

# SIEMENS



Symaro™

## Duct Sensors

## QFM21...

for relative humidity and temperature

- 
- Operating voltage AC 24 V / DC 13.5...35 V
  - Signal output DC 0...10 V / 4...20 mA for relative humidity
  - Signal output DC 0...10 V / 4...20 mA / T1 / LG-Ni 1000 for temperature
  - Measuring accuracy  $\pm 3$  % r. h. within the comfort range
  - Range of use  $-15...+60$  °C / 0...95 % r. h. (non-condensing)

### Use

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The QFM21... duct sensors are for use in air ducts of ventilation and air conditioning plant for acquiring:

- The relative humidity and
- The temperature

The sensors are used as:

- Control sensors in the supply or extract air
- Reference sensors, e.g. for shifting the dew point
- Limit sensors, e.g. in connection with steam humidifiers
- Limit sensors, e.g. for measured value indication or for connection to a building automation and control system
- Sensors for enthalpy and a. h., together with the AQF61.1 (refer to Data Sheet N1899) or SEZ220 (refer to Data Sheet N5146)

## Type summary

Type reference	Temperature measuring range	Temperature signal output	Humidity measuring range	Humidity signal output	Operating voltage
<b>QFM2100</b>	None	None	0...100 %	Active, DC 0...10 V	AC 24 V or DC 13.5...35 V
<b>QFM2101</b>	None	None	0...100 %	Active, 4...20 mA	DC 13.5...35 V
<b>QFM2120</b>	-35...+50 °C	Passive, LG-Ni 1000	0...100 %	Active, DC 0...10 V	AC 24 V or DC 13.5...35 V
<b>QFM2140</b>	-35...+50 °C	Passive, T1 (PTC)	0...100 %	Active, DC 0...10 V	AC 24 V or DC 13.5...35 V
<b>QFM2160</b>	0...50 °C / -35...+35 °C or -40...+70 °C	Active, DC 0...10 V	0...100 %	Active, DC 0...10 V	AC 24 V or DC 13.5...35 V
<b>QFM2171</b>	0...50 °C / -35...+35 °C or -40...+70 °C	Active, 4...20 mA	0...100 %	Active, 4...20 mA	DC 13.5...35 V

## Ordering and delivery

When ordering, please give name and type reference, e.g.:

Duct sensor **QFM2120**

The sensor is supplied complete with mounting flange and cable entry gland M16.

## Equipment combinations

All systems and devices capable of acquiring and handling the sensor's DC 0...10 V, 4...20 mA, LG-Ni 100 or T1 output signal.

When using the passive sensors for averaging, we recommend to use the SEZ220 signal converter (refer to Data Sheet N5146).

## Function

### Relative humidity

The sensor acquires the r. h. in the air duct via its capacitive humidity sensing element whose electrical capacitance changes as a function of the r. h..

The electronic measuring circuit converts the sensor's signal to a continuous DC 0...10 V or 4...20 mA signal, which corresponds to 0...100 % r. h..

### Temperature

The sensor acquires the temperature in the air duct via its sensing element whose electrical resistance changes as a function of the temperature.

Depending on the type of sensor, this change in resistance is converted either to an active DC 0...10 V or 4...20 mA output signal ( $\cong$  0... 50 °C/-35...+35 °C/-40...+70 °C) or is provided as a simulated passive output signal ( $\cong$  -35...50 °C).

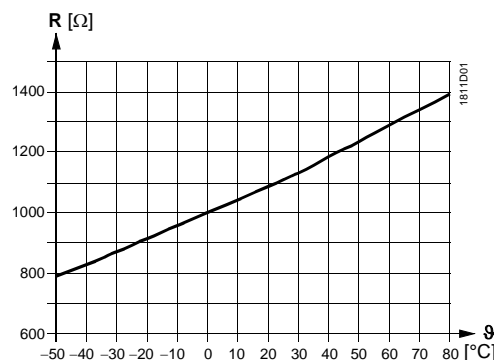
### Simulated passive output signal

The measuring current from systems/devices für acquiring the electrical resistance of the passive sensor differs greatly and impacts self-heating of the temperature sensing element at the end of the measuring probe. To compensate the impact, the passive output signal is simulated with an electronic circuit.

