



# Instruction Manual

T5140

T5141

T5145

Programmable transmitter of CO<sub>2</sub> concentration  
with 4-20 mA output

T5240

T5241

T5245

Programmable transmitter of CO<sub>2</sub> concentration  
with 0-10 V output

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Manufacturer is not responsible for damages caused by using the device in conflict with this manual.

To damages caused by using the device in conflict with this manual can not be provide free repairs during the warranty period.

Read carefully instruction manual before the first device connection.

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## General description

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

<b>T5140</b>	ambient CO <sub>2</sub> transmitter with 4 – 20 mA output
<b>T5240</b>	ambient CO <sub>2</sub> transmitter with 0 – 10 V output
<b>T5141</b>	CO <sub>2</sub> transmitter with cable probe with 4 – 20 mA output
<b>T5241</b>	CO <sub>2</sub> transmitter with cable probe with 0 – 10 V output
<b>T5145</b>	duct mount CO <sub>2</sub> transmitter with 4 – 20 mA output
<b>T5245</b>	duct mount CO <sub>2</sub> transmitter with 0 – 10 V output

A multiple point CO<sub>2</sub> and temperature adjustment procedure leads to excellent CO<sub>2</sub> measurement accuracy over the entire temperature working range; this is a must for process control and outdoor applications. The dual wavelength NDIR CO<sub>2</sub> sensing procedure compensates automatically for ageing effects. The CO<sub>2</sub> 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). 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 CO<sub>2</sub> concentration depends 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 (is available to download free [www.cometsystem.com](http://www.cometsystem.com)).

Measured values are displayed on dual line LCD display. The visual indication of CO<sub>2</sub> concentration is provided by three-color LED.

After power up of the device starts internal test. During this time (about 20s) LCD display shows (----) instead of CO<sub>2</sub> concentration value.

For setting of all parameters of the transmitter serves the user program *TSensor*. Cable SP003 (optional accessory) use for connection the device to a personal computer.

**Device version TxxxxL** with 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. Description is not included in this manual.

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# Factory settings

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

<b>4 - 20 mA output:</b>	corresponds 0 to 2000 ppm (T5140 a T5145) corresponds 0 to 10 000 ppm (T5141)
<b>0 - 10 V output:</b>	corresponds 0 to 2000 ppm (T5240 a T5245) corresponds 0 to 10 000 ppm (T5241)
<b>measurement mode:</b>	„SLOW“
<b>display:</b>	switched ON
<b>LED indication:</b>	up to 1000 ppm lights green LED from 1000 ppm to 1200 ppm lights yellow LED over 1200 ppm lights red LED
<b>altitude:</b>	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.

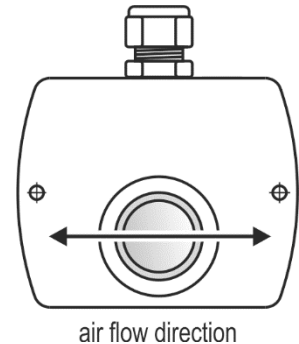
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## Device installation

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 install by inserting the metal stem into the Pg21 cable gland so that the measured air was fed into the head of device (see picture). To fasten the stem it is also possible to use the flange PP4 or PP90 (see „*Optional accessory*“).

The external CO<sub>2</sub> probe unpack and connect 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 released gland and connect the wires to terminals (see „*Typical application wiring*“). By jumper J1 select 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 TxxxxL transmitter connect according to the diagram at „*Typical application wiring*“.

For device connection it is recommended to use a shielded cable with external diameter 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 power cabling. Safety distance is up to 0.5 m, otherwise undesirable induction of interference signals can appear. For TxxxxL devices connection it is recommended to use cable with respect to the female connector specification. Do not connect shielding at connector side

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### Warning

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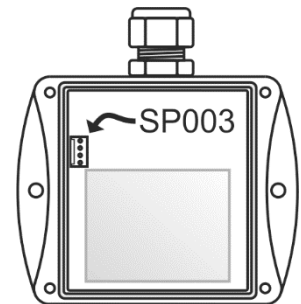
- Installation, commissioning and maintenance may only be carried out by personnel with qualification by applicable regulations and standards.
  - Don't connect transmitter while power supply voltage is on.
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## Modification of device adjustment

