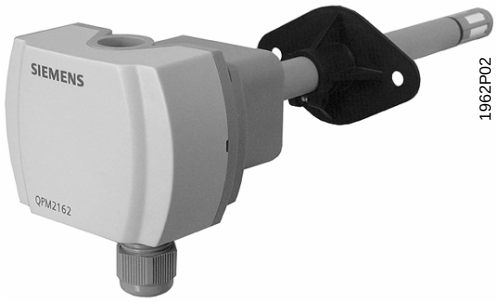
QPM2100, QPM2102



QPM2160, QPM2162

Duct Air Quality Sensors QPM21…

- **With maintenance-free photoacoustic CO_2 sensing element and – depending on the type of sensor – VOC[1] sensing element, based on a heated tin dioxide semiconductor**
- **CO_2 temperature and CO_2 humidity-temperature multisensor**
- **No recalibrations required**
- **Operating voltage AC 24 V or DC 13.5…35 V**
- **Signal outputs DC 0...10 V**

1) VOC = volatile organic compounds (also called mixed gas)

Use

In air ducts of ventilation and air conditioning plant to enhance room comfort and to optimize energy consumption by providing demand-controlled ventilation. The sensor acquires:

- CO_2 concentrations
- VOC concentrations as an indication of odors in the duct air, such as tobacco smoke, body odor, or material fumes
- The relative humidity of the duct air
- The duct air temperature

The QPM21… can be used as a:

- Control sensor in the supply or extract air duct
- Transmitter for building automation and control systems and / or display units

Typical use:

- Acquisition of CO_2 and VOC concentrations:
  In Lüftungsanlagen von Festhallen, Foyers, Messe- und Ausstellungshallen, Restaurants, Kantinen, Kaufhäusern, Sporthallen, Verkaufsräumen, Sitzungsräumen.

- Acquisition of CO_2 concentrations:
  In ventilation plant of rooms with varying occupancy levels where smoking is prohibited, such as museums, theatres, movie theatres, auditoriums, office spaces and school rooms

Important!

- The QPM21… sensors are not suited for use as safety devices, such as gas or smoke warning devices!
- The sensors must not be used outdoors!

Type summary

Type reference	*CO_2 measuring range*	*VOC sensitivity*	*Temperature measuring range*	*Humidity measuring range*
QPM2100	0…2000 ppm	---	---	---
QPM2102	0…2000 ppm	Low (R1) Normal (R2) High (R3)	---	---
QPM2160	0…2000 ppm	---	0...50 °C / –35...+35 °C	---
QPM2162 [1)]	0…2000 ppm	---	0...50 °C / –35...+35 °C	0...100 %

1) Available from March 2006

Ordering

When ordering, please give name and type reference, e.g.:
Duct air quality sensor **QPM2102**
The sensor is supplied complete with mounting flange and cable entry gland M16.

Equipment combinations

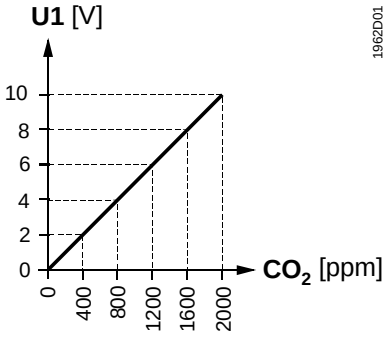
The QPM21… are suited for use with all types of systems and devices capable of acquiring and handling the DC 0...10 V output signal delivered by the sensor.

Mode of operation

CO_2 concentrations

The sensor acquires and evaluates the CO_2 concentration. The resulting output signal of DC 0...10 V is proportional to the CO_2 content of the ambient air.

Function diagram CO_2 (output U1)

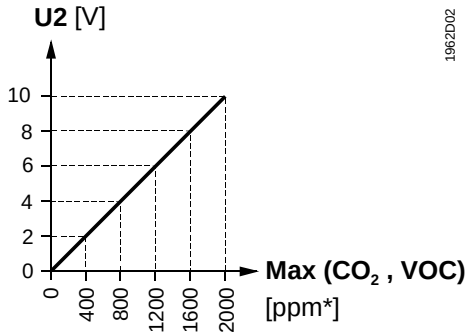


CO_2/VOC concentration
– only with **QPM2102** –

The sensor acquires and evaluates the CO_2 / VOC concentration and transforms it to a ventilation demand signal.
It represents the result of maximum selection of the CO_2 measuring signal and the filtered VOC measuring signal. With maximum selection, the 2 demand signals are compared and – depending on the result and the selected VOC sensitivity – delivered as the common air quality demand.

