COMET T5140 CO2 Concentration Transmitter with 4-20 mA Output Instruction Manual

Instruction Manual
T5140/T5141/T5145
The programmable transmitter of CO2 concentration with 4-20 mA output
Programmable transmitter of CO2 concentration with 0-10 V output

Contents

General description

The transmitters are designed for the measurement of carbon dioxide and the concentration of air without aggressive ingredients.

T5140	ambient CO2 transmitter with 4 – 20 mA output
T5240	ambient CO2 transmitter with 0 – 10 V output
T5141	CO2 transmitter with cable probe with 4 – 20 mA output
T5241	CO2 transmitter with cable probe with 0 – 10 V output
T5145	duct mount CO2 transmitter with 4 – 20 mA output
T5245	duct mount CO2 transmitter with 0 – 10 V output

A multiple-point CO2 and temperature adjustment procedure lead to excellent CO2 measurement accuracy over the entire temperature working range; this is a must for process control and outdoor applications. The dual wavelength NDIR CO2 sensing procedure compensates automatically for aging effects. The CO2 module is highly resistant to pollution and offers maintenance-free operation and outstanding long-term stability. Measured values can be read in „SLOW mode“ (filtered, averaged) or in „FAST mode“ (current values without averaging). The SLOW mode has advantages in applications like climate control because of filtering short time peaks. As an example exhaled air from an employee passing the sensor could affect the climate control negatively with a short response time because the control would trigger a change of the ventilation based on this one-time measurement. On the contrary in „FAST mode, “ no software filter is used for calculating the output value. This fact adds a noise of typ. ±30ppm which has to be considered in terms of accuracy. Of principle, measurement is the measured value of CO2 concentration depending on the value of air pressure – altitude at the installation site. For this reason, it is suitable for accurate measurement to set the altitude of the installation site by TSensor software (which is available to download free at **www.cometsystem.com**).

Measured values are displayed on the dual-line LCD display. The visual indication of CO2 concentration is provided by a three-color LED. After power-up of the device starts an internal test. During this time (about 20s) LCD display shows (—-) instead of CO2 concentration value. The setting of all parameters of the transmitter serves the user program TSensor. Cable SP003 (optional accessory) use for connecting the device to a personal computer.
Device version TxxxxL with a watertight male connector instead of a cable gland is designed for easy connection/disconnection of the output cable.
Models marked TxxxxZ are non-standard versions of the transmitters. The description is not included in this manual.

Factory settings

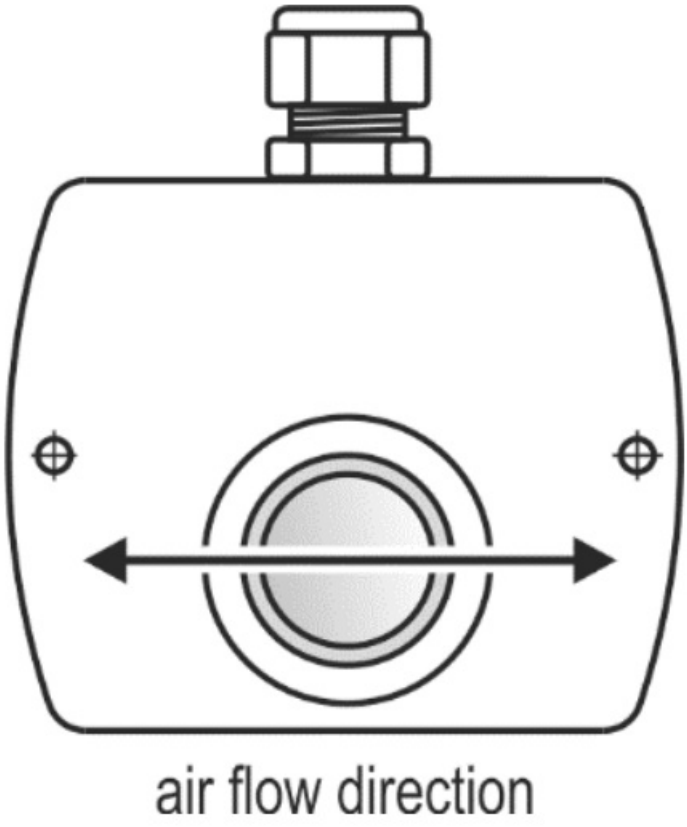
If special setting was not required in the order, the device is set from the manufacturer to the following parameters:

4 – 20 mA output:	corresponds 0 to 2000 ppm (T5140 a T5145) corresponds 0 to 10 000 ppm (T5141)
0 – 10 V output:	corresponds 0 to 2000 ppm (T5240 a T5245) corresponds 0 to 10 000 ppm (T5241)
measurement mode:	„SLOW“
display:	switched ON
LED indication:	up to 1000 ppm lights the green LED from 1000 ppm to 1200 ppm lights yellow LED over 1200 ppm lights red LED
altitude:	300 m above sea level at the installation site

Modification of the setting is possible to do by means of the PC and TSensor program.

