GAS DENSITY MONITOR

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.

Applications

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

Features

- Exact switching output at all temperatures
- No contact bouncing
- Independent, galvanically separated switching circuits
- Suitable for outodoor and indoor applications
- Maintenance free

12/2020
Data sheet H72511r
Subject to change

Technical Data			
Measuring principle	Absolute pressure reference gas measuring system	Quantity of switchpoints	1 ... 4 microswitches
Measuring range	0 …1100 kPa abs. @ 20°C	Dial	Scale and units selectable
Output signal	Floating change-over contact (SPDT)	Ambient temperature	-40°C ... +80°C

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trafag sensors controls

Ordering information/type code

		87x6 . 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					
Monitor 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	
	Process gas wetted O-rings composed of IIR					C2	
	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 test valve for DILO DN8 test port coupling with M26x1.5 protective cap						
	Standard test port orientation					W3	
	Test port orientation 180°					W0	
	Test port orientation 270°					W1	
	Test port orientation 90°					W2	
	Integrated re-filling valve for DILO DN8 filling port coupling with M26x1.5 protective cap						
	Standard filling port orientation					F3	
	Filling port orientation 180°					F0	
	Filling port orientation 270°					F1	
	Filling port orientation 90°					F2	
Accessories	Thermal insulation 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 density dial	kPa, bar, MPa, psi (abs., rel.), kg/m², kg/cm², also dual units available
Switchpoint @ 20°C [1]	Microswitch 1 p= xxx
	Microswitch 2 p= xxx
	Microswitch 3 p= xxx
	Microswitch 4 p= xxx

Specifications		
Mechanical density monitoring	Monitoring principle [2]	Absolute pressure reference gas measuring system
	Monitoring range	0 ... 1100 kPa abs. @ 20°C
	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	IP65 and IP67
	Humidity	IEC 60068-2-30 (damp heat, cyclic, 100 % RH @ +55°C), membrane provides condensation compensation
	Overpressure	1300 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: EPDM [3], IIR as option
	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 ... 1000g Gas density monitor with integrated test or re-filling valve ~ 1100 ... 1300g

[1] Factory setting for decreasing or increasing pressure available

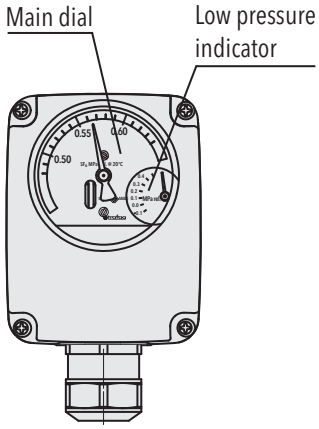
[2] Depending on process gas requirements, the fully sealed reference gas chamber contains up to 0.001kg of SF_6.
The relevant national regulations governing the disposal of hazardous waste apply and must be followed.
Decommissioned or defective monitors can be returned to the manufacturer for disposal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

[3] SF_6 qualified

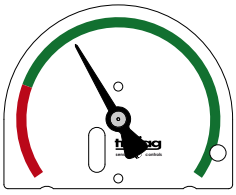
Density indicator		
	Main dial	**Low pressure indication option**
Indicator principle	Absolute pressure, fully temperature compensated by means of sealed reference gas chamber	Indication of relative pressure. For safety reasons it is not temperature compensated
Scale	Colour sectors (standard red/yellow/green or red/green), switchpoint markings, single or dual units	Single unit, graduated range
Unit	Optional kPa, MPa, bar, psi (abs., rel., a, g), kg/m², kg/cm², customer specific units available	According to main dial unit
Numbered range	up to 180 kPa @ 20°C between lowest and highest indicated value [1]	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] Typically ranges are from lock-out switchpoint to filling pressure (no high-alarm), or from lock-out switchpoint to high-alarm switchpoint

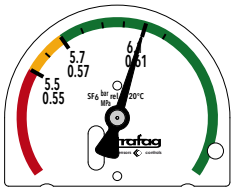
Gas density monitor with main dial and low pressure indicator in standard orientation
(electrical connection in 6 o'clock position)



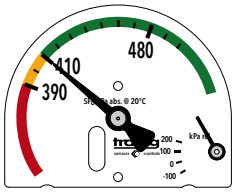
Density indicator dial according to customer specification
Availabilty of a full variety of units including dual range indication
This also includes dial rotated by 90°/180°/270°



