

USER'S GUIDE



Vaisala CARBOCAP[®] Carbon Dioxide Transmitter Series GMT220



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CHAPTER 1

GENERAL INFORMATION

Safety

Throughout the manual, important safety considerations are highlighted as follows:

WARNING

Warning denotes a serious hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury to or death of personnel.

CAUTION

Caution denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

NOTE

Note highlights important information. It calls attention to an essential procedure, practice, condition or the like.

Warranty

Vaisala issues a guarantee for the material and workmanship of this product under normal operating conditions for one (1) year from the date of delivery. Exceptional operating conditions, damage due to careless handling and misapplication will void the guarantee.

CHAPTER 2

PRODUCT DESCRIPTION

Vaisala's GMT220 transmitters are versatile instruments for measuring CO₂ in industrial applications. The CARBOCAP[®] sensor is silicon based and its operation is based on the NDIR Single-Beam Dual-Wavelength principle.

Parts

The GMT220 transmitter is shown in Figures 1 and 2.

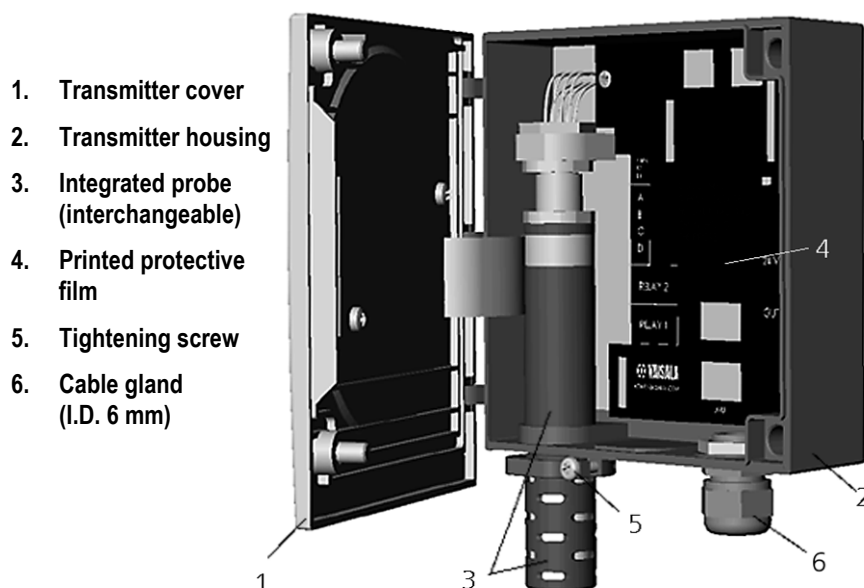


Figure 1. GMT220 with probe integrated into the transmitter housing e.g. wall model transmitter.

