87x6

Gas density monitor with switching contacts

Applications

- High voltage technology
- Medium voltage technology
- SF_6 and variety of alternative mixed gases

Features

- Exact switching output at all temperatures
- Fully temperature compensated by design
- No contact bouncing
- Independent, galvanically separated circuits
- Suitable for highly dynamic measurements
- Maintenance free indoor and outdoor use

Product description

Swiss based Trafag offers precise, reliable and maintenance-free instruments developed for density monitoring of SF_6 and related alternative gases. Monitoring is based on the gas density reference principle. Thus offering the most reliable solution on the market by directly monitoring the insulating gas density.

Technical Data

Measuring principle	Absolute pressure reference gas measuring system
Measuring range	0 …1250 kPa abs. @ 20°C
Output signal	Floating change-over contact (SPDT)
Quantity of switchpoints	1 ... 4 microswitches
Ambient temperature	-40°C ... +80°C

Additional information

Data sheet	www.trafag.com/H72511
Flyer	www.trafag.com/H71103
Instructions	www.trafag.com/H73511

Ordering information/Type code

		XXXX	XX	XXXX	XX	XX	XX
Custom build code	**Gas density monitor with microswitches**						
	One microswitch	**8716**					
	Two microswitches	**8726**					
	Three microswitches	**8736**					
	Four microswitches	**8746**					
Wire terminal block	Standard wire terminal		**20**				
Pressure connection	Threaded, axial and radial types			**1XXX**			
	Flanged and cap nut, axial and radial types			**2XXX**			
	Compartment immersion types			**5XXX**			
Code number	Determined by Trafag				XX		
Options	Basic density indicator dial with two colour sectors without markings					**60**	
	Density indicator dial with scale according to customer specification					**61**	
	Low pressure indicator					**66**	
	Microswitch outlet						
	EMC-cable gland M20x1.5, brass nickel-plated, for cable-ø 7 ... 12.5 [mm]					**10**	
	EMC-cable gland M20x1.5, brass nickel-plated, for cable-ø 8 ... 11 [mm]					**07**	
	EMC-cable gland M20x1.5, brass nickel-plated, for cable-ø 11 ... 14 [mm]					**08**	
	EMC-cable gland M25x1.5, brass nickel-plated, for cable-ø 8 ... 16 [mm]					**11**	
	EMC-cable gland M25x1.5, brass nickel-plated, for cable-ø 12.5 ... 20.5 [mm]					**17**	
	ITT Cannon connector					**12**	
	Blank plug M20x1.5, brass nickel-plated [1]					**13**	
	Blank plug M25x1.5, brass nickel-plated [1]					**04**	
	Blank plug M25x1.5, PA [1][2]					**05**	
	Process gas damping element [3]					**49**	
	Integrated valve for monitor test with DN8 coupling						
	Standard test port orientation					**W3**	
	Test port orientation 180°					**W0**	
	Test port orientation 270°					**W1**	
	Test port orientation 90°					**W2**	
	Integrated valve for process gas quality test and refilling with DN8 coupling						
	Standard filling port orientation					**F3**	
	Filling port orientation 180°					**F0**	
	Filling port orientation 270°					**F1**	
	Filling port orientation 90°					**F2**	
Accessories	Thermal insulation ring for probe housing						**06**
	Thermal foam cover with drain holes						**37**
	Weather protection cover						**46**
	Pressure connection adapter 2300 - G1/2" male						**N1**

[1] Select if EMC-cable gland is procured locally
[2] Without IP compatibility, not for use in operation
[3] Available with pressure connections 2000, 2001, 2045

Further customised parameterisation to be indicated

Process gas	SF_6, SF_6- based mixed gas, customer specific alternative gas
Variety of units for indicater dial	kPa, bar, MPa (abs., rel.[1]), psi (a., g.[1]), kg/m², kg/cm², also dual units available
Switchpoint @ 20°C [2]	Microswitch 1, p= xxx
	Microswitch 2, p= xxx
	Microswitch 3, p= xxx
	Microswitch 4, p= xxx

[1] Monitoring principle is based on absolute pressure reference system and is accordingly calibrated. While using relative dial units, local ambient pressure (e.g. altitude or weather derivations) has to be considered if comparing to local installed relative pressure gauges

[2] Factory setting for decreasing or increasing pressure available

Specifications

Mechanical density monitoring	Monitoring principle	Absolute pressure measuring system with sealed reference gas chamber, no influence due to ambient pressure fluctuations, fully temperature compensated by design [2)]
	Monitoring range	0 ... 1100 kPa abs. @ 20°C with low pressure indicator option 0 ... 1250 kPa abs. @ 20°C without low pressure indicator option
	Monitoring output	Floating change-over contact (SPDT)
	Quantity of switchpoints	1 ... 4 microswitches
	Monitoring accuracy	Refer to density indicator and microswitch sections
Environmental conditions	Ambient temperature	-40°C ... +80°C
	Protection [1)]	IP65 and IP67
	Humidity	IEC 60068-2-30 (damp heat, cyclic, 100 % RH @ +55°C), membrane provides condensation compensation
	Overpressure	1300 kPa abs. with low pressure indicator option Without low pressure indicator option and lowest switchpoint setting ≤ 650 kPa abs. @ 20°C : 1300 kPa abs. > 650 kPa abs. @ 20°C: 1600 kPa abs.
	Shock	70 g / 3 ms / 10'000 times at all axes excited on process connection without damage to instrument
	Routine inspection of gas tightness	Integral pressure testing with 6 bar rel. helium, SF_6 leakage rate less than $1 \cdot 10^{-8}$ mbar · l/s
Mechanical data	Process gas wetted material	Process connection and measuring system: 1.4404, 1.4435, 1.4571 (AISI316L, AISI316Ti) Test and re-filling valve: 1.4404 (AISI316L), CuZn39Pb3 (C38500) Sealing: IIR
	Housing	AlSi10Mg, powder coated
	Screwed cable gland	Brass nickel plated, PA as option
	Dial	Dial face and pointer: Aluminium sheet Window: PMMA
	Weight	Gas density monitor: ~ 800 ... 1000 g Gas density monitor with integrated test or re-filling valve ~ 1100 ... 1300 g

[1)] While using appropriate cable gland and/or mating connector mounted according to instruction