The ventilation demand signal is delivered via output U2 as a DC 0…10 V signal to be fed to the ventilation controller.

Ventilation demand diagram (output U2)



VOC sensitivity

Using the shorting plug on the setting element for the measuring range, the impact of VOC ventilation demand on maximum selection against CO_2 ventilation demand can be changed.
The position in the middle (R2) produces normal sensitivity of the VOC signal (factory setting). The 2 other positions are used for increasing (R3) or decreasing (R1) VOC sensitivity.

Response time "VOC signal"

Before the processor handles a change of the measured VOC value for maximum selection, a response time of 3 minutes for every Volt the signal value changes is observed.

Relative humidity
– only with **QPM2162** –

The sensor acquires the relative humidity in the air duct with a capacitive humidity sensing element whose capacitance changes as a function of the relative humidity.
An electronic measuring circuit converts the signal from the sensing element to a continuous DC 0...10 V signal, corresponding to a relative humidity range of 0...100 %.

Temperature
– only with **QPM2160** and **QPM2162** –

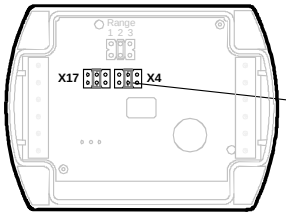
The sensor acquires the temperature in the air duct with a sensing element whose electrical resistance changes as a function of the temperature.
The change is converted to an active DC 0...10 V output signal (≙ 0...50 °C or −35...+35 °C).

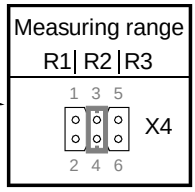
Mechanical design

The duct air quality 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 elements are located on the printed circuit board inside the cover, the connection terminals on the base.
The humidity and temperature sensing elements are located at the end of the measuring probe and are 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 elements …





Test function active				
X4	U1	U2	X17	U3
1 3 5 / 2 4 6	5 V	0 V	1 3 5 / 2 4 6	5 V
1 3 5 / 2 4 6	0 V	5 V	1 3 5 / 2 4 6	0 V
1 3 5 / 2 4 6	5 V	10 V	1 3 5 / 2 4 6	5 V
1 3 5 / 2 4 6	10 V	5 V	1 3 5 / 2 4 6	10 V

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The setting elements are located inside the cover.

… for the measuring range

The different vertical plug positions have the following meaning:

with **QPM2100**

- *For the CO_2 measuring range:*
  Shorting plug in the mid position (R2) = 0…2000 ppm (factory setting)

with **QPM2102**

- *For CO_2 / VOC weighting:*
  - Shorting plug in the left position (R1) = VOC sensitivity "low"
  - Shorting plug in the mid position (R2) = VOC sensitivity "normal" (factory setting)
  - Shorting plug in the right position (R3) = VOC sensitivity "high"

with **QPM2160** and **QPM2162**

- *For the 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 the active test function

Shorting plug for the measuring range in the horizontal positions:
The signal output delivers the values according to table "Test function active".

Behavior in the event of fault

All types

- In the event of CO_2 failure, 10 V will be present at signal output U1 (after 60 seconds)

QPM2102

- In the event of CO_2 or VOC failure, 10 V will be present at signal output U2 (after 60 seconds)

QPM2160

- Should the temperature sensor become faulty, 0 V will be present at signal output U2

QPM2162

- Should the temperature sensor become faulty, 0 V will be present at signal output U3, and the humidity signal at signal output U2 will increase to 10 V (after 60 seconds)
- Should the humidity sensor become faulty, 10 V will be present at signal output U2 (after 60 seconds), and the temperature signal will remain active

Disposal

The major plastic components bear the material references in compliance with ISO / DIS 11 469 to facilitate environment-friendly disposal.