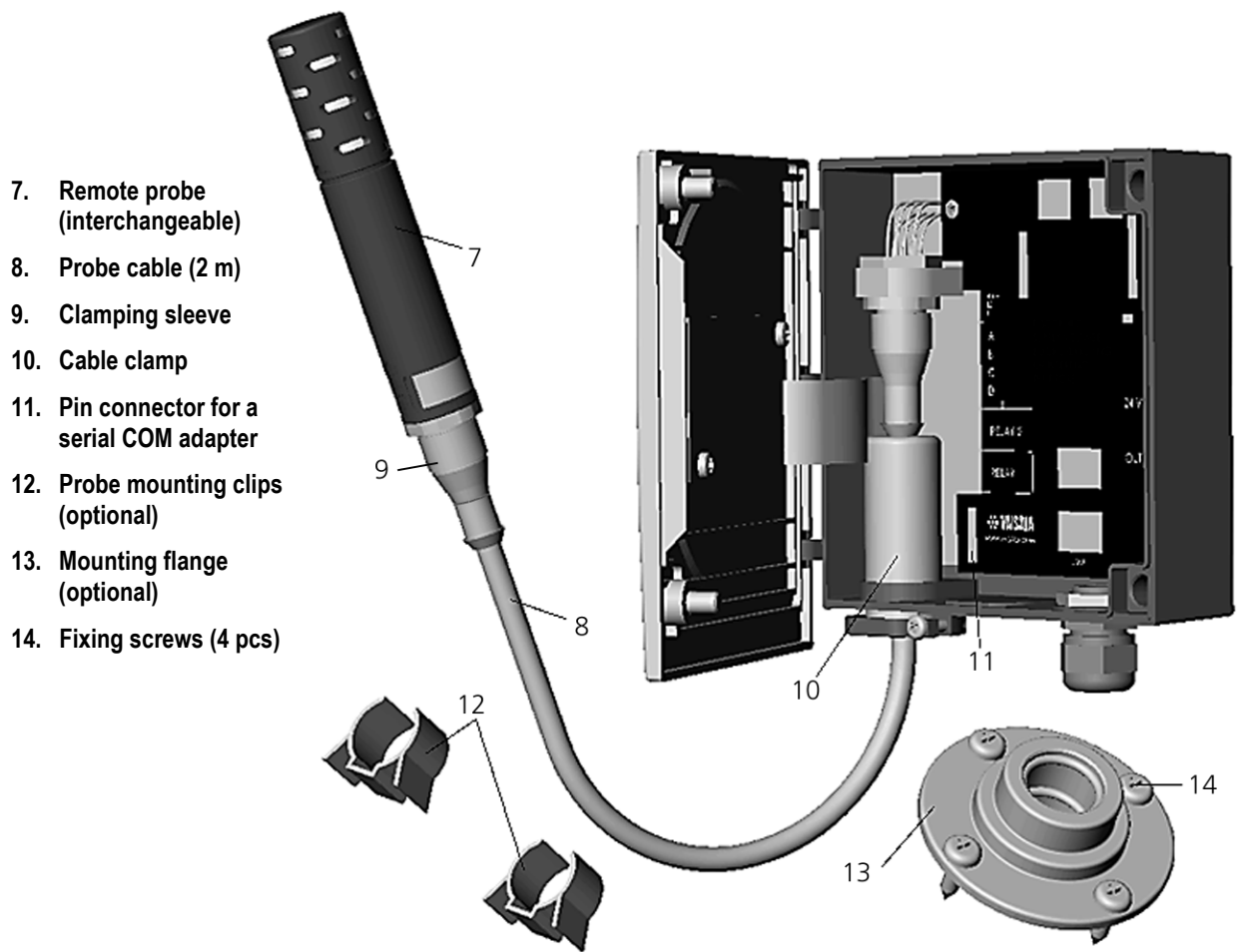


Figure 2. GMT220 with probe installed remotely.

Led light indicators and optional display

The GMT220 series transmitter has as a standard three LED light indicators on the cover plate: OPERATION, LEVEL 1 and LEVEL 2 (see Figure 3).

- The green OPERATION LED is lit as the power is connected.
- The red LEVEL LEDS are lit if the relay setting is reached e.g CO₂ concentration is over predefined limit. If the relays are not in use, the LEVEL LEDS indicating CO₂ concentration are dark.

The transmitter is also available with an optional back lit LCD display, which outputs the CO₂ volume concentration in unit of percentage or ppm depending on the measurement range of the probe.

Blinking led lights and Er-codes in the display indicate operation errors (see Chapter 5, Error messages).

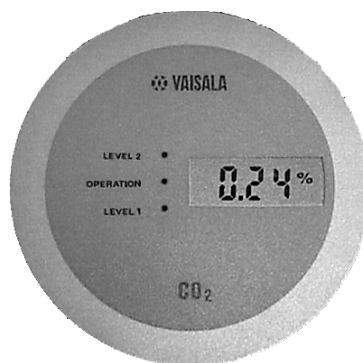


Figure 3. LED light indicators and optional display.

CHAPTER 3

MOUNTING

Wall mounting

Mount the wall model transmitter or the remote probe into a place representing the environment to be measured.