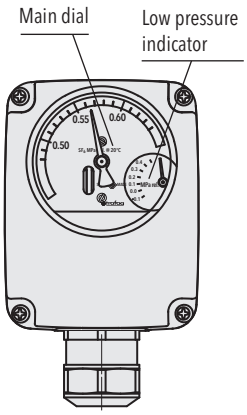
[2)] Depending on process gas requirements, the fully sealed reference gas chamber contains up to 0.001 kg of SF_6. The relevant national regulations governing the disposal of hazardous waste apply and must be followed. Decommissioned or defective monitors can be returned to the manufacturer for disposal in a safe and environmentally appropriate manner

Density indicator

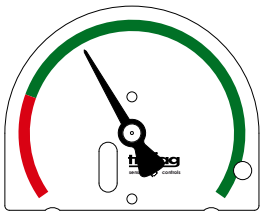
	Main dial	Low pressure indication option
Indicator principle	Absolute pressure, fully temperature compensated by means of sealed reference gas chamber	Indication of relative pressure, for safety reason it is not temperature compensated
Scale	Colour sectors (standard red/yellow/green or red/green), switchpoint markings, single or dual units	Single unit, graduated range
Unit	Optional kPa, bar, MPa (abs., rel.[1]), psi (a., g.[1]), kg/m², kg/cm², customer specific units available	According to main dial unit (rel., g.)
Numbered range	Up to 180 kPa @ 20°C between lowest and highest indicated value [2]	Vacuum up to lowest switchpoint, 500 kPa rel. max.
Accuracy within numbered range	± 10 kPa @ 20°C	Up to 200 kPa rel.: ± 20 kPa Up to 500 kPa rel.: ± 10% MV

[1] Monitoring principle is based on absolute pressure reference system and is accordingly calibrated. While using relative dial units, local ambient pressure (e.g. altitude or weather derivations) has to be considered if comparing to local installed relative pressure gauges
[2] Typically ranges are from lock-out switchpoint to filling pressure (no high-alarm), or from lock-out switchpoint to high-alarm switchpoint

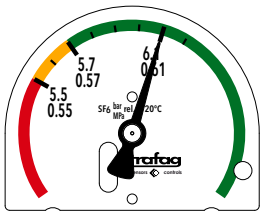
Gas density monitor with main dial and low pressure indicator in standard orientation
(electrical connection in 6 o'clock position)



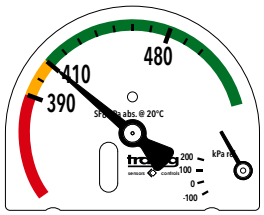
Density indicator dial according to customer specification
Availabilty of a full variety of units including dual range indication, this also includes dial rotated by 90°/180°/270°.



87x6.XX.XXXX.XX.**60**.XX.XX

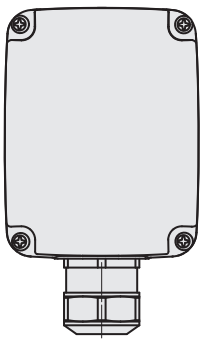


87x6.XX.XXXX.XX.**60.61**XX



87x6.XX.XXXX.XX.**60.61.66**.XX

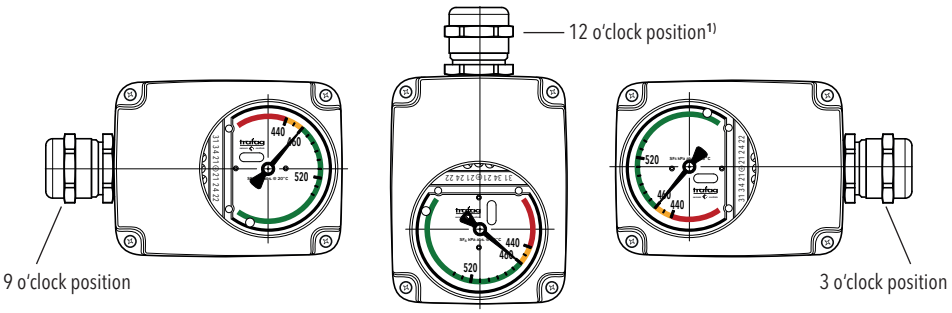
Gas density monitor without indication dial

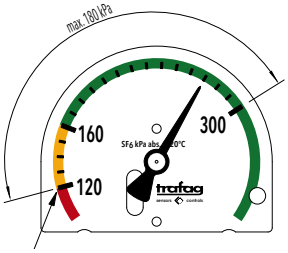


87x6.XX.XXXX.XX.XX.XX

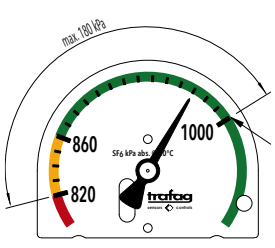
[1] Should only be used for indoor applications while using neither a weather protection cover nor a thermal foam cover

Customized dial orientation based on electrical connection position





Lowest switchpoint setting: 120 kPa abs. @ 20°C, distance from lowest to highest switchpoint: up to 180 kPa @ 20°C



Highest switchpoint setting: 1000 kPa abs. @ 20°C, distance from lowest to highest switchpoint: up to 180 kPa @ 20°C

Microswitch and switchpoint

Microswitch	Output signal	Floating change-over contact (SPDT)
	Resistive load (Inductive load)	AC - 250 V/10 (1.5) A DC - 250 V/0.1 (0.05) A, 220 V/0.25 (0.2) A, 110 V/0.5 (0.3) A, 24 V/2 (1) A
	Resistance of insulation	>100 MΩ, 500 VDC, ex factory
	Dielectric strength	2 kVAC, 50Hz, terminal to ground (earth)
	Switching cycle capacity	Up to 1 Mio. mechanical, more than 10'000 with maximum load
	Effect of vibration	4 g / 20…100 Hz effects no contact bounce at 5 kPa minimum distance from set switchpoint
Switchpoint setting	Factory adjustment	According to customer specification, [1] standard setting is for decreasing pressure
	Lowest switchpoint setting	120 kPa abs. @ 20°C
	Highest switchpoint setting	0 ... 1100 kPa abs. @ 20°C with low pressure indicator option 0 ... 1250 kPa abs. @ 20°C without low pressure indicator option
	Distance from the lowest to the highest switchpoint [2]	Up to 180 kPa @ 20°C
	Switching differential	3 ... 7 kPa typ. (15 kPa max.) if lowest to highest switchpoint distance is up to 130 kPa 5 ... 10 kPa typ. (20 kPa max.) if lowest to highest switchpoint distance is >130 ... 180 kPa