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

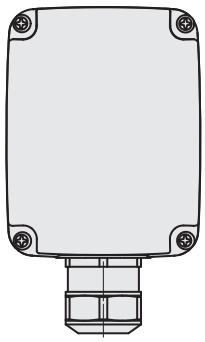


87x6.XX.XXXX.XX.**60.61**.XX



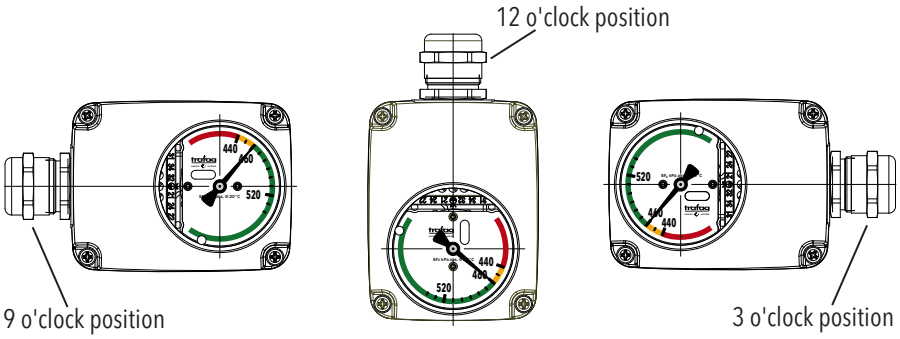
87x6.XX.XXXX.XX.**60.61.66**.XX

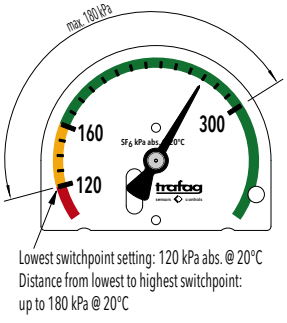
Gas density monitor without indication



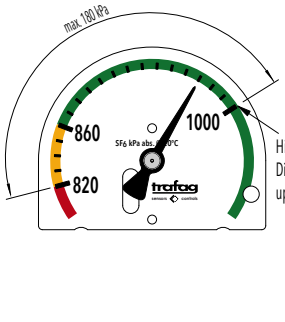
87x6.XX.XXXX.XX.XX.XX

Customised 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) rating	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
	Dielectrical 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 Standard setting is for decreasing pressure
	Lowest switchpoint setting	120 kPa abs. @ 20°C
	Highest switchpoint setting	1000 kPa abs. @ 20°C
	Distance from the lowest to the highest switchpoint [1]	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] Distance from lock-out to high-alarm pressure, or from lock-out to filling pressure (no high-alarm)

Switchpoint accuracy				
		+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	[kPa max.]	± 8	± 12	± 14
High pressure alarm [1] [2]	[kPa max.]	± 10	± 16	± 20

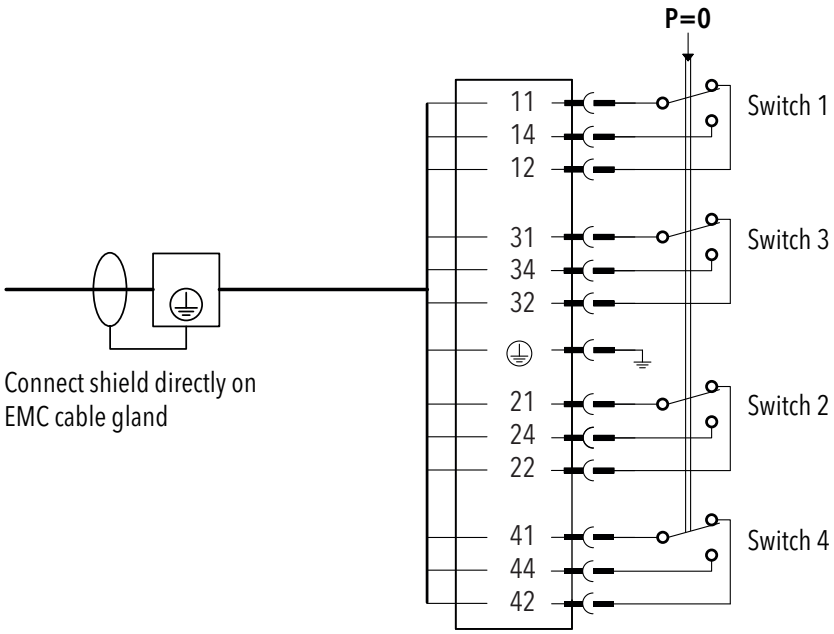
[1] While no liquefaction occurs

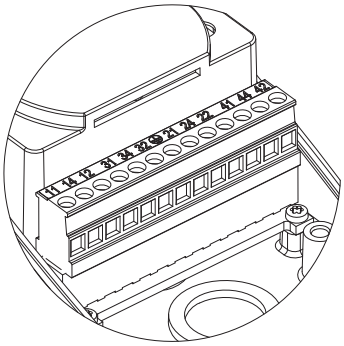
[2] Only applicable if factory adjustment includes high-alarm switchpoint above filling pressure

