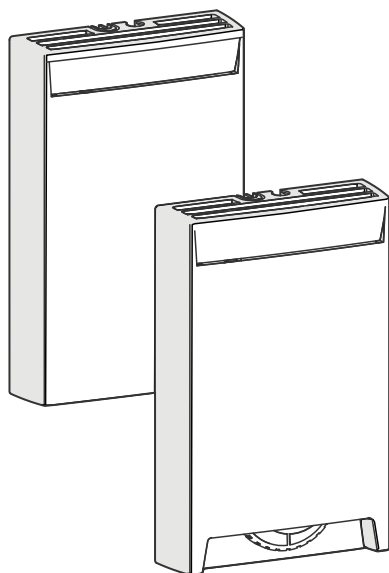


USER'S GUIDE

Vaisala CARBOCAP® Carbon Dioxide and Temperature Transmitters GMW80 Series



PUBLISHED BY

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1

GENERAL INFORMATION

About This Document

This document provides information for installing, operating, and maintaining GMW80 series transmitters.

Table 1 Version Information

Document Code	Description
M211748EN-A	November 2014. First version.

Table 2 Related Documents

Document Code	Description
M211660EN	GM10 Quick Guide

Documentation Conventions



Warnings alert you to a serious hazard. If you do not read and follow instructions very carefully at this point, there is a risk of injury or even death.



Cautions warn you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.



Notes highlight important information on using the product.

Safety

The GMW80 series transmitter delivered to you has been tested for safety and approved as shipped from the factory. Note the following precautions:



Connect only de-energized wires.



Do not modify the unit. Improper modification can damage the product or lead to malfunction.

ESD Protection

Electrostatic Discharge (ESD) can cause immediate or latent damage to electronic circuits. Vaisala products are adequately protected against ESD for their intended use. It is possible to damage the product, however, by delivering electrostatic discharges when touching, removing, or inserting any objects inside the equipment housing.

To make sure you are not delivering high static voltages yourself, avoid touching exposed component contacts during installation and maintenance.

Recycling



Recycle all applicable material.



Dispose of the unit according to statutory regulations. Do not dispose of with regular household refuse.

Regulatory Compliances



GMW80 series is in conformity with the following directives:

- RoHS-Directive
- EMC-Directive

The conformity is declared with using the following standards:

- EN 50581: Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.
 - EN 61326-1: Electrical equipment for measurement, control, and laboratory use – EMC requirements – Immunity test requirements for equipment intended to be used in an industrial electromagnetic environment.
 - EN 55022: Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement.
-

Trademarks

CARBOCAP® is a registered trademark of Vaisala Oyj.

All other trademarks referred to are the property of their respective owners.

Software License

This product contains software developed by Vaisala. Use of the software is governed by license terms and conditions included in the applicable supply contract or, in the absence of separate license terms and conditions, by the General License Conditions of Vaisala Group.

Warranty

Visit our Internet pages for more information and our standard warranty terms and conditions: www.vaisala.com/warranty.

Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

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PRODUCT OVERVIEW

Introduction to GMW80 Series

The Vaisala GMW80 series CARBOCAP® carbon dioxide and temperature transmitters are wall-mount transmitters designed to fulfill the needs for CO₂ measurements in standard demand controlled ventilation applications. The CO₂ measurement is based on a new generation CARBOCAP® sensor, which uses a novel, silicon-based microchip emitter instead of an incandescent light bulb. The internal reference in the CO₂ sensor guarantees the best stability and operation also in constantly occupied buildings without frequent readjustments.

All GMW80 series transmitters measure carbon dioxide (CO₂) and temperature (T). GMW86PT includes a temperature set-point potentiometer.

The CARBOCAP® sensors give correct CO₂ measurements immediately when powered on. As they have a built-in reference measurement they do not need a lengthy learning phase before the measured values are correct. Proper operation can be verified immediately after snapping on the device cover.