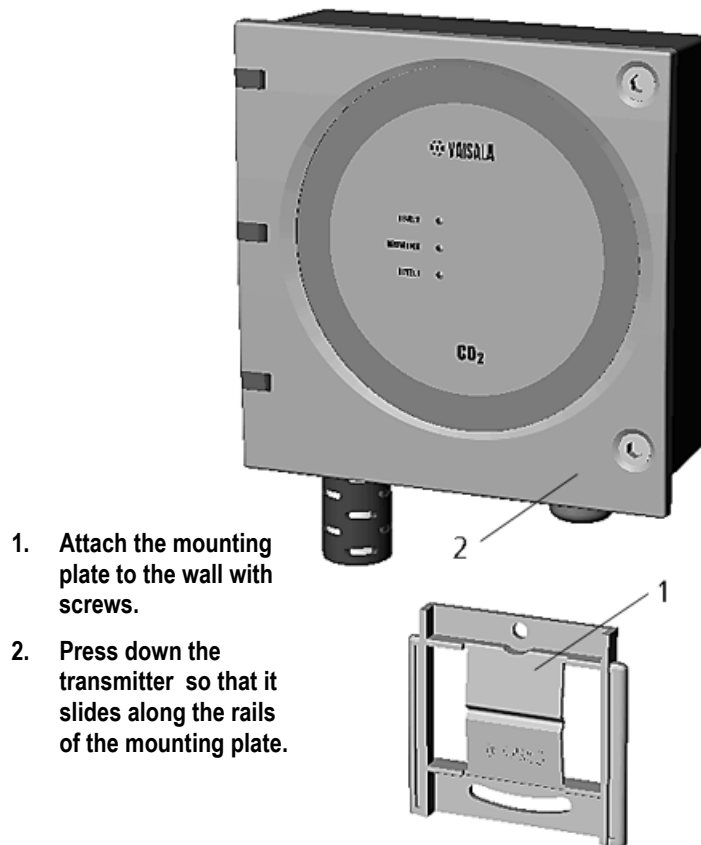


Figure 4. Mounting the transmitter

Duct or channel mounting

When the probe is installed in a duct or channel, it is recommended to use the optional mounting flange (GM45156SP).

1. Drill a hole with minimum diameter of 22 mm in the wall.
2. Attach the flange onto the duct with four screws so that the gasket ring seals the attachment.
3. Place the probe through the flange so deep that the perforated head is completely in the duct (see Figure 5).

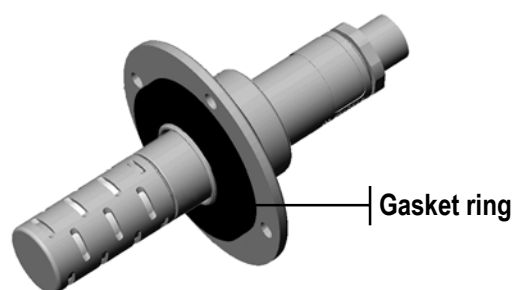


Figure 5. Mounting the probe in a duct or channel.

NOTE

If the air pressure in the duct is clearly lower than in surroundings, an additional sealing may be necessary. This is to avoid possible measurement errors due to leakages through the joint.

CHAPTER 4

ELECTRICAL CONNECTIONS

1. Connect the nominal 24 V supply terminals (+) and (-) on the motherboard (right-hand side, see Figure 6).
2. Connect the analogue output (see Figure 6) as follows:

Terminal 0: **the common wire (-)**
Terminal V: **voltage output signal (+)**
Terminal mA: **current output signal (+)**

If the current output is chosen, select the output range by using the current output jumper 4mA (see Figure 6). If the range of 4...20mA is chosen, connect the jumper (default). If the range of 0...20 mA is chosen, disconnect the jumper.

CAUTION Connecting power leads to the output terminals can seriously damage the product.