Accessories

Name	*Type reference*
Filter cap (for replacement)	**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, local safety regulations must be compleied 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 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

Monting location and orientation

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
- The sensor must not be mounted in ventilation plant on top of a building (impact of solar radiation)! To ensure correct operation, the sensor's ambient temperature must lie in the range of –5…+45 °C

Monting instruction

Mounting Instructions are enclosed in the package.

Commissioning notes

The sensor's functions can be checked 30 minutes after applying power:

- Checking the CO_2 function:
  In well ventilated rooms, the sensor shows the CO_2 concentration of the outside air. Typically, this is 360 ppm (the sensor's measuring accuracy must be considered).
  Also, a basic functional check can be made by exhaling on the sensor. In that case, it must be taken into account that the sensor's rate of response has been purposely delayed (time constant t_{90} = 5 min)
- Checking the VOC function:
  Touch the sensor with a cotton ball dowsed in alcohol (e.g. gas from a cigarette lighter, without lighting a flame)

Ventilation should start when the preset switching level of the connected controller is reached.

Technical data

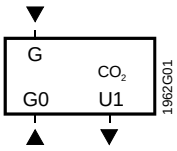
Power supply	Operating voltage (SELV)	AC 24 V ±20 % or DC13.5…35 V
	Frequency	50/60 Hz at AC 24 V
	Power consumption	≤2 VA
Cable lengths for measuring signal	Perm. cable lengths	refer to Data Sheet of the device handling the signal
Functional data "CO_2"	Measuring range	0...2000 ppm [1)]
	Measuring accuracy at 20 °C, 40 % r.h. and 970 hPa	MW = measured value ≤±(20 ppm [1)] + 1.5 % MW)
	Temperature dependency in the range of 15…35 °C	≤±4 % MW
	Repeatability	≤±20 ppm [1)]
	Long-time drift	≤±20 ppm [1)] p.a.
	Time constant t_{90}	<5 min
	Output signal, linear (terminal U1)	DC 0...10 V ≙ 0...2000 ppm [1)], max. ±1 mA
	Recalibration-free	8 years
Functional data "Maximum selection of CO_2 and VOC" with QPA2002 and QPA2002D	Measuring range "VOC"	0...2000 ppm [1)]
	VOC sensitivity	refer to "Type summary"
	Output signal, linear (terminal U2)	DC 0...10 V ≙ 0...2000 ppm [*], max. ±1 mA
	Response time "VOC signal" t_{VOC}	3 min/V
Functional data "r.h." with QPM2162	Range of use	0...95 % r.h. (noncondensing)
	Measuring range	0…100 % r.h.
	Measuring accuracy at 23 °C and AC 24 V 0…95 % r.h. 30…70 % r.h.	 ±5 % r.h. ±3 % r.h. (typically)
	Temperature dependency	≤0.1 % r.h./°C
	Time constant	approx. 20 s in moving air
	Output signal, linear (terminal U2)	DC 0...10 V ≙ 0...100 % r.h., max. ±1 mA
Functional data "Temperature" with QPM2160 and QPM2162	Range of use	−5...+45 °C
	Measuring range	0...50 °C (R2, R3) or −35...+35 °C (R1)
	Measuring element	NTC 10 kΩ
	Measuring accuracy in the range of 15...35 °C −35...+50 °C	 ±0.8 K ±1 K
	Time constant	approx. 20 s in moving air
	Output signal, linear (terminal U2 or U3)	DC 0...10 V ≙ 0...50 °C / −35...+35 °C max. ±1 mA
Protective data	Degree of protection of housing	IP 54 to IEC 529
	Safety class	III to EN 60 730
Electrical connections	Screw terminals for	1 × 2.5 mm^2 or 2 × 1.5 mm^2
Environmental conditions	Operation to Climatic conditions Temperature (housing incl. electronics) Humidity Mechanical conditions	IEC 721-3-3 class 3K5 0...50 °C 0…95 % r.h. (noncondensing) class 3M2

	Transport to	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	PA66 – GF35 (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 61 000-6-2
	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	
	QPM2100, QPM2102	approx. 0.247 kg
	QPM2160, QPM2162	approx. 0.252 kg

