

Electronic Flow Meter **FC03** (compressed air/gases)

Description

The miniature Flow Meter FC03 is designed to operate with air, compressed air, oxygen, nitrogen and biogas. With one analogue output, one frequency output or one flow limit value. Sensor head integral with electronic circuitry.

When used in a compressed-air system, the FC03 has to be installed behind the air dryer to prevent moisture condensation of the sensors. Damage of the ceramic sensors through particles in the pipe system must be prevented by suitable filtering measures.

Features

- Pressure resistant, $p_N = 16 \text{ bar/232 psi}$
- Installation by sensor adapter TP-... or ball valve BV-...
- Connection by means of M8 connectors to IEC 60947-5-2
- Operating range factory preset
- Adjustable limit value
- No moving parts in the flow
- LED status indication
- Relay or analogue output
- Response time $< 1 \text{ s}$

Ordering information FC03

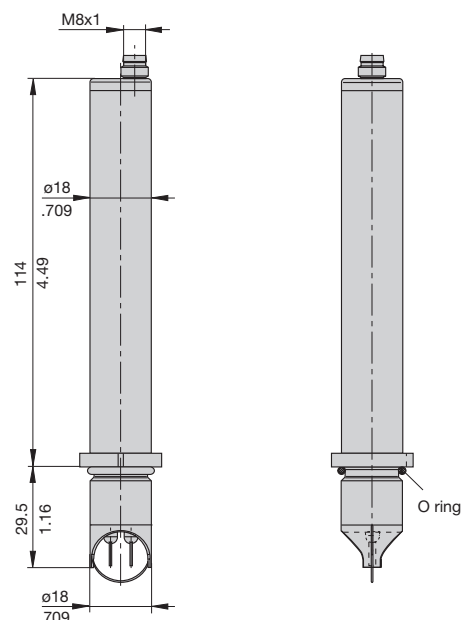
Type	
FC03	Miniature Flow Meter with 4-pole connector
Process connection	
11	Insertion-type (standard)
Material of the area exposed to medium	
M1	stainless steel 1.4571/AISI 316 Ti, polyamide/ceramics/ glass-passivated sealing
Length of shank	
L05	29.5 mm/1.16 in. (standard)
Electrical connection	
E08	IEC947 M8
Output	
C11	analogue output 4 - 20 mA
F1	frequency output 25 - 100 Hz
F2	frequency output 0 - 100 Hz
R1	1 relay output (1 MIN switching point)
Measuring range	
MB1	analogue output only
MB2	analogue or relay output
FC03 - 11 M1 L05 E08 C11- MB1	ordering example



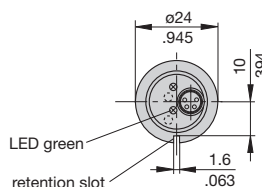
FC03-..

pressure resistant $p_N = 16 \text{ bar/232 psi}$

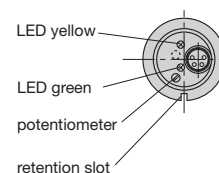
Dimensions FC03



Version F2, F1 and C11



Version R1



This is a metric design and millimeter dimensions take precedence ($\frac{\text{mm}}{\text{inch}}$)

