QBM68..

QBM68..D

Differential pressure sensor for pressure and flow

QBM68.. QBM68..D

for air and non-aggressive gases

- **Pressure-linear characteristic with selectable pressure measuring range (QBM68..)**
- **Flow-linear with adjustable pressure range (QBM68..D)**
- **Operating voltage AC/DC 24 V**
- **Output signal Modbus RTU and 0...10 V / 4…20 mA**
- **Simple and fast mounting**
- **Maintenance free**
- **Calibrated and temperature-compensated measuring signal**

Use

The differential pressure sensor QBM68.. acquires differential, over and under pressure of air and non-aggressive gases.

Fields of application:

- Measuring differential pressures in ventilation and air conditioning plants
- Measuring pressure over the inlet for pressure calculation of the flow
- Monitoring of air flows
- Monitoring of filters and control fans
- Measuring variables for pressure (Pa, PSI, mmHG, mmH^2O)
- Measuring variables for flow (l/s, m^3/h, m^3)

Modbus RTU

Address range	1-249 (40 default addresses)
Baudrate	1200 - 56000
Format	Modbus RTU
Line termination	DIP
Hardware	RS485
Default configuration	9600N1 (9600 baudrate, 1 stop bit no parity)

Type summary

Type (ASN)	Ordering number	Pressure measuring ranges	Output signal
QBM68.1200 **QBM68.1200D**	SE2:QBM68.1200 SE2:QBM68.1200D	1 x 0...1250 Pa	Modbus RTU and 0…10 V / 4…20 mA
QBM68.2500 **QBM68.2500D**	SE2:QBM68.2500 SE2:QBM68.2500D	1 x 0...2500 Pa	Modbus RTU and 0…10 V / 4…20 mA
QBM68.1212 **QBM68.1212D**	SE2:QBM68.1212 SE2:QBM68.1212D	2 x 0...1250 Pa	Modbus RTU and 0…10 V / 4…20 mA
QBM68.2512 **QBM68.2512D**	SE2:QBM68.2512 SE2:QBM68.2512D	1 x 0...2500 Pa + 1 x 0...1250 Pa	Modbus RTU and 0…10 V / 4…20 mA
QBM68.2525	SE2:QBM68.2525	2 x 0...2500 Pa	Modbus RTU and 0…10 V / 4…20 mA
QBM68.5500	SE2:QBM68.5500	1 x -500…+500 Pa	Modbus RTU och 0…10 V / 4…20 mA
QBM68.7070D	SE2:QBM68.7070D	2 x 0…7000 Pa	Modbus RTU and 0…10 V / 4…20 mA

Accessory

Type (ASN)	Ordering number	Name
AQB68.01	SE2:AQB68.01	Silicone tubing (2 m), incl. 2 nipples

Ordering

When ordering, please give name and type reference/ part no.

Example 1
10 units Differential pressure sensors with display QBM68.1200D
10 units Silicone tubing AQB68.01

Example 2
10 units Differential pressure sensors QBM68.1212
20 units Silicone tubing AQB68.01

Equipment combinations

Any systems or devices capable of acquiring and handling the sensor's DC 0...10 V or 4…20 mA output signal.

Functioning

The sensor acquires the differential pressure using a MENS* differential pressure sensor. The sensor generates as per the deflection, a linear and temperature- compensated output signal DC 0...10 V/4…20 mA. The differential pressure can at any time also be read over Modbus. An average of 500, 1000, 4000 and 1600 ms of the differential pressure is continuously calculated and can be access at separated Modbus register addresses. Damping of 1000 or 2000ms is configurable with dips for the DC 0...10 V / 4…20 mA signal.

Extended operation modes

If the pressure is read through Modbus, the 0…10 V or 4…20 mA signal could be used as distributed generic analog outputs. By modifying the operation mode from 0 (default) to 1(manual mode).
Modifying the operation mode can only be done over Modbus.

Operation modes

0 is default mode.