[1] Especially in areas with high daily temperature fluctuations it is recommended to maintain a minimum switchpoint distance of 40-60 kPa from filling pressure to surrounding switchpoint(s). Please contact us for more information

[2] Distance from lock-out to high-alarm pressure, or from lock-out to filling pressure (no high-alarm)

Switchpoint accuracy over temperature based on reference chamber pressure

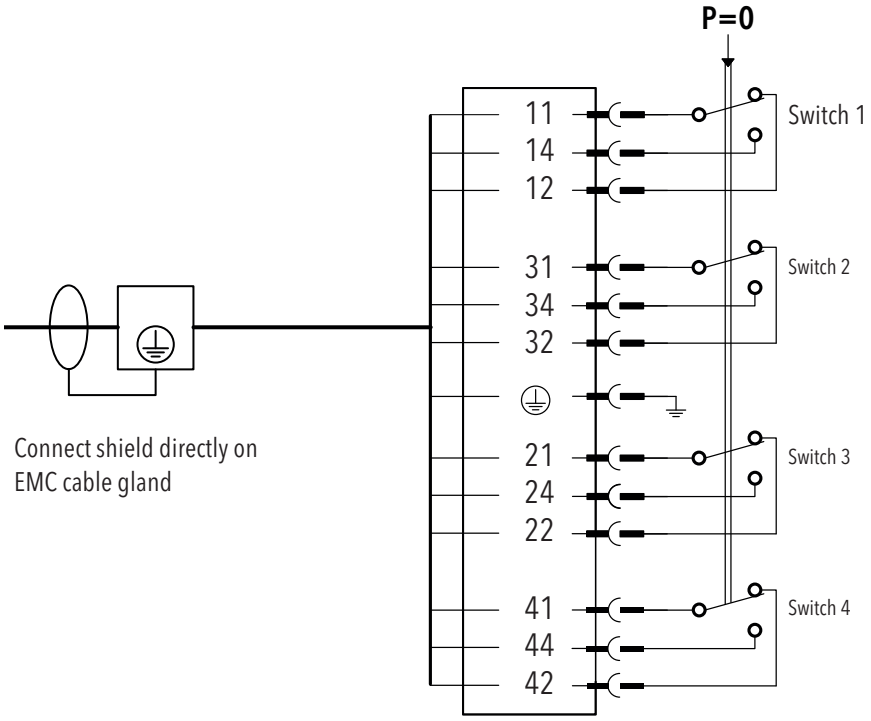
		+20°C	-30°C ... +50°C	-40°C ... +60°C
First alarm switchpoint setting pressure abs. @ 20°C [1]				
≤ 650 kPa	[kPa max.]	± 8	± 10	± 12
> 650 kPa … 1000 kPa	[kPa max.]	± 8	± 12	± 14
> 1000 kPa	[kPa max.]	± 10	± 15	± 16
High pressure alarm [1] [2]				
≤ 1000 kPa	[kPa max.]	± 10	± 16	± 20
> 1000 kPa	[kPa max.]	± 10	± 17	± 21

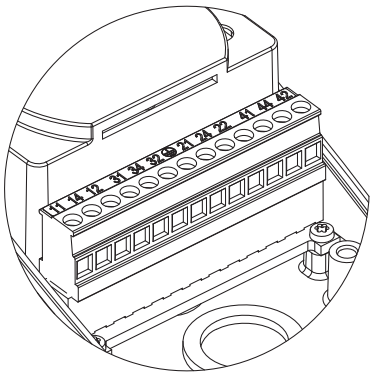
[1] While no liquefaction occurs and the insulation gas is completely gaseous

[2] Only applicable if factory adjustment includes high-alarm switchpoint above filling pressure

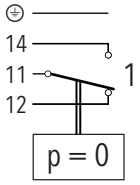
Electrical connections

Number of microswitches according to customer application

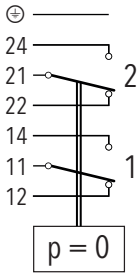




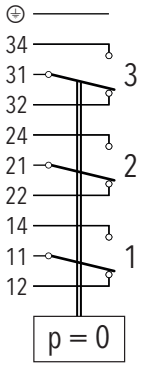
Microswitch in non-pressurised condition (p=0)



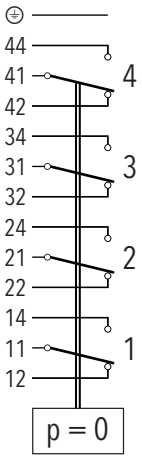
8716.XX.XXXX.XX...



8726.XX.XXXX.XX...



8736.XX.XXXX.XX…



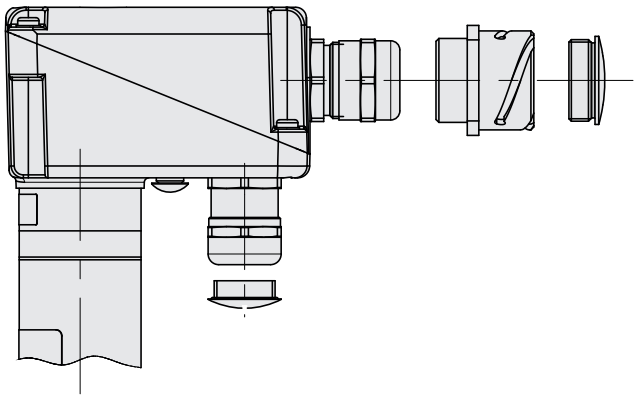
8746.XX.XXXX.XX...

Connected with all electrically conductive elements of the density monitor

Instructions: www.trafag.com/H73511

Connections for microswitch

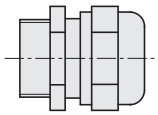
EMC-cable gland	See ordering information
Wire terminal	Plugable, 0.2 ... 2.5 mm², 13-pins
Connector option	ITT Cannon



Microswitch connection either with EMC-cable gland, ITT Cannon connector or closed with blank plug.

