



Oscillation Flow Meter for Gases



measuring
•
monitoring
•
analysing



- Measuring ranges:
0.2-20 to 200-20 000 m³/h air
- p_{max}: PN 40, t_{max}: 120 °C
- Connection: flange DN 25 - DN 400
- Material: Cast Iron,
steel or stainless steel
- Accuracy: ±1.5 % of measured value
- No moving parts
- Long-term stability



KOBOLD companies worldwide:

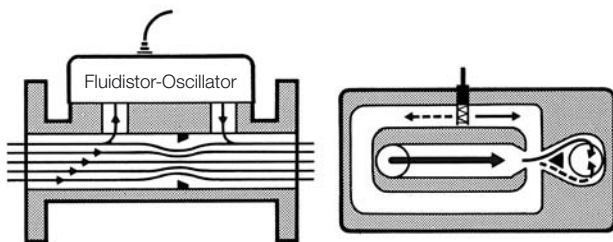
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Model:
DOG-1
DOG-3

Description

The KOBOLD flow meter DOG-1 and DOG-3 are used for non-contact flow measurement of gases. The medium flows through an orifice in a tube. Bypass bores are located at the sides. The dynamic pressure at the orifice causes part of the gas volumetric flow to flow into the bypass. The division ratio remains constant over the whole measuring range.



The bypass channel contains the Fluidistor Oscillator - the measuring cell itself. When the gas flows through the measuring cell, a gas column oscillates in a u-shaped channel mounted to the left and right. This oscillation frequency is proportional to the flow velocity and thus to the total volume flow. The oscillation frequency is sensed with a hot wire sensor. An electrical alternating signal is generated that is displayed in the series-connected electronics.

Application

The inner, connected flow channels are generously dimensioned. The constant changes of direction of the flow in the channels have a self-cleaning effect. The devices are therefore extremely dirt resistant and have no consumables. The mounting position can be chosen at will. When condensate forms in the gas, the horizontal mounting position with the sensing element pointing upwards is recommended. The gas flow velocity anywhere in the pipe-work upstream of the flow meter should not exceed the sound velocity. Pressure drops above critical and pulsating streams must be avoided.

The recommended inlet pipe section is 10xDN and the outlet pipe section 5xDN.

Areas of application

- Compressed air
- Natural gas, biogas, fermentation gas
- Propane
- Hydrogen gas
- Nitrogen
- Argon

Technical details

Measuring accuracy: $\pm 1.5\%$ of meas. value (at $Q_t=100\%$ *)
 $\pm 5\%$ of measured value (at $1\% - Q_t^*$)
 *The lower limit Q_t depends on the density

$Q_t = 8\%$ at density 1 kg/m^3
 $Q_t = 4\%$ at density 2 kg/m^3
 $Q_t = 2\%$ at density 4 kg/m^3
 $Q_t = 1\%$ at density $\geq 8 \text{ kg/m}^3$


Repeatability: 0.1 % of measured value
 Max. temperature: $-20 \dots +120^\circ\text{C}$
 $-20 \dots +60^\circ\text{C}$ (Ex-Version)
 Ambient temperature: max. 80°C
 $-25 \dots +60^\circ\text{C}$ (Ex-Version)
 Operating pressure: DOG-11/12..., DOG-31/32...: PN 16
 DOG-12/13..., DOG-32/33...: PN 40
 Span: DOG-1...: 1 : 100
 DOG-3...: 1 : 50
 Sensor: hot-wire, RDC
 Pulses: max. 200 Hz
 Protection: IP 65

Materials

Case: DOG-11...: cast Iron GG25
 DOG-13...: Steel St. 35.8
 DOG-33...: Steel St. 52-3N
 DOG-12/32...: St. steel 1.4571

Orifice: stainless steel 1.4436
 Sensing element: polyphenylene sulfide (PPS)
 Sensor: Platinum
 Gaskets: silicone, nitrile or FPM

Electronics

Electrical connection: Cable with PG-thread
 Display: 4-digit LCD display, counter
 Power supply: $230 \text{ V}_{AC} - 10\%, +12\% / 48 - 62 \text{ Hz}$
 Input: hot wire sensor
 Pulse output 1: 12 V_{DC} , max. 100 mA, Open Collector
 Pulse output 2: floating contact decadic 250 V_{AC} , max. 3 A
 Analogue output: $0 - 20 \text{ mA}$ or $4 - 20 \text{ mA}$
 max. 500Ω
 Ambient temperature: 0 to $+50^\circ\text{C}$
 Permissible distance: max. 50 m to DOG-1...DOG-3
 Connection cable: minimum 0.5 mm^2 , screening recommended
 Ex-Version:  II 1G EEx ia IIC T4