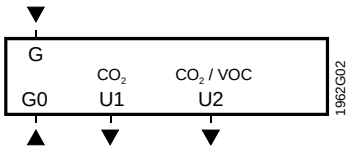
1) ppm = parts per million

Connection terminals

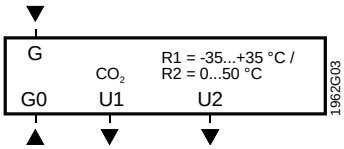
QPM2100



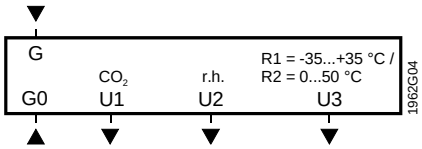
QPM2102



QPM2160

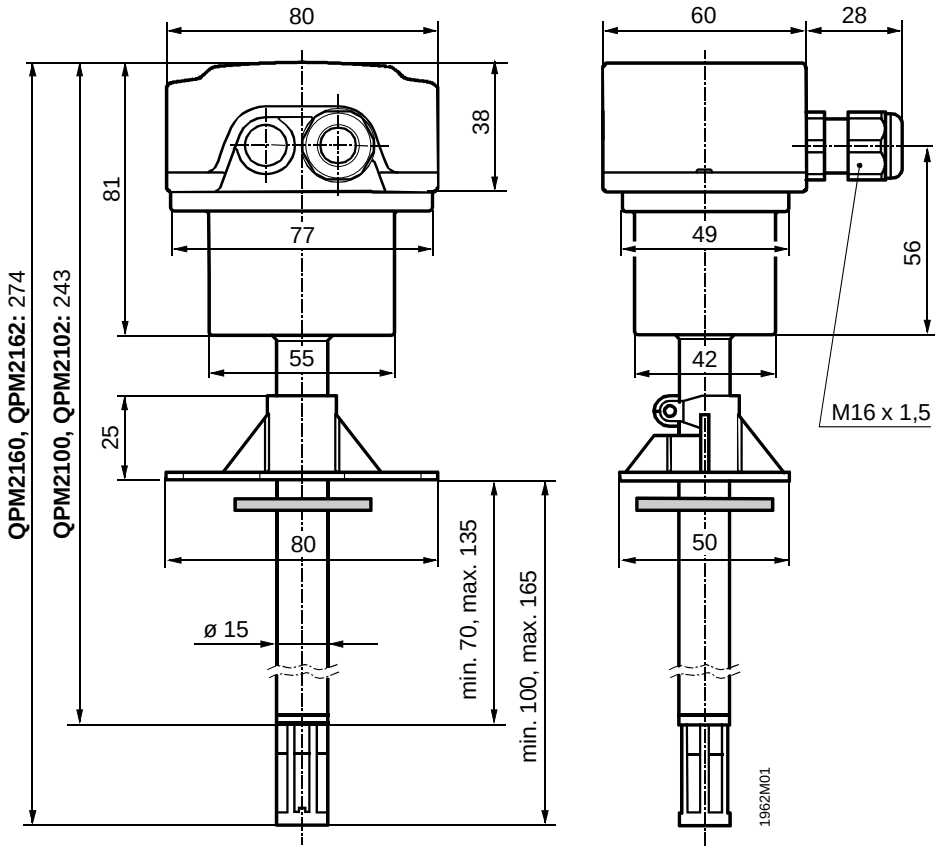


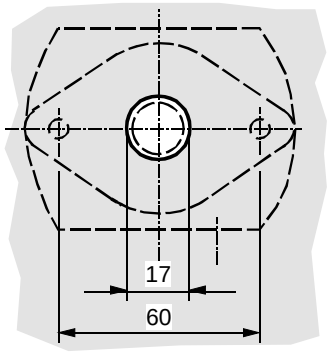
QPM2162



G	Sytem voltage AC 24 V (SELV) or DC 13.5...35 V
G0	System ground and measuring neutral
U1	Signal output DC 0...10 V
U2	Signal output DC 0...10 V
U3	Signal output DC 0...10 V

Dimensions





Drilling plan

Dimensions in mm