

Device Type Code	Wire Terminal	Instructions
879X.20.XXXX	Type 1	H73520
879X.20.XXXX	Type 2	H73517
879X.21.XXXX	Type 1	H73520
879X.22.XXXX	Type 2	H73517

Technical specifications

Characteristics

Purpose: Measurement of gas density
Principle: microswitch contacts for reference gas measurement digital output for quartz based density measurement
Vibrations: 4 g (20...80 Hz), min. difference 5 kPa from switch point
Ambient temperature: -40...+80°C
Protection: IP 67
Mechanical measuring range: 0 ... 1100 kPa absolute
Electrical measuring range: 0 ... 1100 kPa absolute
Max. overpressure: 0 ... 1300 kPa absolute

Storage

Storage temp.: -40 ... +80°C
Humidity: max. 98% relative only with original packing in clean and dustfree rooms

Mechanical data

Material
Measurement system:
 Sensor: 1.4435, 1.4404, 1.4571 (AISI316L, AISI316)
 Probe housing: 1.4435, 1.4404, 1.4571 (AISI316L, AISI316)
 O-Ring (media contacting): EPDM
 Filling: Gas
Housing (density monitor): AISI10Mg
Screwed cable gland: brass nickel plated
Weight: ~ 1 kg

Type label (Identification)

For all inquiries please indicate:
Instrument type: Type: 879X.XX.XXXX.XX
Instrument serial number: S/N:XXXXX.X.XX.XX-XXXX

Electrical data

Output signal: RS485/Modbus (RTU)
Parameters: density [kg/m³], pressure [kPa]@20°C, temperature [K], pressure [kPa]@temp. var. [K] (SF₆ Pressure only correct for 100 % SF₆ gas)
Measuring range: 0 ... 1100 kPa absolute @20°C
 0...60 kg SF₆/m³
Measuring range temperature: -40 ... +80°C
Earthing: via gas connection of sensor
Supply voltage: 11...32 VDC
Dielectrical strength: 500 VAC, 50 Hz
Resistance of insulation: > 10 MΩ, 500 VDC

Modbus settings:

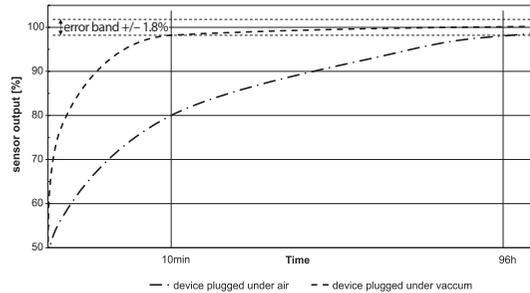
Baudrate: 1200...57600
Parity: none (2 stop bits)
 odd (1 stop bit)
 even (1 stop bit)
Slave-ID: 1...247
Max. devices in one bus: 64

Electrical data of switch

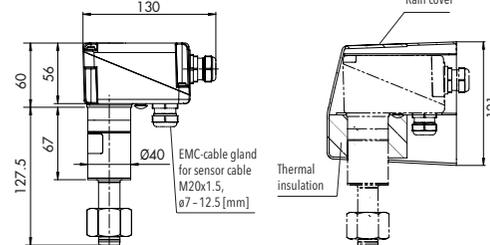
	AC	250 V	10 (1.5) A
Rating	DC	250 V	0.1 (0.05) A
Resistive Load (Inductive Load)		220 V	0.25 (0.2) A
Standard switch 20		110 V	0.5 (0.3) A
		24 V	2 (1) A

Initial response time after installation

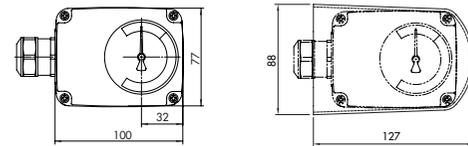
Time scale for very first installation, measured value within 98% of exact value