- Y1 and/or Y2 will always be proportional to differential pressure P1/P2 with selected scaling

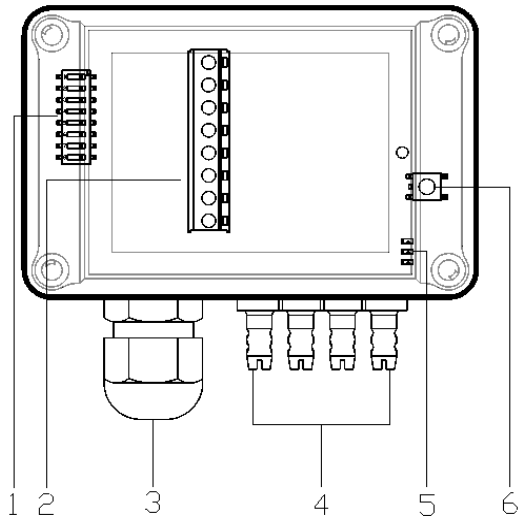
1 is manual mode

- Y1 and Y2 will be set to value specified by Modbus register 0027 (Y1) 0057 (Y2)

* MEMS = Micro Mechanical System

Mechanical design

Setting and connection elements



1. DIP switch for selecting the measuring range
2. Terminal block used for all connections
3. Cable gland entry M16 (without cable strain relief)
4. Connection nipples (see "Mounting notes")
5. Status LEDs
6. Push-button for zero-point calibration and configuration

Engineering notes

The transformer used must be suited for safety extra low voltage (SELV). It must have separate windings and be designed for 100 % duty. Transformer size and fuse must comply with local safety regulations.
Observe maximum permissible cable lengths. If cable lengths exceed 100 meters and/or run parallel to the mains cables: Use shielded cables!

Mounting notes

The differential pressure sensor is suited for direct mounting on air ducts, walls, ceilings, or in control panels...
To achieve the housing protective class indicated under "Technical data", the differential pressure sensors must be mounted with the nipples facing down. In addition, they should be higher than the air duct probes.

⚠ **Caution!**

If the pressure connection nipples point upward or are at a lower level than the air duct probes, condensation can collect inside the sensor, causing damage to the device.

The pressure tubing for the sensor nipples are connected as follows to the differential pressure sensors:

On the air duct side	On the pressure sensor side
Tubing with higher pressure side (lower vacuum)	Connect to pressure nipple P1+ resp. P2+
Tubing with lower pressure side (higher vacuum)	Connect to pressure nipple P1– resp. P2–

The sensor is supplied with mounting instructions.
For detailed information on installation and mounting position, refer to the Sensor Installation Guide in www.siemens.se/hit

Configuration

Status LEDs

Green	Operation status
Set:	Normal operation
Flash:	Zero-point calibration (flashes for 3 seconds QBM68..)
Yellow	Modbus status
Flash:	Modbus communication active
Red	Error LED
Set:	Device error

Push-button

0 - 10s	Save configuration
10 - 30s	Calibrate Zero point, the green LED flashes for 3 seconds
> 30 s	Factory reset. Modbus will be reset
Important notice:	**After factory reset the DIP switches positions will be read. This means enabled temperature sensors and selected Modbus address will be used according to the DIP switches positions.**

QBM68..D

The differential pressure sensor QBM68..D configuration is performed via the display.

QBM68..

The differential pressure sensor QBM68.. configuration is performed via the DIP-switches. See Commissioning notes.

Commissioning notes

⚠ Caution

The differential pressure sensor zero point must always be calibrated first time the voltage is set, after installation.

1. Wiring connection terminals – Do not connect pressuring tubing (P1+ –, P2+ –) at this time
2. Press the zero-point calibration button (6) for more than 10 seconds until the LED briefly lights up
3. Connect pressure tubing (P1+ –, P2+ –)

Set measuring range (QBM68..)

A DIP switch is used to individual adjusts the pressure measuring range.
The various DIP switch positions are described on the inside of the cover.