Transmitter Models

Table 3 GMW80 Series Transmitters

Model	CO ₂ Output(s)	T Output	T Setpoint Potentiometer
GMW80P	1 x 4 ... 20 mA 1 x 0 ... 10 V	Pt1000 (passive)	No
GMW80PT	1 x 4 ... 20 mA 1 x 0 ... 10 V	Pt1000 (passive)	Yes

Transmitter Parts

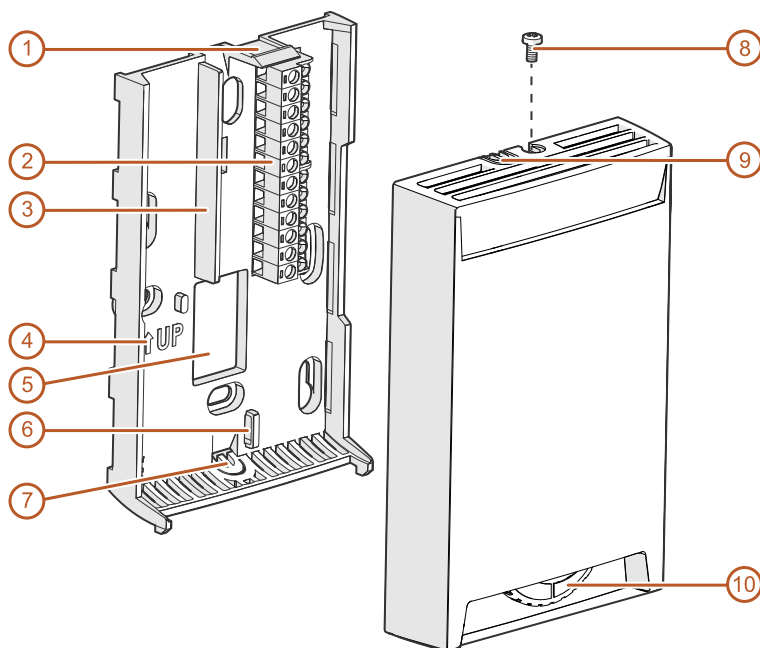


Figure 1 GMW80 Series Transmitter Parts

- 1 = Opening tab.
- 2 = Screw terminals. The wiring information is marked on the mounting base next to the terminals.
- 3 = Barrier to prevent the cable from being routed below the GM10 measurement module. The area to avoid is marked **No cable** on the mounting base.
- 4 = Orientation arrow. Should point up after the mounting base has been installed.
- 5 = Opening for cable when wiring from behind (recommended).
- 6 = Place for zip tie (optional, for cable strain relief).
- 7 = Breakaway tab for routing the cable from below.
- 8 = Locking screw. Supplied with the transmitter.
- 9 = Breakaway tab for routing the cable from the top.
- 10 = Setpoint wheel (model GMW86PT only).

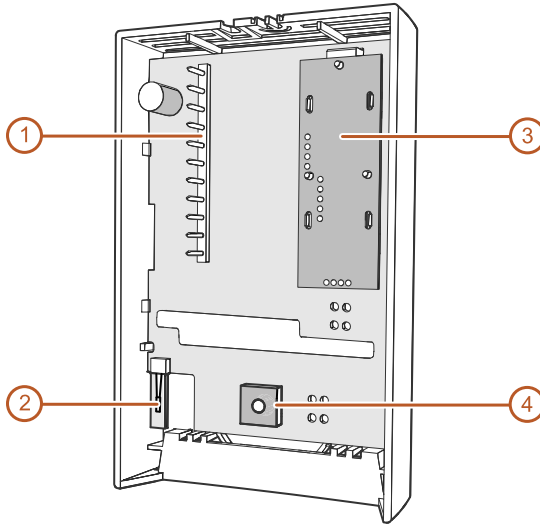


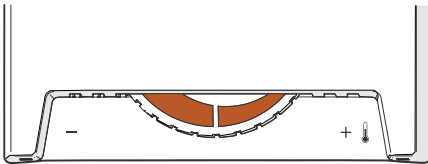
Figure 2 GMW80 Series Component Board Parts

- 1 = Pins that connect the transmitter cover to the screw terminals when the transmitter cover is in place.
- 2 = Pt1000 temperature sensor.
- 3 = GM10 carbon dioxide measurement module.
- 4 = Potentiometer component (model GMW86PT only).