Dimensions

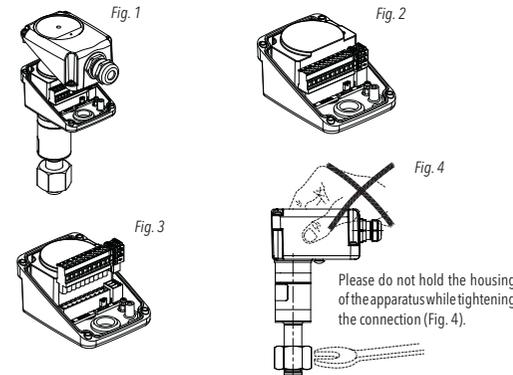


EMC-cable gland for sensor cable M20x1.5, ø7 - 12.5 [mm]: Accessory U1
 Temperature insulation: Accessory O6
 Rain cover: Accessory 46



Disassembly/Assembly

When disassembling proceed as follows:
 - Turn off control voltage.
 - Remove cover by unscrewing screws (Fig. 1).
 - Lift off wire terminal. A screwdriver is not necessary (Fig. 2/3).



Modbus Register Software Versions 1.2...1.X

Frame description

Slave Address	Function Code	Data	CRC
1 byte	1 byte	0..252 byte(s)	2 bytes CRC Hi CRC Lo

Sensor data

FC 04 Read Input Registers (read Sensor data from slave device)

Value	Address #	Register #	Scale	Unit	Data range
SF ₆ gas density ⁽¹⁾	0	1	Value*0.01	kg/m ³	0..60 kg/m ³
SF ₆ gas pressure (@20°C) ^{(1) (2)}	1	2	Value*0.1	kPa	0..1100 kPa
SF ₆ gas temperature	2	3	Value*0.1	K	215..360 K
SF ₆ gas pressure (var °C) ^{(1) (2)}	3	4	Value*0.1	kPa	0..1100 kPa
Slave ID	4	5	-	-	1..247
Serial number Hi	5	6	-	-	-
Serial number Low	6	7	-	-	-
SW release	7	8	Value*0.1	-	-
Quartz frequency ⁽¹⁾	8	9	Value*0.01	Hz	10..300 Hz

⁽¹⁾ Change to 0xFFFF if value range is exceeded
⁽²⁾ SF₆ pressure value only correct for 100 % SF₆ gas

Sensor settings

FC 06 Write Single Register, FC 16 Write Multiple Registers, FC 03 Read Holding Registers

Value	Address #	Register #	Valid values / Description															
Not used	0	1	-															
Not used	1	2	-															
Slave ID	2	3	1...247															
Baudrate Hi	3	4	0															
Baudrate Low	4	5	1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 56000, 57600															
Parity	5	6	0 = none parity (2 stop bits) 1 = odd parity (1 stop bit) 2 = even parity (1 stop bit)															
Mode	6	7	0 = RTU															
Bootloader	7	8	1 = Enter bootloader mode for 10s															
Write permissions (read only)	8	9	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="5">Register 9</th> </tr> <tr> <th>Bit #</th> <th>3</th> <th>2</th> <th>1</th> <th>0</th> </tr> </thead> <tbody> <tr> <td></td> <td>Mode</td> <td>Parity</td> <td>Baud</td> <td>Slave ID</td> </tr> </tbody> </table> <p style="text-align: center;">0: write permission, 1: no write permission</p>	Register 9					Bit #	3	2	1	0		Mode	Parity	Baud	Slave ID
Register 9																		
Bit #	3	2	1	0														
	Mode	Parity	Baud	Slave ID														