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

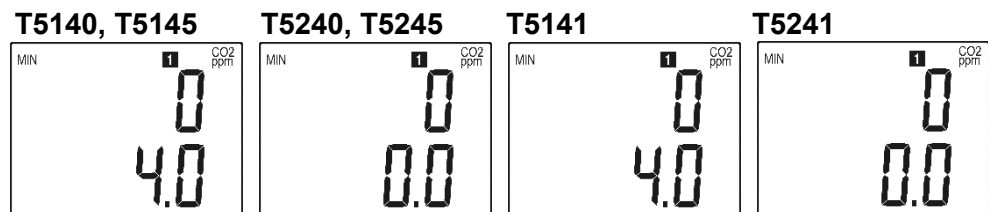
- unscrew four screws of the device lid and remove the lid. If device is already installed to measuring system, disconnect wires from terminals
- connect SP003 communication cable to the PC. Installed USB driver detect connected cable and create virtual COM port inside the PC
- run installed Tsensor program and continue in accordance with his instructions
- when new setting is saved and finished, disconnect the cable from the device, connect wires into its terminals and place the lid back to the device



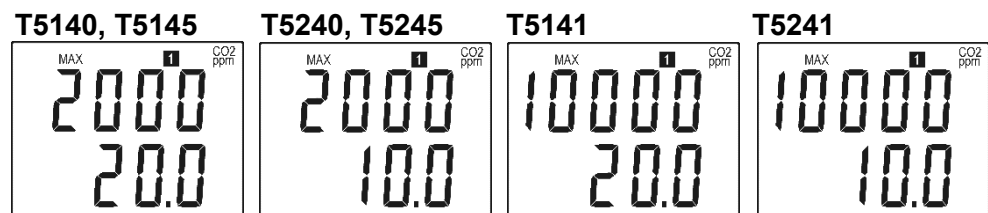
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## Info mode

Several settings of installed transmitter are possible to verify without a use of the computer. It is necessary to connect power supply. Unscrew the transmitter lid and shortly press button (the right of the terminal) by means of a tool (e.g. screwdriver). Upper line of the LCD display shows value of CO<sub>2</sub> concentration corresponding to output current 4mA (output voltage 0V)



Press button again to get value of CO<sub>2</sub> concentration corresponding to output current 20mA (output voltage 10V).



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

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### Warning

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

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## Error states of the device

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

- Error 0** - first line displays „Err0“ (output current value is < 3.8 mA). Check sum error of stored setting inside device's memory. This error appears if incorrect writing procedure to device's memory occurred or if damage of calibration data appeared. At this state device does not measure. It is a serious error, contact distributor of the device to fix.
- Error 2** - there is a reading „Err2“ on LCD display. The CO<sub>2</sub> concentration measurement error occurred.
- Error 3** - there is a reading „Err3“ on LCD display upper line. Error of internal A/D converter appeared (converter does not respond, probably damage of A/D converter). This error does not affect CO<sub>2</sub> concentration measurement. It is a serious error, contact distributor of the device.
- Error 4** - there is a reading „Err4“ on LCD display. It is internal device error during initialization of CO<sub>2</sub> sensor. Under this condition device does not measure concentration of CO<sub>2</sub>. Value read from device is -9999. CO<sub>2</sub> sensor is probably damaged. It is a serious error, contact distributor of the device.

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## Technical support and service

Technical and service is provided by distributor. For contact see warranty certificate. You can use discussion forum at web address [www.forum.cometsystem.cz](http://www.forum.cometsystem.cz).

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# Technical data

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## T5140 – ambient air CO<sub>2</sub> transmitter

<b>Output:</b>	4 to 20 mA
<b>Power:</b>	9 to 30 V
<b>Power consumption:</b>	1 W during normal operation max. 4 W (for 50 ms with 15 s period)
<b>Output in case of error:</b>	< 3.8 mA or > 24 mA
<b>Concentration of CO<sub>2</sub>:</b>	
Accuracy:	± (50 ppm + 2 % of measuring value) (at temperature 25 ° and pressure 1013 hPa)
Range:	0 to 2 000 ppm
Temp. dependence:	typ. 2 ppm / °C in the range -20 to 45 °C
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t <sub>90</sub> < 105 s in “SLOW” measurement mode t <sub>90</sub> < 60 s in “FAST” measurement mode

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## T5240 – ambient air CO<sub>2</sub> transmitter

<b>Output:</b>	0 to 10 V
<b>Power:</b>	15 to 30 V
<b>Power consumption:</b>	0.5 W during normal operation max. 3 W (for 50 ms with 15 s period)
<b>Output in case of error:</b>	< -0.1 V or > 10.5 V
<b>Concentration of CO<sub>2</sub>:</b>	
Accuracy:	± (50 ppm + 2 % of measuring value) (at temperature 25 ° and pressure 1013 hPa)
Range:	0 to 2 000 ppm
Temp. dependence:	typ. 2 ppm / °C in the range -20 to 45 °C
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t <sub>90</sub> < 105 s in “SLOW” measurement mode t <sub>90</sub> < 60 s in “FAST” measurement mode