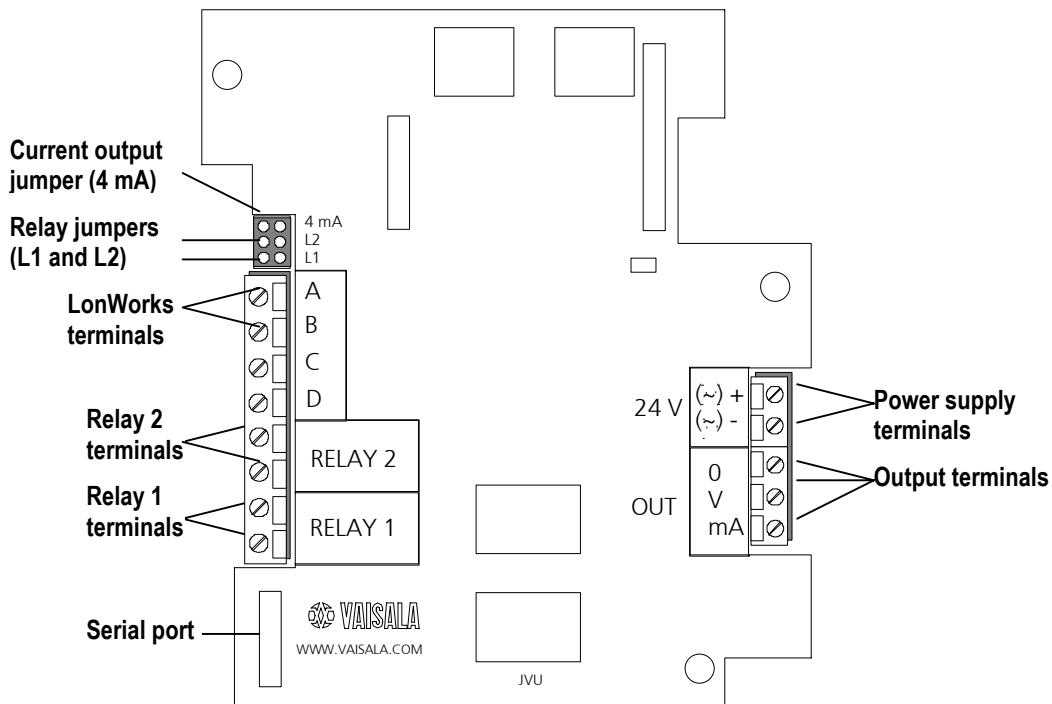


Figure 6. Electrical connections and jumpers.

Power supply requirements

The GMT220 series transmitters are designed to operate with a nominal 24 VAC/DC supply. The power supply should maintain the voltage for all load conditions and all mains voltages. The power input includes a halfwave rectifier. To avoid current peaks, it is recommended to use a DC supply.

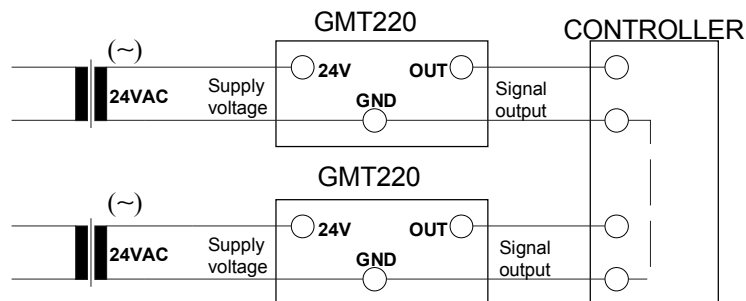
Connection to a 24 VAC supply

The GMT220 series transmitters can be connected to a 24 VAC supply without an external rectifier. However, when more than one transmitter is connected to one 24 VAC transformer, a common loop is formed and risk of a short-circuit increases. To avoid this, always use separate floating supply for each transmitter (see figure 7 A).

CAUTION

If several transmitters have to share one transformer, the phase (~) must always be connected to (+) connector (24 V) in each transmitter (see figure 7 B).

A) Connection of separate AC supplies to the transmitters (recommended connection).



B) Connection of one AC supply to the transmitters.

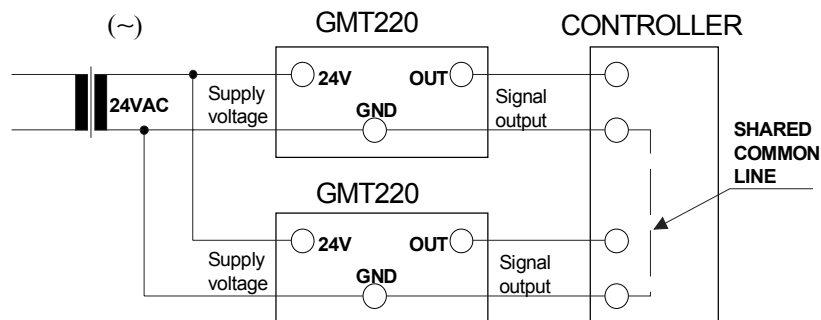


Figure 7. AC Connections.

Relays

The relay output wiring is done at the left-hand side terminals on the motherboard (see Figure 6). When the relay trigger point is exceeded, the relay switches ON. This function can be inverted by disconnecting the corresponding relay jumper (L1 or L2).

The relay trigger points have been set at factory as defined in the order form. The points can also be changed with a PC and the optional serial COM adapter 19040GM. For more detailed information see page 15.

CHAPTER 5

MAINTENANCE

Replacing the probe

Transmitter with integrated probe (wall model)

1. Open the cover
2. Loosen the tightening screw on the transmitter body (see page 3).
3. Pull out the probe and install a new probe. Tighten the screw and close the cover.

Transmitter with remote probe

1. Loosen the clamping sleeve, pull the probe out (see page 3).
2. Install a spare probe and tighten the clamping sleeve.

All the calibration electronics are in the probe. The new probe is automatically identified by the control electronics of the transmitter.

NOTE

Disconnection of the probe causes an error and switches the relays OFF.

Calibration

Comparison with the calibrated probe

It is recommended to check the calibration of the GMT220 every second year. A simple field calibration checking can be performed by using a calibrated reference probe. During the checking procedure, please avoid exhaling towards the probe as this alters the CO₂ concentration.