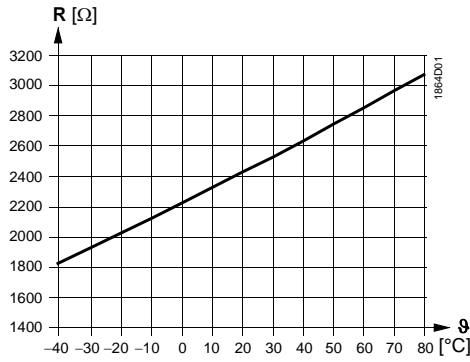
### Sensing elements, simulated

Characteristic:

### LG-Ni 1000



T1 (PTC)

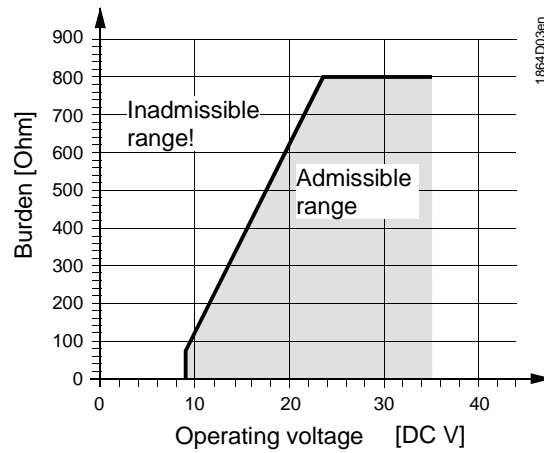


Legend

R Resistance value in Ohm  
 $\theta$  Temperature in degrees Celsius

Burden diagram

Output signal, terminal I1 / I2



Mechanical design

The duct sensor consists of housing, printed circuit board, connection terminals, mounting flange and immersion rod with measuring probe.

The 2-sectional housing is comprised of base and removable cover (snap-on design).

The measuring circuit and the setting element are located on the printed circuit board inside the cover, the connection terminals on the base.

The sensing elements are located at the end of the measuring probe and protected by a filter cap.

Cable entry is made via the cable entry gland M16 (IP 54) supplied with the sensor, which screws into the housing.

Immersion rod and housing are made of plastic and are rigidly connected.

The sensor is fitted with the mounting flange supplied with the sensor. The flange is to be placed over the immersion rod and then secured in accordance with the required immersion length.

Setting element

Measuring range 1 2 3	Test function active				
	U1	U2	BS-MS	I1	I2
1	10 V	5 V	☑ 20 °C	20 mA	12 mA
2	5 V	10 V	☑ 75 °C	12 mA	20 mA
3	0 V	5 V	☑ 20 °C	4 mA	12 mA
4	5 V	0 V	☑ -35 °C	12 mA	4 mA

The setting element is located inside the cover. It consists of 6 pins and a shorting plug. It is used to select the required measuring range and to activate the test function.

The different plug positions have the following meaning:

- *For the passive temperature measuring range:*  
Shorting plug in the mid position (R2) =  $-35...+50$  °C (factory setting)
- *For the active temperature measuring range:*  
Shorting plug in the left position (R1) =  $-35...+35$  °C,  
Shorting plug in the mid position (R2) =  $0...50$  °C (factory setting)  
Shorting plug in the right position (R3) =  $-40...+70$  °C
- *For activating the test function:*  
Shorting plug in the horizontal position: The values according to the table "Test function active" will be made available at the signal output.