Order details for DOG-1 with flange (example: DOG-1101L F25N S ER00)

Meas. range m³/h air	Model			Connection flange		Gasket	Evaluat. electronics
	Material cast iron	Material steel	Material stainless steel	Standard PN 16 only GG, VA	Special PN 40 only St., VA		
0.2...20 0.35...35 0.7...70	DOG-1101L.. DOG-1102L.. DOG-1103L..	- - -	DOG-1201L.. DOG-1202L.. DOG-1203L..	F25N=DN25	F25S=DN25		
0.2...20 0.6...60 1.0...100	- - -	DOG-1304L.. DOG-1305L.. DOG-1306L..	- - -	F32N=DN32	F32S=DN32		
0.2...20 0.9...90 2.0...200	DOG-1107L.. DOG-1108L.. DOG-1109L..	- - -	DOG-1207L.. DOG-1208L.. DOG-1209L..	F40N=DN40	F40S=DN40		
0.2...20 1.1...110 2.5...250	DOG-1110L.. DOG-1111L.. DOG-1112L..	- - -	DOG-1210L.. DOG-1211L.. DOG-1212L..	F50N=DN50	F50S=DN50		with external electronics
0.9...90 1.7...170 4.5...450	- - -	DOG-1313L.. DOG-1314L.. DOG-1315L..	DOG-1213L.. DOG-1214L.. DOG-1215L..	F65N=DN65	F65S=DN65		...A RDC input, without display, no EX protection, with analogue and pulse output
1.4...140 4.5...450 8.0...800	DOG-1116L.. DOG-1117L.. DOG-1118L..	- - -	DOG-1216L.. DOG-1217L.. DOG-1218L..	F80N=DN80	F80S=DN80		...D RDC input, with display for instantaneous value and total, no EX protection, with analogue and pulse output
2.7...270 6.5...650 10...1000	DOG-1119L.. DOG-1120L.. DOG-1121L..	- - -	DOG-1219L.. DOG-1220L.. DOG-1221L..	F1HN=DN100	F1HS=DN100	S = Silicone N = Nitrile	...E RDC input, without display, with EX protection, with analogue and pulse output
4...400 8...800 15...1500	- - -	DOG-1322L.. DOG-1323L.. DOG-1324L..	DOG-1222L.. DOG-1223L.. DOG-1224L..	F1ZN=DN125	F1ZS=DN125	V = FPM	...X RDC input, with display for instantaneous value and total, with EX protection, with analogue and pulse output
6...600 12...1200 30...3000	- - -	DOG-1325L.. DOG-1326L.. DOG-1327L..	DOG-1225L.. DOG-1226L.. DOG-1227L..	F1FN=DN150	F1FS=DN150		
12...1200 25...2500 60...6000	- - -	DOG-1328L.. DOG-1329L.. DOG-1330L..	DOG-1228L.. DOG-1229L.. DOG-1230L..	F2HN=DN200	F2HS=DN200*		
20...2000 40...4000 75...7500	- - -	DOG-1331L.. DOG-1332L.. DOG-1333L..	DOG-1231L.. DOG-1232L.. DOG-1233L..	F2FN=DN250	F2FS=DN250*		
30...3000 50...5000 113...13 000	- - -	DOG-1334L.. DOG-1335L.. DOG-1336L..	- - -	F3HN=DN300	F3HS=DN300		
40...4000 70...7000 140...14 000	- - -	DOG-1337L.. DOG-1338L.. DOG-1339L..	- - -	F3FN=DN350	-		
50...5000 100...10 000 160...16 000	- - -	DOG-1340L.. DOG-1341L.. DOG-1342L..	- - -	F4HN=DN400	-		

*not for DOG-12 (stainless steel)

Please state the exact operating conditions (gas types, flow volume, pressure, temperature, installation position etc.) when ordering.