1. Check the current transmitter reading.
2. Replace the probe with the reference.
3. Let the transmitter stabilize for a few minutes. The measured CO₂ concentration near by the transmitter may have increased due to breathing.
4. Compare the readings measured with the original and the reference probe.

The difference between the readings should be less than 5 % of the full scale reading of the GMT220. If there is need for an adjustment of the probe, please contact Vaisala SSD Service or Vaisala's representative (see page 14).

On-site checking and adjusting by using a reference gas and GM70 hand-held meter

A probe to be checked can be flushed in a reference gas by using a field check adapter (optional part, 26150GM). The procedure requires pressurized gas bottle giving a flow rate of 0.4...1.0 l/min through the adapter chamber. If an adjustment is needed, it can be carried out by a user with a Vaisala's hand-held carbon dioxide meter GM70. Probes can be sent also to Vaisala SSD Service Centers (see page 14) to be calibrated.

Calibrator GMK220

The Vaisala GMK220 calibrator is intended for spot checking and two-point calibration of the GMT220-series probes. The calibration parameters are stored to the nonvolatile memory of the probes. Contact Vaisala's representative to get more information about the GMK220.

Error messages

Transmitters with a display

The following error messages Er 01... Er 13 appears on the display as an operation error occurs in the transmitter:

Error code	Type of error
Er 01	Main board memory problem
Er 02	Main board memory problem
Er 03	Main board memory problem
Er 04	Probe contact failure
Er 05	Probe memory failure
Er 06	Probe memory failure
Er 08	Incompatible probe
Er 10	IR-source failure
Er 11	IR-source failure
Er 12	Sensor failure
Er 13	Signal error

In all the error cases, check first that the probe is connected properly then reset the transmitter by disconnecting it. In case of constant error, please contact Vaisala SSD Service or local Vaisala representative (see page 14).

NOTE

Disconnection of the probe and fatal operation errors switch the relay OFF.

Transmitters without a display

The transmitter without a display indicates problems by blinking the three LED lights on the cover plate: OPERATION, LEVEL 1 and LEVEL 2 (see Figure 3) as follows:

- the green OPERATION LED is blinking when a non-critical error occurs (no effect on relays).
- the red LEVEL 1 and LEVEL 2 LEDs are blinking when a fatal error occurs (switches the relays OFF). Note ! The red LEVEL LED is continuously lit when the predefined CO₂ concentration is exceeded.

In case of non-critical or fatal errors, check first that the probe is connected properly then reset the transmitter by disconnecting it. In case this does not help, please contact Vaisala SSD Service or local Vaisala representative (see Table 1).

Table 1. Vaisala SSD Service Centres.

NORTH AMERICAN SERVICE CENTER

Vaisala Inc., 100 Commerce Way, Woburn, MA 01801-1068, USA.

Phone: +1 781 933 4500, Fax +1 781 933 8029

Email: us-customersupport@vaisala.com

EUROPEAN SERVICE CENTER

Vaisala SSD Service, Vanha Nurmijärventie 21 FIN-01670 Vantaa, FINLAND.

Phone: +358 9 8949 2758, Fax +358 9 8949 2295

E-mail: ssdservice@vaisala.com

ASIAN SERVICE CENTER

Vaisala KK, 42 Kagurazaka 6-Chome, Shinjuku-Ku, Tokyo 162-0825, JAPAN.

