Symaro™

Duct Sensors QFM21...

for relative humidity and temperature

- **Operating voltage AC 24 V or DC 13.5...35 V**
- **Signal output DC 0...10 V for relative humidity**
- **Signal output DC 0...10 V or T1 or LG-Ni 1000 for temperature**
- **Measuring accuracy ±3 % relative humidity within the comfort range**

Use

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

- The relative humidity and
- The temperature

The sensors are used as:

- Control sensors in the supply or extract air
- Reference sensor, e.g. for shifting the dew point
- Limit sensor, e.g. in connection with steam humidifiers
- Limit sensor, e.g. for measured value indication or for connection to a building automation and control system
- Sensor for enthalpy and absolute humidity, together with the AQF61.1 (refer to Data Sheet N1899) or SEZ222 (refer to Data Sheet N5146)

Type summary

Type reference	*Temperature measuring range*	*Temperature signal output*	*Humidity measuring range*	*Humidity signal output*
QFM2100	None	None	0...100 %	Active, DC 0...10 V
QFM2120	−35...+60 °C	Passive, LG-Ni 1000	0...100 %	Active, DC 0...10 V
QFM2140	−35...+60 °C	Passive, T1 (PTC)	0...100 %	Active, DC 0...10 V
QFM2160	0...50 °C or −35...+35 °C	Active, DC 0...10 V	0...100 %	Active, DC 0...10 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 or devices capable of acquiring and handling the sensor's DC 0...10 V or 4...20 mA output signal.

Function

Relative humidity

The sensor acquires the relative humidity in the air duct via its capacitive humidity sensing element whose electrical capacitance changes as a function of the relative humidity.
The electronic measuring circuit converts the sensor's signal to a continuous DC 0...10 V signal, which corresponds to 0...100 % relative humidity. In the range 0...9.5 V (≙ 0...95 % r. h.), the signal is linear to the measuring accuracy given in "Technical data", resulting in an effective measuring range of 0…95 % r.h.

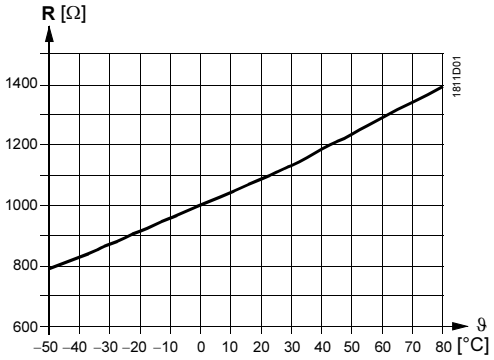
Temperature

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 DC0…10 V output signal (≙ 0… 50 °C or –35…+35 °C) or is provided as a passive output signal (≙ –35…60 °C).

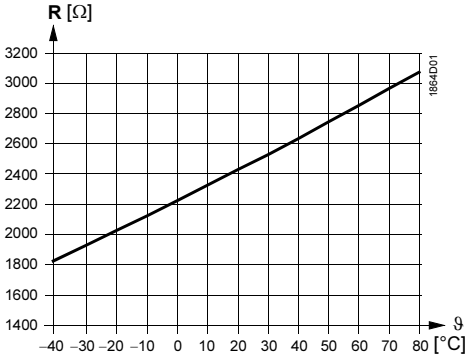
Sensing elements, simulated

Characteristic:

LG-Ni 1000



T1 (PTC)



Legend

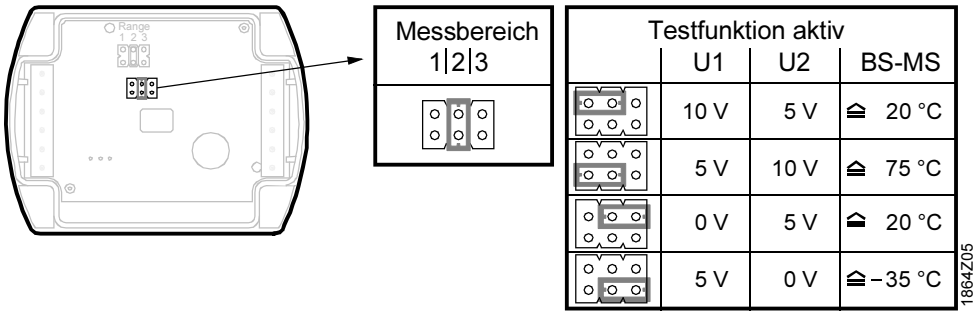
R	Resistance value in Ohm
ϑ	Temperature in degrees Celsius

