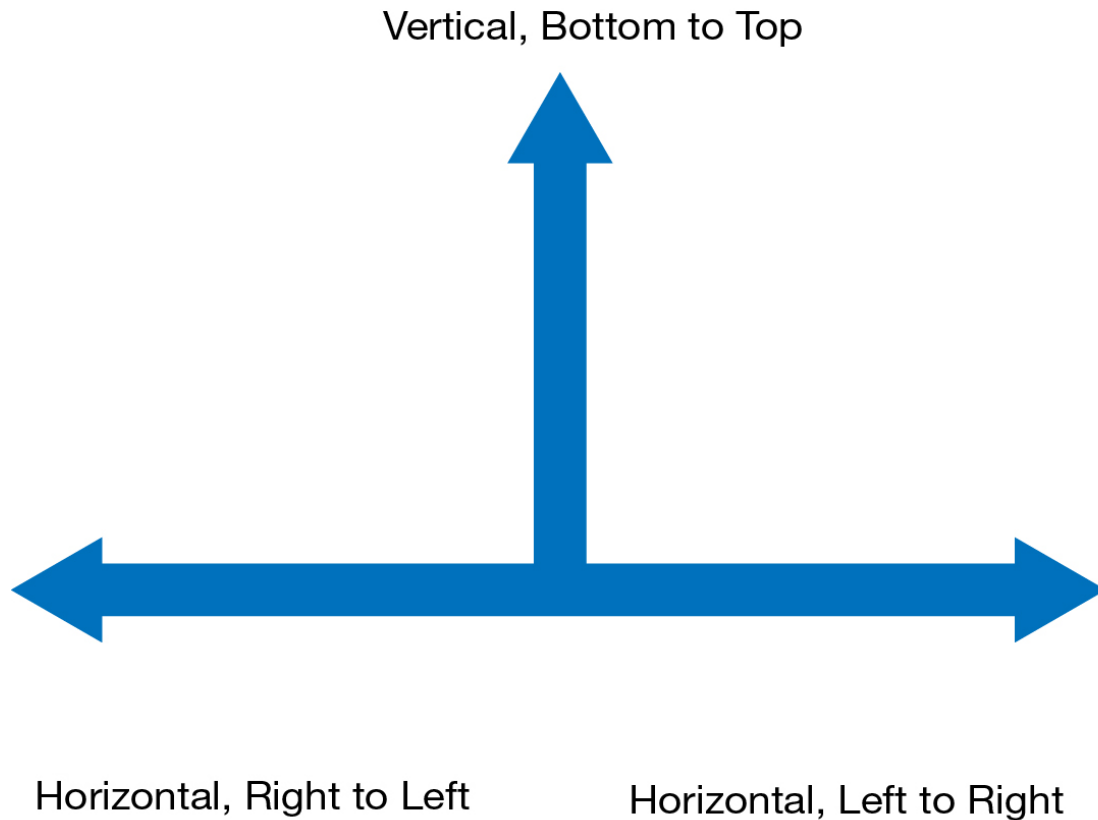
Model	A		B			C		
	Thread Connection	Flange Connection	Pulse Output	Zx/xA	Mechanical Totalizer M4	Pulse Output/Lx	Zx/xA	Mechanical Totalizer M4
DON-x04	2.67"	-	3.62"	5.16"	-	2.83"	5.28"	-
DON-x05	2.67"	-	3.62"	5.16"	-	2.83"	5.28"	-
DON-x10	2.67"	-	3.62"	5.16"	-	2.83"	5.28"	-
DON-x15	2.67"	-	3.89"	5.43"	-	2.83"	5.28"	-
DON-x20	4.33"	-	4.13" (3.98")	5.28" (5.12")	7.17" (7.01")	4.41"	5.28"	6.50"
DON-x25	6.93"	9.33"	5.36"	6.50"	7.64"	4.72"	5.28"	6.69"
DON-x30	7.40"	9.92"	6.54"	7.68"	8.78"	6.42"	6.42"	7.88"
DON-x35	8.34"	10.90"	6.77"	7.92"	9.61"	7.09"	7.09"	7.88"
DON-x40	8.34"	10.90"	9.69"	10.83"	11.77"	7.09"	7.09"	7.88"
DON-x45	10.50"	13.90"	9.13"	10.28"	11.18"	9.37"	9.37"	9.41"
DON-x50	11.60"	15.00"	9.02"	10.16"	11.89"	11.41"	11.41"	11.41"
DON-x55	11.60"	15.30"	10.80"	11.93"	13.66"	11.41"	11.41"	11.41"
DON-x60	12.60"	16.30"	13.80"	14.96"	16.70"	13.03"	13.03"	13.03"

\*Dimensions for DON-2/4/8/9... are specified in ( ) only when they are different from DON-1/3...