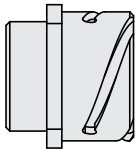
Electrical connection

EMC-cable gland [1)]



87x6.XX.XXXX.XX.**XX**.XX.XX
Type code 07 ... 17,
see ordering information

ITT Cannon connector [2) 3)]



87x6.XX.XXXX.XX.**12**.XX.XX

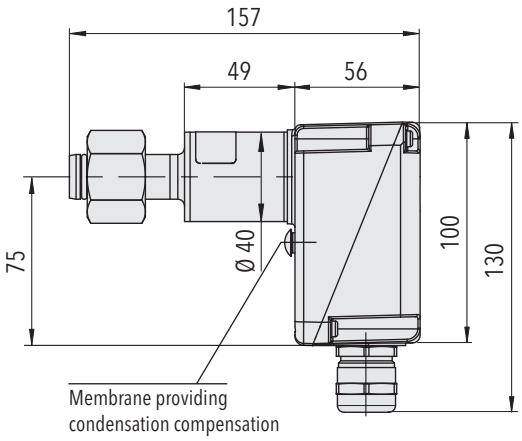
Blank plug [1)]

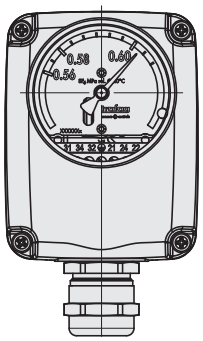
87x6.XX.XXXX.XX.**XX**.XX.XX
Type code 04 ... 13,
see ordering information

[1)] IP 65 and IP 67 protection, exceptions are indicated in ordering information/type code
[2)] IP 65 and IP 67 protection while using an equivalent mating connector mounted according to instruction
[3)] Please contact us for standard pin-out and more details.
Monitor internal wiring provided. Sheltering options are limited to weather protection cover (46) and/or thermal insulation ring (06) for probe housing

Main dimensions of density monitor

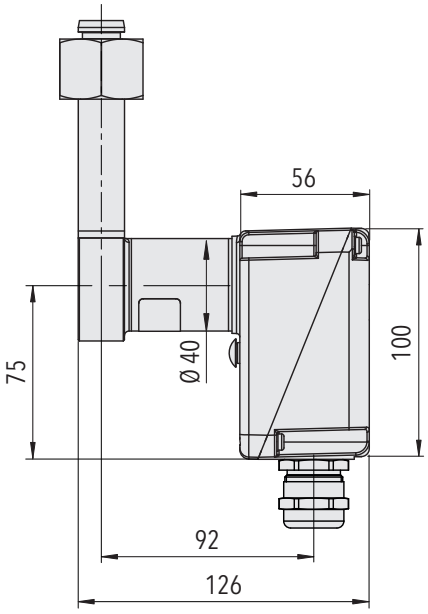
Example model with axial process connection



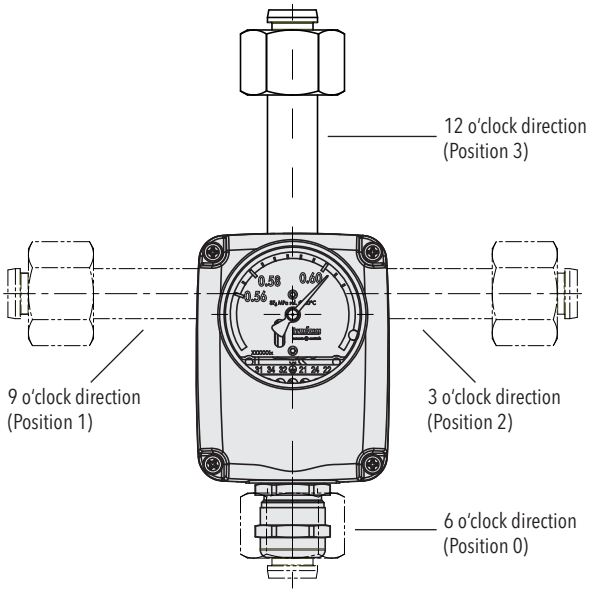


87x6.**20**.**2XXX**.XX.XX.XX.XX

Example model with radial process connection



87x6.**20**.**2XXX**.XX.XX.XX.XX

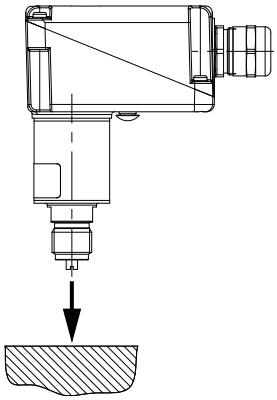


Radial process connection is configurable for 12/3/6/9 o'clock direction

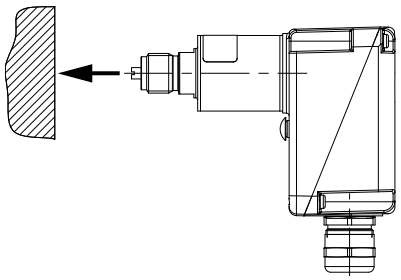
Installation

	Indoor application	Outdoor application	Outdoor application with rapidly changing or extreme weather conditions
Installation orientation	No limitations, any orientation possible	A, B, C [1)]	A, B, C [1)]
Recommended option	None	• Weather protection cover (46) • Thermal insulation for probe housing (06)	• Thermal foam cover (37) • Compartment immersion type process connection (5XXX)