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 the filter cap.
Cable entry is made via the cable entry gland M16 (IP 54) supplied with the sensor, which can be screwed into the housing.
Immersion rod and housing are made of plastic and rigidly connected.
The sensor is designed for screwed or flanged mounting.
It can be fitted as follows:

- With the mounting flange supplied with the sensor (recommended), which is to be fitted to the sensor and then secured in accordance with the required immersion length, or
- Without mounting flange (making use of the maximum immersion length). For that propose, the housing has 4 holes for fitting the sensor directly to the air duct

Setting element



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...+60 °C (factory setting)
- *For the activating 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) = 0...50 °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 at signal output U2 or signal output BS-MS ≙ −35 °C, and the humidity signal at signal output U1 will reach 10 V
- Should the humidity sensor become faulty, there will be a voltage of 10 V at signal output U1 after 60 seconds, and the temperature signal will remain active

Accessories (for replacement)

Name	*Type reference*
Filter cap	**AQF3101**

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, the local safety regulations must be observed.
When sizing the transformer, the power consumption of the duct sensor must be taken into consideration.
For correct wiring of the sensor, refer to the Data Sheets of the devices with which the sensor is used.
The permissible line 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 the 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.

Mounting notes

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

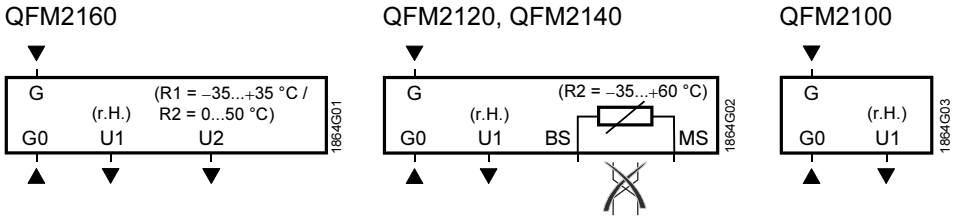
Check wiring before switching on power. The temperature measuring range must be selected on the sensor, if required.

Technical data

Power supply	Operating voltage	AC 24 V ±20 % or DC 13.5...35 V
	Frequency	50/60 Hz
	Power consumption	≤1 VA
Line lengths for the measuring signal, terminal U1, U2	Perm. cable lengths	
	Copper cable 0.6 mm dia.	50 m
	Copper cable 1 mm^2	150 m
	Copper cable 1.5 mm^2	300 m
Cable lengths for measuring signal terminals BS-MS	Perm. cable lengths	refer to Data Sheet of the device handling the signal
Functional data of humidity sensor	Measuring range	refer to "Type summary"
	Measuring accuracy at 23 °C	
	0...95 % r.h.	±5 %
	30...70 % r.h.	±3 %, typically
	Temperature dependency	≤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...9.5 V ≙ 0...95 % r. h., max. ±1 mA

