8774

Gas density sensor with current output

Applications

- Density monitoring in insulating and quenching gas
- High voltage technology
- Medium voltage technology
- SF_6 and variety of alternative mixed gases

Features

- Continuous current loop output
- Suitable for outdoor and indoor applications
- Long term drift free sensor output signal
- Maintenance free

EMC: 2014/30/EU

S.I. 2016 No. 1091

RoHS/Reach compliant

Product description

Swiss based Trafag offers precise, reliable and maintenance-free instruments developed for density measuring of SF_6 and related alternative gases. Measurement is based on the patented quartz tuning fork technology. Thus offering the most reliable and long term drift free solution on the market by directly measuring the insulating gas density.

Technical Data

Measuring principle	Oscillating quartz
Measuring range	max. 0 ... 60 kg/m³
Output signal	4 ... 20 mA, 6.5 ... 20 mA
Ambient temperature	-40°C ... +80°C

Additional information

Data sheet www.trafag.com/H72507
Instructions www.trafag.com/H73507

Ordering information/Type code

		8774	XX	XX	XX	XX
Density measuring range	0 … 60 kg/m³	51				
	0 … 30 kg/m³	52				
	0 … 15 kg/m³	53				
	0 … 56.1 kg/m³	50				
Process connections	G3/8" male		11			
Output signal	4 … 20 mA, Density [kg/m³], gas specific linearised [1]			A4		
	4 … 20 mA, Density [Gas pressure @ 20°C], gas specific linearised [1]			B4		
	6.5 … 20 mA, generic, non-linear (legacy) [2]			04		
Electrical connection	Male electrical connector EN 175301-803-A (DIN 43650-A), 4-pole				04	
	Male electrical connector M12x1, 5-pole, A-coding				35	
Accessories	Female electrical plugs					
	EN 175301-803-A (DIN 43650-A), 4-pole					58
	M12x1, 5-pole, A-coding, PA					33
	M12x1, 5-pole, A-coding, brass nickel-plated					35
	Pressure connection adapters					
	G3/8" female - 2200					22
	G3/8" female - 2300					23
	G3/8" female - 2550					27
	G3/8" female - 2570					28
	G3/8" female - 2800					29
	T-adapter M30x2 male - G3/8" female - 2300					25

[1] Not with measuring range 50
[2] Only with measuring range 50, do not use for new designs

Further customised parameterisation to be indicated

Process gas	SF_6, SF_6- based mixed gas, customer specific alternative gas

Electronical density measuring

Sensor	Principle	Oscillating quartz sensor
	Range [1]	max. 0 ... 60 kg/m³ max. 0 ... 1250 kPa abs. @ 20°C
	Output	4 ... 20 mA, 6.5 ... 20 mA
Electrical data	Supply voltage	10 ... 30 VDC
	Earthing	Via process connection or wire terminal
	Resistance of insulation	>100 MΩ, 500 VDC, ex factory
	Dielectric strength	500 VAC, 50 Hz, terminal to ground (earth)
EMC protection	ESD	15 kV air, 8 kV contact, EN/IEC 61000-4-2
	Radiated immunity	10 V/m, 80 ... 6000 MHz, EN/IEC 61000-4-3
	Burst	2 kV, EN/IEC 61000-4-4
	Surge	Up to 2 kV, EN/IEC 61000-4-5
	Conducted immunity	10 Vrms, EN/IEC 61000-4-6
Accuracy	Density measurement	See table: Accuracy
	Repeatability density measurement	See table: Accuracy
	Transient response time required for signal output to reach accuracy tolerance band	Less than 1 h after connecting monitor to pressurised compartment Less than 1 min. when monitor is vacuumised together with compartment before gas filling

[1] The oscillating quartz sensor principle is a direct density measurement. Shown density / pressure @ 20°C correlation corresponds to 100 % SF_6 gas. Maximum value is 15, 30, 60, 56.1 kg/m³ depending on the measuring range chosen or 1250 kPa abs. @ 20°C, whichever is reached first. Density / pressure @ 20°C correlation is defined by particular gas isochores and is specifically fitted. Please contact us for process gases other than 100 % SF_6

Accuracy

The indicated accuracy is validated for SF_6 and common SF_6 mixtures, common C4-FN (CAS No. 42532-60-5) mixtures and synthetic air. Please contact us for further information.