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## T5141 – CO<sub>2</sub> transmitter with external probe

<b>Output:</b>	4 to 20 mA
<b>Power:</b>	9 to 30 V
<b>Power consumption:</b>	1 W during normal operation max. 4 W (for 50 ms with 15 s period)
<b>Output in case of error:</b>	< 3.8 mA or > 24 mA
<b>Concentration of CO<sub>2</sub>:</b>	
Accuracy:	± (110 ppm + 5 % of measuring value) (at temperature 25 ° and pressure 1013 hPa)
Range:	0 to 10 000 ppm
Temp. dependence:	± (1 + CO <sub>2</sub> koncentre [ppm] / 1000) ppm / °C (in the range -20 to 45 °C)
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t <sub>90</sub> < 105 s in "SLOW" measurement mode t <sub>90</sub> < 60 s in "FAST" measurement mode

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## T5241 – CO<sub>2</sub> transmitter with external probe

<b>Output:</b>	0 to 10 V
<b>Power:</b>	15 to 30 V
<b>Power consumption:</b>	0.5 W during normal operation max. 3 W (for 50 ms with 15 s period)
<b>Output in case of error:</b>	< -0.1 V or > 10.5 V
<b>Concentration of CO<sub>2</sub>:</b>	
Accuracy:	± (110 ppm + 5 % of measuring value) (at temperature 25 ° and pressure 1013 hPa)
Range:	0 to 10 000 ppm
Temp. dependence:	± (1 + CO <sub>2</sub> koncentre [ppm] / 1000) ppm / °C (in the range -20 to 45 °C)
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t <sub>90</sub> < 105 s in "SLOW" measurement mode t <sub>90</sub> < 60 s in "FAST" measurement mode

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## T5145 – CO<sub>2</sub> duct mount transmitter

<b>Output:</b>	4 to 20 mA
<b>Power:</b>	9 to 30 V
<b>Power consumption:</b>	1 W during normal operation max. 4 W (for 50 ms with 15 s period)
<b>Output in case of error:</b>	< 3.8 mA or > 24 mA
<b>Concentration of CO<sub>2</sub>:</b>	
Accuracy:	± (50 ppm + 2 % of measuring value) (at temperature 25 ° and pressure 1013 hPa)
Range:	0 to 2 000 ppm
Temp. dependence:	typ. 2 ppm / °C in the range -20 to 45 °C
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t <sub>90</sub> < 105 s in “SLOW” measurement mode t <sub>90</sub> < 60 s in “FAST” measurement mode

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## T5245 – CO<sub>2</sub> duct mount transmitter

<b>Output:</b>	0 to 10 V
<b>Power:</b>	15 to 30 V
<b>Power consumption:</b>	0.5 W during normal operation max. 3 W (for 50 ms with 15 s period)
<b>Output in case of error:</b>	< -0.1 V or > 10.5 V
<b>Concentration of CO<sub>2</sub>:</b>	
Accuracy:	± (50 ppm + 2 % of measuring value) (at temperature 25 ° and pressure 1013 hPa)
Range:	0 to 2 000 ppm
Temp. dependence:	typ. 2 ppm / °C in the range -20 to 45 °C
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t <sub>90</sub> < 105 s in “SLOW” measurement mode
rozsař:	0 ař 2 000 ppm

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## 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)
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**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

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## 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 CO<sub>2</sub> 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

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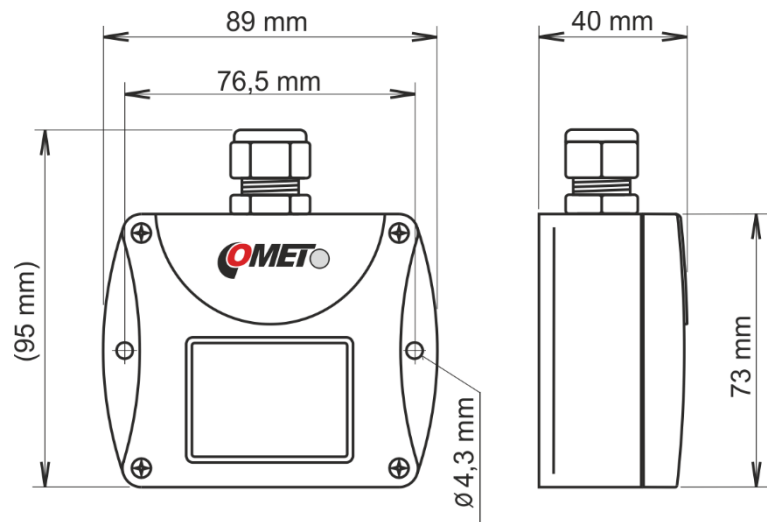
## End of operation

Dispose of the device according to statutory regulations.