Device installation

The housing with electronics of the T5140 (T5240) or T5141 (T5241) transmitter is designed for wall mounting with two screws or bolts.
The T5145 (T5245) transmitter installs by inserting the metal stem into the Pg21 cable gland so that the measured air was fed into the head of the device (see picture). To fasten the stem it is also possible to use the flange PP4 or PP90 (see „Optional accessory").



The external CO2 probe unpacks and connects to the T5141 (T5241) device. Then place the probe into the measured environment.
The connecting terminals are accessible after unscrewing the four screws in the corners of the case and removing the lid. Pass the connecting cable through the released gland and connect the wires to terminals (see „Typical application wiring"). By jumper, J1 selects galvanically or non-galvanically isolated output (T5140, T5141, and T5145). Tighten the gland and screw the lid (check the integrity of the seal). The female connector for connecting the TxxxxL transmitter connects according to the diagram at „Typical application wiring".
For device connection it is recommended to use a shielded cable with an external diameter of 3.5 to 8 mm. Maximum cable length of the current loop is 1200 m, maximum voltage output cable length is 15 m. The cable must be located at indoor rooms and should not be led in parallel along with power cabling. Safety distance is up to 0.5 m, otherwise undesirable induction of interference signals can appear. For the TxxxxL device connection, it is recommended to use a cable with respect to the female connector specification. Do not connect shielding at the connector side

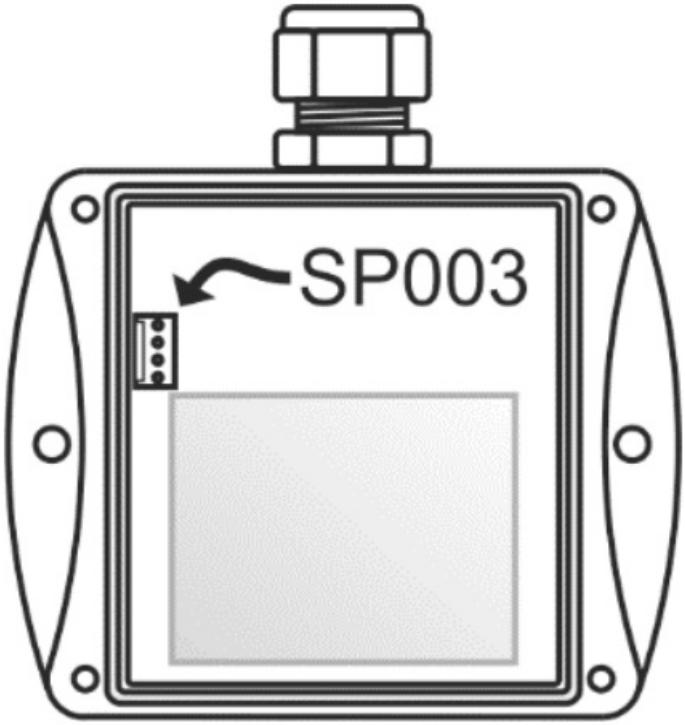
Warning

- Installation, commissioning, and maintenance may only be carried out by personnel with qualifications by applicable regulations and standards.
- Don´t connect the transmitter while the power supply voltage is on.

Modification of device adjustment

Device adjustment is performed by means of the optional SP003 communication cable, connected to the USB port of the PC. It is necessary to have installed the configuration program Tensor on the PC (the program is free to download at **www.cometsystem.com**). During installation please take care about the installation of the driver for USB communication.

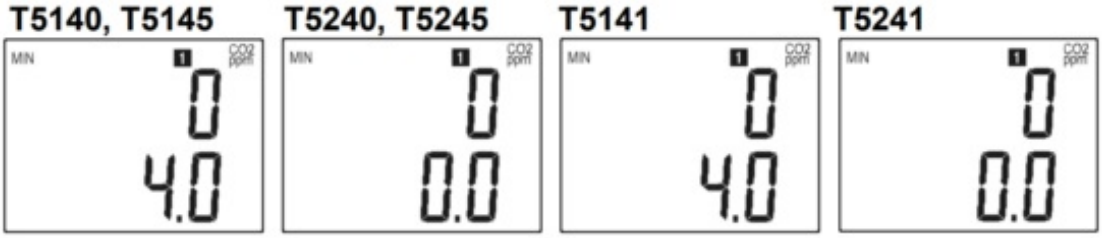
- unscrew four screws of the device lid and remove the lid. If the device is already installed to the measuring system, disconnect wires from terminals
- and connect the SP003 communication cable to the PC. Installed USB driver detect connected to cable and create virtual COM port inside the PC