#### Fault

- Should the temperature sensor become faulty, there will be a voltage of 0 V (4 mA) at signal output U2 (I2) or signal output BS-MS  $\hat{=}$   $-35$  °C after 60 seconds, and the humidity signal at signal output U1 (I1) will reach 10 V (20 mA)
- Should the humidity sensor become faulty, there will be a voltage of 10 V (20 mA) at signal output U1 (I1) after 60 seconds, and the temperature signal will remain active

#### Accessories

<i>Name</i>	<i>Type reference</i>
Filter cap (for replacement)	<b>AQF3101</b>

#### Engineering notes

To power the sensor, a transformer for safety extra low-voltage (SELV) with separate windings for 100 % duty is required. When sizing and protecting the transformer, local safety regulations must be completed with.

When sizing the transformer, the power consumption of the duct sensor must be taken into consideration.

For correct wiring, refer to the Data Sheets of the devices with which the sensor is used.

The permissible cable lengths must be observed.

#### Cable routing and cable selection

When laying the cables, it must be observed that the longer the cables run side by side and the smaller the distance between them, the greater electrical interference. Shielded cables must be used in environments with EMC problems.

Twisted pair cables are required for the secondary supply lines and the signal lines.

#### Note to QFM2171

Terminals G1(+) and I1(-) for the humidity output must always be connected to power, even if only the temperature output G2(+) and I2(-) is used!

#### Mounting notes

To ensure degree of protection IP 54, the sensor must be fitted with the cable entry pointing downward!

The sensor should be mounted in locations where it can be easily accessed for service.

#### Note!

- If used in connection with steam humidifiers, the distance to the humidifier must be a minimum of 3 m. If permitted by the installation, the distance should be as great as possible, but no more than 10 m
- The sensing elements in the immersion rod are susceptible to impact and shock. Any impact or shock should therefore be avoided

If the application involves dew point shifting, the sensor must be mounted in the extract air duct.

Mounting Instructions are printed on the package.

## Commissioning notes

Check wiring before switching on power. The temperature measuring range must be selected on the sensor, if required.

Wiring and the output signals can be checked by making use of the test function (refer to "Mechanical design").



We recommend not to use voltmeters or ohmmeters directly at the sensing element. In the case of the simulated passive output signals, measurements with commercially available metres cannot be made (measuring current too small).