Adjustable pressure ranges

Sensor 1			
	QBM68.12xx	**QBM68.25xx**	**QBM68.5500**
	1250 Pa	**2500 Pa**	**-500…+500 Pa**
0	0...100 Pa	0…100 Pa	+/- 100 Pa
1	0…200 Pa	0…250 Pa	+/- 200 Pa
2	0…300 Pa	0...500 Pa	+/- 300 Pa
3	0…500 Pa	0…1000 Pa	+/- 500 Pa
4	0…700 Pa	0…1500 Pa	0…100 Pa
5	0…1000 Pa	0…2000Pa	0…200 Pa
6	0…1250 Pa	0…2500 Pa	0…300 Pa
7	-100…100 Pa	-100…100 Pa	0…500 Pa

Sensor 2		
	QBM68.xx12	**QBM68.xx25**
	1250 Pa	**2500 Pa**
0	0...100 Pa	0…100 Pa
1	0…200 Pa	0…250 Pa
2	0…300 Pa	0...500 Pa
3	0…500 Pa	0…1000 Pa
4	0…700 Pa	0…1500 Pa
5	0…1000 Pa	0…2000Pa
6	0…1250 Pa	0…2500 Pa
7	-100…100 Pa	-100…100 Pa

Permissible pressure ranges

The following permissible pressure ranges are valid for each sensor type.

Sensor type	Permissible pressure ranges
1250 Pa	-100…+1300 Pa
2500 Pa	-175…+2675 Pa
-500…+500 Pa	-540…+540 Pa
7000 Pa	-500…+7500 Pa

Note! All values outside of these ranges results in lack of reliability.

K-factor

The following formulas for calculation of the K-factor in QBM68…D are available in the sensor. The selection of the formula and setting of the K-factor are made via the display. Not changeable via Modbus.

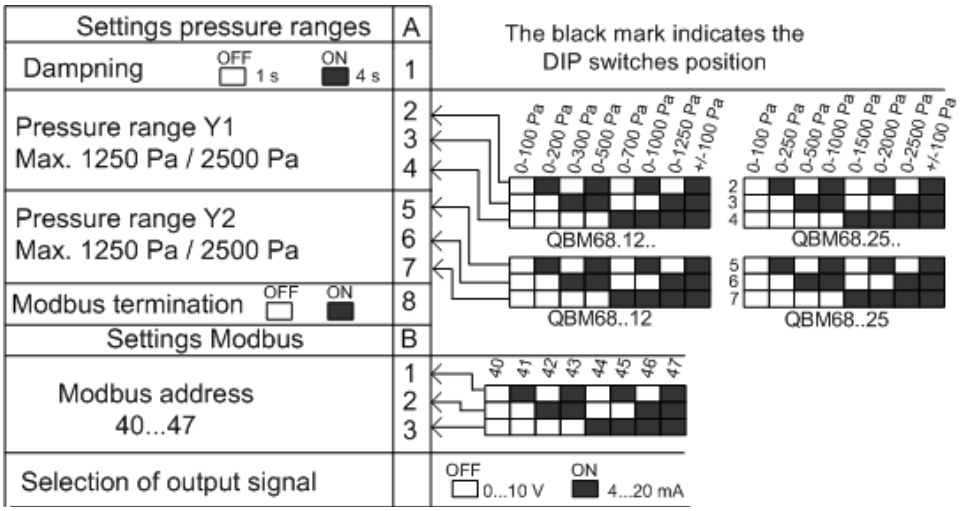
$$q=K\sqrt{\Delta p}$$

$$q=K_{10}\sqrt{\frac{z\Delta p}{p}}$$

$$q=\frac{1}{K}\sqrt{\Delta p}$$

Example **QBM68..**

DIP-switches setting example placed inside top cover (QBM68..).

