

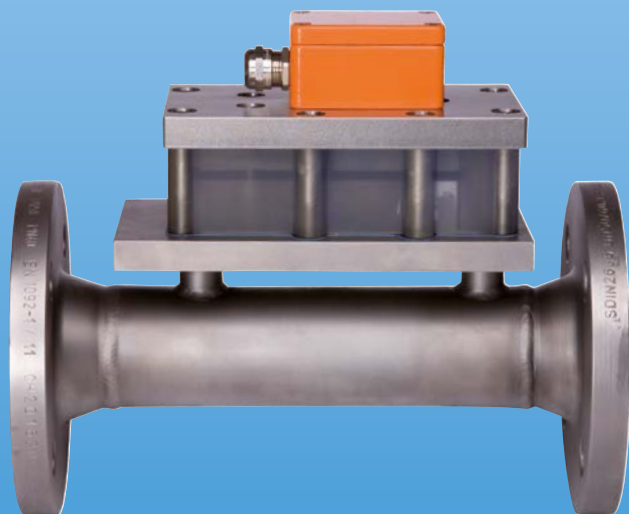


Oscillation Flowmeter for gases



measuring
•
monitoring
•
analysing

DOG-4



- Measuring ranges:
0.2 - 20 ... 60 - 6000 m³/h air
- p_{max}: PN 40; t_{max}: 120°C
- Connection:
flange DN 25 ... DN 200
- Material: stainless steel
- Accuracy:
±1.5 % of measured value
- No moving parts
- Long-term stability
- Options: flow computer,
analogue and pulse outputs

SS



KOBOLD companies worldwide:

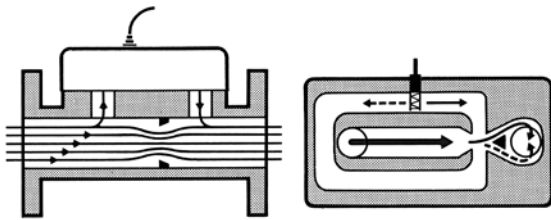
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Description

The KOBOLD flowmeter DOG-4 is used for noncontact 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 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 platinum 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 pipework upstream of the flowmeter 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.

The version available with the bypass ball valves installed between the measuring head and the housing enables easy sensor replacement and/ or measuring head cleaning without flow interruption in main line/ flow meter. The bypass valves also serve for sensor protection against mechanical damage during start-up.

Areas of Application

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

Technical Data

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

Media temperature: $-20 \dots +120 \text{ }^\circ\text{C}$ (non ATEX version)

$-20 \dots +60 \text{ }^\circ\text{C}$ (ATEX version)

Ambient temperature: $-25 \dots +80 \text{ }^\circ\text{C}$ (non ATEX version)

$-25 \dots +60 \text{ }^\circ\text{C}$ (ATEX version)

Operating pressure:

DOG-42xxx25 ... DOG-42xxx50: PN 40

DOG-42xxx80 ... DOG-42xxx1F: PN 16

Span: 1:100

Sensor: platinum sensor

Protection: IP 65

Materials (Transmitter)

Housing: stainless steel 1.4404/316L

Orifice: stainless steel 1.4404/316L

Measuring head: polyphenylene sulfide (PPS)

Sensor: platinum

Gaskets: Klingersil® C-4265, NBR

Ball valves: stainless steel

Note: Sponsored by the Federal Ministry of Economics and Technology on the basis of a resolution of the German Bundestag.



Elektronic Options

Electronics DOG-...A/B

(Transducer with/without ATEX certification)

Power supply:

A/B: 230 V_{AC} ± 10 %, 50 ... 60 Hz

Input: Platinum sensor (Allowed distance: max. 50 m to transmitter)

Output: Opto coupler, frequency linear to flow (see graph below)

V_{CE}: max. 30 V

I_C: max. 50 mA

P_{tot}: 100 mW at 25 °C

Derating: 0.91 mW/°C

Ambient temperature: -25 ... +60 °C

Protection: IP20

Ex version (A):

