

Gas density sensor with Modbus output



Product description

Swiss based Trafag offers precise, reliable and maintenance-free instruments developed for density measuring of SF₆ 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..

Applications

- Density measurement in insulating and quenching gas
- High voltage technology
- Medium voltage technology
- SF₆ and variety of alternative mixed gases

Features

- Continuous density measurement
- 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

Technical Data

Measuring principle	Oscillating quartz
Measuring range	0 ... 60 kg/m ³
Output signal	RS485/Modbus (RTU)
Ambient temperature	-40°C ... +80°C

Additional information

Data sheet www.trafag.com/H72519
 Instructions www.trafag.com/H73519

Ordering information/Type code

		8775	XX	XX	XX	XX	XX	XX
Density measuring range	0 ... 60 kg/m ³	50						
Pressure connection	G3/8" male		11					
Sensor output	RS485/Modbus			05				
Electrical connection	Male electrical connector M12x1, 5-pole, A-coding					35		
Modbus settings	Baudrate and parity fixed							
	Baudrate 9600 and parity even (1 stop bit)						76	
	Baudrate 19200 and parity even (1 stop bit)						77	
	Baudrate and parity customised ¹⁾						78	
	Baudrate and parity open configurable							
	Default baudrate 19200, parity even (1 stop bit)						79	
	Default settings customised ¹⁾						80	
	Server-ID							
	Open configurable (default ID = 1)						95	
	Increasing number per order, start-ID selectable from 1 ... 247						96	
	Fixed, customised per order, selectable from 1 ... 247						97	
Accessories	Female electrical plugs							
	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⁾ Selectable baudrate: 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 56000, 57600
 Selectable parity: none (2 stop bits), odd (1 stop bit), even (1 stop bit)

Further customised parameterisation to be indicated

Process gas	SF ₆ , SF ₆ -based mixed gas, customer specific alternative gas
Gas pressure @ 20°C	Requirement for specific process gas if other than 100 % SF ₆

 Trafag develops and manufactures customised products according to your specifications to meet your specific requirements. Please contact us for further details.

Electronical density measuring

Sensor	Principle	Oscillating quartz sensor
	Range ¹⁾	0 ... 60 kg/m ³ 0 ... 1250 kPa abs. @ 20°C
	Output	RS485/Modbus (RTU)
	Output parameter	Gas density [kg/m ³], gas pressure [kPa abs.] @ 20°C, gas temperature [K], gas pressure [kPa abs.] @ temperature variable [K]
Electrical data	Supply voltage	11 ... 32 VDC
	Current consumption	@ 24 VDC: 22 mA typ. / 40 mA max. @ 11 VDC: 47 mA typ. @ 32 VDC: 18 mA typ.
	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	max. 2 kV, EN/IEC 61000-4-5
	Conducted immunity	10 Vrms, EN/IEC 61000-4-6
Modbus settings	Baudrate ²⁾	Default 9600 or 19200, optional selectable from 1200 ... 57600
	Parity	Default even (1 stop bit), optional selectable odd (1 stop bit) or none (2 stop bits)
	Server-ID	Selectable from 1 ... 247
	Devices in one bus	Up to 64
Accuracy	Density measurement ³⁾	± 1.0 % FS typ. ± 1.8 % FS max.
	Temperature measurement	± 1.0 % FS typ. ± 3.0 % FS max.
	Resolution density output	13 bit
	Resolution temperature output	10 bit
	Repeatability density measurement	± 0.2 % FS
	Repeatability temperature measurement	± 0.1 % FS
	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
	Measurement output signal refresh time ⁴⁾	Less than 40 ms

¹⁾ The oscillating quartz sensor principle is a direct density measurement. Shown density / pressure @ 20°C correlation corresponds to 100 % SF₆ gas. Maximum value is either 60 kg/m³ 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 % SF₆

²⁾ See ordering information

³⁾ Total error band (TEB) for defined ambient temperature range while the insulation gas is completely gaseous

⁴⁾ The refresh time mainly depends on the density been measured as the oscillating quartz sensor generates a basic frequency signal. A typical refresh time for a density of 40 kg/m³ is 7 ms, for a density of 10 kg/m³ it is 20 ms

Surge level details

Maximum surge load level [kV]	Coupling category	Coupling settings	Signal coupling	Severity level
1	Line to Line	L-N	U_s+ to U_s-	3
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
1	Line to Earth	I/O	Dataline to Earth	2