Additional information		
Documents	Data sheet	www.trafag.com/H72511
	Instructions	www.trafag.com/H73511

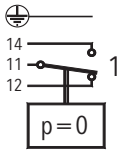
Electrical connections

Standard wiring terminal
87x6.20.XXXX.XX.XX.XX.XX
Number of microswitches according to customer application

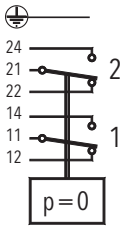




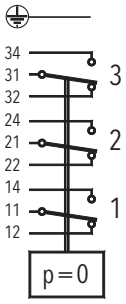
Microswitch in non-pressurised condition (p=0)



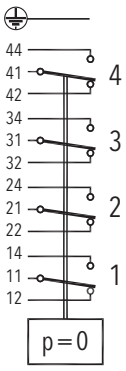
8716.XX.XXXX.XX..



8726.XX.XXXX.XX..



8736.XX.XXXX.XX..



8746.XX.XXXX.XX..

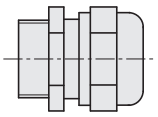
Connected with all electrically conductive elements of the density monitor

Instruction: www.trafag.com/ H73511

Electrical connections

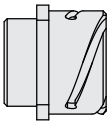
Connections for microswitch	
EMC-cable gland	See ordering information
Wire terminal	Plugable, 0.2 ... 2.5 mm², 13-pins
Connector option	ITT Cannon

EMC-cable gland



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

ITT Cannon connector [1)]

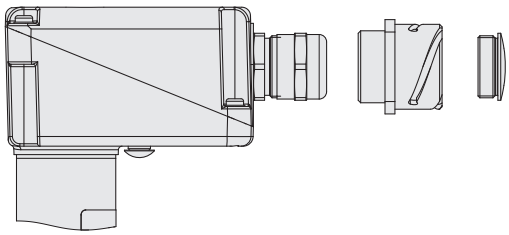


87x6.XX.XXXX.XX.**12**.XX.XX

Blank plug

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

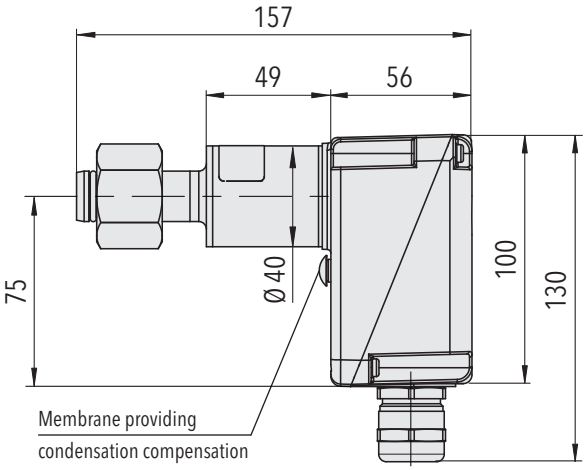
Microswitch connection either with EMC-cable gland, ITT Cannon connector or closed with blank plug

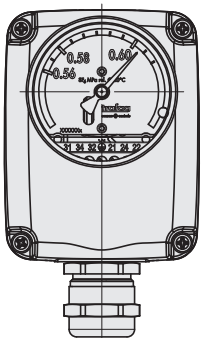


[1)] Monitor internal wiring provided. Please contact us for standard pin-out and more details.
Sheltering option with weather protection cover (46) and/or thermal insulation ring (06) for probe housing only

Main dimensions of density monitor

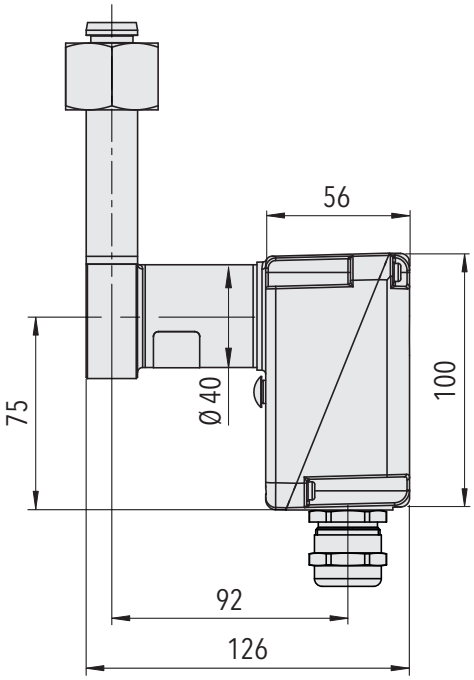
Example model with axial process connection and cap nut