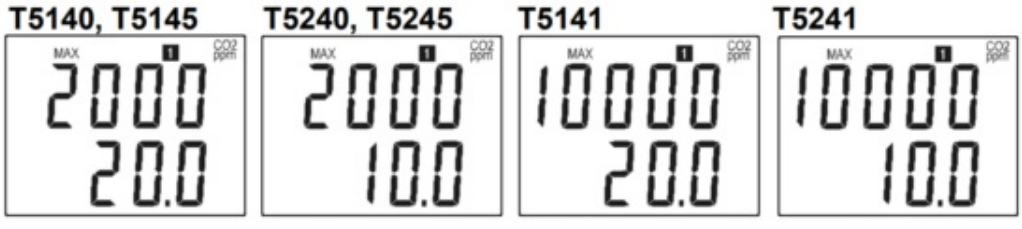
- run installed Tensor program and continue in accordance with his instructions
- when a new setting is saved and finished, disconnect the cable from the device, connect wires to its terminals and place the lid back to the device

Info mode

Several settings of the installed transmitter are possible to verify without the use of the computer. It is necessary to connect the power supply. Unscrew the transmitter lid and shortly press the button (the right of the terminal) by means of a tool (e.g. screwdriver). The upper line of the LCD display shows the value of CO2 concentration corresponding to output current 4 mA (output voltage 0 V)



Press the button again to get the value of CO2 concentration corresponding to the output current 20 mA (output voltage 10 V).



Press the button again to end info mode and display actual measured values.

Warning

During info mode, no measurement and no output current generation proceed. The transmitter stays at info mode for 15 s, and then automatically goes back to the measuring cycle.

Error states of the device

The device continuously checks its state during operation. In case the error is found LCD displays the corresponding error code:

Error 0 –

first-line displays „Err0“ (output current value is < 3.8 mA). Checksum error of stored setting inside device’s memory. This error appears if an incorrect writing procedure to the device’s memory occurred or if the damage to calibration data appeared. At this stage, the device does not measure. It is a serious error, contact the distributor of the device

o, fix.

Error 2

there is a reading „Err2“ on the LCD display. The CO2 concentration measurement error occurred.

Error 3 –

there is a reading „Err3“ on the LCD display upper line. The error of the internal A/D converter appeared (converter does not respond, probably damage of A/D converter). This error does not affect CO2 concentration measurement. If it is a serious error, contact the distributor of the device.

Error 4 –

there is a reading „Err4“ on the LCD display. It is an internal device error during the initialization of the CO2 sensor. Under this condition, the device does not measure the concentration of CO2. The value read from the device is -9999. The CO2 sensor is probably damaged. It is a serious error, contact the distributor of the device.

Technical support and service

Technical and services are provided by the distributor. For contact see warranty certificate. You can use the discussion forum at the web address **www. forum. comet system. CZ.**

Technical data

T5140 – ambient air CO2 transmitter

Output:	4 to 20 mA
Power:	9 to 30 V dc
Power consumption:	1 W during normal operation
Output in case of error:	max. 4 W (for 50 ms with 15 s period)
Concentration of CO2:	< 3.8 mA or > 24 mA
Accuracy:	± (50 ppm + 2 % of measuring value)
Range:	(at temperature 25 ° and pressure 1013 hPa)
Temp. dependence:	0 to 2 000 ppm
Long term stability:	typ. 2 ppm / °C in the range -20 to 45 °C
Resolution:	typ. 20 ppm / year
Response time:	1 ppm
	t90 < 105 s in “SLOW” measurement mode
	t90 < 60 s in “FAST” measurement mode

T5240 – ambient air CO2 transmitter

Output: Power: Power consumption: Output in case of error: Concentration of CO2: Accuracy: Range: Temp. dependence: Long term stability: Resolution: Response time:	0 to 10 V 15 to 30 V dc 0.5 W during normal operation max. 3 W (for 50 ms with 15 s period) < -0.1 V or > 10.5 V ± (50 ppm + 2 % of measuring value) (at temperature 25 ° and pressure 1013 hPa) 0 to 2 000 ppm typ. 2 ppm / °C in the range -20 to 45 °C typ. 20 ppm / year 1 ppm t90 < 105 s in “SLOW” measurement mode t90 < 60 s in “FAST” measurement mode

T5141 – CO2 transmitter with external probe

Output: Power: Power consumption: Output in case of error: Concentration of CO2: Accuracy: Range: Temp. dependence: Long term stability: Resolution: Response time:	4 to 20 mA 9 to 30 V dc 1 W during normal operation max. 4 W (for 50 ms with 15 s period) < 3.8 mA or > 24 mA ± (110 ppm + 5 % of measuring value) (at temperature 25 ° and pressure 1013 hPa) 0 to 10 000 ppm ± (1 + CO2 koncentrace [ppm] / 1000) ppm / °C (in the range -20 to 45 °C) typ. 20 ppm / year 1 ppm t90 < 105 s in “SLOW” measurement mode t90 < 60 s in “FAST” measurement mode