ATEX

Transducer: II (1)G [Ex ia Ga] IIC

Sensor: II G Ex ia IIC T4 Ga

IECEX

Transducer: [Ex ia Ga] IIC

Sensor: Ex ia IIC T4 Ga

Mounting: DIN Rail

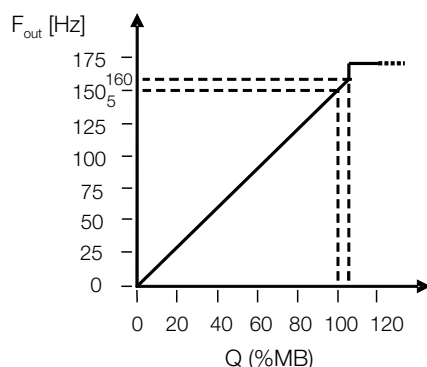
Dimensions: Width: 45 mm

Height: 105.6 mm

Depth: 113.6 mm

Weight: approx. 200 g

Frequency/Flow linearity



Electronics DOG-...G/H

(Transducer without/with ATEX certification and Flow rate/Unit counter, with current/pulse output)

Display: alphanumeric LCD, UV-resistant, Flow rate and/or total (7 digits, 17 mm high) resettable, accumulated total (11 digits, 8 mm high) not resettable

Units: **Flow:** ml, l, m³, Gallons, kg, Ton, lb, bl, cf, RND, ft³, scf, Nm³, NI, igal - no unit

Total: l, m³, GAL, USGAL, kg, lb, bbl, no unit

Accumulated total: according to selection for total

Decimals: **Flow:** 0, 1, 2 or 3

Accumulated total: according to selection for total

Time units: /sec, /min, /hr, /day

Backlightning: yes

Signal input: Sine wave (minimum 20 m V_{pp} or 80 m V_{pp} sensitivity selectable), NPN/PNP, open collector, reed switch, Namur, active pulse signals 8 ... 12 and 24 V_{DC}

Power supply:

G/H: 230 V_{AC} ± 10 %, 50 ... 60 Hz

Linearisation: 15 points

Electrical connection: 6 x M16x1.5 cable gland

Housing material: ABS with PC cover

Weight: approx. 1800 g

Analogue output: 4 ... 20 mA active

Pulse output: PNP, 24 V_{DC} active max. 50 mA, scaled, according to linearised accumulated total (e. g. pulse every 12 liters)

Pulse duration: user defined

0.008 s ... 2 s

max. frequency 64 Hz

Protection: IP65

Mounting: Wall mounting

Data protection: EEPROM backup, backup of running totals every minute, Data retention at least 10 years

Communication: Modbus (on request)



Elektronic Options (continuation)

Electronics DOG-...M/N
(Transducer without/with ATEX certification and Flow computer)

Display: Alphanumeric LCD,
UV-resistant with displayed functions:
Compensated flow rate (7 digits, 17 mm high)
Compensated total (7 digits, 17 mm high)
Resettable and accumulated total (11 digits, 8 mm high) not resettable
Actual line temperature (6 digits)
Actual line pressure (6 digits)

Units: **Flow:** ml, l, m³, Gallons, kg, Ton, lb, bl, cf, RND, ft³, scf, Nm³, NI, igal - no units
Total: l, m³, GAL, USGAL, kg, lb, bbl, no unit
Accumulated total: according to selection for total
Temperature: °C, °F or K
Pressure: mbar, bar, PSI, no unit

Decimals: **Flow:** 0, 1, 2 or 3
Accumulated total: according to selection for total
Temperature/Pressure: 1

Time units: /sec, /min, /hr, /day

Backlightning: yes

Signal input: **Flow:** Sine wave (minimum 20 m Vpp or 80 m Vpp sensitivity selectable), NPN/PNP, open collector, reed switch, Namur, active pulse signals 8... 12 and 24 V_{DC}
Temperature: PT100, 3 wire
Pressure: 0(4) ... 20 mA (passive), scalable