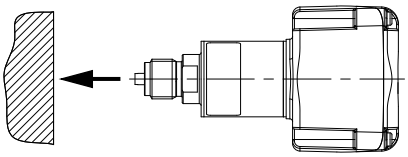
A



B

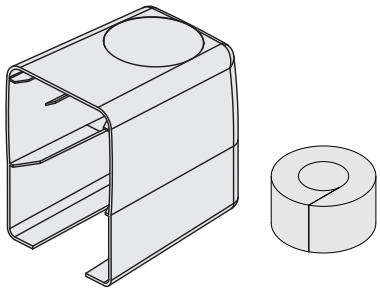


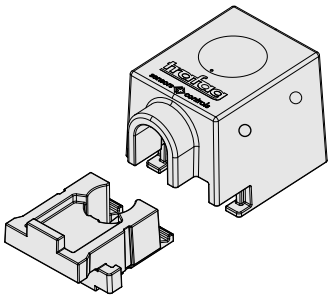
C



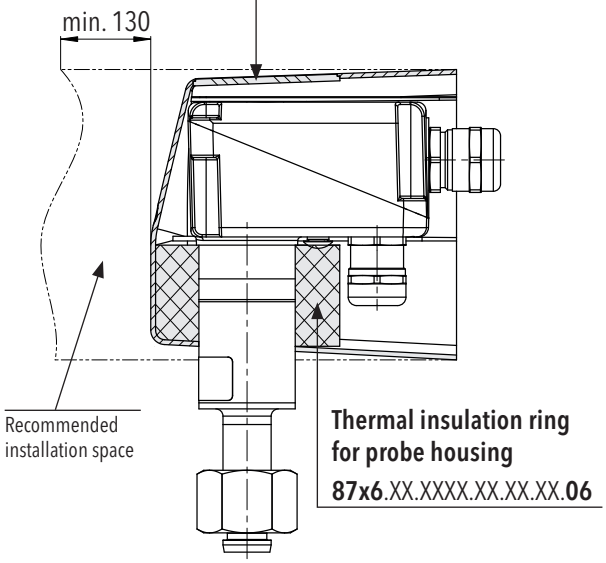
[1)] Or any orientation in between. A vertical upside down installation shall be avoided

Sheltering options

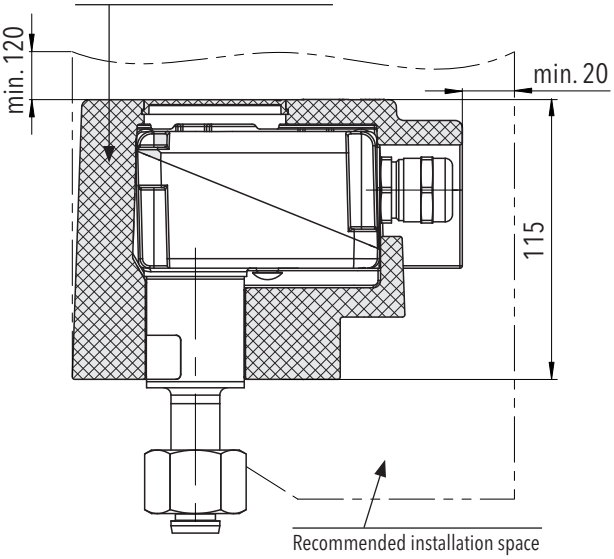


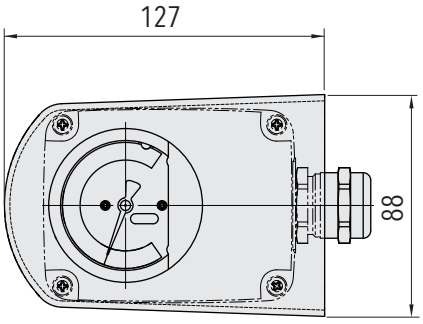


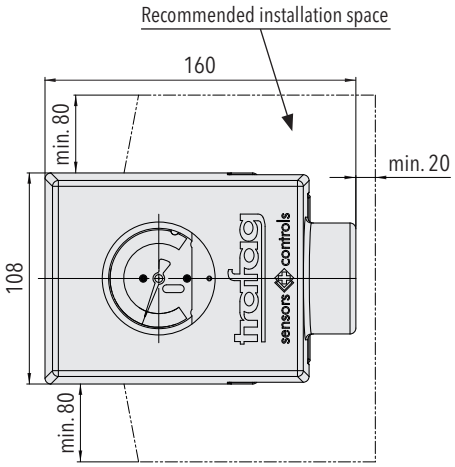
Weather protection cover
87x6.XX.XXXX.XX.XX.XX.**46**



Thermal foam cover
87x6.XX.XXXX.XX.XX.XX.**37**



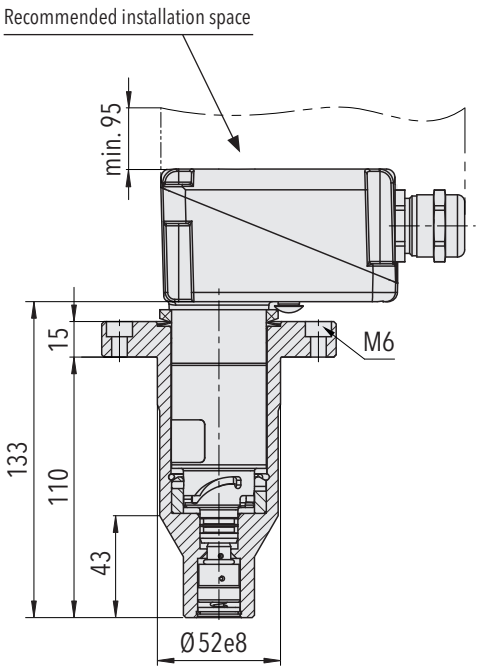


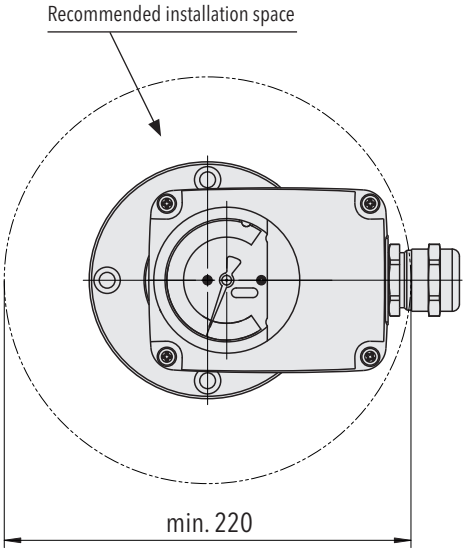


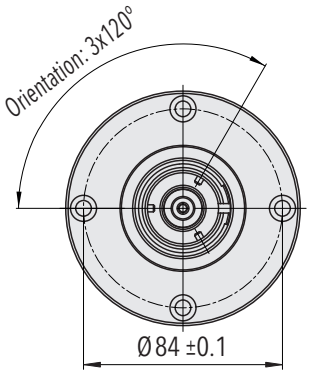
Weather protection cover (46) is aimed for long-term element protection. Insulation ring (06) for probe housing increases thermal inertia in moderate climates. Probe housing refers to the lower part of the monitor where the reference chamber is located.

Foam cover (37) increases thermal inertia of the density monitor. It is recommended in locations with high solar radiation or daily temperature fluctuations (high altitude, arctic, desert).