T5241 – CO2 transmitter with external probe

Output: Power: Power consumption: Output in case of error: Concentration of CO2: Accuracy: Range: Temp. dependence: Long term stability: Resolution: Response time:	0 to 10 V 15 to 30 V dc 0.5 W during normal operation max. 3 W (for 50 ms with 15 s period) < -0.1 V or > 10.5 V ± (110 ppm + 5 % of measuring value) (at temperature 25 ° and pressure 1013 hPa) 0 to 10 000 ppm ± (1 + CO2 koncentrace [ppm] / 1000) ppm / °C(in the range -20 to 45 °C) typ. 20 ppm / year 1 ppm t90 < 105 s in “SLOW” measurement mode t90 < 60 s in “FAST” measurement mode

T5145 – CO2 duct mount transmitter

Output: Power: Power consumption: Output in case of error:Concentration of CO 2: Accuracy: Range: Temp. dependence: Long term stability: Resolution: Response time:	4 to 20 mA 9 to 30 V dc 1 W during normal operation max. 4 W (for 50 ms with 15 s perio d) < 3.8 mA or > 24 mA ± (50 ppm + 2 % of measuring value) (at temperature 25 ° and pr essure 1013 hPa) 0 to 2 000 ppm typ. 2 ppm / °C in the range -20 to 45 °C typ. 20 ppm / year 1 ppm t90 < 105 s in “SLOW” measurement mode t90 < 60 s in “FAST” measurement mode

T5245 – CO2 duct mount transmitter

Output: Power: Power consumption: Output in case of error: Concentration of C O2: Accuracy: Range: Temp. dependence: Long term stability: Resolution: Response time: rozsah:	0 to 10 V 15 to 30 V dc 0.5 W during normal operation max. 3 W (for 50 ms with 15 s peri od) < -0.1 V or > 10.5 V ± (50 ppm + 2 % of measuring value) (at temperature 25 ° and pr essure 1013 hPa) 0 to 2 000 ppm typ. 2 ppm / °C in the range -20 to 45 °C typ. 20 ppm / year 1 ppm t90 < 105 s in “SLOW” measurement mode 0 až 2 000 ppm

General

Protection:

IP30	T5140(L), T5240(L)
IP65 (device with probe)	T5141(L), T5241(L)
IP20	T5145(L), T5245(L)

Recommended interval of calibration:
5 year
Working position:

cable gland upwards	T5140(L), T5240(L)
any position	T5141(L), T5241(L)
any position *)	T5145(L), T5245(L)

*) The holes on the stem must be routed in the direction of the air flow, see chapter “Device installation”.

Electromagnetic compatibility:
EN 61326-1
Storage temperature range:
-40 to +60 °C
Storage relative humidity range:
5 to +95 °C
Storage atmospheric pressure range:
700 to 1100 hPa
Cable length of probe:

1 m, 2 m or 4 m	T5141(L), T5241(L)

Weight: approximately

T5140(L), T5240(L)	150 g
T5141(L), T5241(L) 1m probe	250 g
T5141(L), T5241(L) 2m probe	280 g
T5141(L), T5241(L) 4m probe	340 g
T5145(L), T5245(L)	260 g

Housing material:
ABS

Operation conditions

Operating temperature range of housing with electronics:

-30 to +60 °C	T5140(L), T5240(L), T5145(L), T5245(L)
-30 to +80 °C	T5141(L), T5241(L)

It is recommended to switch off the LCD display at ambient temperatures above 70 °C.

Operating temperature range of the measuring end of stem:

-30 to +60 °C	T5145(L), T5245(L)

Operating temperature range of CO2 probe:

-40 to +60 °C	T5141(L), T5241(L)