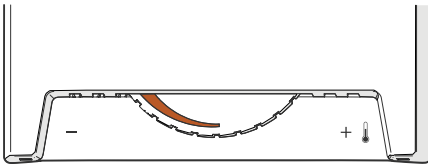
Temperature Setpoint Potentiometer

Some GMW80 series transmitter models include a temperature setpoint function that gives the occupant of the monitored space a way to adjust the temperature. The setpoint function is implemented using a passive 10 k Ω potentiometer (variable resistor) that is mechanically actuated by a setpoint wheel on the lower part of the transmitter.

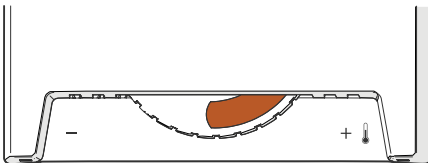
The transmitter is simply marked with plus "+" and minus "-" signs to indicate the direction of adjustment. The rotation of the wheel is mechanically limited to approximately 180 degrees, so in actual use the resistance range of the potentiometer varies between approximately 2.1 k Ω and 7.2 k Ω . The corresponding temperature change is decided on the building controller level.



Setpoint wheel at midpoint:
~4.65 k Ω resistance.



Setpoint wheel at minimum:
~2.1 k Ω resistance.



Setpoint wheel at maximum:
~7.2 k Ω resistance.

Analog Output Overage Behavior

Analog outputs of the GMW80 series transmitters have a defined behavior when the values measured by the transmitter are outside the scaled analog output range:

- Output of the CO₂ measurement is clipped at the end of the scaled output range (2000 ppm). For example, the current output will not go above 20 mA even if the measured CO₂ reading keeps rising.
- If the measured CO₂ reading rises above 6000 ppm, the outputs are set to the error state. See section [Error State on page 18](#).

The reading from the passive Pt1000 resistor is not affected by the overrange behavior or the error state.

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INSTALLATION

Selecting Location

When mounting wall model transmitters:

- Select a location that represents well the area of interest.
- Do not install on the ceiling.
- Avoid placing the transmitter near heat and moisture sources, close to the discharge of the supply air ducts, and in direct sunlight.

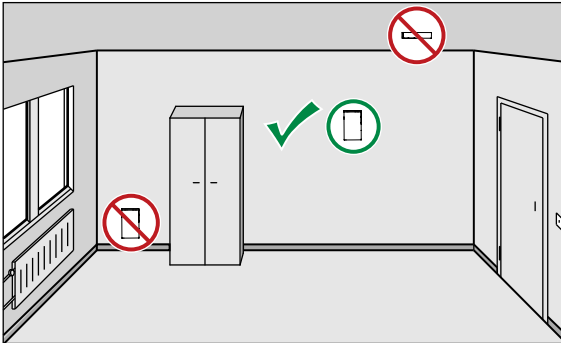


Figure 3 Selecting Transmitter Location



Seal the cable opening when bringing a cable through the wall. The hole will supply air from outside the room into the transmitter and affect the measurement readings. For example, fresh concrete binds CO₂ and may cause low readings, especially in new buildings.

Opening and Closing the Transmitter

GMW80 series transmitters are delivered from the factory with a pull tab that makes it easy to open the transmitter for installation.

To **open** the transmitter after it has been installed:

1. Remove the locking screw if it has been installed.
2. Use a flat screwdriver to push down the tab that holds the transmitter cover and mounting base together, and pull the top of the transmitter cover away from the mounting base.