Phone: +81 3 3266 9611, Fax +81 3 3266 9610

E-mail: aftersales.asia@vaisala.com

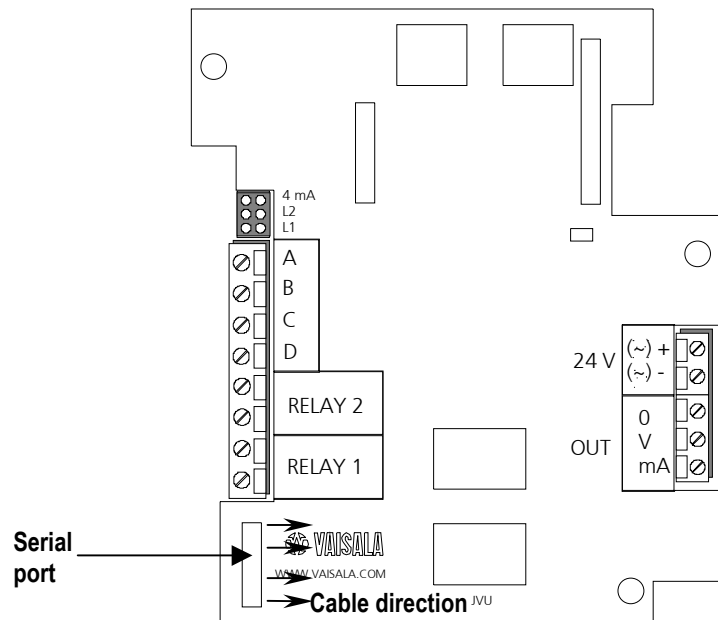
www.vaisala.com

CHAPTER 6

SERIAL COMMANDS

The GMT220 is linked to PC via a serial cable equipped with a COM adapter (optional part 19040GM, can be ordered from Vaisala).

1. Connect the serial cable to your PC's serial port and transmitter's serial port located in the motherboard, see figure below.



2. Set the serial settings as in the following table.

Table 2. Serial interface settings

Baud rate	9600
Parity	none
Data bits	8
Stop bits	1
Flow control	X_{on}/X_{off} (none)

NOTE

Remember to save the settings after each command.

Setting relay trigger points

The relays of the transmitter turn ON/OFF when the CO₂ content reaches the predefined trigger point. There are two trigger points for both relays. The higher limit activates the relay and the lower deactivates it. The two limits are used to prevent the relay switching back and forth when the measured value is very close to set point.

```
MF_Rx_HIGH yyy<cr>
```

where: x = 1 or 2 (number of the relay)
 yyy = trigger point (CO₂ content in ppm)

Example of setting the higher trigger limit of the relay 1:

```
>MF_R1_HIGH 1200  
MF_R1_HIGH=1200.0000  
>
```

Save the settings:

```
MAIN_SAVE F<cr>
```

Give the lower trigger limit:

```
MF_Rx_LOW yyy<cr>
```

where: x= 1 or 2 (number of the relay)
 yyy = trigger point (CO₂ content in ppm)

Example of setting the lower trigger limit of the relay 1:

```
>MF_R1_Low 900  
MF_R1_LOW=900.000000  
>
```

Save the settings:

```
MAIN_SAVE F<cr>
```

Pressure compensation

For achieving the most accurate measurements in high altitudes where the barometric pressure is lower than in the sea level, the actual pressure value can be set to the GMT220's software. The factory

setting is 1013 hPa. The ambient pressure value can be set by using the following command:

```
MF_PRESSURE xxxx<cr>
```

where: xxxx = pressure in hPa

Example of setting desired pressure:

```
>MF_PRESSURE 900
MF_PRESSURE=900
>
```

Save the settings:

```
MAIN_SAVE F<cr>
```

Altitude/Atmospheric pressure table

Altitude m (ft)	Atmospheric pressure (hPa)	Atmospheric pressure (psi)
0 (sea level)	1013	14.69
500 m (1640 ft)	954	13.84
1000 m (3281 ft)	899	13.04
1500 m (4921 ft)	845	12.26
2000 m (6562 ft)	795	11.53
2500 m (8202 ft)	747	10.83
3000 m (9843 ft)	701	10.17

Temperature setting

The ambient temperature value can be set by using the following command:

```
MF_TEMP xxx<cr>
```

where: xxx = ambient temperature (°C) x 10.

Example of setting desired temperature (25 °C):

```
>MF_TEMP 250
MF_TEMP=250
>
```

Save the settings:

```
MAIN_SAVE F<cr>
```

CHAPTER 7

TECHNICAL DATA**Technical specifications**

Measuring range	
GMT221	0...2% CO ₂ , 0...3% CO ₂ , 0...5% CO ₂ , 0...10% CO ₂ , 0...20% CO ₂
GMT222	0...2000 ppm, 0...3000 ppm, 0...5000 ppm, 0...7000 ppm, 0...10 000 ppm
Accuracy at 25°C against certified factory references	
GMT221	<±[0.02% CO ₂ + 2% of reading]
GMT222	<±[20 ppm CO ₂ + 2% of reading]
(including repeatability and calibration uncertainty)	
Non-linearity	<±0.5 %FS
Temperature dependence (typically)	-0.1 %FS / °C (When temperature rises, the output decreases, default 25 °C (77 °F))
Pressure dependence (typically)	+0.15 % of reading/hPa (When pressure rises, the output increases, default 1013 hPa (1 atm))
Long-term stability	<±5 %FS / 2 years
Response time (63%)	20 seconds (GMT221) 30 seconds (GMT222)