Density measuring range	**0 … 15 kg/m³**	**0 … 30 kg/m³**	**0 … 60 kg/m³** **0 … 56.1 kg/m³**
Total error band -40°C … +80°C [1]	± 1.8 % FS typ. ± 2.3 % FS max.	± 1.4 % FS typ. ± 2.0 % FS max.	± 1.0 % FS typ. ± 1.8 % FS max.
Repeatability	± 0.3 % FS typ.	± 0.3 % FS typ.	± 0.2 % FS typ.

[1] Total error band (TEB) for defined ambient temperature range while the insulation gas is completely gaseous

Surge level details

Maximum surge load level [kV]	Coupling category	Coupling settings	Signal coupling	Severity level
1	Line to Earth	L-PE	U_s+ to Earth	2
1	Line to Earth	N-PE	U_s– to Earth	2
2	Line to Earth	L-N	Shield to Earth	3

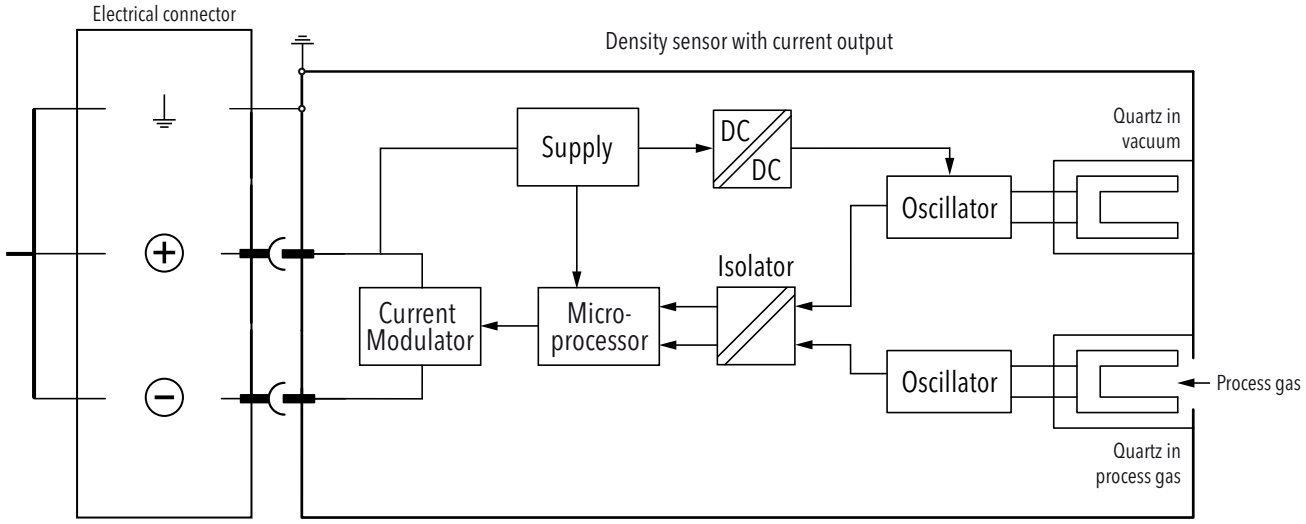
General specifications

Environmental conditions	Ambient temperature [1]	-40°C ... +80°C
	Protection [2]	IP65 and IP67
	Humidity	IEC 60068-2-30 (damp heat, cyclic, 100 % RH @ +55°C)
	Overpressure	1600 kPa abs.
	Vibration	15 g, 5 ... 2000 Hz
	Shock	100 g, 6 ms, 10'000 times at all axes excited on process connection without damage to sensor
	Routine inspection of gas tightness	Integral pressure testing with helium, leakage detection rate < $7 \cdot 10^{-8}$ mbar · l/s
Mechanical data	Process gas wetted material	Process connection and measuring system: 1.4435 (AISI316L) Sealing: IIR
	Housing	1.4301 (AISI304)

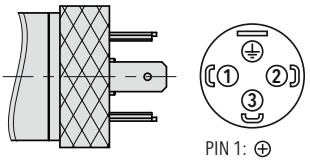
[1] Approved for extended temperature range -55°C … +80°C for 200h max. per year
[2] While using an appropriate mating connector mounted according to instruction

Electrical connections and options

Wiring diagram



Male electrical connector
EN 175301-803-A (DIN 43650-A), 4-pole [1)]



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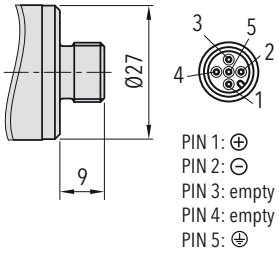
Material: Collar nut 1.4305 with PA contact holder

Male electrical connector
M12x1, 5-pole [2)]