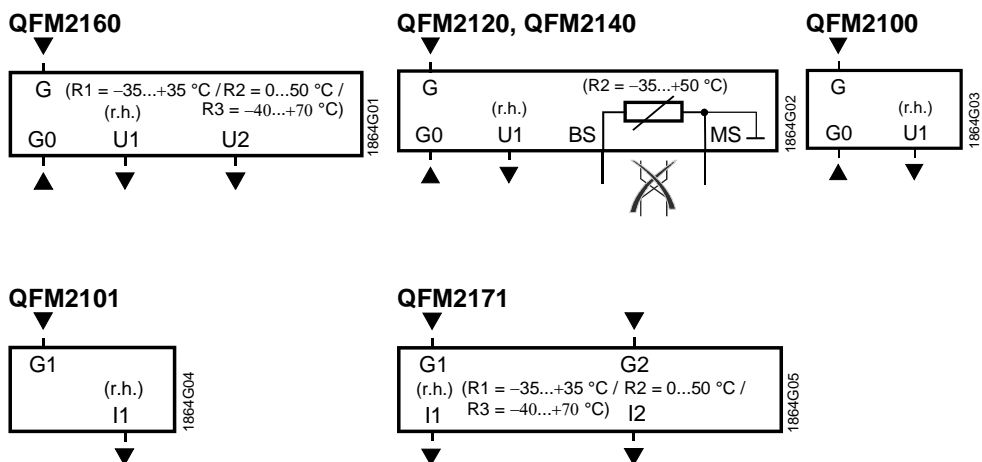
### Technical data

Power supply	Operating voltage	AC 24 V $\pm$ 20 % or DC 13.5...35 V	
	Frequency	50/60 Hz at AC 24 V	
	Power consumption	$\leq$ 1 VA	
Cable lengths for measuring signal	Perm. cable lengths	refer to Data Sheet of the device handling the signal	
Functional data of humidity sensor	Range of use	0...95 % r. h. (non-condensing)	
	Measuring range	0...100 % r. h.	
	Measuring accuracy at 23 °C	0...95 % r.h.	$\pm$ 5 %
		30...70 % r.h.	$\pm$ 3 %, typically
	Temperature dependency	$\leq$ 0.1 % r. h./°C	
	Time constant at 0...50 °C and 10...80 % r.h.	approx. 20 s, in moving air	
	Perm. air velocity	20 m/s	
	Output signal, linear (terminal U1)	DC 0...10 V $\cong$ 0...100 % r. h., max. $\pm$ 1 mA	
	Output signal, linear (terminal I1)	4...20 mA $\cong$ 0...100 % r.h.	
		Burden	refer to "Function"
	Functional data of temperature sensor with QFM2160, QFM2171	Measuring range	0...50 °C / -35...+35 °C / -40...+70 °C
Sensing element		NTC 10 k $\Omega$	
Measuring accuracy at		15...35 °C	$\pm$ 0.8 K
		-35...+50 °C	$\pm$ 1 K
Time constant		approx. 20 s, in moving air	
Output signal, linear (terminal U2)		DC 0...10 V $\cong$ 0...50 °C / -35...+35 °C / -40...+70 °C max. $\pm$ 1 mA	
Output signal, linear (terminal I2)	4...20 mA $\cong$ 0...50 °C / -35...+35 °C / -40...+70 °C		
	Burden	refer to "Function"	
Functional data of temperature sensor with QFM2120, QFM2140	Measuring range	-35...+50 °C	
	Sensing element simulated, corresponding to	QFM2120	LG-Ni 1000
		QFM2140	T1 (PTC)
	Measuring accuracy at	15...35 °C	$\pm$ 0.8 K
		-35...+50 °C	$\pm$ 1 K
Time constant	approx. 20 s, in moving air		
Perm. measuring current with	QFM2120	1.18...3.29 mA	
	QFM2140	0.53...1.46 mA	
Protective data	Degree of protection of housing	IP 54 to IEC 529	
	Safety class	III to EN 60 730	

Electrical connections	Connection terminals for	1 × 2.5 mm <sup>2</sup> or 2 × 1.5 mm <sup>2</sup>
	Cable entry gland (enclosed)	M 16 x 1.5
Environmental conditions	Operation	IEC 721-3-3
	Climatic conditions	class 3K5
	Temperature (housing with electronic)	-15...+60 °C
	Humidity	0...95 % r. h. (non-condensing)
	Mechanical conditions	class 3M2
	Transport	IEC 721-3-2
Materials and colors	Climatic conditions	class 2K3
	Temperature	-25...+70 °C
	Humidity	<95 % r. h.
	Mechanical conditions	class 2M2
	Base	polycarbonate, RAL 7001 (silver-grey)
	Cover	polycarbonate, RAL 7035 (light-grey)
Standards	Immersion rod	polycarbonate, RAL 7001 (silver-grey)
	Filter cap	polycarbonate, RAL 7001 (silver-grey)
	Mounting flange	PA66 – GF35 (black)
	Cable entry gland	PA, RAL 7035 (light-grey)
	Sensor (complete assembly)	silicone-free
	Packaging	corrugated cardboard
	Product safety	
	Automatic electrical controls for household and similar use	EN 60 730-1
	Electromagnetic compatibility	
	Immunity	EN 61 000-6-1
Emissions	EN 61 000-6-3	
Weight	CE conformity to	EMC Directive 89/336/EEC
	CB conformity to	
	Australian EMC Framework Radio Interference Emission Standard	Radio Communication Act 1992 AS/NZS 3548
	UL conformity <sup>1)</sup>	UL 873
Weight	Incl. packaging	
	QFM21...	approx. 0.18 kg

1) Does not apply to the **QFM2160** duct sensor!