Operating conditions

Operating temperature range	-20...+60 °C
Humidity range	0 - 100 %RH (non-condensing)
General	
Analog outputs	0 - 20 mA or 4 - 20 mA and 0 - 10 V
Resolution of analog outputs	0.03 %FS

Recommended external load:	
current output	max. 400 Ω
voltage output	min. 1 k Ω
Relay contact ratings	max. 30 VAC / 60 VDC, 0.5 A
Power supply	nominal 24 VAC/DC
Power consumption	< 4 W
Warm-up time	< 15 minutes
Storage temperature range	-30...+70°C

Mechanics

Housing material	
transmitter body	ABS plastic
probe	PC plastic
Housing classification	IP65/NEMA4
Weight	
GMT221:	max. 280 g
GMT222	max. 300 g

Electromagnetic compatibility

The GMT221 and GMT222 transmitters comply with the following standards:

EN 61326-1:1997 + Am1:1998, Electrical equipment for measurement, control and laboratory use - EMC requirements - Generic environment.

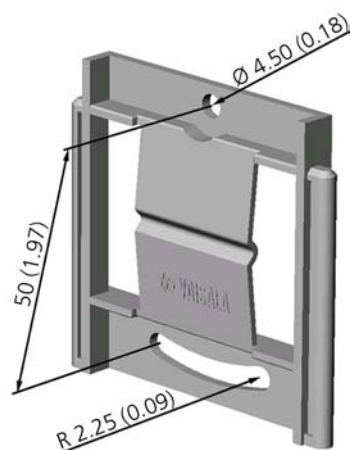
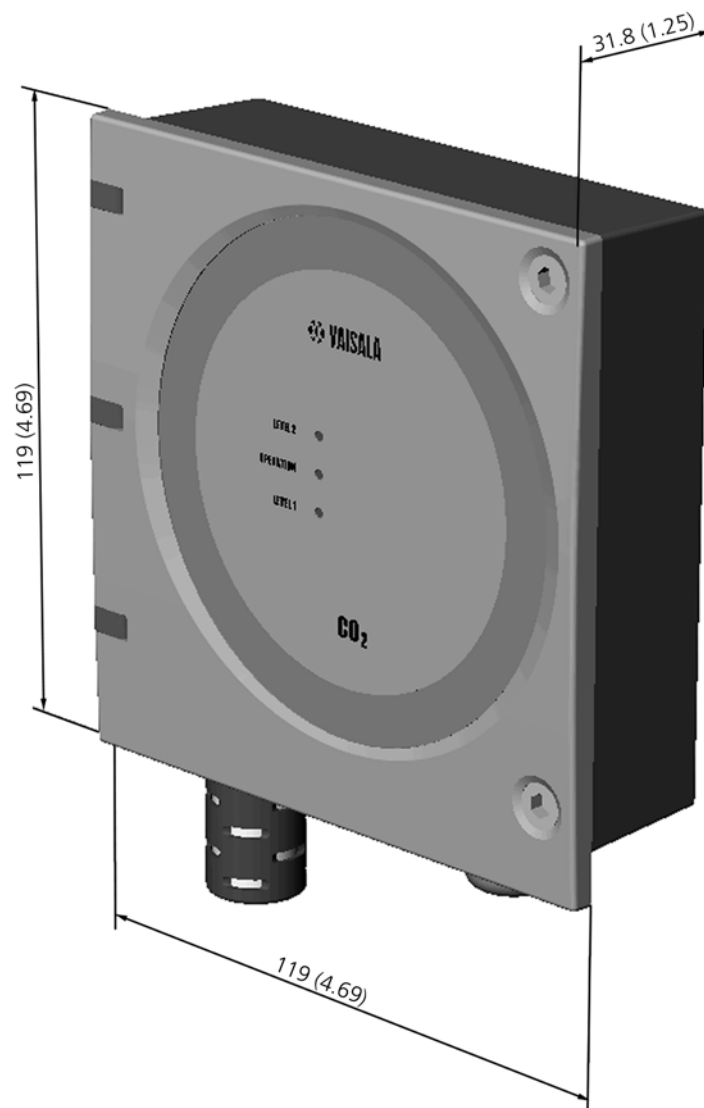
[CISPR16/22 Class B, EN/IEC 61000-4-2, EN/IEC 61000-4-3, EN/IEC 61000-4-4, EN/IEC 61000-4-5, EN/IEC 61000-4-6]