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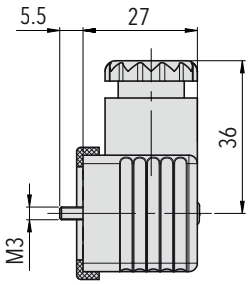
Material: Thread 1.4435 with PA contact holder

[1)] IP 65 protection while using an equivalent mating connector mounted according to instruction
[2)] IP 65 and IP 67 protection while using an equivalent mating connector mounted according to instruction

Electrical connections and options

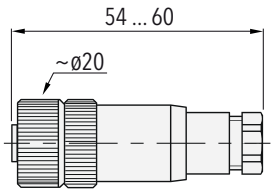
Female electrical plug
EN 175301-803-A (DIN 43650-A), 4-pole [1)]



For cable-Ø unified 4 ... 8 mm,
6.5 ... 9.5 mm, max. 1.5 mm²

8774.XX.XX.XX.04.**58**.XX
Material: Polyamide (PA)

Female electrical plug
M12x1, 5-pole, A-coding [2)]



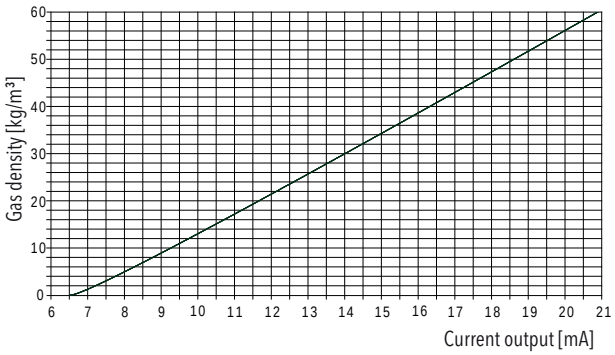
For cable-Ø unified 4 ... 6 mm,
max. 0.75 mm²

8774.XX.XX.XX.35.**33**/**35**.XX
Material:
Type code 33: Polyamide (PA)
Type code 35: Brass, nickel-plated

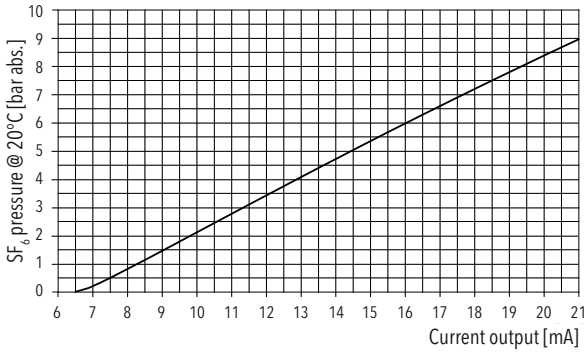
[1)] IP 65 protection while connector and plug are mounted according to instruction
[2)] IP 65 and IP 67 protection while connector and plug are mounted according to instruction

Conversion of output signal 6.5 ... 20 mA

Relation of current output to gas density



Relation of current output to SF_6 pressure @ 20°C



Gas density [kg/m³] = 4.651 * I[mA] - 1.898 *$\sqrt{\text{I[mA] - 6.475}}$ - 29.921

SF_6 pressure @ T [K] [bar abs.] =
{0.000569502 * T [K] *Density [kg/m³] +
(0.00250695 * 0.000569502 * T [K] –
0.00073822) * Density [kg/m³] ² –
(0.00000212238 * 0.000569502 * T [K] –
0.000000513) * Density [kg/m³] ³ }

SF_6 pressure @ 20°C [bar abs.] ≈ 0.6303 * I [mA] – 4.1419
(add. non-linearity ± 0.3 % FS between 9.5 and 19.25 mA)

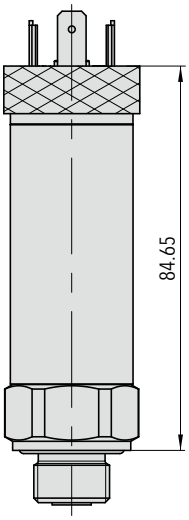
The relation of current output to SF_6 pressure @ 20°C above applies only if 100 % SF_6 gas is used. Density and current to pressure @ 20°C correlations are defined by specific isochores. Please contact us for process gases other than 100 % SF_6.

Conversion of output signal 4 … 20 mA

In contrast to the 6.5 … 20 mA signal, the 4 … 20 mA signal is linearised for the specific gas, either to density [kg/m³] or to normalised pressure [kPa @ 20°C]. Thus, no additional conversion is required.