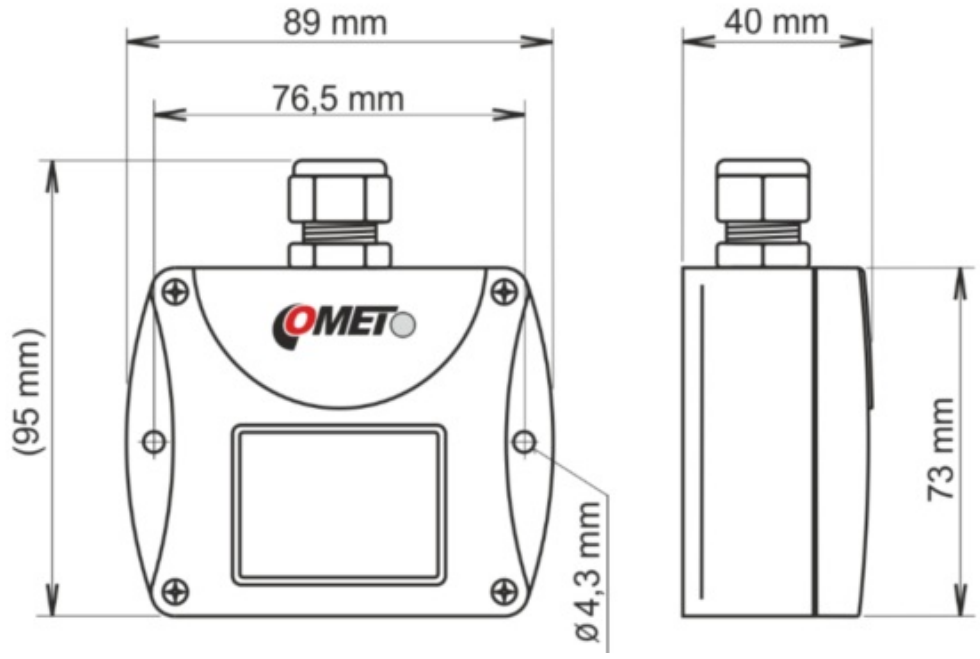
Operating relative humidity range:

5 to 95 %RH	T5140(L), T5240(L), T5145(L), T5245(L)
0 to 100 %RH (no condensation)	T5141(L), T5241(L)

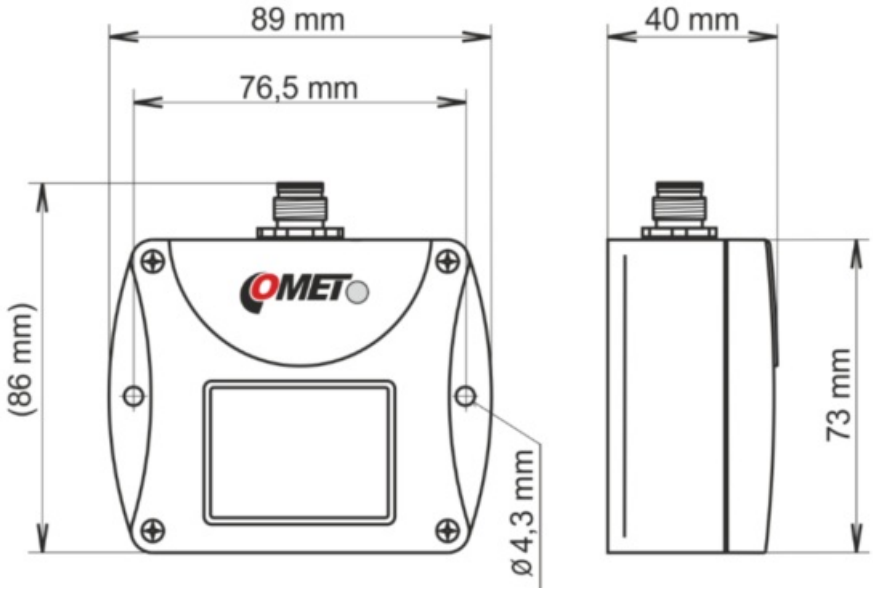
Operating pressure range:
850 to 1100 hPa
End of operation
Dispose of the device according to statutory regulations.