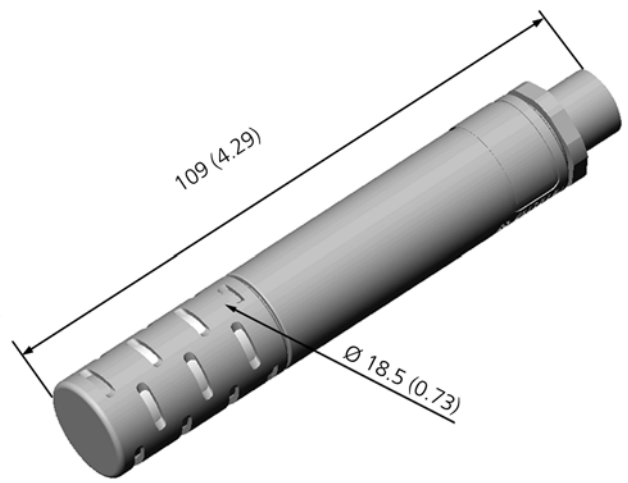


Accessories

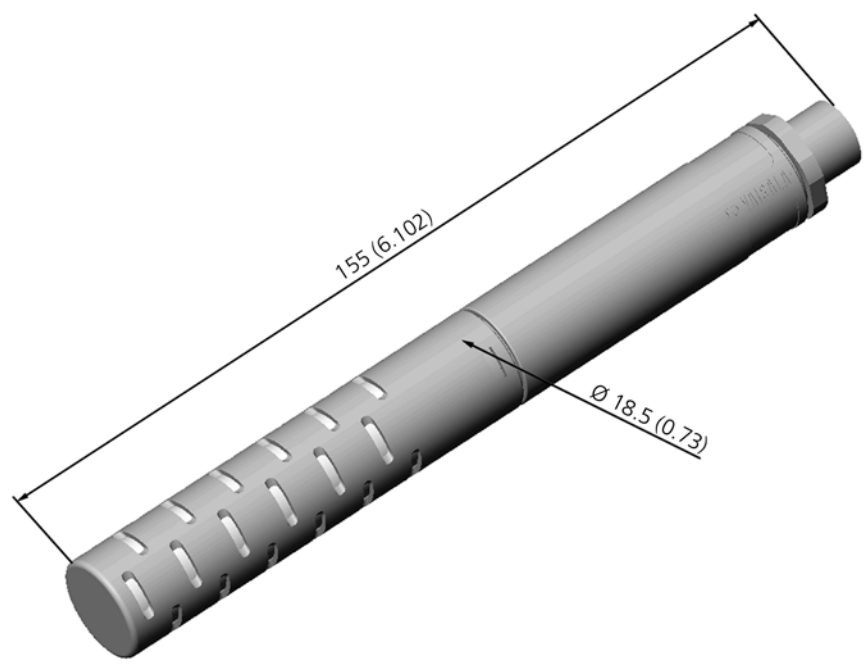
Order code	Description
GMP221, GMP222	Spare probe (use the order form to define measurement range etc.)
25378GMSP	Spare filter for GMP221
25879GMSP	Spare filter for GMP222
25245GMSP	Clips (2 pcs) for attaching the probe
26150GM	Field check adapter
GM45168SP	Protective sleeve for the GMP221
GM45237SP	Protective sleeve for the GMP222
GM45156SP	Mounting flange for the probe
25665GMSP	2 meters probe cable (includes a cable clamp)
210848GMSP	10 meters probe cable (includes a cable clamp)
19040GM	Serial COM adapter
GML220	LonWorks [®] module*
26204GM	XIF-external interface file for LonWorks [®] module
GM70	Hand-held carbon dioxide meter
GMK220	Calibrator for the probes

Dimensions in mm (inches)

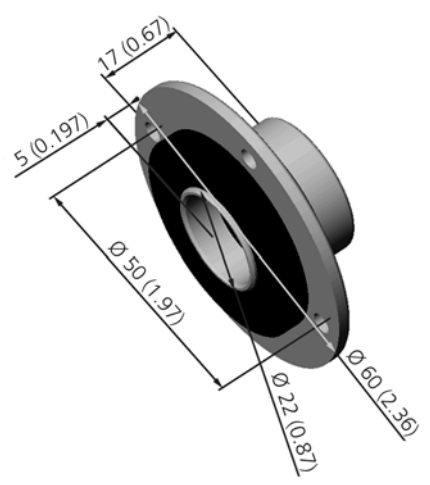




Probe GMP221



Probe GMP222



Mounting flange GM45156SP



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