TECHNICAL DATA

Flow Meter FC03		FC03-....C11- Analogue output	FC03-....F1/F2- Frequency output	FC03-....R1- Relay output
General data				
Suitable for		air, compressed air, oxygen, nitrogen, biogas, please enquire for other gases	air, compressed air, oxygen, nitrogen, biogas, please enquire for other gases	air, compressed air, gases
Measuring functions		standard volume flow/mass flow	standard volume flow/mass flow	switching point
Display		LED (green = busy)	LED (green = busy)	LEDs (green = busy, yellow = switching point)
Temperature range (gas, ambient and storage)		0 ... +60 °C/+32 ... +140°F	0 ... +60 °C/+32 ... +140°F	0 ... +60 °C/+32 ... +140°F
Electrical data				
Input voltage		DC 24 V (18 ... 32 V)	DC 24 V (18 ... 32 V)	DC 24 V (18 ... 32 V)
Power consumption ⁽¹⁾		30 ... 115 mA	30 ... 115 mA	30 ... 100 mA
Analogue output, non-linear (flow volume)		4 - 20 mA (max. 500 Ω)		
Frequency output, non-linear (flow volume)			0/25 - 100 Hz (max. 100 mA)	
Signal output (limit value)				relay contact, 1 normally open, AC/DC 32 V, 0.7 A
MTTF (SN 29500)		376 years		301 years
Flow rate measurement/monitoring		measurement	measurement	monitoring
Measuring range/ adjustment range for air, compressed air, oxygen, nitrogen (dependent on use of sensor adapter TP01... TP06 or ball valve BV03...BV06) ^{(2) (7)}	MB1 in TP01	0 - 20 Nm³/h	0 - 20 Nm³/h	
	MB1 in TP02	0 - 30 Nm³/h	0 - 30 Nm³/h	
	MB1 in TP03/BV03	0 - 50 Nm³/h	0 - 50 Nm³/h	
	MB1 in TP04/BV04	0 - 80 Nm³/h	0 - 80 Nm³/h	
	MB1 in TP05/BV05	0 - 125 Nm³/h	0 - 125 Nm³/h	
	MB1 in TP06/BV06	0 - 200 Nm³/h	0 - 200 Nm³/h	
	MB2 in TP01	0 - 50 Nm³/h	0 - 50 Nm³/h	0 - 50 Nm³/h
	MB2 in TP02	0 - 75 Nm³/h	0 - 75 Nm³/h	0 - 75 Nm³/h
	MB2 in TP03/BV03	0 - 125 Nm³/h	0 - 125 Nm³/h	0 - 125 Nm³/h
	MB2 in TP04/BV04	0 - 200 Nm³/h	0 - 200 Nm³/h	0 - 200 Nm³/h
	MB2 in TP05/BV05	0 - 310 Nm³/h	0 - 310 Nm³/h	0 - 310 Nm³/h
	MB2 in TP06/BV06	0 - 500 Nm³/h	0 - 500 Nm³/h	0 - 500 Nm³/h
Accuracy ⁽⁸⁾		±3 % of m.v. * ±1% f.v. **	±3 % of m.v. * ±1% f.v. **	
Repeatability ⁽³⁾		±1 % of m.v. *, ±0.5 % of f.v. **	±1 % of m.v. *, ±0.5 % of f.v. **	±1 % of m.v. *, ±0.5 % of f.v. **
Switching hysteresis				10 % ± 5 % of m.v. *
Temperature drift		typically ±0.25 %/°C / ±0.45 %/°F of m.v. *	typically ±0.25 %/°C / ±0.45 %/°F of m.v. *	typically ±0.25 %/°C / ±0.45 %/°F of m.v. *
Delay on switch on		typically 30 s	typically 30 s	typically 30 s
Response time (step function) ⁽⁵⁾		< 1 s	< 1 s	< 1 s
Adjustment time t_{so} ⁽⁴⁾		typically 10 s	typically 10 s	typically 10 s
Mechanical data (electronic circuitry)				
Degree of protection	between medium and electronic circuitry	IP64	IP64	IP64
	electronic circuitry	IP64	IP64	IP40 ⁽⁶⁾
Vibration resistance		20 g/0.0441 lb (10 ... 2000 Hz) test to IEC 60068-2g test Fc		
Materials	housing: FC03-11M1...	stainless steel 1.4571		
	sensor assembly: cap	polyamide		
	sensor assembly: sensor	ceramics glass-passivated		
	sensor assembly: protective bracket	stainless steel 1.4571		
	sensor assembly: O-Ring	Viton		
Housing dimensions (LxWxH)		Ø 18 mm (24 mm), L = 143,5 mm/ Ø 0.709 in. (0.945 in.), L = 5.65 in.		
Weight		100 g/0.220 lb		
Cables		connector to IEC 947-5-2, 8 mm/0.315 in. dia, 4-pole (see accessories for cable)		
Max. cable length		depending on cable resistance and input voltage (R_{load} + cable resistance max. 550 R)		

⁽¹⁾ Flow meter with analogue output: depending on input voltage and volume flow, including load current.

⁽²⁾ Standard volume flow related to 0 °C/+32 °F and 1013 mbar/14.7 psi.

⁽³⁾ At constant temperature and flow conditions, and stable thermal conductivity.

⁽⁴⁾ Upon flow rate changes and for reaching 90 % of the final value.