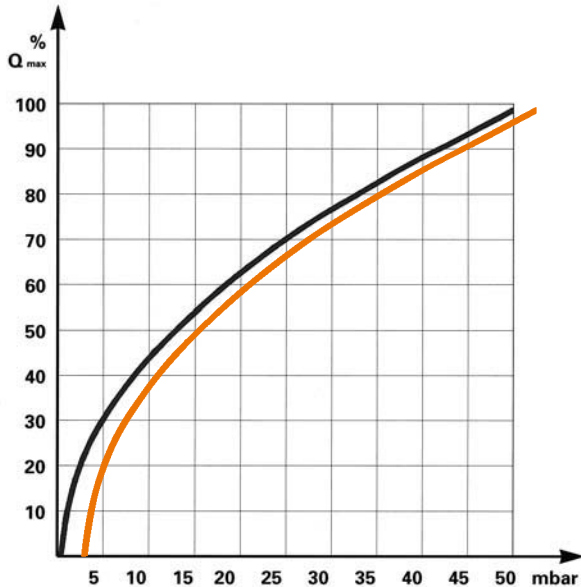


Order details for DOG-3 with Wafer design (example: DOG-3301L F25N S A)

Meas. range m ³ /h air	Model		Connection Wafer design		Gasket	Evaluat. electronics
	Material steel	Material stainless steel	Standard PN 16	Special PN 40		
0.4...20 0.7...35 1.4...70	DOG-3301L.. DOG-3302L.. DOG-3303L..	DOG-3201L.. DOG-3202L.. DOG-3203L..	F25N=DN25	F25S=DN25	S = Silicone N = Nitrile V = FPM	with external electronics ...A RDC input, without display, no EX protection, with analogue and pulse output ...D RDC input, with display for instantaneous value and total, no EX protection, with analogue and pulse output ...E RDC input, without display, with EX protection, with analogue and pulse output ...X RDC input, with display for instantaneous value and total, with EX protection, with analogue and pulse output
0.4...20 1.8...90 3.5...180	DOG-3307L.. DOG-3308L.. DOG-3309L..	DOG-3207L.. DOG-3208L.. DOG-3209L..	F40N=DN40	F40S=DN40		
0.4...20 2.2...105 5...250	DOG-3310L.. DOG-3311L.. DOG-3312L..	DOG-3210L.. DOG-3211L.. DOG-3212L..	F50N=DN50	F50S=DN50		
1.8...90 3.5...170 9...450	DOG-3313L.. DOG-3314L.. DOG-3315L..	DOG-3213L.. DOG-3214L.. DOG-3215L..	F65N=DN65	F65S=DN65		
2.8...135 6...300 16...800	DOG-3316L.. DOG-3317L.. DOG-3318L..	DOG-3216L.. DOG-3217L.. DOG-3218L..	F80N=DN80	F80S=DN80		
6...300 14...700 18...900	DOG-3319L.. DOG-3320L.. DOG-3321L..	DOG-3219L.. DOG-3220L.. DOG-3221L..	F1HN=DN100	F1HS=DN100		
8...400 18...900 40...2000	DOG-3322L.. DOG-3323L.. DOG-3324L..	DOG-3222L.. DOG-3223L.. DOG-3224L..	F1ZN=DN125	F1ZS=DN125		
12...600 25...1250 60...3000	DOG-3325L.. DOG-3326L.. DOG-3327L..	DOG-3225L.. DOG-3226L.. DOG-3227L..	F1FN=DN150	F1FS=DN150		
24...1200 50...2500 120...6000	DOG-3328L.. DOG-3329L.. DOG-3330L..	DOG-3228L.. DOG-3229L.. DOG-3230L..	F2HN=DN200	F2HS=DN200		
40...2000 80...4000 150...7500	DOG-3331L.. DOG-3332L.. DOG-3333L..	DOG-3231L.. DOG-3232L.. DOG-3233L..	F2FN=DN250	F2FS=DN250		
60...3000 100...5000 240...12 000	DOG-3334L.. DOG-3335L.. DOG-3336L..	DOG-3234L.. DOG-3235L.. DOG-3236L..	F3HN=DN300	F3HS=DN300		
80...4000 140...7000 280...14 000	DOG-3337L.. DOG-3338L.. DOG-3339L..	DOG-3237L.. DOG-3238L.. DOG-3239L..	F3FN=DN350	F3FS=DN350		
100...5000 200...10 000 400...20 000	DOG-3340L.. DOG-3341L.. DOG-3342L..	DOG-3240L.. DOG-3241L.. DOG-3242L..	F4HN=DN400	F4HS=DN400		

Please state the exact operating conditions (gas types, flow volume, pressure, temperature, installation position etc.) when ordering.