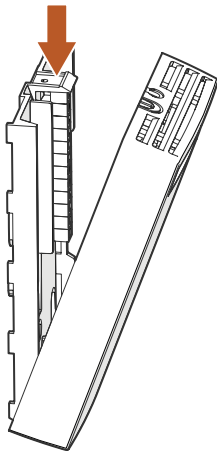


Figure 4 Location of the Opening Tab



Be careful when opening the transmitter:

- Pushing down too hard can break off the opening tab.
- Inserting the screwdriver too far into the transmitter enclosure may damage transmitter components.

To **close** the transmitter:

1. Align the bottom of the transmitter cover with the bottom of the mounting base.
2. Tilt the top of the transmitter cover forward until the tab catches. Note that closing the transmitter starts it up if power is supplied to the screw terminals.
3. Reinstall the locking screw if desired.

Installing the Mounting Base

Use the mounting holes to attach the mounting base securely. Use at least two screws (not included). The mounting holes are suitable for the most common European, American, and Asian mounting boxes. The mounting base can be twisted on to pre-mounted screws.

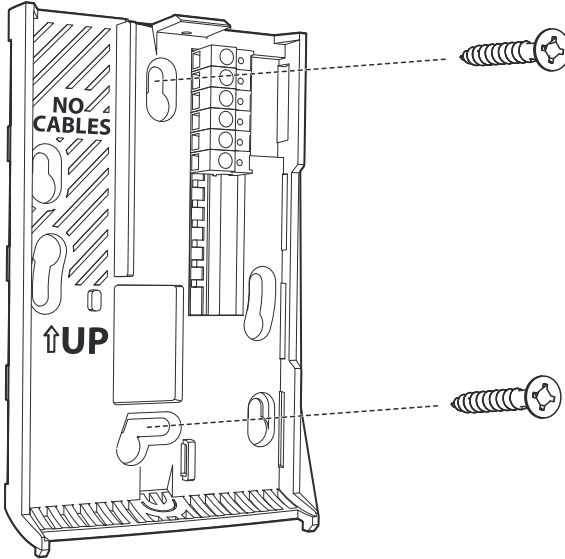


Figure 5 Installing the Mounting Base



Note that mounting bases are model-specific. If you attach several mounting bases before connecting the transmitters, store the transmitters in their individual shipping boxes.



The arrow on the mounting base must point straight up after installation. Proper orientation is important: air must flow through the vents on the bottom and top.

Wiring

Connect the wiring to the screw terminals on the mounting base. The terminal assignments are marked next to the screw terminals. Maximum wire size is 2 mm² (AWG14).

Route the cable through the hole in the mounting base if possible. You can also bring the cable to the housing from above or below, but you have to break off the small plastic tab that covers the hole on top or bottom of the mounting base.

After completing the wiring, connect the transmitter body over the mounting base. Note that mounting bases are model-specific.



Connect only de-energized wires.



Do not route the cable through the area marked **NO CABLES** on the mounting base. That space is taken up by the CO₂ measurement module when the transmitter cover is attached.