Dimensions

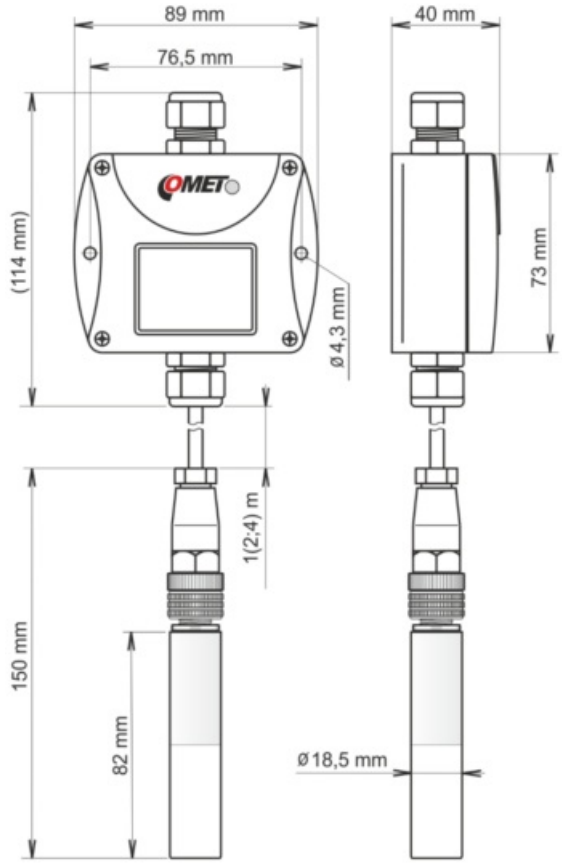
T5140/T5240



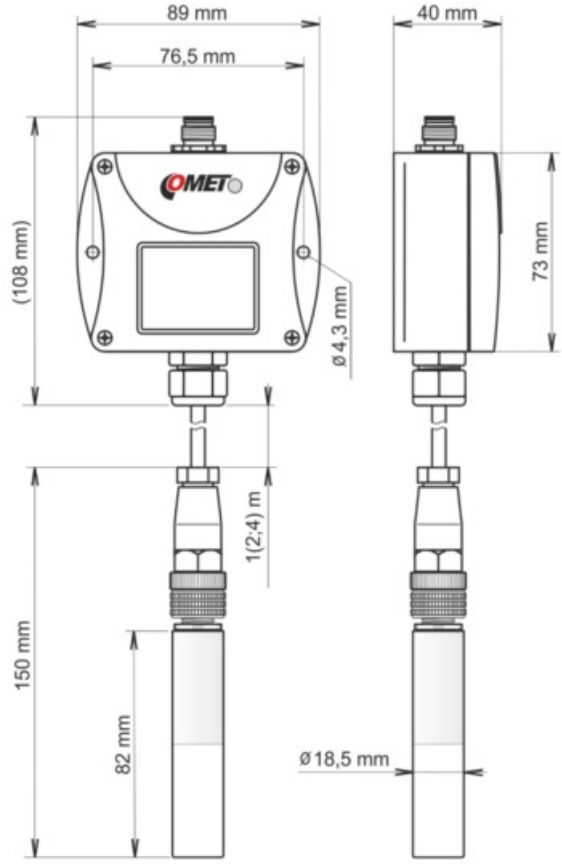
T5140L
T5240L



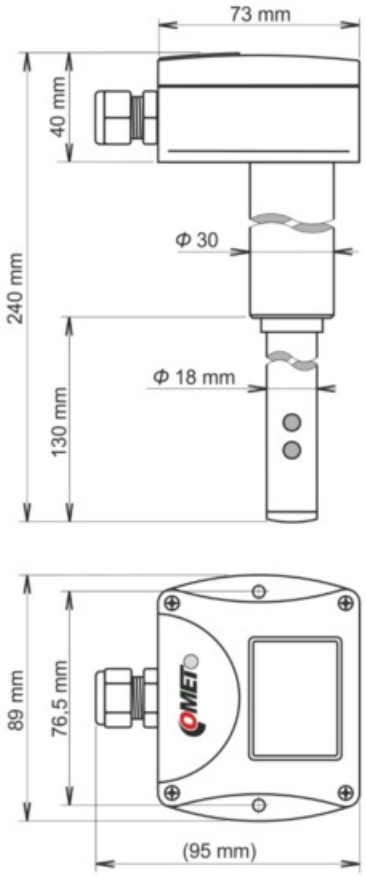
T5141
T5241



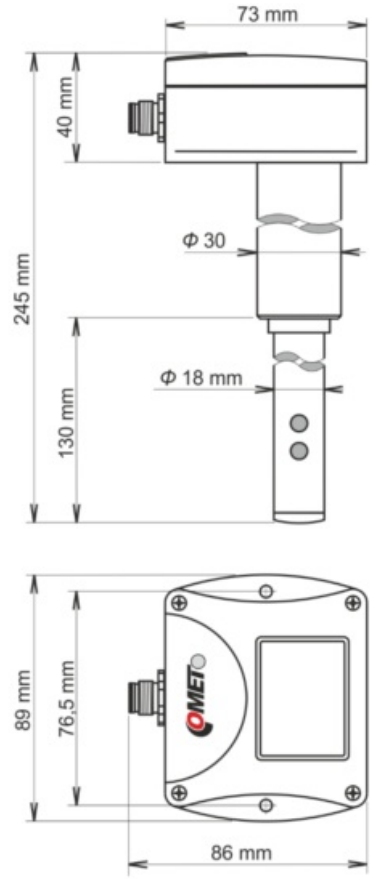
T5141L
T5241L



T5145
T5245



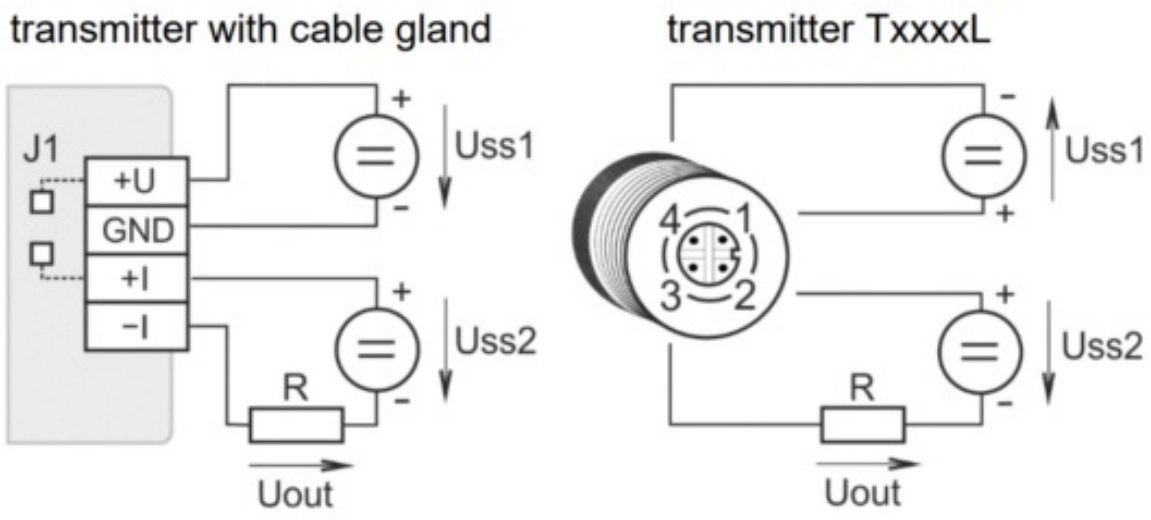
T5145L
T5245L



Typical application wiring

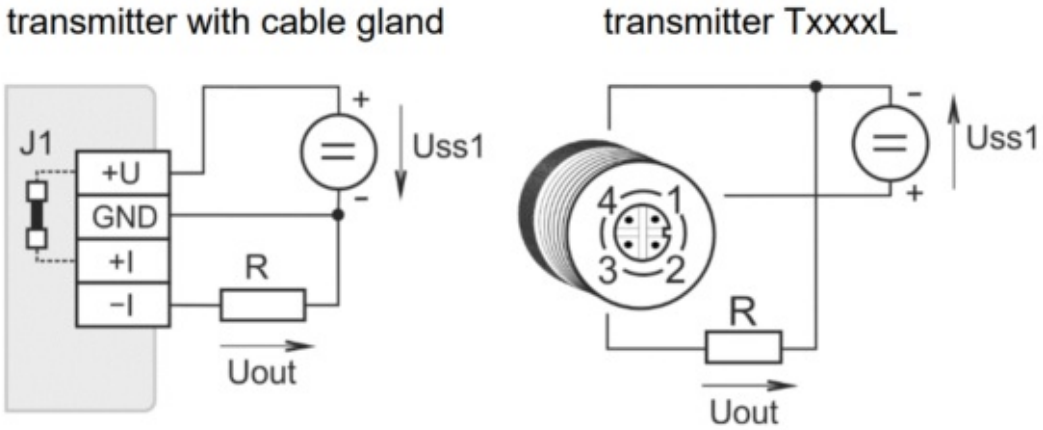