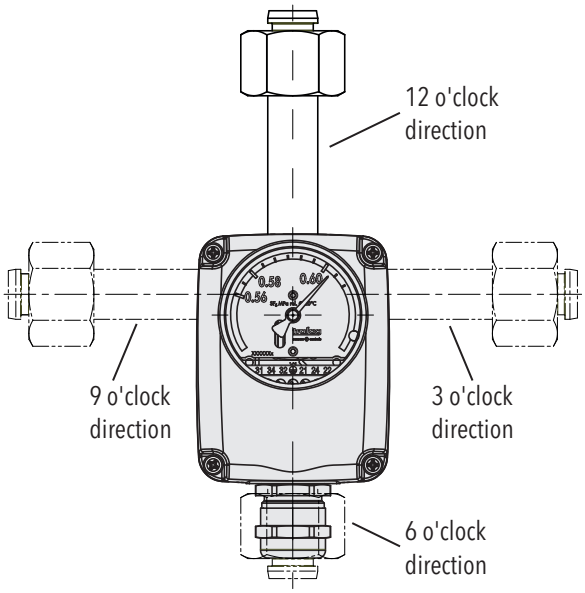




87x6.20.2XXX.XX.XX.XX.XX

Example model with radial process connection





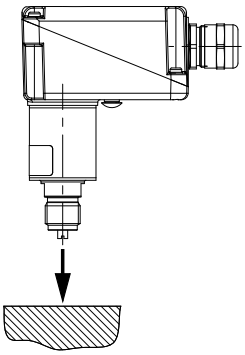
Radial process connection is configurable
for 12/3/6/9 o'clock direction

87x6.20.1XXX.XX.XX.XX.XX

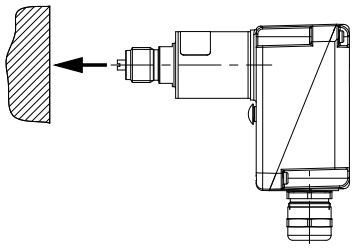
Installation and sheltering options

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)