Compartment immersion process connection







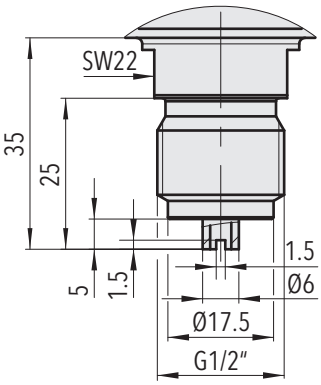
87x6.XX.**5XXX**.XX.XX.XX.XX

The in-compartment installation (5xxx) is aimed to match process gas and monitor probe temperature.
Bayonet fitting allows installation while process is pressurised.

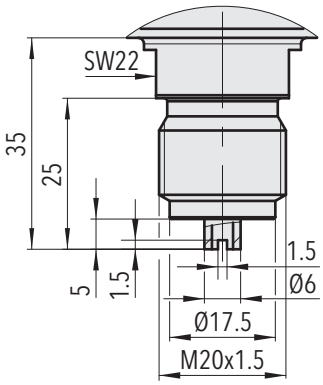
Further details see datasheet: www.trafag.com/H72502

Process connections

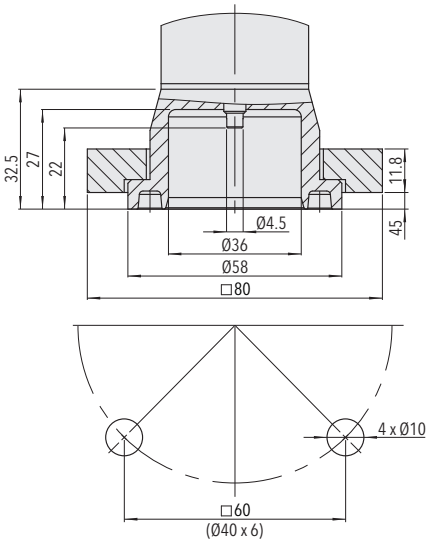
Axial process connections



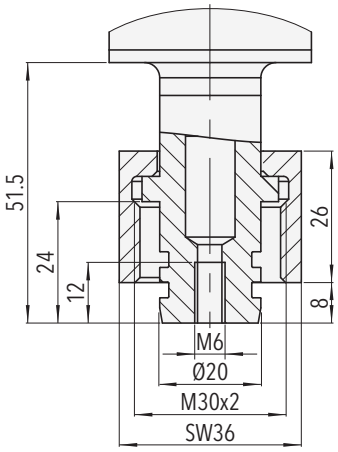
87x6.XX.**1000**.XX.XX.XX.XX
Axial threaded connection G1/2"



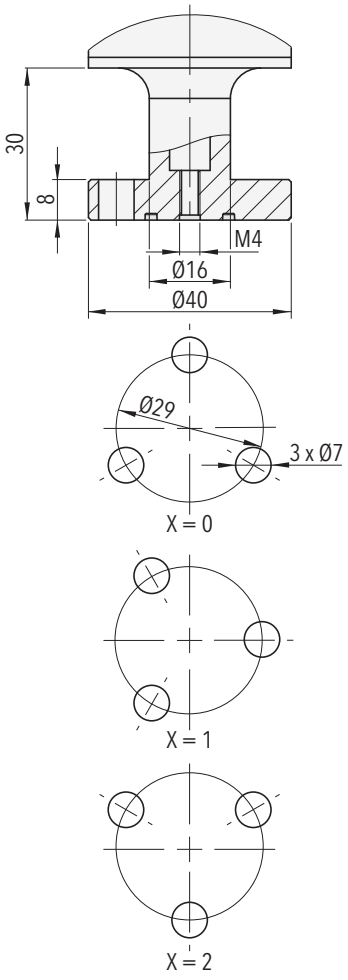
87x6.XX.**1120**.XX.XX.XX.XX
Axial threaded connection M20x1.5



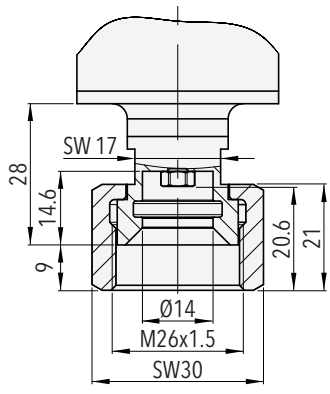
87x6.XX.**2000**.XX.XX.XX.XX
Axial flanged connection



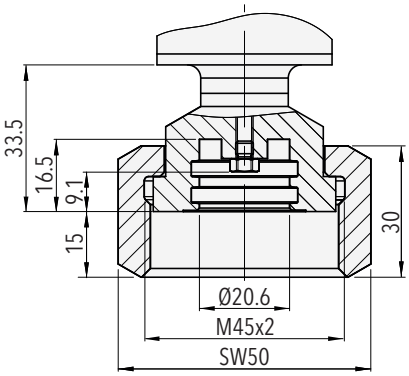
87x6.XX.**2300**.XX.XX.XX.XX
Axial cap nut connection



87x6.XX.**220x**.XX.XX.XX.XX
Axial flanged connection

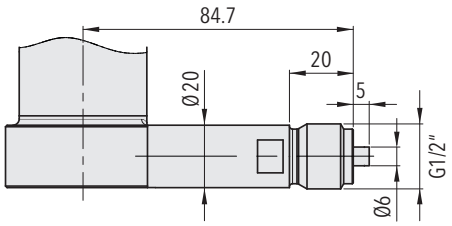


87x6.XX.**2550**.XX.XX.XX.XX
Axial connection DN8

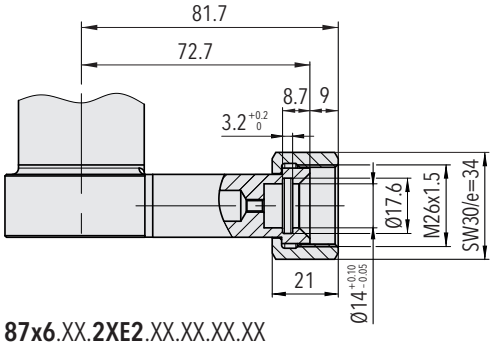


87x6.XX.**2570**.XX.XX.XX.XX
Axial connection DN20

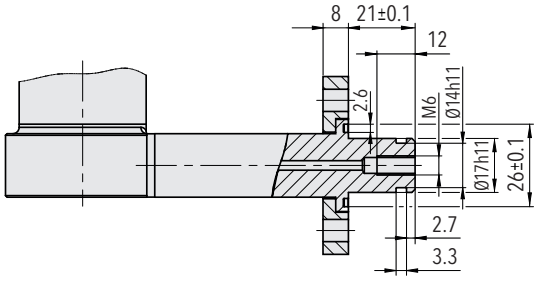
Radial process connections

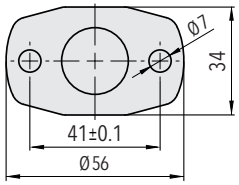


87x6.XX.**1030**.XX.XX.XX.XX
Radial threaded connection G1/2"