Power supply: M/N: 230 V_{AC} ± 10%, 50 ... 60 Hz

Electrical Connection: 5 x M16x1.5 cable gland

Housing material: ABS with PC cover

Weight: approx. 1800 g

Analogue output: 4 ... 20 mA active

Protection: IP65

Mounting: Wall mounring

Data protection: EEPROM backup, backup of running totals every minute, Data retention at least 10 years

Communication: Modbus (on request)

Display





Order details for DOG-4 (Example: DOG-4200 S 50 0 A0 0)

Measuring range air [m ³ /h]	Model Material st. steel	Pressure rating [PN]	Connection flange [size/type]	Ball valve	Electronics	Options
0.2...20	DOG-4200S25..	10...40 bar	DN25	0 = without ball valve 1 = with ball valve		
	DOG-4200S40..		DN40			
	DOG-4200S50..		DN50			
	DOG-4200B25..	Class 300	ANSI 1"			
	DOG-4200B40..		ANSI 1½"			
	DOG-4200B50..		ANSI 2"			
0.35...35	DOG-4250S25..	10...40 bar	DN25			
	DOG-4250B25..	Class 300	ANSI 1"			
0.7...70	DOG-42A0S25..	10...40 bar	DN25			
	DOG-42A0B25..	Class 300	ANSI 1"			
0.9...90	DOG-42A5S40..	10...40 bar	DN40			
	DOG-42A5B40..	Class 300	ANSI 1½"			
1.1...110	DOG-42B0S50..	10...40 bar	DN50			
	DOG-42B0B50..	Class 300	ANSI 2"			
1.4...140	DOG-42B5F80..	16 bar	DN80			
	DOG-42B5S80..	40 bar	DN80			
	DOG-42B5A80..	Class 150	ANSI 3"			
	DOG-42B5B80..	Class 300	ANSI 3"			
2...200	DOG-42C0S40..	10...40 bar	DN40			
	DOG-42C0B40..	Class 300	ANSI 1½"			
2.5...250	DOG-42C5S50..	10...40 bar	DN50			
	DOG-42C5B50..	Class 300	ANSI 2"			
2.7...270	DOG-42D0F1H..	16 bar	DN100			
	DOG-42D0S1H..	40 bar	DN100			
	DOG-42D0A1H..	Class 150	ANSI 4"			
	DOG-42D0B1H..	Class 300	ANSI 4"			
4.5...450	DOG-42D5F80..	16 bar	DN80			
	DOG-42D5S80..	40 bar	DN80			
	DOG-42D5A80..	Class 150	ANSI 3"			
	DOG-42D5B80..	Class 300	ANSI 3"			
6.0...600	DOG-42E0F1F..	16 bar	DN150			
	DOG-42E0S1F..	40 bar	DN150			
	DOG-42E0A1F..	Class 150	ANSI 6"			
	DOG-42E0B1F..	Class 300	ANSI 6"			
6.5...650	DOG-42E5F1H..	16 bar	DN100			
	DOG-42E5S1H..	40 bar	DN100			
	DOG-42E5A1H..	Class 150	ANSI 4"			
	DOG-42E5B1H..	Class 300	ANSI 4"			

B0 = Frequency output, 230 V_{AC}

A0 = as 'B', with ATEX

G0 = Unit counter, pulse output, analogue output, 230 V_{AC}

H0 = as 'G', with ATEX

M0 = Flow computer, pulse output, analogue output, 230 V_{AC}

N0 = as 'M', with ATEX

Y0 = Special (specify in clear text)

0 = without

Y = Special option (specify in clear text)



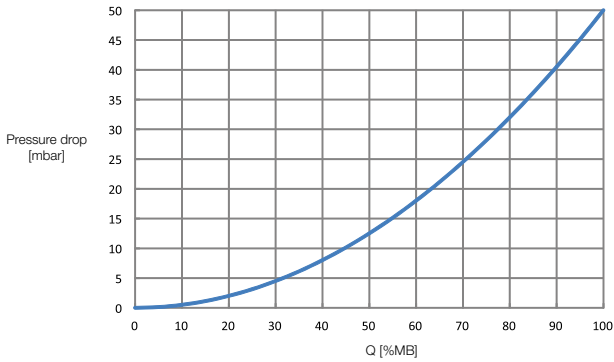
Oscillation Flowmeter Model DOG-4

Order details for DOG-4 (Example: DOG-4200 S 50 0 A0 0) (continuation)