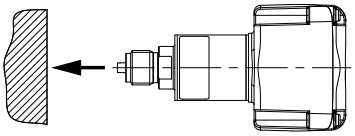
A



B

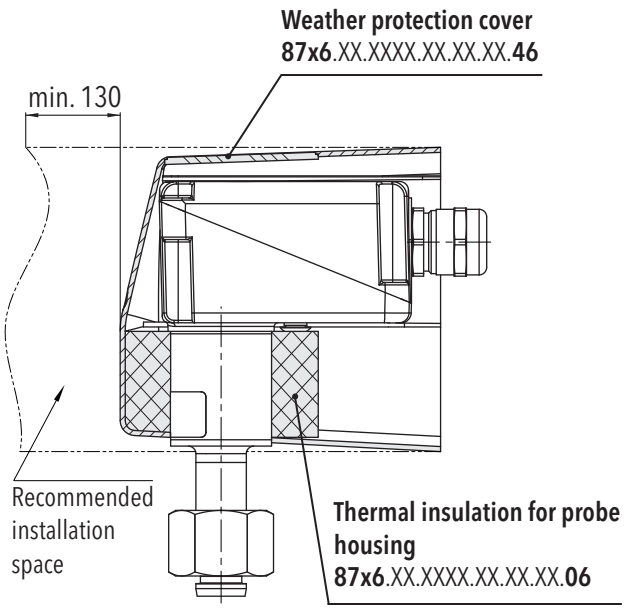


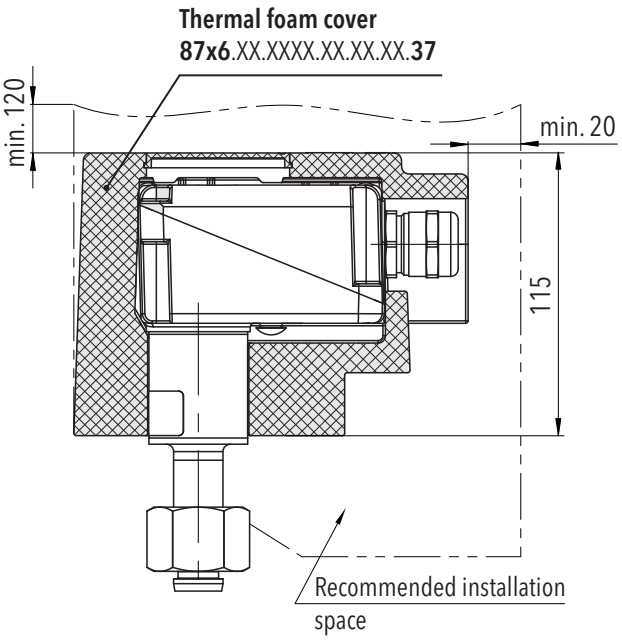
C

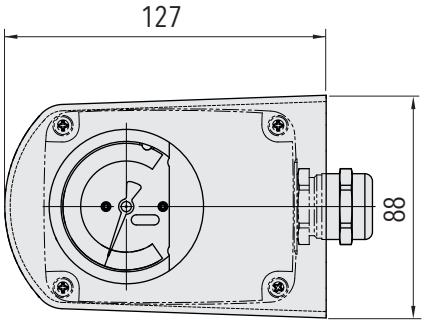


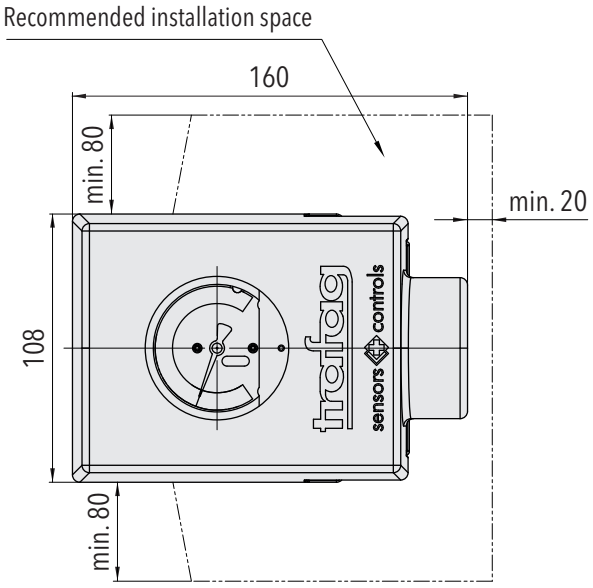
[1] Or any orientation in between. A horizontal upside down installation shall be avoided