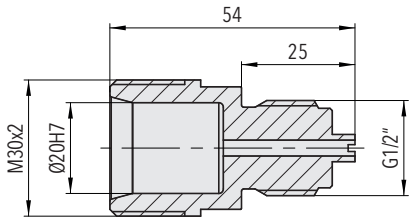
87x6.XX.**2XE2**.XX.XX.XX.XX
Radial connection DN8





87x6.XX.**2XP2**.XX.XX.XX.XX
Radial for two-hole flange connection

Adapter



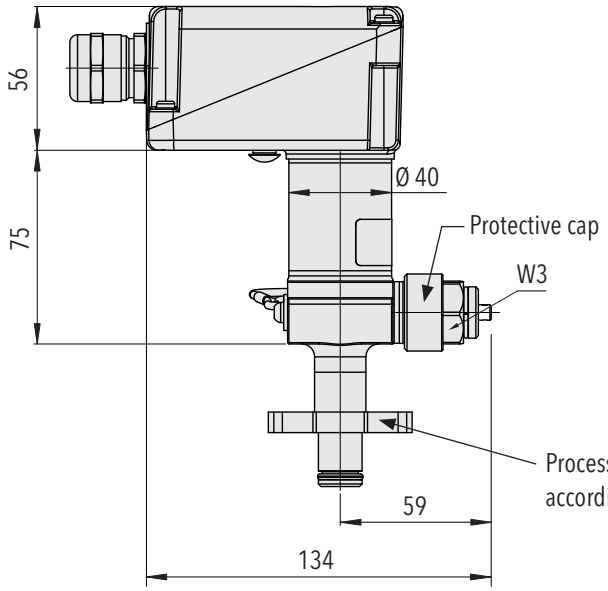
87x6.XX.**2300**.XX.XX.XX.**N1**
Adapter 2300 - G1/2" male for rotatable G1/2" pressure connection

Delivery includes assembly kit and O-Ring set where applicable.

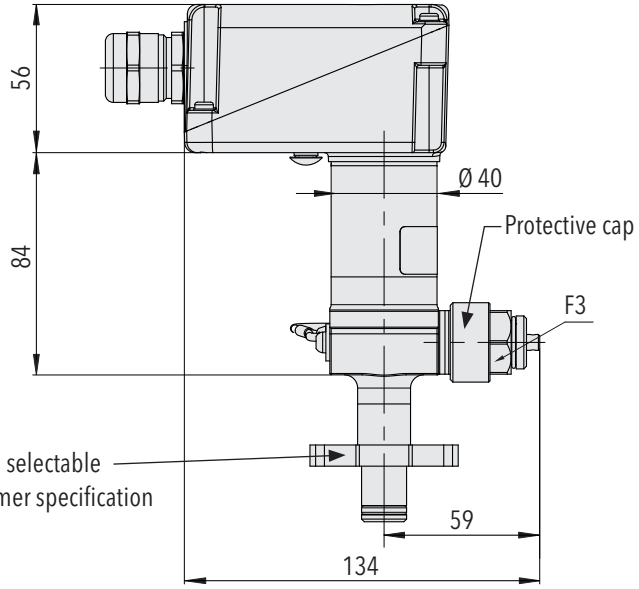
For full range of process connections and more details see data sheet www.trafag.com/H72502.

Valve options

Integrated density monitor test valve



Integrated process gas test and re-filling valve



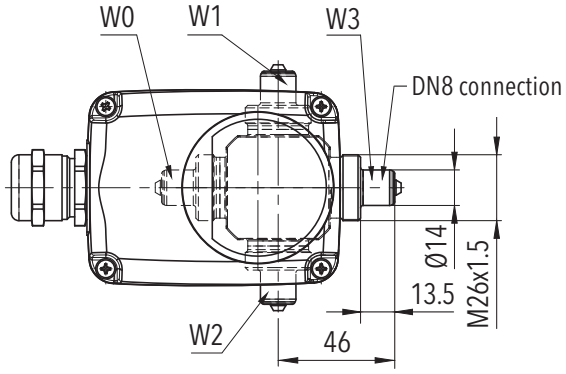
87x6.XX.XXXX.XX.**W0**/**W1**/**W2**/**W3**.XX.XX

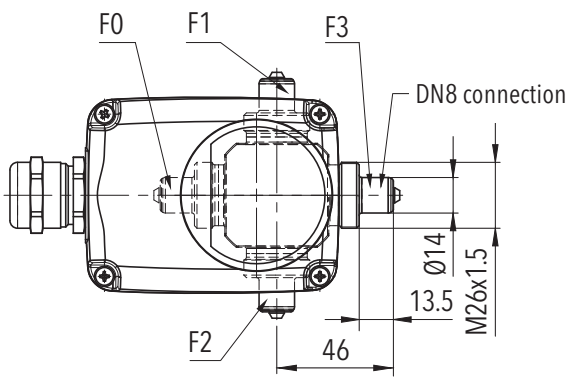
Test valve allows in-situ monitor verification without dismounting from pressure compartment. Test equipment is connected via DN8 port. Connection is configurable for direction W0/W1/W2/W3.

87x6.XX.XXXX.XX.**F0**/**F1**/**F2**/**F3**.XX.XX

Valve allows in-situ analyzing of gas quality and direct insulating gas replenishment of pressure compartment via DN8 port on re-filling valve. Connection is configurable for direction F0/F1/F2/F3.