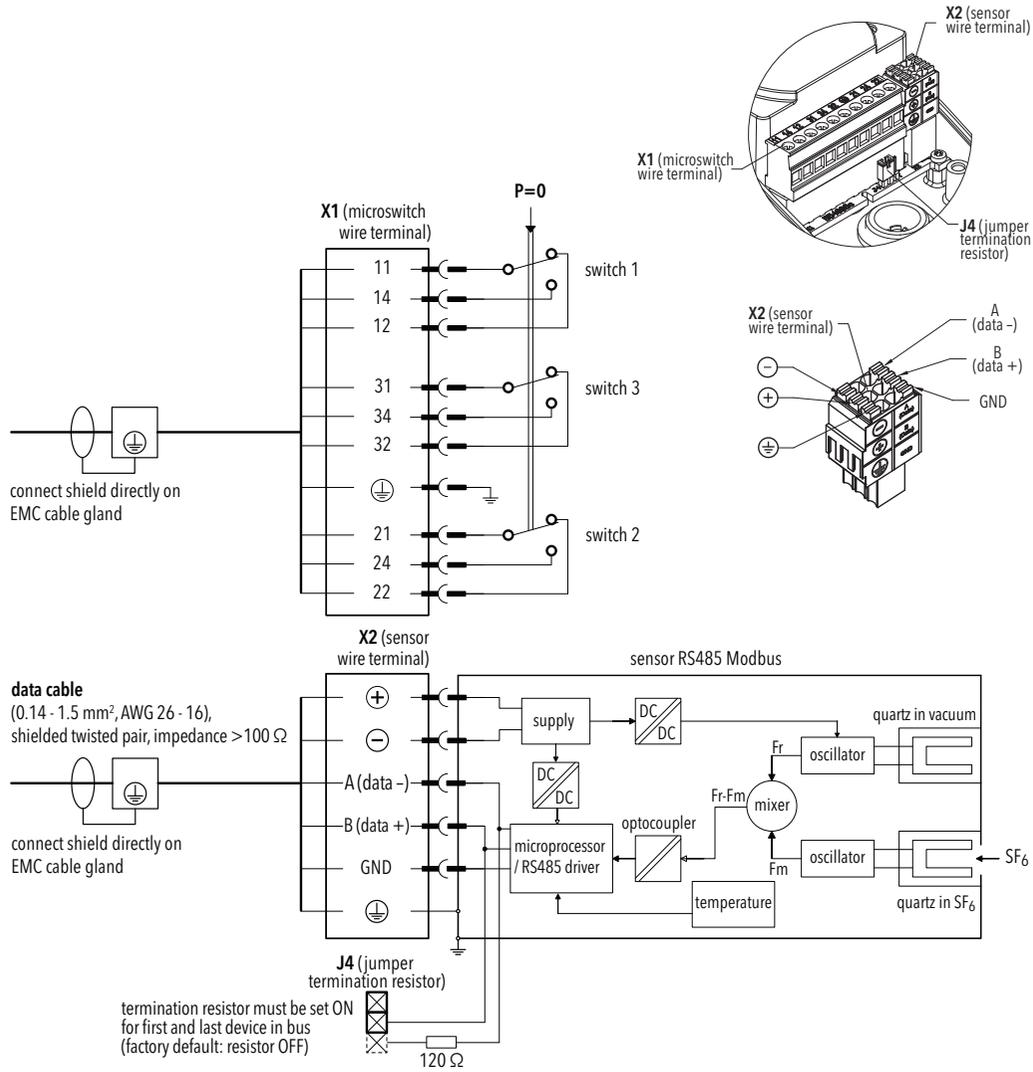
Sensor status

FC 02 Read Discrete Inputs

Value	Bit #	Description
Sensor error	0	0 = sensor is working properly, 1 = sensor error

For Modbus examples see: www.trafag.com/H73520

Electrical connection



Electrical connection of density monitor

Parts

Inside view

Termination

Jumper Left: off

Jumper Right: on

Step 1

Remove cover
Remove terminal block

Step 2

Strip individual conductors according to requirements and insert into the housing

Step 3

Connect individual conductors at appropriate position on terminal block according to customer's specifications

Step 4

Pull back conductors with terminal block

Step 5

Connect terminal block with conductors to density monitor

Step 6

Reposition cover and fasten to housing

Valve opener

Important

No grease on pressure port

Grease O-rings only

Indicator cover

Important

Do not remove indicator cover

Do not exert pressure on SF₆ indicator

Housing O-Ring

Wrong

Check whether O-ring of housing is correctly positioned in order to ensure seal

Cable gland

Tightly fasten cable gland by using a wrench

Correct cable diameter

Wrong

Cable diameter too small to ensure good seal of cable gland

Correct

Cable diameter correct to fit cable gland (good seal)