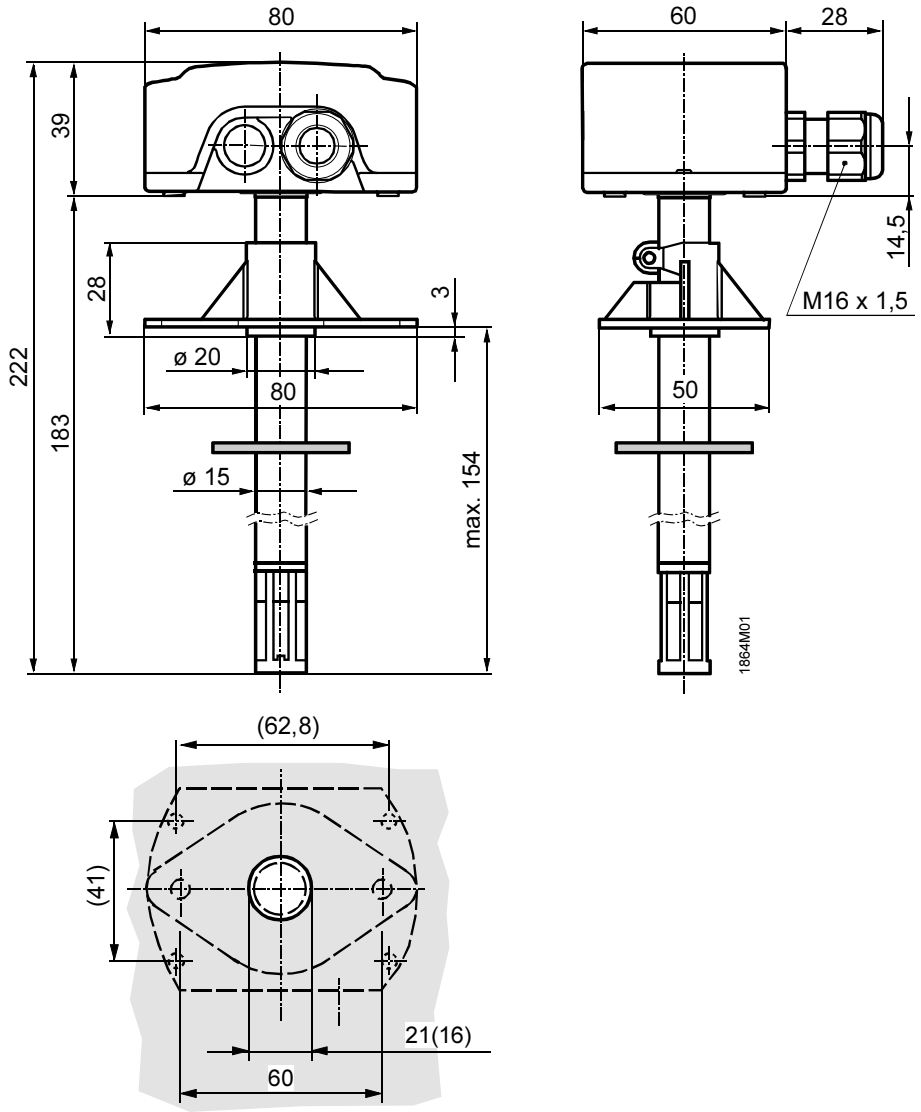
Functional data of temperature sensor with QFM2160	Measuring range	0...50 °C / −35...+35 °C
	Sensing element	NTC 10 kΩ
	Measuring accuracy at	
	15...35 °C	±0.8 K
	−35...+50 °C	±1 K
	Time constant	approx. 20 s, in moving air
	Output signal, linear (terminal U2)	DC 0...10 V ≙ 0...50 °C / −35...+35 °C max. ±1 mA
Functional data of temperature sensor with QFM2120, QFM2140	Measuring range	−35...+60 °C
	Sensing element simulated, corresponding to	
	QFM2120	LG-Ni 1000
	QFM2140	T1 (PTC)
	Measuring accuracy at	
	15...35 °C	±0.8 K
	−35...+60 °C	±1 K
	Time constant	approx. 20 s, in moving air
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^2 or 2 × 1.5 mm^2
	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
	Climatic conditions	class 2K3
	Temperature	−25...+70 °C
	Humidity	<95 % r. h.
	Mechanical conditions	class 2M2
Materials and colors	Base	polycarbonate, RAL 7001 (silver-grey)
	Cover	polycarbonate, RAL 7035 (light-grey)
	Immersion rod	polycarbonate, RAL 7001 (silver-grey)
	Filter cap	polycarbonate, RAL 7001 (silver-grey)
	Mounting flange	PA 66(black)
	Cable entry gland	PA, RAL 7035 (light-grey)
	Sensor (complete assembly)	silicone-free
	Packaging	corrugated cardboard
Standards	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
	CE conformity to	EMC Directive 89/336/EEC
	conformity to	
	Australian EMC Framework	Radio Communication Act 1992
	Radio Interference Emission Standard	AS/NZS 3548
Weight	Incl. packaging	
	QFM2100	approx. 0.18 kg
	QFM2120	approx. 0.18 kg
	QFM2140	approx. 0.18 kg
	QFM2160	approx. 0.18 kg

Connection terminals



G, G0	Operating voltage AC 24 V (SELV) or DC 13.5...35 V
U1	Signal output DC 0...9.5 V for relative humidity 0...95 %
U2	Signal output DC 0...10 V for temperature range 0...50 °C or –35...+35 °C
BS, MS	Signal output for temperature range –35...+60 °C (passive); the wires must not be interchanged

Dimensions (in mm)



Drilling template with (without) mounting flange

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