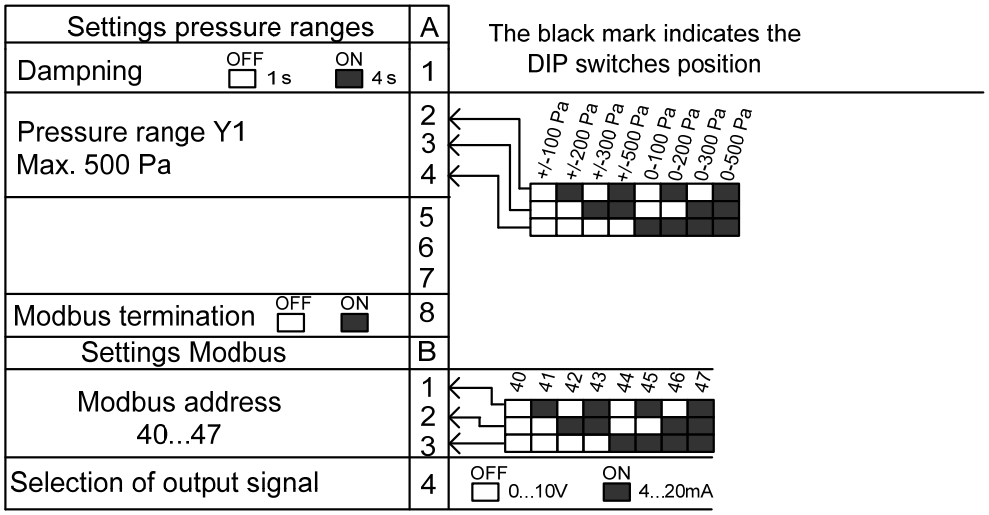


Note

- DIP switches A2 and A4 for selection of desired pressure range of P1 (single sensor).
- DIP switches A5 and A7 for selection of desired pressure range of P2 (double sensor)
- DIP switches B1, B2 and B3 for selection of the address on the sensor (it`s possible to chose more addresses over Modbus)
- DIP switch B4 for selection of output signal 0…10 V or 4…20 mA (factory-set to 0…10 V)

Exempel **QBM68.5500**

DIP-switches setting example placed inside top cover (QBM68.5500).



Note

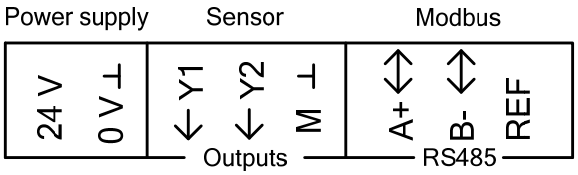
- DIP switches A2 and A4 for selection of desired pressure range of P1 (single sensor)
- DIP switches B1, B2 and B3 for selection of the address on the sensor (it`s possible to chose more addresses over Modbus)
- DIP switch B4 for selection of output signal 0…10 V or 4…20 mA (factory-set to 0…10 V)

Technical data

Electrical interface	Power supply	Safety extra low voltage (SELV/PELV)	
	Operating voltage	AC/DC 24 V ±15 %, 50/60 Hz	
	Power consumption	< 1 VA	
	Current draw QBM68..	< 25 mA	
	QBM68..D	35 mA	
	Output	MODBUS RTU (RS485) **NOT** galvanically separated, 3-wire, connection, 0...10 V/4…20 mA, Load 5… 250 KΩ **NOT** galvanic separated 2-wire connection Short-circuit proof, protected against reverse polarity	
Functional data	Measuring range	See “Type summary“	
	Sensing element	MEMS (Micro Mechanical System)	
	Measuring accuracy at recommended mounting position and 20 °C ambient temperature	(FS = Full Scale)	
	Total error	<±1 % FS	
	TC zero point	<±0,1 % FS / °C	
	TC sensitivity	<±0,06 % FS / °C	
	Reaction time	1 s	
	Tolerable overload on one side	10 000 Pa	
	on P1	4000 Pa	(QBM68.12xx)
		4000 Pa	(QBM68.25xx)
		4000 Pa	(QBM68.5500)
		10000 Pa	(QBM68.70xx)
	on P2	4000 Pa	(QBM68.xx12)
		4000 Pa	(QBM68.xx25)
		10000 Pa	(QBM68.xx70)
	Maximum burst pressure 0…70 °C	200 kPa	
	Media	Air and non-aggressive gases	
	Admissible medium temperature	0...70 °C	
	Maintenance	Maintenance free	
Degree of protection	Degree of protection of housing at recommended installation		
	QBM68..	IP65 as per IEC 60 529	
	QBM68..D	IP54 as per IEC 60 529	
Connections	Electrical connection		
	Screw terminals for	Max. 1.5 mm^2 (wire or stranded wire)	
	Cable lead	Cable gland entry M16	
	Pressure connection	Brass nipples ∅ 5 mm	
Degree of protection	Degree of protection of housing at recommended installation	IP65 as per IEC 60 529	
Environmental conditions	Permissible ambient temperature	IEC 60 721-3-3	
	Operation	-25…50 °C (non-condensing)	
	Calibrated range	0…50 °C	
	Transport/ storage	-35…70 °C	
	Permissible ambient humidity	<90 % r.h. (without condensation)	
Directives, standards	CE -conformity as per		
	EMC guidelines	2004/108/EC	
	Immunity, emissions	EN 61 326-1, EN 61 326-2-3	
	RoHS 1 + 2 directive	2011/65/EU	
	Technical RoHS documentation	EN 50581	