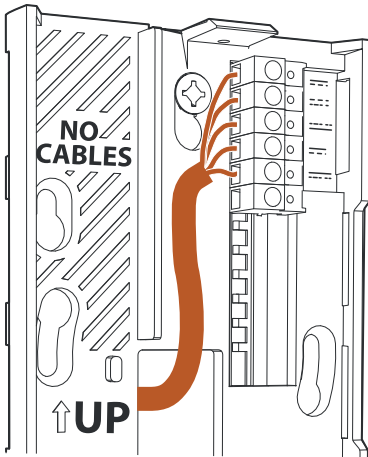


Figure 6 Routing the Cable from Behind

Wiring GMW86P

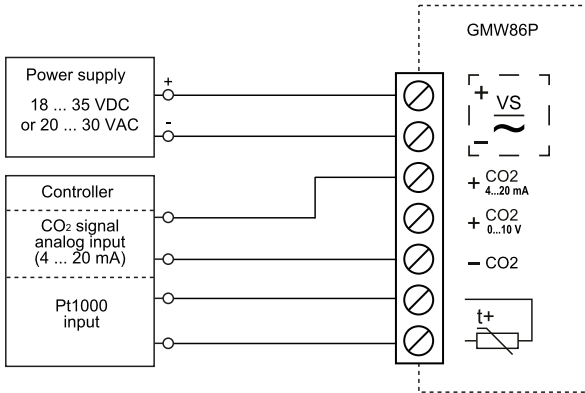


Figure 7 GMP86P Wiring

Wiring GMW86PT

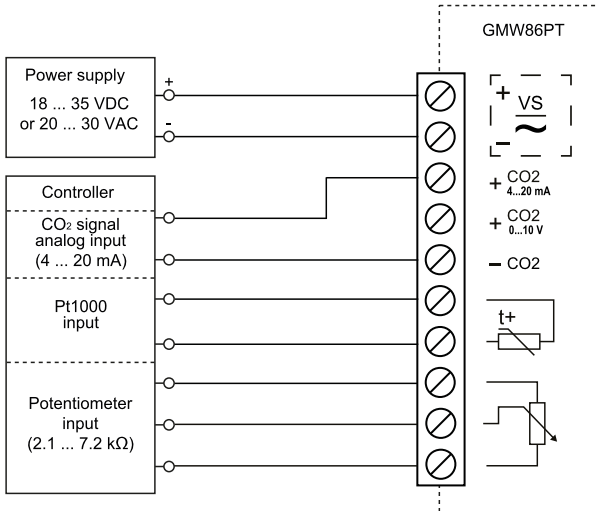


Figure 8 GMP86PT Wiring

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MAINTENANCE

Cleaning

The body of the transmitter can be cleaned by wiping with a moistened lint-free cloth. Do not use cleaning agents or solvents, or blow pressurized air into the transmitter housing.



If you suspect the CO₂ measurement module is dirty, do not attempt to open it. Instead, replace it with a new part. For order codes of spare parts, see section [Spare Parts and Accessories on page 23](#).

Replacing the CO₂ Measurement Module (GM10)



- GM10 spare part module (Vaisala order code GM10SP80)
- Flat head screwdriver (for opening the transmitter)

1. Disconnect the transmitter body from the mounting base.
2. Locate the GM10 module on the transmitter. The module is a separate component board with a golden cuvette that contains the CARBOCAP® sensor. The module is connected to the main transmitter board with a connector, and held in place by a plastic clip on the other side. See [Figure 2 on page 7](#).
3. Disconnect the module by carefully lifting the module from the connector side.

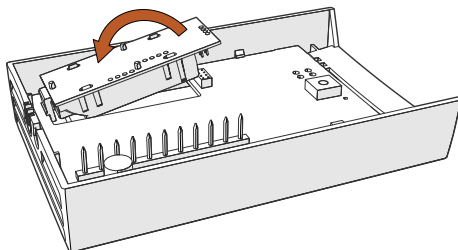


Figure 9 Disconnecting the GM10 Module

4. Take the new GM10 module and place it in the hole for the module so that the plastic clip meets the component board. Then lower the connector end of the module.
5. Push down on the module to secure the connector.
6. Reconnect the transmitter to the mounting base.
7. Check the output of the transmitter to verify that the CO₂ measurement is working normally and is not in the error state. For more information on the error state, see section [Error State on page 18](#).