Mechanical connection of density monitor (might vary depending on gas connection)

Step 1

Position density monitor properly on valve opener and push-in (insert)

Step 2

Tighten by using a wrench

Important Density monitor to be held only at probe (see also next picture)

Important

Avoid holding monitor housing while tightening (see Step 2)

Do not align monitor by turning the housing → align by turning probe

Modbus Examples

FC04 Read Input Registers: Request of "SF6 gas density" value

Slave device address: 5, Start address: 0, Quantity of registers: 1

Master request (Tx)							
ID	FC	Start addr. Hi	Start addr. Lo	Quan. reg. Hi	Quan reg. Low	CRC Hi	CRC Low
0x05	0x04	0x00	0x00	0x00	0x01	0x30	0x4E

Slave response (Rx)						
ID	FC	Byte count	Input reg. 0 Hi	Input reg. 0 Low	CRC Hi	CRC Low
0x05	0x04	0x02	0x00	0x89	0x89	0x56

↓
137 _{Dez} -> 1.37 kg/m ³
SF ₆ gas density

Change Slave-ID with broadcast

The slave ID can alternatively be changed with broadcast if the current slave address is not known.

1. Split the serial number (visible on the identification plate) into two 16 bit numbers.

- S/N: 100309-004 -> dec2hex (100309004_{DEC}) = 05FA980C_{HEX}
- Serial Hi = 05FA_{HEX}, Serial Low = 980C_{HEX}

2. FC06 / FC16

- Register Address # 0: Serial Hi
- Register Address # 1: Serial Low
- Register Address # 2: New slave ID (1..247)

FC06 Write Single Register: Set "Slave address" to a new value

Current Slave Device address: 5, Start address: 2, Register value: 6 (Slave Address changes to 6 after slave response)

Master request (Tx)							
ID	FC	Start addr. Hi	Start addr. Low	Reg. value Hi	Reg. value Low	CRC Hi	CRC Low
0x05	0x06	0x00	0x02	0x00	0x06	0xA9	0x4E

Slave response (Rx)							
ID	FC	Start addr. Hi	Start addr. Lo	Reg. value Hi	Reg. value Low	CRC Hi	CRC Low
0x05	0x06	0x00	0x02	0x00	0x06	0x30	0x4E

#	Exceptional Responses
01	Illegal function The function code received in the query is not an allowable action for the server (or slave). This may be because the function code is only applicable to newer devices, and was not implemented in the unit selected. It could also indicate that the server (or slave) is in the wrong state to process a request of this type, for example because it is unconfigured and is being asked to return register values.
02	Illegal data address The data address received in the query is not an allowable address for the server (or slave). More specifically, the combination of reference number and transfer length is invalid. For a controller with 100 registers, a request with offset 96 and length 4 would succeed. A request with offset 96 and length 5 will generate exception 02.
03	Illegal data value A value contained in the query data field is not an allowable value for the server (or slave). This indicates a fault in the structure of the remainder of a complex request, such as that the implied length is incorrect. It specifically does NOT mean that a data item submitted for storage in a register has a value outside the expectation of the application program, since the MODBUS protocol is unaware of the significance of any particular value of any particular register.
04	Slave device failure An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.

Example

The master sends a request to a slave device with FC04 for the data address 0x09 (only 0x00..0x08 is supported).

Master request (Tx)							
ID	FC	Start addr. Hi	Start addr. Lo	Quan. reg. Hi	Quan reg. Low	CRC Hi	CRC Low
0x05	0x04	0x00	0x09	0x00	0x01	0xE0	0x4C

In an exception response, the server sets the most significant bit (MSB) of the function code to 1 (function code value in an exception is exactly 80 hexadecimal higher than in a normal response).

Slave response (Rx)				
ID	FC	Exception code	CRC Hi	CRC Low
0x05	0x84	0x02	0x89	0x56
	↓	↓		
	0x84 -> Exception Response 0x84 -> Function Code 04	0x02 -> Exception Code „Illegal data address“		