Modbus settings

Baudrate	Default 9600 or 19200, optional selectable from 1200 ... 57600 ¹⁾
Parity	Default even (1 stop bit), optional selectable odd (1 stop bit) or none (2 stop bits)
Server-ID	Selectable from 1 ... 247
Devices in one bus	Up to 64

¹⁾ See ordering information

General specifications

Environmental conditions	Ambient temperature	-40°C ... +80°C ¹⁾
	Protection	IP65 and IP67 ²⁾
	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 reference chamber gas tightness	Integral pressure testing with 6 bar rel. helium, leakage detection rate < 7·10 ⁻⁸ mbar · l/s
Mechanical data	Process gas wetted material	Process connection and measuring system: 1.4435 (AISI316L) Sealing: IIR
	Housing	1.4301 (AISI304)
	Weight	~ 200 ... 400 g

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

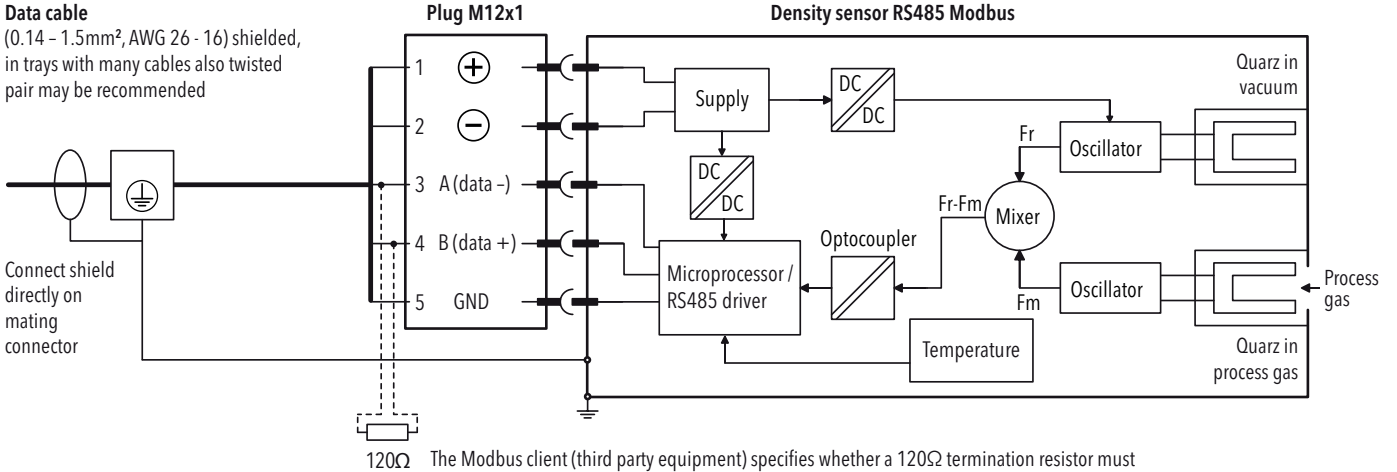
Electrical connections and options

Wiring diagram

8775.50.XX.05.35.XX.XX.XX

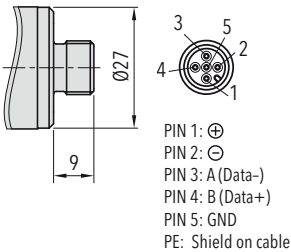
Data cable

(0.14 - 1.5mm², AWG 26 - 16) shielded, in trays with many cables also twisted pair may be recommended



120Ω The Modbus client (third party equipment) specifies whether a 120Ω termination resistor must be applied or not for the first and last device in the bus. Please observe the operation manual of the Modbus client.

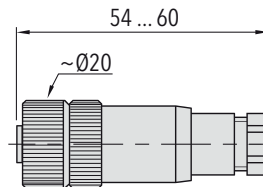
Male electrical connector M12x1, 5-pole ¹⁾



8775.50.XX.05.35.XX.XX.XX

Material:
Thread 1.4435 with PA contact holder

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



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

8775.50.XX.XX.35.33/35.XX

Material:
Type code 33: Polyamide (PA)
Type code 35: Brass, nickel-plated

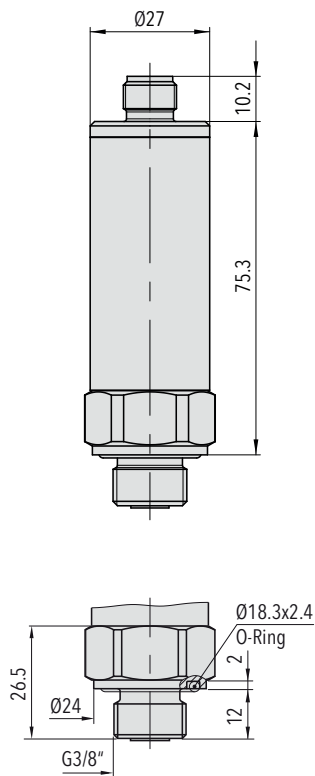
¹⁾ IP 65 and IP 67 protection while using an equivalent mating connector mounted according to instruction

²⁾ IP 67 protection while connector and plug are mounted according to instruction

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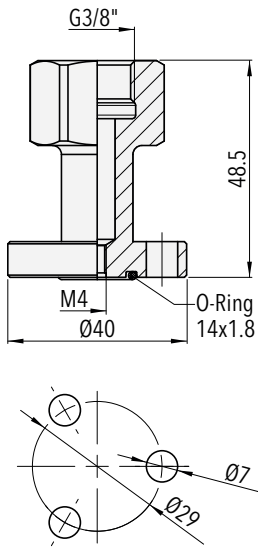
Dimensions and process connections

Sensor with G3/8" male process connection



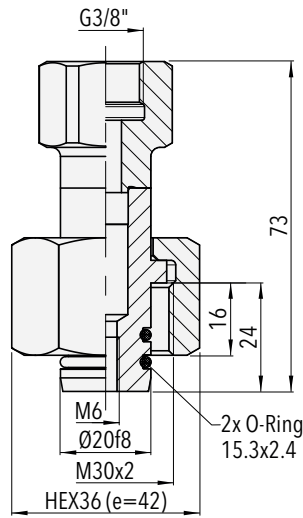
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Process connection adapters



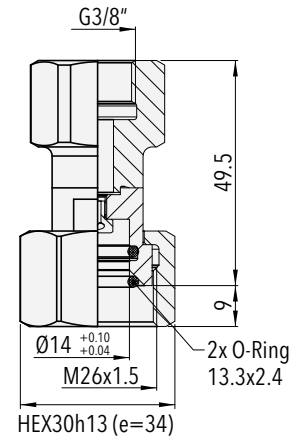
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Adapter G3/8" female -
3-hole flange 2200 series
Material: 1.4435 (AISI316L)



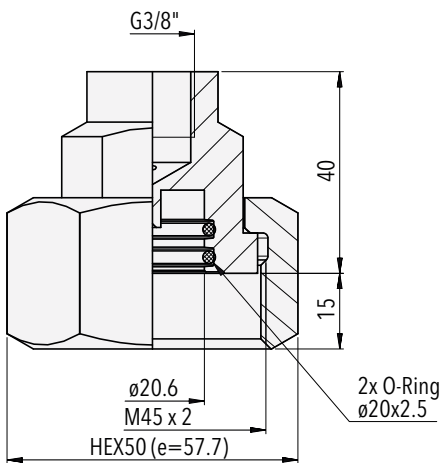
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Adapter G3/8" female - 2300
Material: 1.4435 (AISI316L)
with nickel-plated brass nut



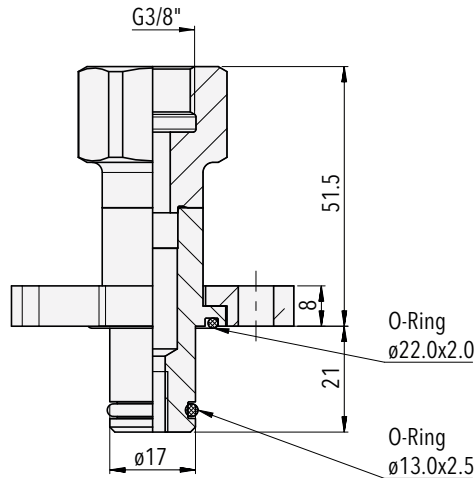
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Adapter G3/8" female - 2550 for DN8
Material: 1.4435 (AISI316L)
with nickel-plated brass nut



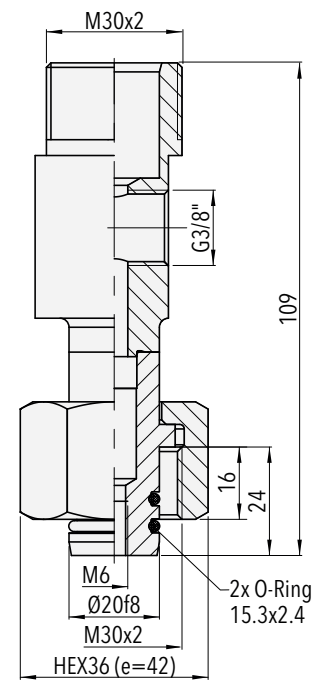
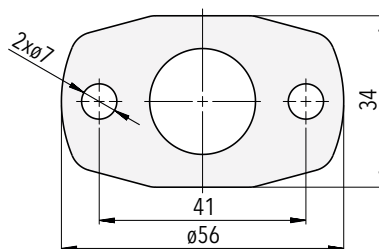
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Adapter G3/8" female - 2570 for DN20
Material: 1.4435 (AISI316L)
with nickel-plated brass nut



8775.50.11.05.35.XX.XX.29

Adapter G3/8" - 2800
(flange process connection)
Material: 1.4404, 1.4572
with flange AlMgSi1



8775.50.11.05.35.XX.XX.25

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

Reliable quality

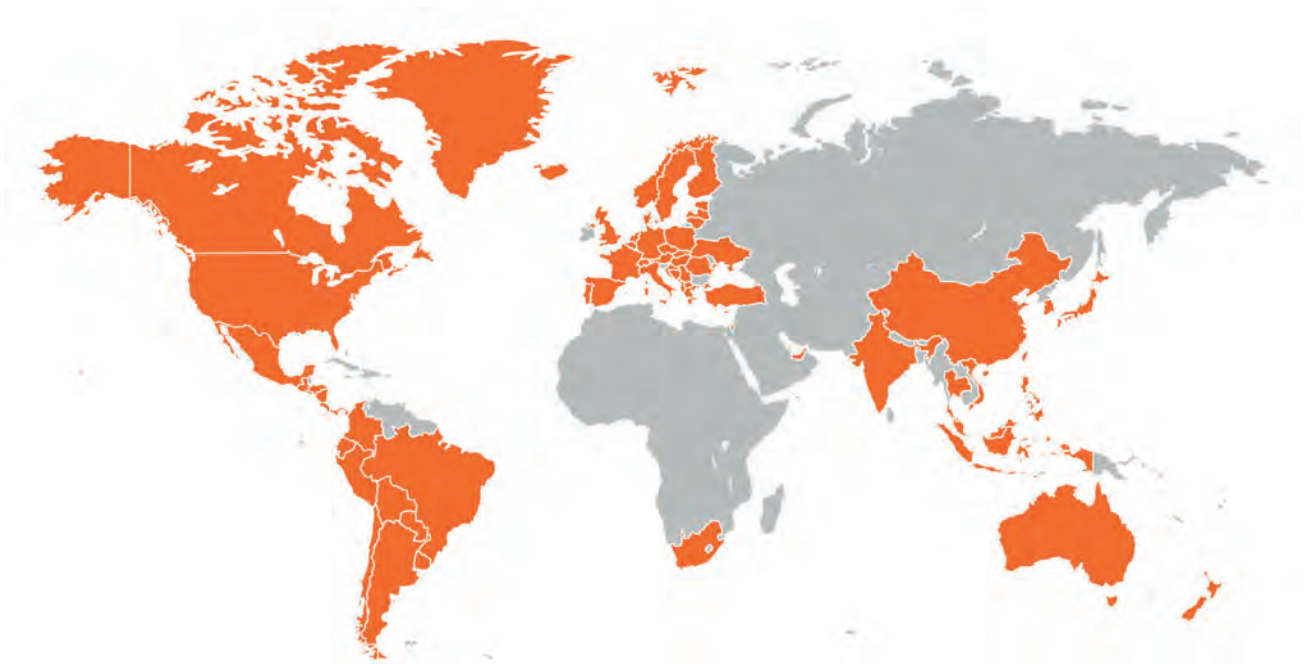
Worldwide represented, globally trusted, Swiss based

Trafag develops, manufactures and markets accurate, robust, and maintenance-free instruments for monitoring SF₆ 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