⁽⁵⁾ Delay with the limit value set at 10 m/s / 32.8 fps and the flow at 20 m/s / 65.6 fps, after a sudden complete stop.

⁽⁶⁾ By gluing of potentiometers IP64

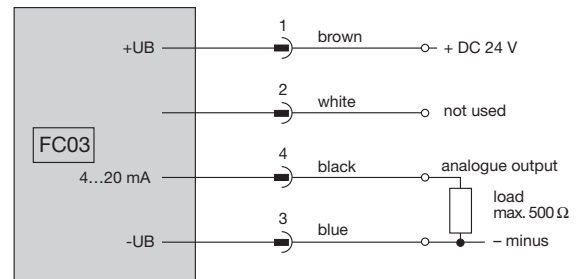
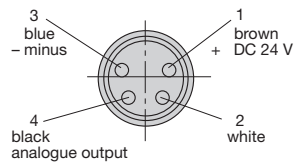
⁽⁷⁾ Measuring/adjustment range for biogas (MB1): 15 Nm³/h (TP01), 26 Nm³/h (TP02), 40 Nm³/h (TP03/BV03), 65 Nm³/h (TP04/BV04), 105 Nm³/h (TP05/BV05), 170 Nm³/h (TP06/BV06)
Measuring/adjustment range for biogas (MB2): 37 Nm³/h (TP01), 62 Nm³/h (TP02), 95 Nm³/h (TP03/BV03), 161 Nm³/h (TP04/BV04), 260 Nm³/h (TP05/BV05), 425 Nm³/h (TP06/BV06)

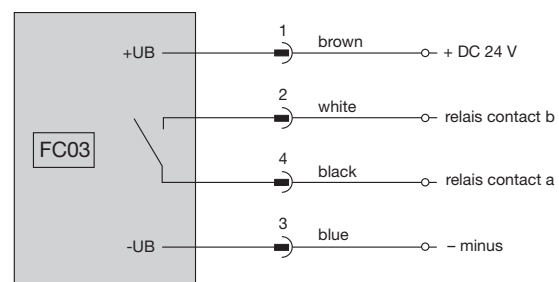
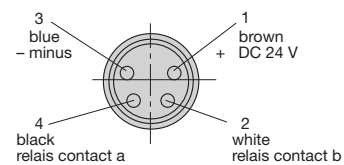
⁽⁸⁾ Accuracy specification for biogas valid up to: 18,1 Nm³/h (TP01), 28,3 Nm³/h (TP02), 44,2 Nm³/h (TP03/BV03), 72,4 Nm³/h (TP04/BV04), 113,1 Nm³/h (TP05/BV05), 176,7 Nm³/h (TP06/BV06)

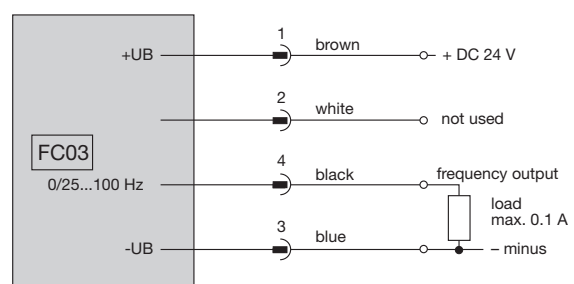
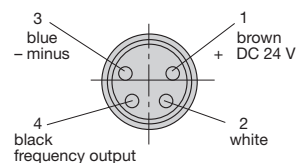
* m.v. = measured value

** f.v. = final value

Connection diagram FC03
Analogue output C11

 Connector to EN 60947-5-2
 8 mm dia (.315 in.), 4-pole

Relay output R1

 Connector to EN 60947-5-2
 8 mm dia (.315 in.), 4-pole

Frequency output F2 / F1

 Connector to EN 60947-5-2
 8 mm dia (.315 in.), 4-pole


Sensor adapter TP.../Ball valve BV...



TP...

BV...