Measuring range air [m³/h]	Model Material st. steel	Pressure rating [PN]	Connection flange [size/type]	Ball valve	Electronics	Options
8.0...800	DOG-42F0F80..	16 bar	DN 80	0 = without ball valve 1 = with ball valve	B0 = Frequency output, 230 V _{AC} A0 = as 'B', with ATEX G0 = Unit counter, pulse output, analogue output, 230 V _{AC} H0 = as 'G', with ATEX M0 = Flow computer, pulse output, analogue output, 230 V _{AC} N0 = as 'M', with ATEX Y0 = Special (specify in clear text)	0 = without Y = Special option (specify in clear text)
	DOG-42F0S80..	40 bar	DN 80			
	DOG-42F0A80..	Class 150	ANSI 3"			
	DOG-42F0B80..	Class 300	ANSI 3"			
10...1000	DOG-42F5F1H..	16 bar	DN 100			
	DOG-42F5S1H..	40 bar	DN 100			
	DOG-42F5A1H..	Class 150	ANSI 4"			
	DOG-42F5B1H..	Class 300	ANSI 4"			
12...1200	DOG-42G0F1F..	16 bar	DN 150			
	DOG-42G0S1F..	40 bar	DN 150			
	DOG-42G0A1F..	Class 150	ANSI 6"			
	DOG-42G0B1F..	Class 300	ANSI 6"			
	DOG-42G0E2H..	10 bar	DN200			
	DOG-42G0F2H..	16 bar	DN200			
	DOG-42G0S2H..	40 bar	DN200			
	DOG-42G0A2H..	Class 150	ANSI 8"			
25...2500	DOG-42G0B2H..	Class 300	ANSI 8"			
	DOG-42G5E2H..	10 bar	DN200			
	DOG-42G5F2H..	16 bar	DN200			
	DOG-42G5S2H..	40 bar	DN200			
	DOG-42G5A2H..	Class 150	ANSI 8"			
30...3000	DOG-42G5B2H..	Class 300	ANSI 8"			
	DOG-42H0F1F..	16 bar	DN 150			
	DOG-42H0S1F..	40 bar	DN 150			
	DOG-42H0A1F..	Class 150	ANSI 6"			
60...6000 ¹⁾	DOG-42H0B1F..	Class 300	ANSI 6"			
	DOG-42H5E2H..	10 bar	DN200			
	DOG-42H5F2H..	16 bar	DN200			
	DOG-42H5S2H..	40 bar	DN200			
	DOG-42H5A2H..	Class 150	ANSI 8"			
Special	DOG-42YYYYY..	Special	Special			

¹⁾ calibrated up to 4000 m³/h. Higher flow rate calibration on request.

Pressure Loss/Flow



The diagram applies for gases with a density of air at NPT (0°C and 1013,25 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:

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

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

T = temperature in K

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

T_0 = 273K

P = operating pressure in bar (absolute pressure)

Calculating the Norm Flow

$$Q_N = Q \cdot \frac{P \cdot 273}{1.013 \cdot T}$$

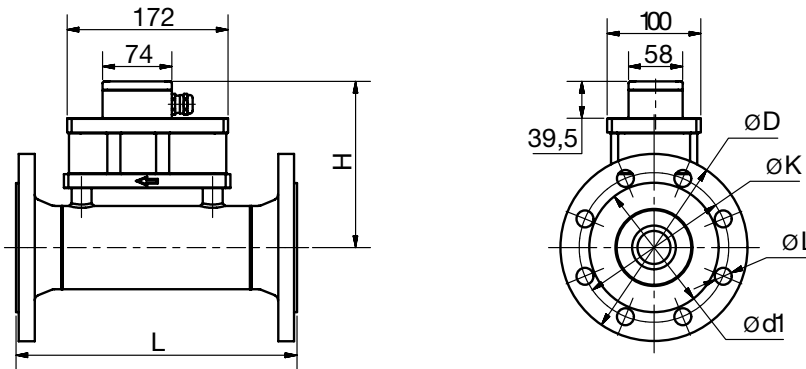
Q_N = norm flow at 1.013 bar abs. and 0°C