DON with CT Electronics



## Flow Direction Diagram



Flow is in the direction of the arrow. Orientation is indicated as directly facing the flowmeter with flow direction aligned with the diagram. For the DON, the rotor shafts must be installed in a horizontal plane, please consider this when specifying flow direction orientation. For all options except the M4, the electronic screen or digital display can be rotated in 90° increments, but specifying the correct flow direction avoids the need for field modification.

Example: Horizontal flow, left to right



# DON Application Guide

Rev 10/10/25

## General Information

Contact Name: \_\_\_\_\_

Company Name: \_\_\_\_\_

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

Quote Number (if already quoted): \_\_\_\_\_

Date: \_\_\_\_\_

Part Number: \_\_\_\_\_

Number of Pieces Required: \_\_\_\_\_

This has not been quoted yet and pricing is required.

## Design Conditions

Accurate design pressure and temperature are essential to ensure the flowmeter will be built to operate without damage. Please fill out accurately and completely.

1. Pressure: Maximum \_\_\_\_\_ PSIG

2. Temperature: Maximum \_\_\_\_\_ °F

## Process Operating Conditions

1. Type of Liquid: \_\_\_\_\_

4. Desired Measuring Range: \_\_\_\_\_

GPH LPH

2. Normal Operating Temperature: \_\_\_\_\_ °F

5. Maximum Liquid Viscosity: \_\_\_\_\_

GPM LPM

3. Normal Operating Pressure: \_\_\_\_\_ PSIG

6. Piping Size: \_\_\_\_\_

## Body/Rotor Material

Aluminum/PPS (Max 176°F)

Stainless Steel/Stainless Steel

Stainless Steel/PPS (Max 176°F)

## Connection

NPT Thread

150lb ANSI Flange (DON-X25...DON-X60)

300lb ANSI Flange (DON-X25...DON-X40)

Other (specify)

G thread

PN 16 DIN Flange (DON-X40...DON-X60)

PN 40 DIN Flange (DON-X25...DON-X40)

## O-Ring Material

FKM (standard)

FEP-Coated EPDM/FKM Core

NBR

Fluoroprene®

FKM Vi 840  
(No ATEX)

## Electronic/Display

H0 = Hall/Reed Sensor P-P

Z2 = Batch Totalizer LCD

HE = H0 + ATEX (Exd)

GA = G0 + ATEX (Exi)

HU = Hall/Reed Sensor NPN

Z3 = Rate Totalizer, LCD

BE = B0 + ATEX (Exd)

DA = D0 + ATEX (Exi)

B0 = Pulsating Flow

Z5 = Z3 + x2 SPDT Relays

KE = K0 + ATEX (Exd)

1A = Z1 + HA ATEX (Exi)

T0 = Hall Sensor High Temp

Z6 = Z1 + B0

GE = G0 + ATEX (Exd)

2A = Z2 + HA ATEX (Exi)

K0 = High Res. Hall x2

Z7 = Z3 + B0

DE = D0 + ATEX (Exd)

3A = Z3 + HA ATEX (Exi)

G0 = High Res. Hall x4

Z8 = Z1 + D0

LE = L0 + ATEX (Exd)

5A = Z5 + HA ATEX (Exi)

D0 = Quad Hall

Z9 = Z3 + D0

HA = H0 + ATEX (Exi)

CT = U-PACE

L0 = 4-20 mA, 2-wire

ZE = LCD Rate Totalizer

BA = B0 + ATEX (Exi)

M4 = Mech. Totalizer  
(Max 176°F)

Z1 = Dual Totalizer LCD

ZB = LCD Rate Totalizer

KA = K0 + ATEX (Exi)

Other = \_\_\_\_\_

**Cable Entry** (not for electronic/display code M4 or CT)

M = M20

N = 1/2" NPT

S = M20 with Cooling Fin

T = 1/2" NPT with Cooling Fin

P= Electrical Connection M12x1  
(Blind outputs only)

**Options**

0 = Without Options

N = Without Battery

Y = Special Request, i.e. Check Valve, not for ATEX

**Flow Direction**

Vertical Up

Horizontal to the Left

Horizontal to the Right

Note: Flow direction is required for M4 and can be specified for Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, 1A, 2A, 3A, 5A, CT (these can be adjusted in the field if needed) electronic/display options.

Special Requirements or Considerations: