

# GAS DENSITY SENSOR WITH MODBUS OUTPUT

Swiss based Trafag offers precise, reliable and maintenance-free instruments developed for density measuring of SF<sub>6</sub> 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
- SF<sub>6</sub> and variety of alternative mixed gases

## Features

- Continuous density and temperature measurement
- Suitable for outdoor and indoor applications
- Long term drift free sensor output signal
- Maintenance free

## Technical Data

Measuring principle	Oscillating quartz	Supply voltage	11 ... 32 VDC
Measuring range	0 ... 60 kg/m <sup>3</sup>	Ambient temperature	-40°C ... +80°C
Output signal	RS485/Modbus (RTU)		

12/2022

Data sheet H72519h

Subject to change

## Ordering information/type code

		8775	XX	XX	XX	XX	XX	XX
<b>Density measuring range</b>								
	0 ... 60 kg/m <sup>3</sup>	50						
<b>Process connection</b>	G3/8" male		11					
	2-hole flange 2800 series		28					
<b>Sensor output</b>	RS485/Modbus			05				
<b>Electrical connection</b>	Male electrical connector M12x1, 5-pole, A-coding					35		
<b>Modbus settings</b>	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 <sup>1)</sup>							78
	Baudrate and parity open configurable							
	Default baudrate 19200, parity even (1 stop bit)							79
	Default settings customised <sup>1)</sup>							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	
<b>Accessories</b>	Female electrical plugs							
	M12x1, 5-pole, A-coding, PA							33
	M12x1, 5-pole, A-coding, brass nickel-plated							35
	Pressure connection adaptaters							
	G3/8" female - 2200							22
	G3/8" female - 2300							23
	G3/8" female - 2550							27
	G3/8" female - 2570							28
	T-adapter M30x2 male - G3/8" female - 2300							25

<sup>1)</sup> 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 <sub>6</sub> , SF <sub>6</sub> - based mixed gas, customer specific alternative gas
Gas pressure @ 20°C	Requirement for specific process gas if other than 100 % SF <sub>6</sub>



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

Specifications		
<b>Electronical density measuring</b>	Measuring principle	Oscillating quartz sensor
	Density measuring range <sup>1)</sup>	0 ... 60 kg/m <sup>3</sup> 0 ... 1100 kPa abs. @ 20°C
	Temperature measuring range	-40°C ... +80°C
	Sensor output	RS485/Modbus (RTU)
	Output parameter	Gas density [kg/m <sup>3</sup> ], gas pressure [kPa abs.] @ 20°C, gas temperature [K], gas pressure [kPa abs.] @ temperature variable [K]
<b>Electrical data</b>	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 plug
	Resistance of insulation	> 100 MΩ, 500 VDC, ex factory
	Dielectric strength	500 VAC, 50 Hz, terminal to ground (earth)
<b>Environmental conditions</b>	Ambient temperature	-40°C ... +80°C <sup>3)</sup>
	Protection <sup>2)</sup>	IP65 and IP67
	Humidity	IEC 60068-2-30 (damp heat, cyclic, 100 % RH @ +55°C)
	Overpressure	1500 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 6 bar rel. helium, SF <sub>6</sub> leakage rate less than 1·10 <sup>-8</sup> mbar · l/s
<b>EMC protection</b>	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	2 kV, EN/IEC 61000-4-5
	Conducted immunity	10 Vrms, EN/IEC 61000-4-6
<b>Mechanical data</b>	Process gas wetted material	Process connection and measuring system: 1.4435 (AISI316L) Sealing: EPDM <sup>4)</sup>
	Housing	1.4301 (AISI304)
	Weight	~ 200 ... 400 g

<sup>1)</sup> The oscillating quartz sensor principle is a direct density measurement. Shown density / pressure @ 20°C correlation corresponds to 100 % SF<sub>6</sub> gas. Maximum value is either 60 kg/m<sup>3</sup> or 1100 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<sub>6</sub>

<sup>2)</sup> While using an appropriate mating connector mounted according to instruction

<sup>3)</sup> Approved for extended temperature range -55°C ... +80°C for 200h max. per year

<sup>4)</sup> SF<sub>6</sub> qualified

Accuracy	
Density measurement <sup>1)</sup>	± 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 sensor to pressurised compartment Less than 1 min. when sensor is vacuumised together with compartment before gas filling
Measurement output signal refresh time <sup>2)</sup>	Less than 40 ms

Modbus settings	
Baudrate	Default 9600 or 19200, optional selectable from 1200 ... 57600 <sup>3)</sup>
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

<sup>1)</sup> Total error band (TEB) for defined ambient temperature range while the insulation gas is completely gaseous

<sup>2)</sup> 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/m<sup>3</sup> is 7 ms, for a density of 10 kg/m<sup>3</sup> it is 20 ms

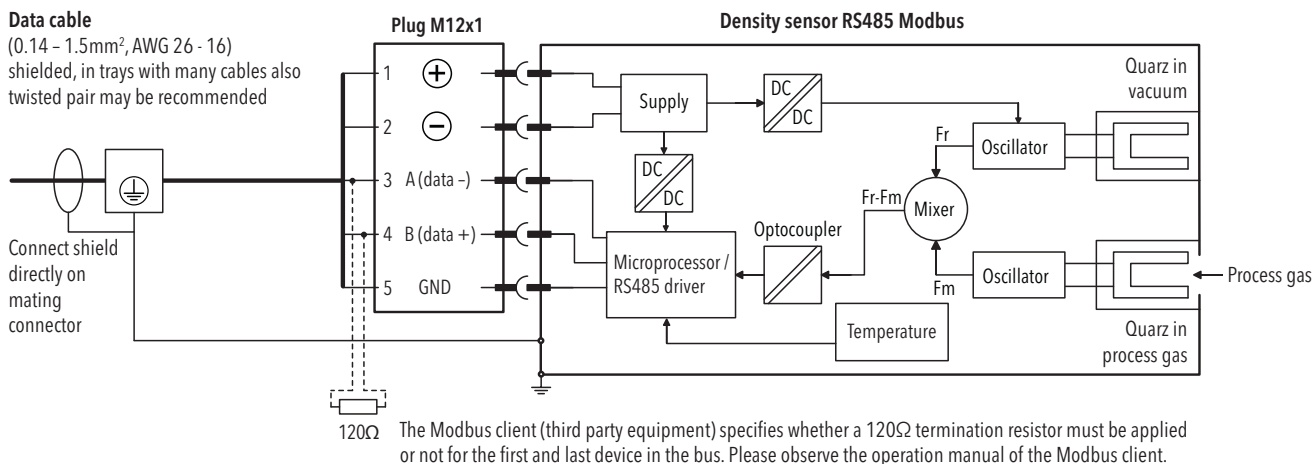
<sup>3)</sup> See ordering information

Additional information		
Documents	Data sheet	<a href="http://www.trafag.com/H72519">www.trafag.com/H72519</a>
	Instructions	<a href="http://www.trafag.com/H73519">www.trafag.com/H73519</a>
	Flyer	<a href="http://www.trafag.com/H71107">www.trafag.com/H71107</a>

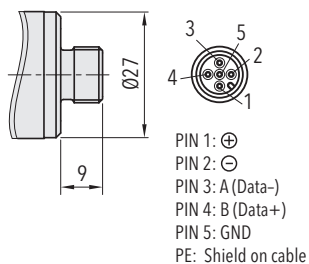
## Electrical connections and options

### Wiring diagram

8775.50.XX.05.35.XX.XX.XX



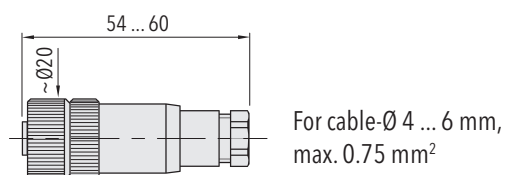
### Male electrical connector M12x1, 5-pole, A-coding <sup>1)</sup>



8775.50.XX.05.35.XX.XX.XX

Material: Thread 1.4435 with PA contact holder

### Female electrical plug M12x1, 5-pole, A-coding <sup>2)</sup>



8775.50.XX.05.35.33/35.XX.XX

Material:

Type code 33: Polyamide (PA)

Type code 35: Brass, nickel-plated

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

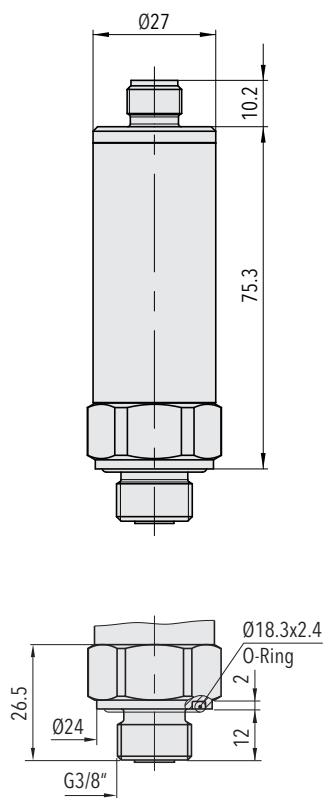
<sup>2)</sup> IP 67 protection while connector and plug are mounted according to instruction



Instruction [www.trafag.com/H73519](http://www.trafag.com/H73519)