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TROUBLESHOOTING

Problem Situations

Table 4 Possible Problem Situations and their Remedies

Problem	Possible Cause	Remedy
Analog output reading is unchanging and appears incorrect.	Analog output is in error state.	Inspect the transmitter for the cause of the error and remove the cause. See section Error State on the next page .
Temperature reading is too high.	Transmitter is installed in an unsuitable location, for example, near a heat source or in sunlight.	Relocate transmitter. See section Selecting Location on page 10 .
	Transmitter installed in improper orientation.	Reinstall transmitter with the arrow on the mounting base pointing up.
	Unsuitable operating environment.	Verify that the operating environment is within specified operating limits.
CO ₂ reading is too high.	Source of CO ₂ near the transmitter.	<ul style="list-style-type: none"> ■ Use a portable instrument to verify the CO₂ reading at the installation location. Avoid breathing on the instruments while checking. ■ Check for sources of CO₂ in the measured area, such as people working right next to the transmitter.
	CO ₂ measurement module must be replaced.	See section Replacing the CO₂ Measurement Module (GM10) on page 16 .

Problem	Possible Cause	Remedy
CO ₂ reading is too low.	The measured area contains materials that bind CO ₂ (such as fresh concrete), producing a low-CO ₂ environment.	<ul style="list-style-type: none"> ■ Use a portable instrument to verify the CO₂ reading at the installation location. Avoid breathing on the instruments while checking. ■ Check if the transmitter is installed on a mounting box that supplies air from inside the wall into the transmitter. If yes, plug the hole. See section Selecting Location on page 10.
	CO ₂ measurement module must be replaced.	See section Replacing the CO2 Measurement Module (GM10) on page 16 .

Error State

If the transmitter detects a serious hardware or software error, or the measured reading is well outside the scaled range, the analog outputs are set into a defined error level instead of the measured result. The error level depends on the output type:

- For 4 ... 20 mA output, the error level is **3.6 mA**.
- For 0 ... 10 V output, the error level is **11 V**.

If the cause of the error is removed, the transmitter resumes normal operation of analog outputs. Some errors may require a reset of the transmitter to recover.

Examples of situations that can cause the error state:

- The CO₂ measurement module (GM10) is disconnected.
- The transmitter measures over 6000 ppm CO₂. For more information, see section [Analog Output Overrange Behavior on page 9](#).

Technical Support

For technical questions, contact the Vaisala technical support by e-mail at helpdesk@vaisala.com. Provide at least the following supporting information:

- Name and model of the product in question
- Serial number of the product
- Name and location of the installation site
- Name and contact information of a technically competent person who can provide further information on the problem.

Product Returns

If the product must be returned for service, see www.vaisala.com/returns.

For contact information of Vaisala Service Centers, see www.vaisala.com/servicecenters.

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TECHNICAL DATA

Specifications

Table 5 Performance

Property	Specification
Carbon dioxide	
Measurement range	0 ... 2000 ppm
Accuracy across temperature range	
+20 ... +30 °C	±(30 ppm +3 % of reading)
+10 ... +20 °C, +30 ... +40 °C	±(35 ppm +3.7 % of reading)
+0 ... +10 °C, +40 ... 50 °C	±(40 ppm +4.8 % of reading)
Stability in typical HVAC applications	±(15 ppm + 2% of reading) over five years
Warmup time	1 min 10 min for full specification
Response time (63 %)	60 s
Carbon dioxide sensor	Vaisala CARBOCAP® GM10
Temperature	
Temperature sensor	Pt1000 RTD Class F0.15 IEC 60751
Product lifetime	>15 years

Table 6 Operating Environment

Property	Specification
Operating temperature range	0 ... +50 °C (+32 ... 122 °F)
Operating humidity range	0 ... 95 %RH Dewpoint <30 °C (+86 °F)
Storage temperature range	-40 ... +70 °C (-40 ... 158 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Table 7 Mechanics

Property	Specification
IP class	IP30
Housing material	ABS/PC UL-V0 approved
Housing color	White (RAL9003)
Output connector	Screw terminal
Max wire size	2 mm ² (AWG14)
Weight	
GMW86P	114 g
GMW86PT	120 g