Installation and sheltering options







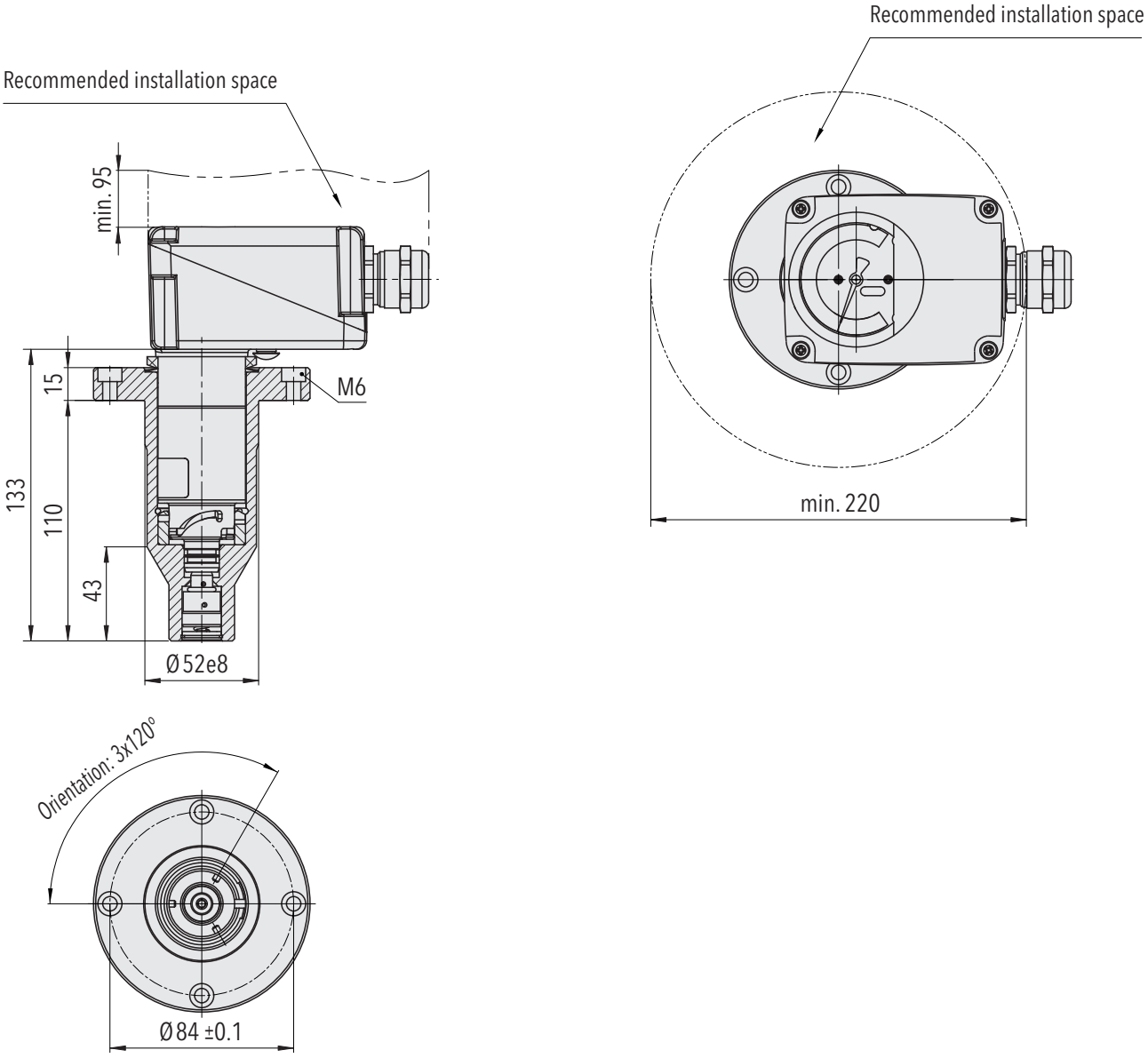


Weather protection cover (46) is aimed for long-term element protection. Insulation ring (06) for probe housing increases thermal inertia in moderate climates. Probe housing refers to the lower part of the monitor where the reference chamber is located.

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).

Installation and sheltering options

Compartment immersion process connection



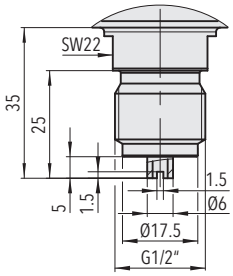
87x6.XX.**5XXX**.XX.XX.XX.XX

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

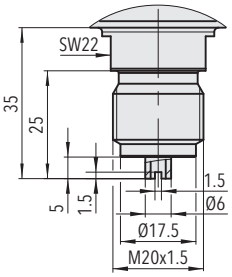
Further details see datasheet: www.trafag.com/H72502

Process connections

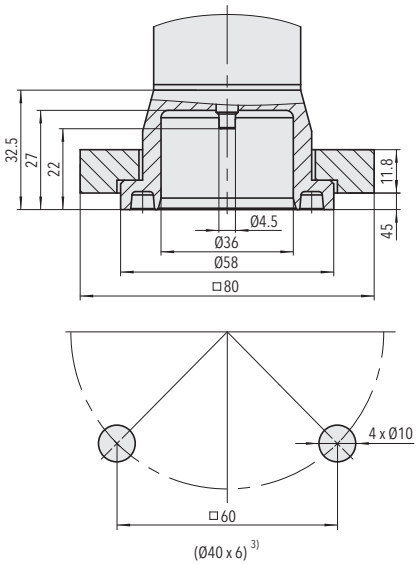
Axial process connections



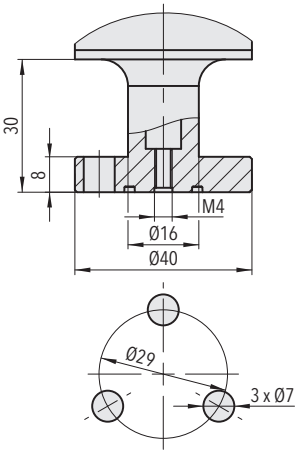
87x6.XX.**1000**.XX.XX.XX.XX
Axial threaded connection G1/2"



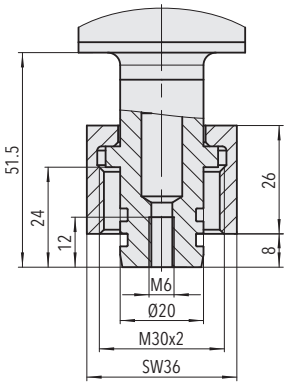
87x6.XX.**1120**.XX.XX.XX.XX
Axial threaded connection M20x1.5



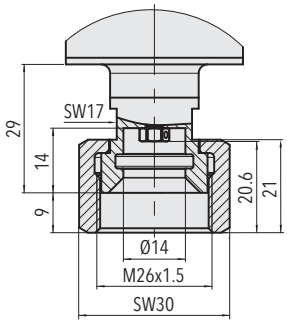
87x6.XX.**2000**.XX.XX.XX.XX
Axial flanged connection