Dimensions and process connections

Sensor with G3/8" male process connection



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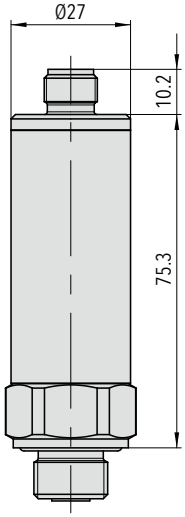
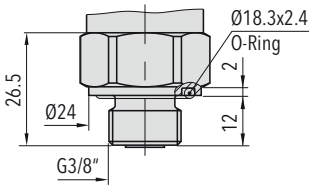
Sensor with EN 175301-803-A (DIN 43650-A)
electrical connector and G3/8" male process connection



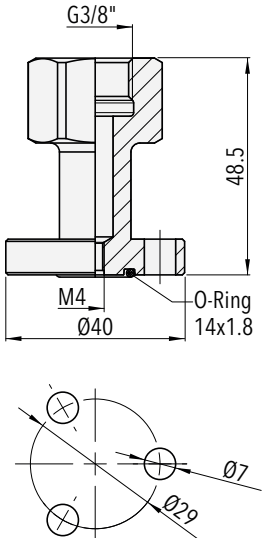
8774.XX.**11**.XX.**35**.XX.XX.XX

Sensor with M12x1 electrical connector and
G3/8" male process connection



G3/8" male process connection

Process connection adapters



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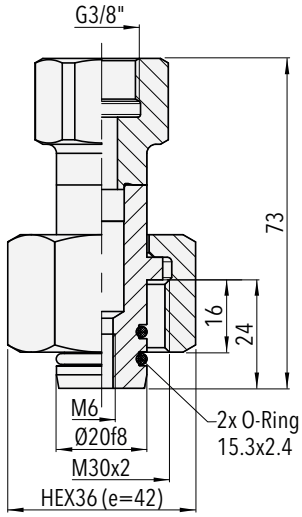
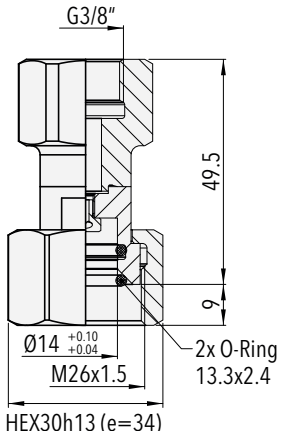
Adapter G3/8" female –
3-hole flange 2200 series
Material: 1.4435 (AISI316L)



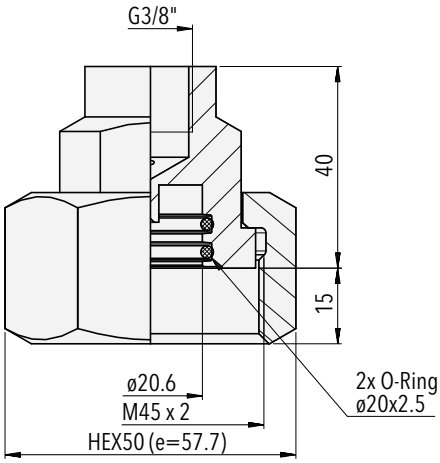
8774.XX.**11**.XX.XX.XX.XX.**23**

Adapter G3/8" female – 2300
Material: 1.4435 (AISI316L)
with nickel-plated brass nut



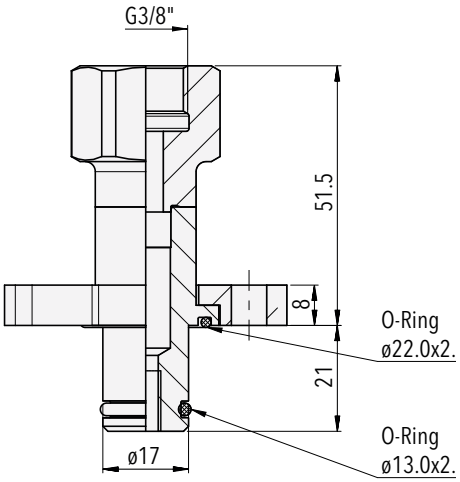
8774.XX.**11**.XX.XX.XX.XX.**27**

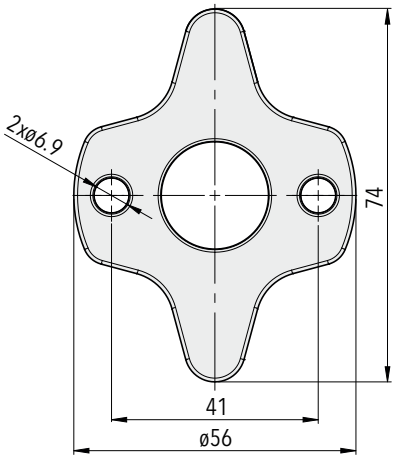
Adapter G3/8" female – 2550 for DN8
Material: 1.4435 (AISI316L)
with nickel-plated brass nut