Orientation service connection (top view) [1)]
please specify when ordering



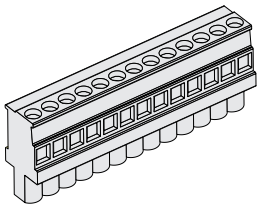


[1)] While using weather protection cover or thermal foam cover, the indicated installation spaces should be followed. See section installation and sheltering options

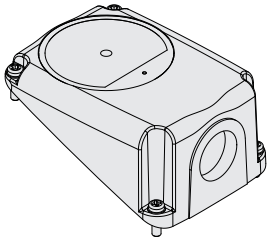
Operating specification for test and re-filling valve:
Opening and closing shall be limited to temperature range of -25°C ... +50°C.
Mechanical lifetime min. 250 actuation cycles.

For more details see instruction: www.trafag.com/H73521

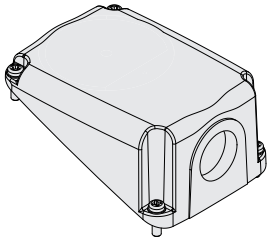
Spare parts



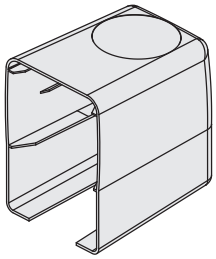
Standard microswitch wire terminal, 13-pins [1]



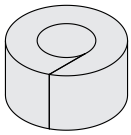
Housing cover with dial window [2]



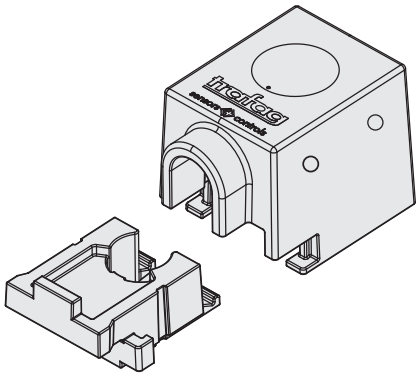
Housing cover without dial window [2]



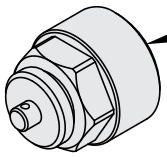
Weather protection cover
(Trafag part no.: C16354)



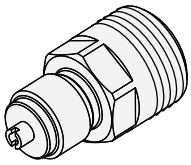
Thermal insulation ring for probe housing
(Trafag part no.: D34570)



Thermal foam cover with drain holes (Trafag part no.: C16421)



M26x1.5 protective cap for test and re-filling valve
(Trafag part no.: C30645)



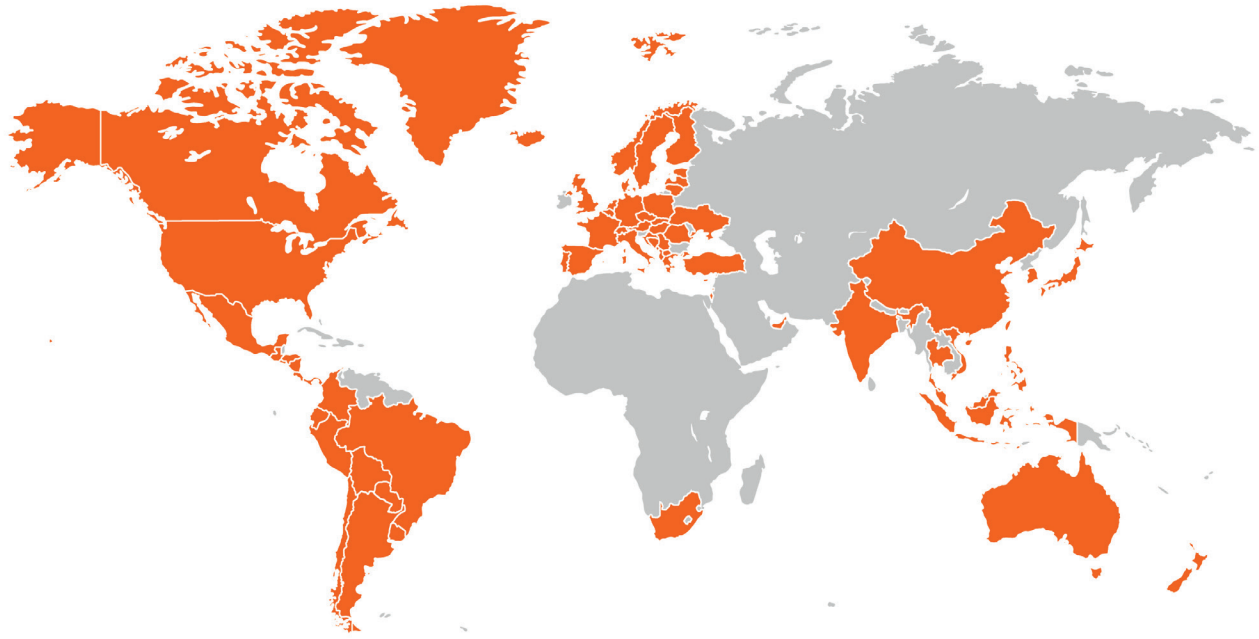
Pressure connection adapter 2300 - G1/2″ male
(Trafag part no.: C30931)

[1] Please contact us for more details
[2] Please identify if microswitch cable outlet is required. For options see ordering information

Reliable quality

Worldwide represented, globally trusted, Swiss based

Trafag develops, manufactures and markets accurate, robust, and maintenance-free instruments for monitoring SF_6 and alternative insulating gases in high and medium voltage switchgear. Trafag also offers a wide range of pressure and temperature monitoring products for various applications.
All innovative products and key components are designed in-house by Trafag's research and development departments in Switzerland, Germany and India and are then produced in the manufacturing sites in Switzerland, Germany, Czech Republic, and India. Strict quality management in accordance with ISO 9001 and ISO 14001 ensure that Trafag products meet the required quality and sustainability standards.
Trafag is headquartered in Switzerland, was founded in 1942 and has an extensive sales and service network in more than 40 countries worldwide.



Headquarters Switzerland

Trafag AG
Industriestrasse 11
8608 Bubikon (Switzerland)
+41 44 922 32 32
trafag@trafag.com
www.trafag.com

Coordinates of representatives can be found at **www.trafag.com/trafag-worldwide**

Pressure transmitters | Electronic pressure switchs | Mechanical pressure switchs | Pressure gauge | Thermostats | Temperature transmitters | Gas density