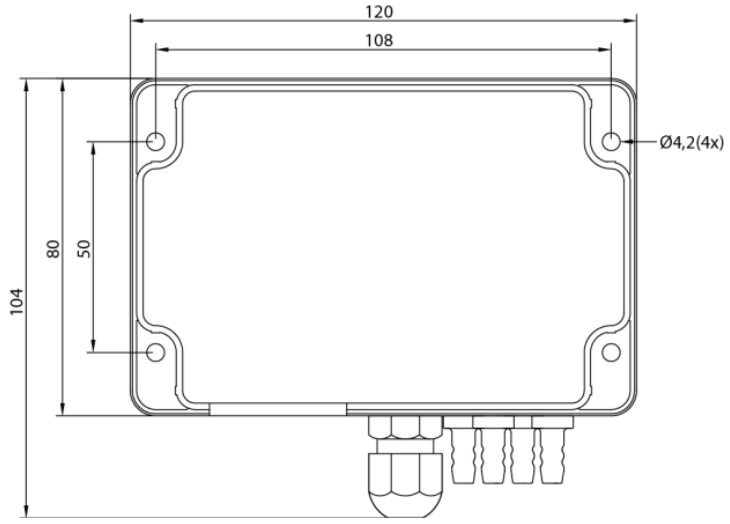
Environmental compatibility	The product environmental declaration CE1E1910en contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal)	ISO 14001 (Environment) ISO 9001 (Quality)
Weight	Weight (with packaging)	0.150 kg

Connection terminals



24V	Operating voltage AC/DC 24 V (G)
0 V ⊥	GND (G0)
Y1	Analog output 1: 0…10 V / 4…20 mA (version 14)
Y2	Analog output 2: 0…10 V / 4…20 mA (QBM68.1212(D) QBM68.2512(D), QBM68.7070D) (version 14)
M	GND measurment neutral for Y1 and Y2
A (+)	Modbus Comm. +
B (-)	Modbus Comm. -
REF	Modbus reference

Dimensions (in mm)



Modbus specification

Holding registers

Addr	Description	Unit	Scaling	Read/Write
4x0001	Device type		1	R
4x0002	Device status		1	R
4x0003	Operation mode		1	R/W
4x0004	Differential pressure 1 – Reliability		1	R
4x0005	Differential pressure - Value		1	R
4x0006	Differential pressure 2 – Reliability		1	R
4x0007	Differential pressure 2 - Value		1	R
4x0008	Flow 1 low [1)] (valid for QBM68..D)		1	R
4x0009	Flow 1 high [1)] (valid for QBM68..D)		1	R
4x0010	Flow 2 low [1)] (valid for QBM68..D)		1	R
4x0011	Flow 2 high [1)] (valid for QBM68..D)		1	R