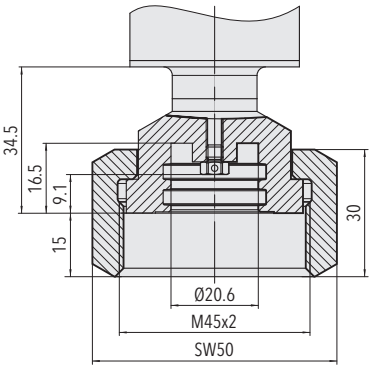
87x6.XX.**2200**.XX.XX.XX.XX
Axial flanged connection



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



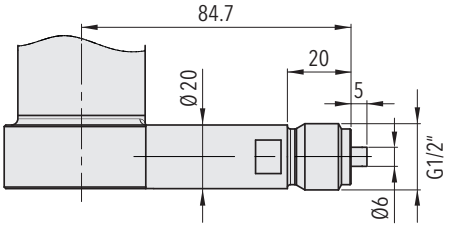
87x6.XX.**2550**.XX.XX.XX.XX
Axial for DILO DN8 connection



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

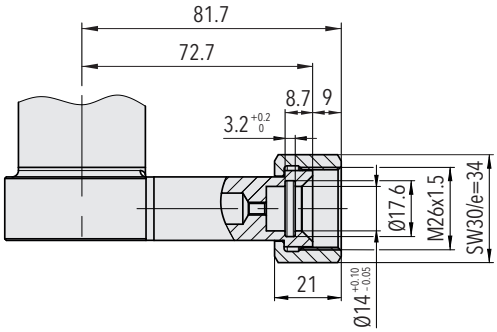
Process connections

Radial process connections



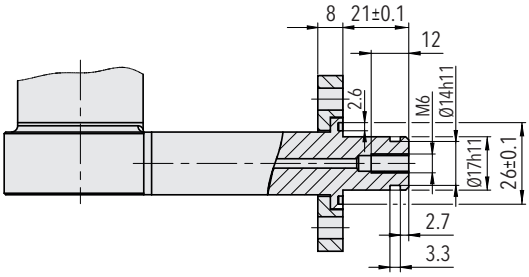
87x6.XX.**1030**.XX.XX.XX.XX

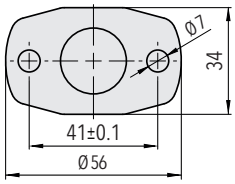
Radial threaded connection G1/2"