A device with 4-20 mA output can be connected to the circuitry by means of the galvanically isolated or galvanically non-isolated current loop. Output 0 – 10 V is galvanically non-isolated.

Galvanically isolated 4 – 20 mA output



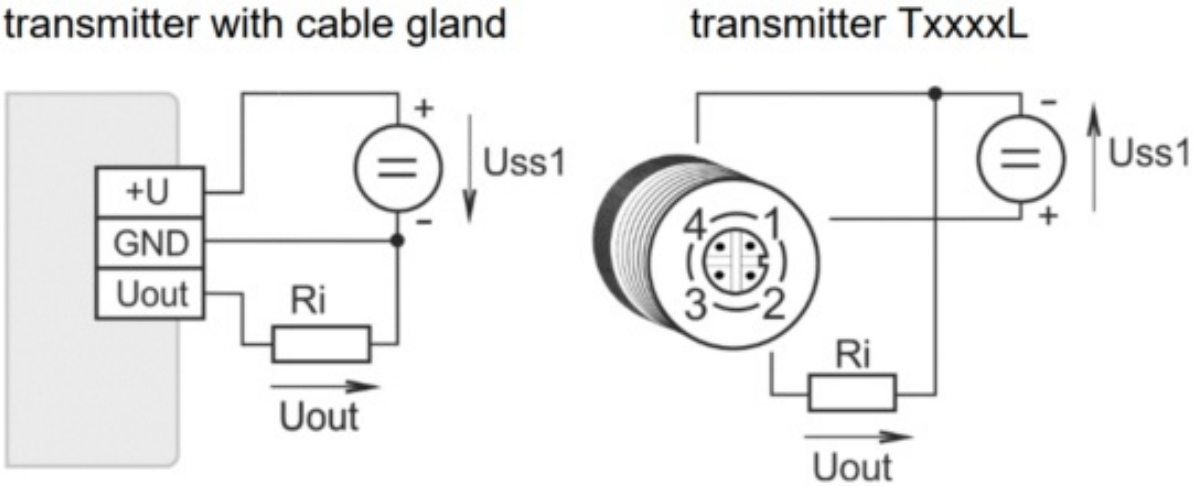
Loop resistance value Rc = R + resistance of wires shall fulfill the condition Rc[Ω] < 40 x Uss2[V] – 360.