Table 8 Inputs and Outputs

Property	Specification
Supply voltage	18 ... 35 VDC 24 VAC $\pm 20\%$ 50/60 Hz
Max current consumption	45 mA at 18 VDC 100 mA at 24 VAC
CO ₂	
Outputs	4 ... 20 mA 0 ... 10V
Scale	0 ... 2000 ppm
Current loop resistance (4 ... 20mA)	0 ... 600 Ω
Voltage output load resistance	10 k Ω min.
Temperature	
Output	Pt1000 RTD
Temperature setpoint	
GMW86PT	10 k Ω potentiometer

Dimensions



All dimensions are in millimeters (mm).

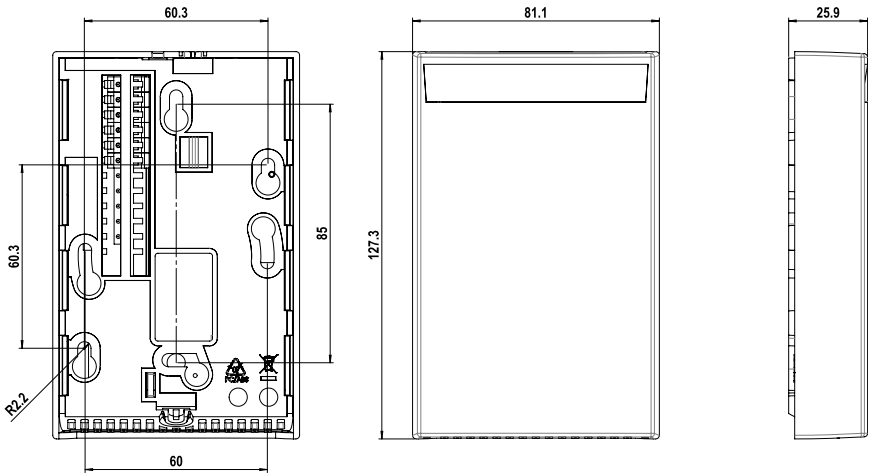


Figure 10 GMW86P Dimensions

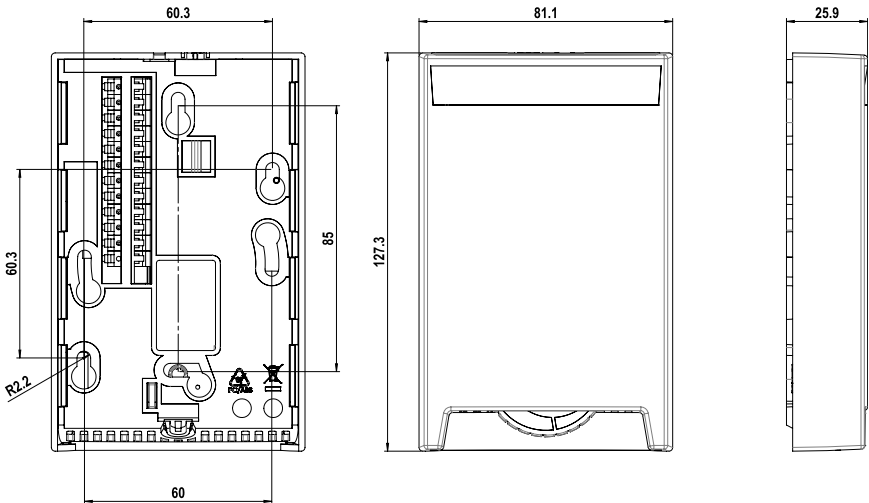


Figure 11 GMW86PT Dimensions

Spare Parts and Accessories



Information on spare parts, accessories, and calibration products is available online at www.vaisala.com and store.vaisala.com.

Table 9 Spare Parts and Accessories

Item	Order Code
CO ₂ module	GM10SP80



www.vaisala.com