Q = operating flow

P = operating pressure in bar (absolute pressure)

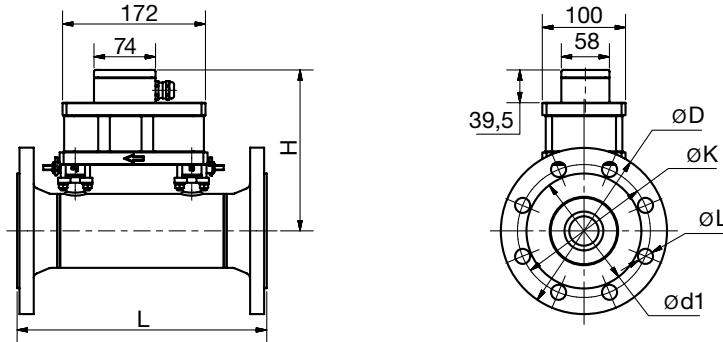
T = operating temperature in K

Dimensions and Weights DOG-4 (without ball valve)



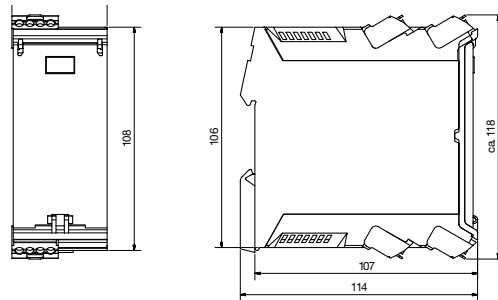
Dimensional details without ball valve									
DN [mm]	L (Length) [mm]	H (Height) [mm]	ØD (outer Ø) [mm]	ØK (pitch circle) [mm]	ØL (hole Ø) [mm]	Ød1 (sealing surface) [mm]	No. of screws	Screw size	Weight [kg]
25	300	150	115	85	14	68	4	M12	8.1
40	300	158	150	110	18	88	4	M16	10
50	300	164	165	125	18	102	4	M16	11.6
80	300	178	200	160	18	138	8	M16	14.4
100	320	191	220	180	18	58	8	M16	16.6
150	320	218	285	240	22	212	8	M20	24.8
200	320	243	340	295	22	268	8	M20	35.8

Dimensions and Weights DOG-4 (with ball valve)

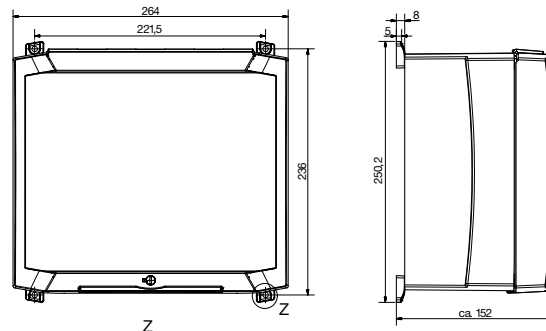


Dimensional details with ball valve									
DN [mm]	L (Length) [mm]	H (Height) [mm]	ØD (outer Ø) [mm]	ØK (pitch circle) [mm]	ØL (hole Ø) [mm]	Ød1 (sealing surface) [mm]	No. of screws	Screw size	Weight [kg]
25	300	166	115	85	14	68	4	M12	8.5
40	300	174	150	110	18	88	4	M16	10.4
50	300	180	165	125	18	102	4	M16	12
80	300	194	200	160	18	138	8	M16	14.8
100	320	207	220	180	18	58	8	M16	16.9
150	320	234	285	240	22	212	8	M20	25.3
200	320	259	340	295	22	268	8	M20	36.3

Dimensions Electronics DOG-...A/B



Dimensions Electronics DOG-...G/H/M/N



Accessories (optional)

- Modbus TTL (on request)
- Modbus RS485 (on request)
- Replacement sensor
- Sealing for oscillator