Features

- Correct positioning of sensor
- Ease of sensor replacement
- Measuring point can be closed if not used
- Sensor adapter available as screw-in or welding type
- Ball valve also serves as a shutoff valve (both input and output)

Description

Sensor adapters TP and ball valves BV facilitate correct positioning and exchange of CSP monitoring heads, FC03, FC04 or FS10-U1...11 (plug-in type connection) in pipes with process connection DN 15...DN 50. Ball valve BV enables pressure-free installation or removal of CSP monitoring heads, Flow Meter FC03, FC04 and Flow Monitor FS10-U1...11 (plug-in type connection) simply by closing the input and output pipe. The measuring points are suited to temporary measurements; after completion of the measuring cycle they can be closed by means of blanking plugs.

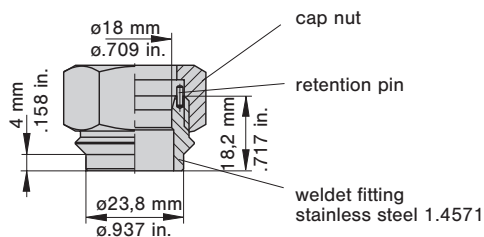
Ordering information

Type	
TP	Sensor adapter with internal thread
Process connection/Nominal size	
01	DN 15 G1/2 internal thread length: 50 mm/1.97 in.
02	DN 20 G3/4 internal thread length: 64 mm/2.52 in.
03	DN 25 G1 internal thread length: 78 mm/3.07 in.
04	DN 32 G1 1/4 internal thread length: 94 mm/3.70 in.
05	DN 40 G1 1/2 internal thread length: 110 mm/4.33 in.
06	DN 50 G2 internal thread length: 138 mm/5.43 in.
Material of the area exposed to medium	
M1	stainless steel 1.4571/AISI 316Ti PN 315 bar/4569 psi
M3	brass (not TP-03..) PN 25 bar/363 psi
M5	red brass (only TP-03..) PN 16 bar/232 psi
TP - 01	M3 ordering example

Accessories

Description	Ref. No.
Blanking plug, brass, with O ring	0Z121Z000186
Union nut, brass	Y 306 901 01
Blanking plug, stainless steel 1.4571/AISI 316 Ti, with viton O ring	0Z121Z000187
Union nut, stainless steel	Y 306 901 03

Welding set 05 (only usable with FC03...R1...)
0Z122Z000202



Ordering information

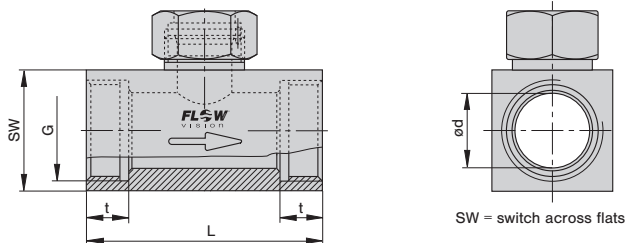
Type	
TP	Sensor adapter with welding nipples
Process connection/Nominal size	
01	DN 15 dia.d: 16 mm/.630 in. length: 50 mm/1.97 in.
02	DN 20 dia.d: 20 mm/.787 in. length: 70 mm/2.76 in.
03	DN 25 dia.d: 25 mm/.984 in. length: 80 mm/3.15 in.
04	DN 32 dia.d: 32 mm/1.26 in. length: 100 mm/3.94 in.
05	DN 40 dia.d: 40 mm/1.57 in. length: 110 mm/4.33 in.
06	DN 50 dia.d: 50 mm/1.97 in. length: 140 mm/5.51 in.
Material of the area exposed to medium	
M1	stainless steel 1.4571/AISI 316Ti
Process connection	
SA	welded connection
TP - 01	M1 - SA ordering example

Ordering information

Type	
BV	ball valve with internal thread
Process connection/Nominal size	
03	DN 25 G1 internal thread length: 88 mm/3.46 in.
04	DN 32 G1 1/4 internal thread length: 100 mm/3.94 in.
05	DN 40 G1 1/2 internal thread length: 110 mm/4.33 in.
06	DN 50 G2 internal thread length: 131 mm/5.16 in.
Material of the area exposed to medium	
M3	nickel plated brass, Delrin seal
BV - 03	M3 ordering example

Dimensions

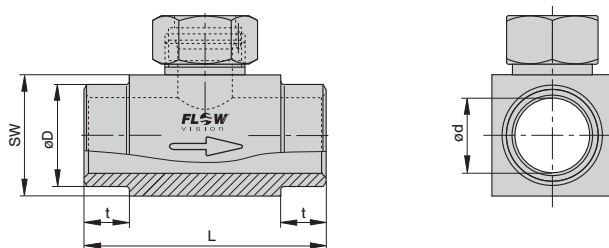
TP-... sensor adapter with internal thread