87x6.XX.**2XE2**.XX.XX.XX.XX

Radial for DILO DN8 connection

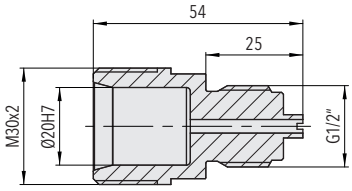




87x6.XX.**2XP2**.XX.XX.XX.XX

Radial for two-hole flange connection

Adapter



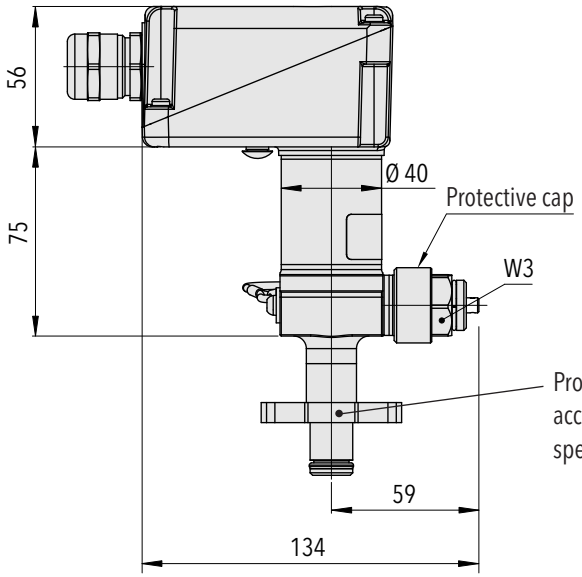
87x6.XX.**2300**.XX.XX.XX.**N1**

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

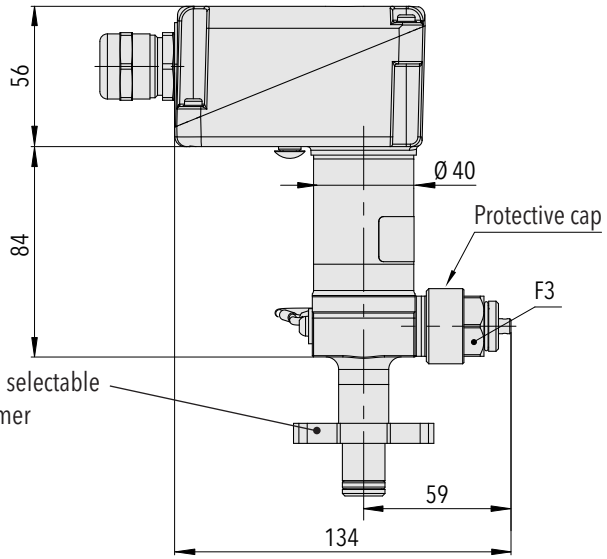
Integrated test valve



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

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

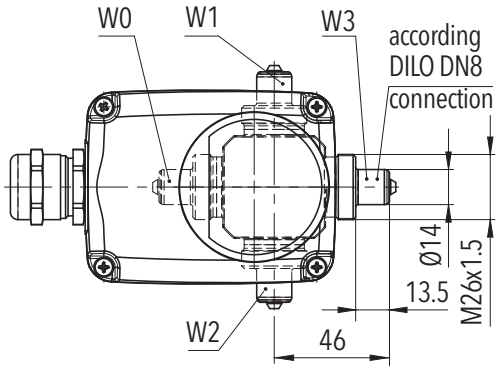
Integrated re-filling valve

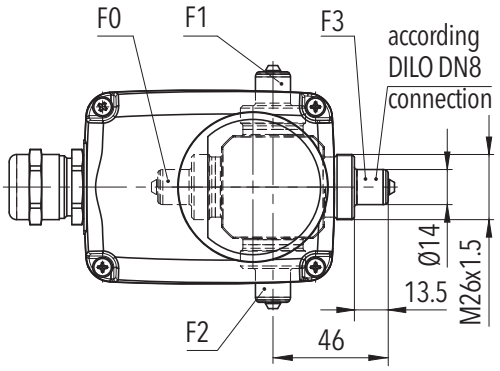


87x6.XX.XXXX.XX.**F0/F1/F2/F3**.XX.XX

Re-filling valve allows direct insulating gas replenishment of pressure compartment via DILO DN8 port on re-filling valve. Connection is configurable for direction F0/F1/F2/F3.

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



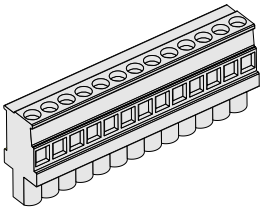


[1)] While using weather protection cover or thermal foam cover, the indicated installation spaces should be followed. See section installation and sheltering options

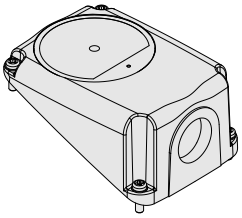
Operating specification for test and re-filling valve:
Opening and closing shall be limited to temperature range of -25°C ... +50°C
Mechanical lifetime min. 250 actuation cycles

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

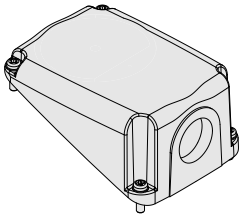
Spare parts



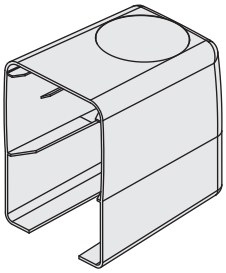
Standard microswitch wire terminal, 13-pins [1)]



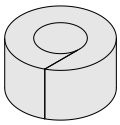
Housing cover with dial window [2)]



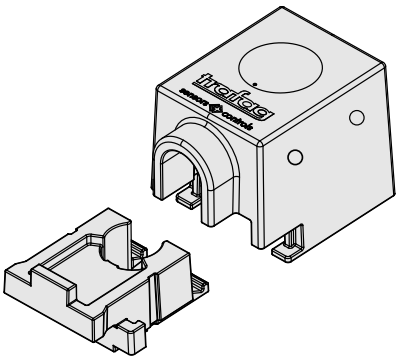
Housing cover without dial window [2)]



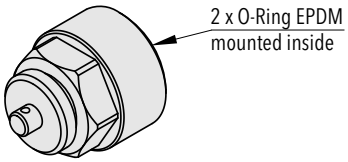
Weather protection cover
(Trafag part no.: C16354)



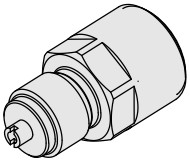
Thermal insulation for probe housing
(Trafag part no.: D34570)



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