## Connection terminals

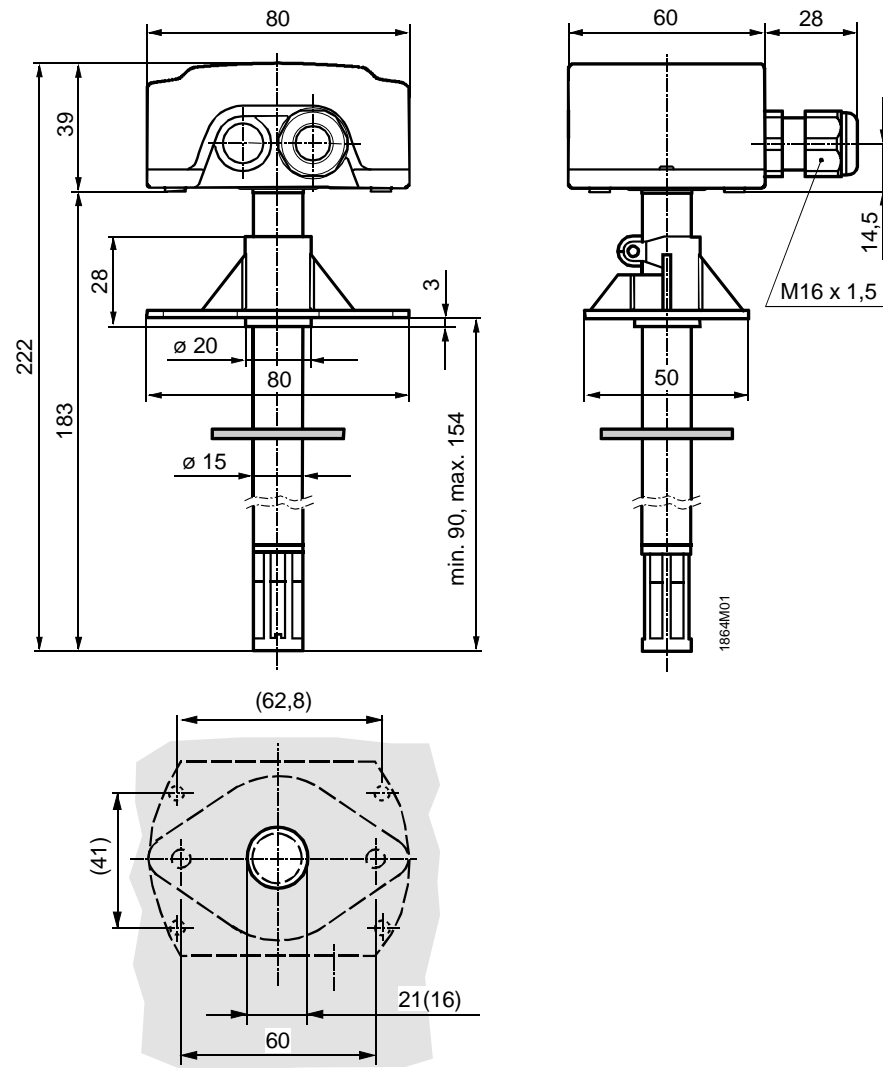


G, G0	Operating voltage AC 24 V (SELV) or DC 13.5...35 V
G1, G2	Operating voltage DC 13.5...35 V
U1	Signal output DC 0...10 V for 0...100 % r. h.
U2	Signal output DC 0...10 V for temperature range 0...50 °C, -35...+35 °C or -40...+70 °C
I1	Signal output 4...20 mA for 0...100 % r. h.
I2	Signal output 4...20 mA for temperature range 0...50 °C, -35...+35 °C or -40...+70 °C
BS, MS	Signal output for temperature range -35...+50 °C (passive, simulated); wires must not be interchanged

*Note on connection terminals of the QFM2171:*

Terminals G1(+) and I1(-) for the humidity output must always be connected to power, even if only the temperature output G2(+) and I2(-) is used!

Dimensions



Drilling plan with (without) mounting flange

Dimensions in mm