Material stainless steel (-M1): PN 315 bar / 4569 psi
Material brass (-M3): PN 25 bar / 363 psi
Material red brass (-M5): PN 16 bar / 232 psi

Type	DN		dia. d		G	t		L		SW	
	mm	in.	mm	in.		mm	in.	mm	in.	mm	in.
TP-01 ...	15	.591	16	.630	1/2"	11	.433	50	1.97	27	1.06
TP-02 ...	20	.787	20	.787	3/4"	12	.472	64	2.52	32	1.26
TP-03 ...	25	.984	25	.984	1"	14	.551	78	3.07	40	1.57
TP-04 ...	32	1.26	32	1.26	1 1/4"	15	.591	94	3.70	50	1.97
TP-05 ...	40	1.57	40	1.57	1 1/2"	15	.591	110	4.33	55	2.16
TP-06 ...	50	1.97	50	1.97	2"	19	.748	138	5.43	70	2.76

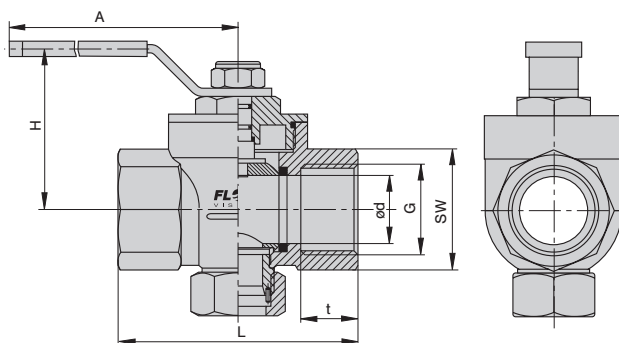
TP-... M1-SA sensor adapter with welding nipples



PN 315 bar / 4569 psi

Type	DN		dia. d		dia. D		t		L		SW	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
TP-01M1-SA	15	.591	16	.630	21.3	.839	15	.591	50	1.97	27	1.06
TP-02M1-SA	20	.787	20	.787	26.9	1.06	15	.591	70	2.76	32	1.26
TP-03M1-SA	25	.984	25	.984	33.7	1.33	15	.591	80	3.15	40	1.57
TP-04M1-SA	32	1.26	32	1.26	42.4	1.67	15	.591	100	3.94	50	1.97
TP-05M1-SA	40	1.57	40	1.57	48.3	1.90	15	.591	110	4.33	55	2.16
TP-06M1-SA	50	1.97	50	1.97	60.3	2.37	15	.591	140	5.51	70	2.76

BV-... M3 Ball valve with internal thread



PN 25 bar / 363 psi

Type	DN		dia. d		G	t		L		SW		H		A	
	mm	in.	mm	in.		mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
BV-03M3	25	.984	25	.984	1"	21	.827	88	3.46	41	1.61	59	2.32	115	4.53
BV-04M3	32	1.26	32	1.26	1 1/4"	24	.945	100	3.94	50	1.97	65	2.56	115	4.53
BV-05M3	40	1.57	40	1.57	1 1/2"	24	.945	110	4.33	54	2.13	77	3.03	150	5.91
BV-06M3	50	1.97	50	1.97	2"	28	1.10	131	5.16	70	2.76	85	3.35	150	5.91

This is a metric design and millimeter dimensions take precedence ($\frac{mm}{inch}$)

Cable type 21 with connectors



Description

Connection cable M8 for flow meter FC03 for connection of supply voltage and output signal.

Technical data

Cable type 21

Features: Protection degree IP67 (only with connector fitted)
Resistant to chemicals and oils

Temperature range: -25 °C ... +80 °C

Current carrying capacity: 4 A

Insulation resistance: > 10⁹ Ω

Withstand voltage: 1.5 kV/60 s

Ordering information

Cable and cable connector

Do + Ka type 21 - 5 m with connector to IEC 60947-5-2, 4-pole
M8 and PUR insulated cable 4x0.25 mm²

Do + Ka type 21 - 5 m ordering example