Pressure loss / flow



The diagram applies for gases with a density of air at NPT (0°C and 1000 mbar). The pressure loss is always proportional to the density of the gas. For example, the pressure loss doubles at 100% higher operating pressure.

Calculating the actual density

The actual density can be calculated with the following formula:

$$D = D_0 \cdot \frac{P \cdot T_0}{T}$$

D_0 = density at 1 bar abs. and 0°C (= 273°K)

T = temperature in °K
(= °C + 273 for example 20°C = 273 + 20 = 293°K)

T_0 = 273°K

P = operating pressure in bar (absolute pressure)

Calculating the norm flow

$$Q_N = Q \cdot \frac{P \cdot 273}{1,013 \cdot T}$$

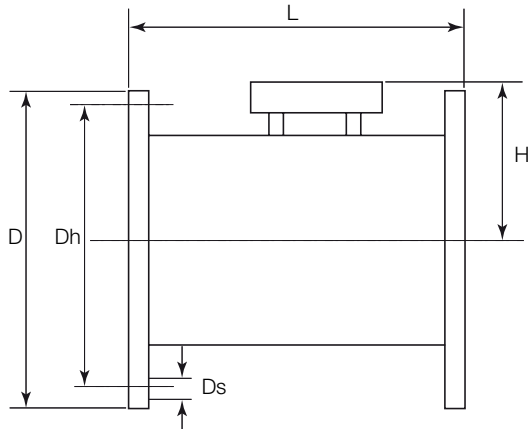
Q_N = norm flow at 1.013 bar abs. and 0°C

Q = operating flow

P = operating pressure in bar (absolute pressure)

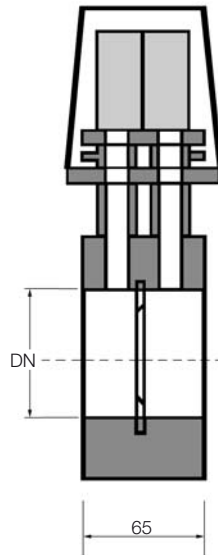
T = operating temperature in °K

Dimensions and weight DOG-1

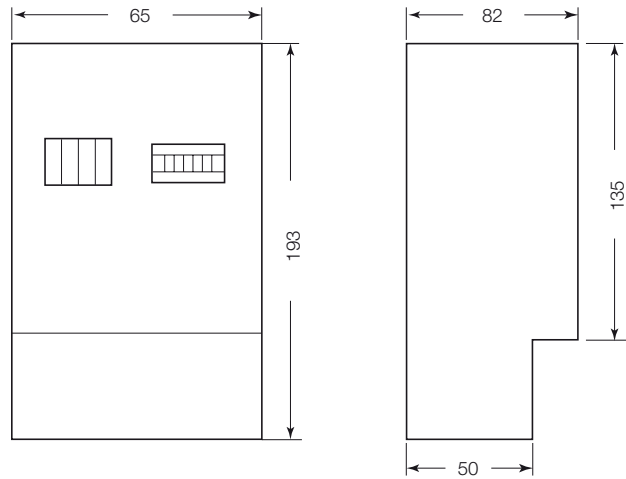


DN [mm]	L [mm]	D [mm]	Dh [mm]	Ds [mm]	Number of holes	H [mm]	H with AVF [mm]	Weight [kg]
25	300	115	85	14	4	130	165	10
32	300	140	100	18	4	140	175	11
40	300	150	110	18	4	140	175	12
50	300	165	125	18	4	145	180	13
65	300	185	145	18	4	155	190	14
80	300	200	160	18	8	160	195	20
100	360	220	180	18	8	200	235	23
125	300	250	210	18	8	230	265	20
150	350 or 500	285	240	22	8	255	290	26, 28
200	350	340	295	22	12	280	315	36
250	450	405	355	26	12	305	340	53
300	500	460	410	26	12	330	365	70
350	500	520	470	26	16	360	395	83
400	500	580	525	30	16	380	415	90

Dimensions and weight DOG-3



Dimensions of electronics



DN mm	D mm	Weight kg
25	65	10
32	65	11
40	65	12
50	65	13
65	65	14
80	65	20
100	65	23
125	65	20
150	65	28
200	65	36
250	65	53
300	65	70
350	65	90
400	65	120

Accessory

Valve in the bypass (between measuring tube and measuring cell) for easy sensor changing and for protection of the sensor when starting the installation.