Galvanically non-isolated 4 – 20 mA output



Loop resistance value Rc = R + resistance of wires shall fulfill the condition Rc[Ω] < 40 x Uss1[V] – 360.

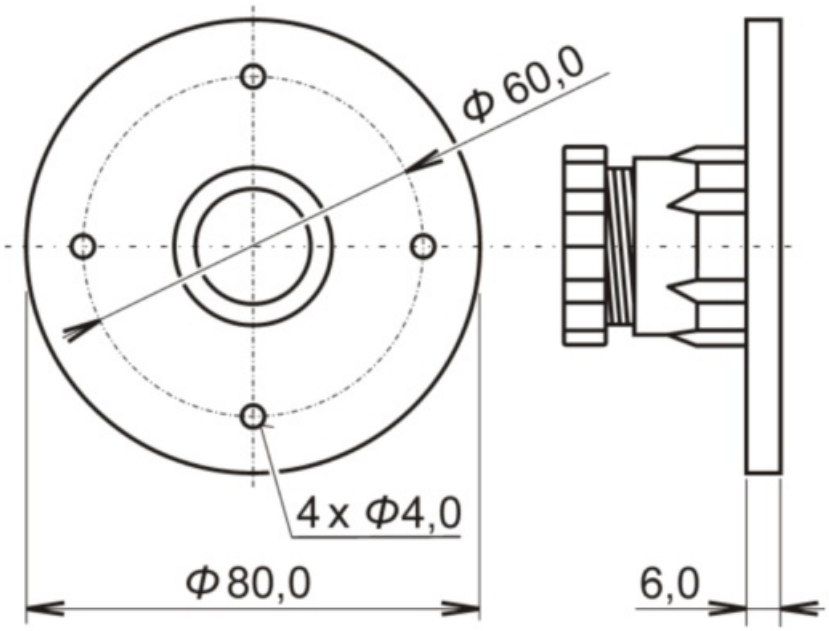
Galvanically nonisolated 0 – 10 V output



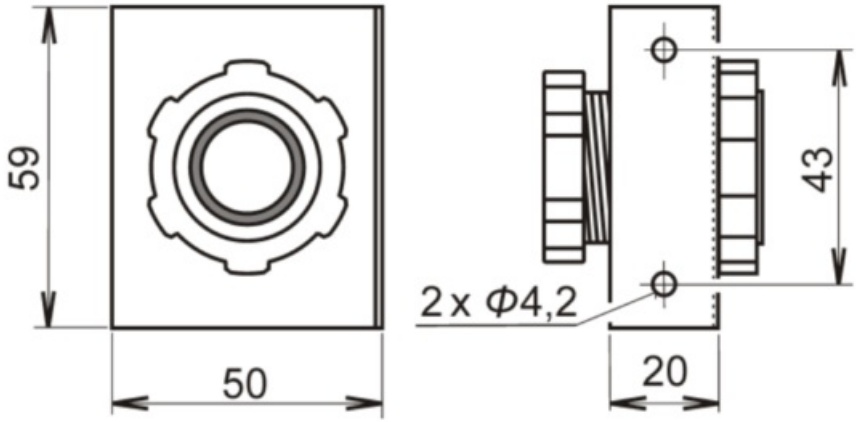
The value of the internal resistance (Ri) of the measuring instrument must be greater than 20 kΩ.

Optional accessory

Mounting flange PP4



Mounting flange PP90



Read carefully instruction manual before the first device connection.
Contact address of this device's producer:

COMET SYSTEM, s.r.o.
Bezrucova 2901
756 61 Roznov pod Radhostem
Czech Republic
www.cometsystem.com

Documents / Resources

	**COMET T5140 CO2 Concentration Transmitter with 4-20 mA Output** [pdf] Instruction Manual T5140, T5141, T5145, T5140 CO2 Concentration Transmitter with 4-20 mA Output, CO2 Concentration Transmitter with 4-20 mA Output, T5240, T5241, T5245

References

- Manufacturer of Dataloggers, Thermometers, Hygrometers,CO2 meters
- Manufacturer of Dataloggers, Thermometers, Hygrometers,CO2 meters
- Comet system forum
- Comet system forum