Differential pressure 1				
4x0021	Reliability		1	R
4x0022	Differential pressure - Value	Controlled by #0023		R
4x0023	Differential pressure – Unit (i)		1	R/W
4x0024	Response time (ii)	s	1	R/W
4x0025	Scaling low – (0 V)	Controlled by #0023		R/W
4x0026	Scaling low – (10 V)	Controlled by #0023		R/W
4x0027	Analog Value(iii)		1	R/W
4x0028	Feedback 0-10 V	V	0.001	R
4x0029	Differential pressure (Pa)	Pa	1	R
4x0030	Differential pressure (PSI)	PSI	0.0001	R
4x0031	Differential pressure (mmHg)	mmHg	0.001	R
4x0032	Differential pressure (mmH20)	mmH20	0.1	R
4x0033	Average value 500 ms	Controlled by #0023		R
4x0034	Average value 1000 ms	Controlled by #0023		R
4x0035	Average value 4000 ms	Controlled by #0023		R
4x0036	Average value 16000 ms	Controlled by #0023		R
…				
4x0040	Calibrate Zero point ( )		1	R/W
Differential pressure 2				
4x0051	Reliability		1	R
4x0052	Differential pressure - Value	Controlled by #0053		R
4x0053	Differential pressure – Unit (i)		1	R/W
4x0054	Response time (ii)	s	1	R/W
4x0055	Scaling low – (0 V)	Controlled by #0053		R/W
4x0056	Scaling low – (10 V)	Controlled by #0053		R/W
4x0057	Analog Value (iii)		1	R/W
4x0058	Feedback 0-10V	V	0.001	R
4x0059	Differential pressure (Pa)	Pa	1	R
4x0060	Differential pressure (PSI)	PSI	0.0001	R
4x0061	Differential pressure (mmHg)	mmHg	0.01	R
4x0062	Differential pressure (mmH20)	mmH20	0.1	R
4x0063	Average value 500 ms	Controlled by #0053		R
4x0064	Average value 1000 ms	Controlled by #0053		R
4x0065	Average value 4000 ms	Controlled by #0053		R
4x0066	Average value 16000 ms	Controlled by #0053		R
…				
4x0070	Calibrate Zero point (iv)		1	R/W

Addr	Description	Unit	Scaling	Read/Write
Flow (Differential pressure k 1) (valid for QBM68..D)				
4x0081	Flow low [1)]		1	R
4x0082	Flow high [1)]		1	R
4x0083	k low [1)]		0.01	R
4x0084	k high [1)]		0.01	R
4x0085	Unit [2)]		1	RW
4x0086	Type		1	R
4x0087	Temperature		0.1	RW
Flow (Differential pressure 2) (valid for QBM68..D)				
4x0091	Flow low [1)]		1	R
4x0092	Flow high [1)]		1	R
4x0093	k low [1)]		0.01	RW
4x0094	k high [1)]		0.01	RW
4x0095	Unit		1	RW
4x0096	Type		1	R
4x0097	Temperature		0.1	RW

Configuration			
4x1001	Modbus address	1	R
4x1002	Base address	1	R/W
4x1003 [3]	Baud rate	1	R/W
4x1004 [3]	Data bits	8	R/W
4x1005 [3]	Stop bits (1 stop bit)	1	R/W
4x1006 [3]	Parity (no parity)	1	R/W
4x1007	Save configuration	1	R/W

Sensors with firmware older than version V20

These sensors have limited address register. The following addresses are possible.

Address:
0…7
40…47
80…87
120…127
160…167
200…207
240…247

Reliability

Value		Pressure sensor	0…10 V
0	OK		
1	No sensor	Pressure sensor malfunction	
2	Over range	Over pressure	
3	Under range	Under pressure	
4	Open loop		
5	Short loop		Short circuit (load less than 5 KΩ)
6	No output signal		
7	Other fault	Zero point calibration required	Feedback not within limits
8	Calculation error		
9	Extended error		
10	Configuration error	Configuration error	

[1] Flow calculated with high *65536 +low part

[2] Flow unit 0=l/s, 1=m³/h, 2=m³/s

[3] Address 1003: Baudrate 9600
Address 1004: Data Bit 1
Address 1005: Stop Bit 1 (1 stop bit) (version 14)
Address 1006: Parity 0 (no parity) (version 14)

The following is valid for Stop bit (modbus register 1005):
0 or 1 = 1 stop bit
2 = 2 stop bits
1.5 stop bits is not supported by the current firmware

The following is valid for Parity 8 (modbus register 106):
0 = None
1 = ODD
2 = Even
No one else mode is supported (the hardware supports Force 0/1 parity but not the firmware)

The following addresses can be set by choosing optional tens, select tens via modbus and use the DIP-switches to set the address.
Address:
1-8
10-18
20-28
30-38
….
240-248