8774.XX.**11**.XX.XX.XX.XX.**28**

Adapter G3/8" female – 2570 for DN20
Material: 1.4435 (AISI316L)
with nickel-plated brass nut





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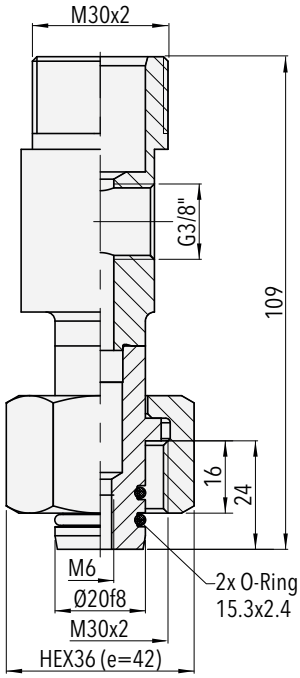
Adapter G3/8" – 2801/2802/2803
(flange process connection)
Material: 1.4404, 1.4572
with flange AlMgSi1



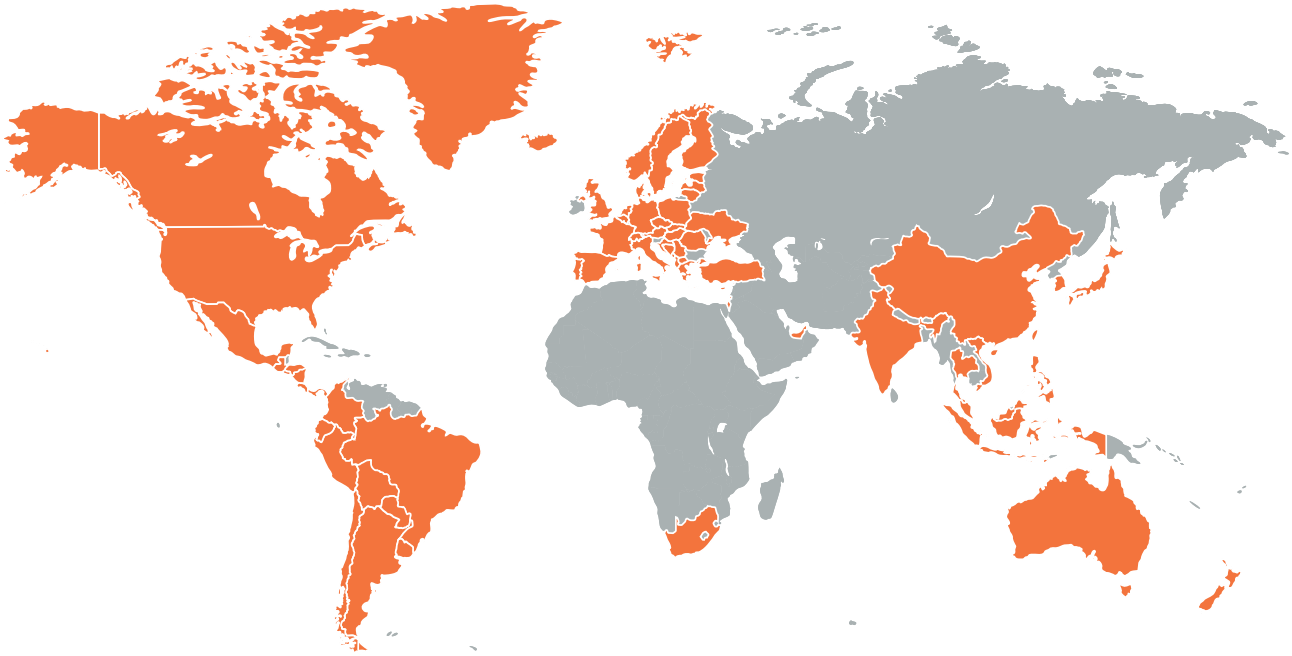
8774.XX.**11**.XX.XX.XX.XX.**25**

T-adapter M30x2 male –
G3/8" female – 2300
Material: 1.4435 (AISI316L)
with nickel–plated brass nut

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.



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