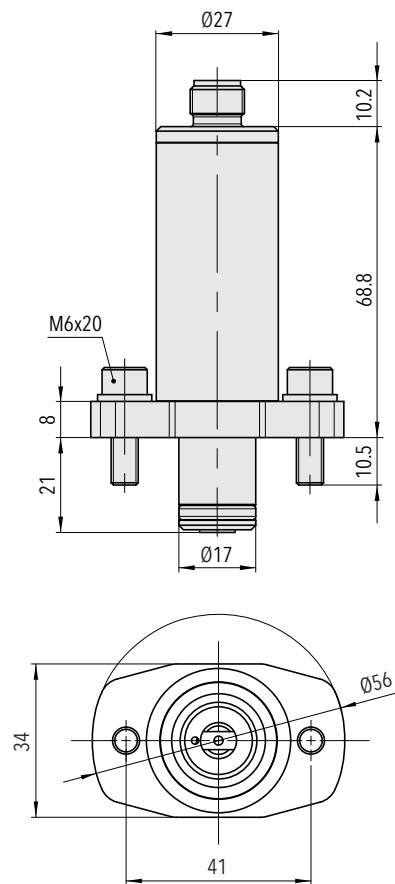
## Dimensions and process connections

Sensor with G3/8" male process connection



8775.50.11.05.35.XX.XX.XX

Sensor with 2-hole flange 2800 series



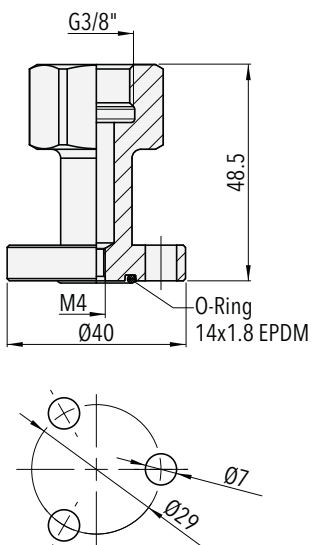
8775.50.28.05.35.XX.XX.XX



Instruction [www.trafag.com/H73519](http://www.trafag.com/H73519)

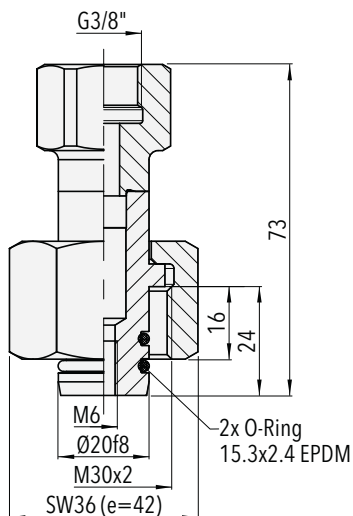
## Dimensions and process connections

### Process connection adapters



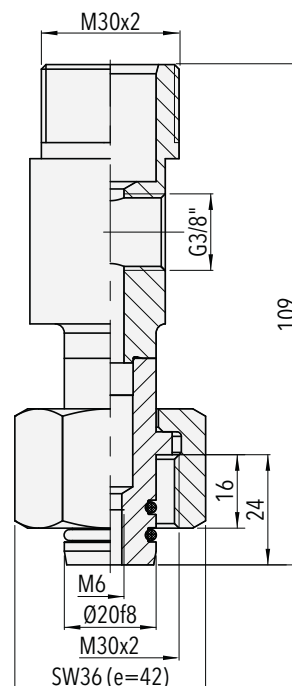
#### 8775.50.11.05.35.XX.XX.22

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



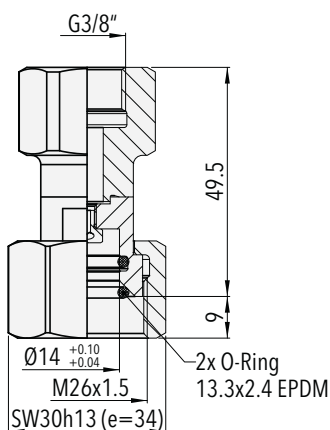
#### 8775.50.11.05.35.XX.XX.23

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



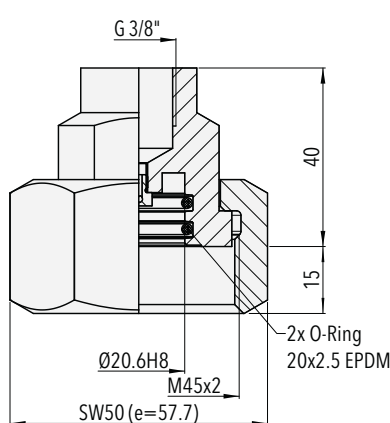
#### 8775.50.11.05.35.XX.XX.25

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



#### 8775.50.11.05.35.XX.XX.27

Adapter G3/8" female - 2550 for DN8  
Material: 1.4404 (AISI316L)  
with nickel-plated brass nut



#### 8775.50.11.05.35.XX.XX.28

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