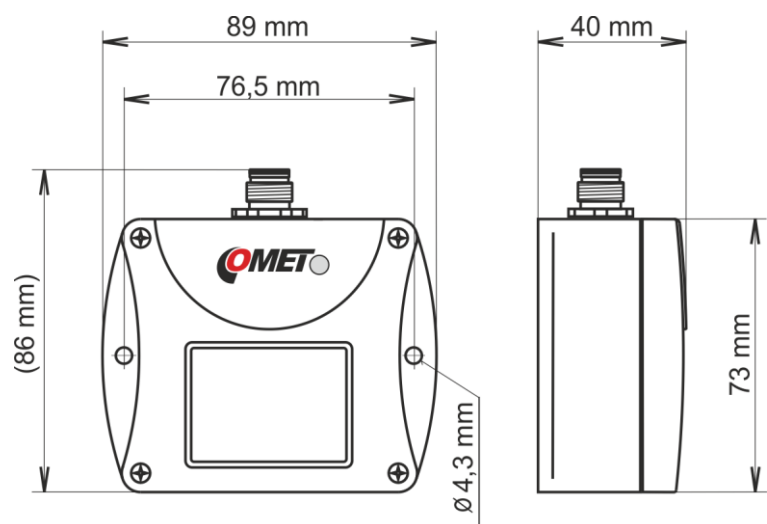
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## Dimensions

**T5140  
T5240**

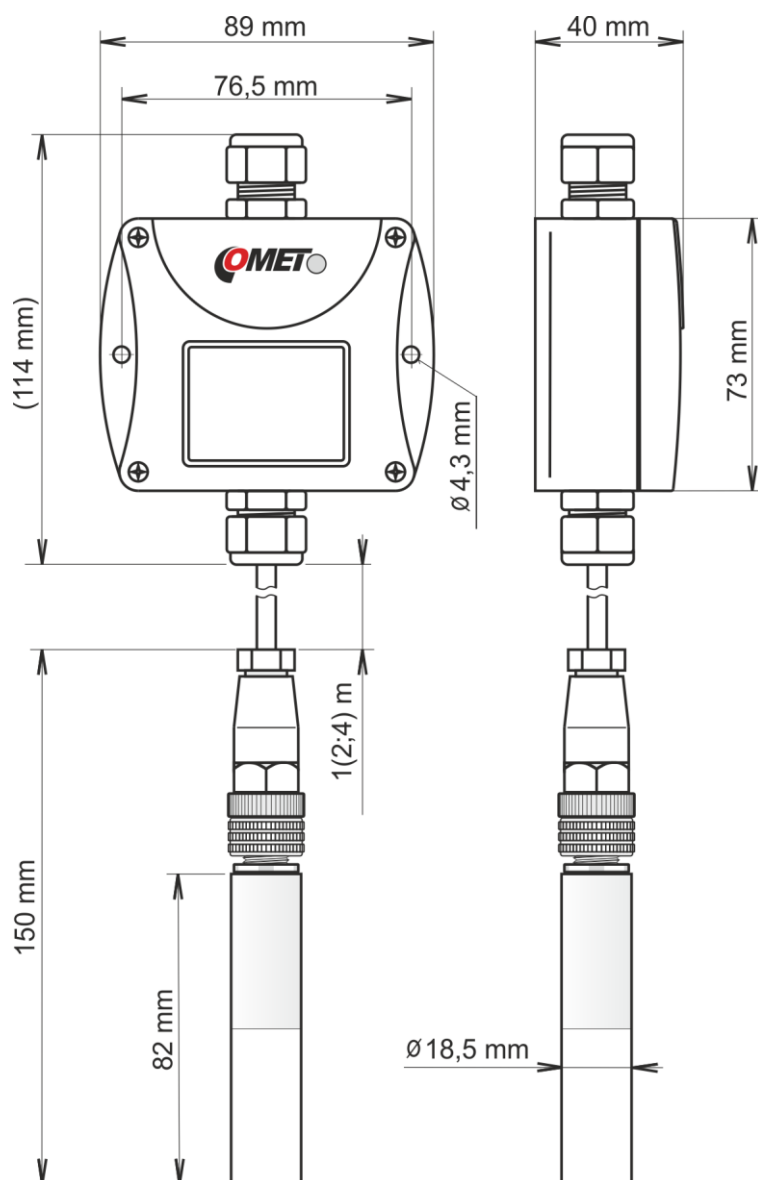


**T5140L  
T5240L**

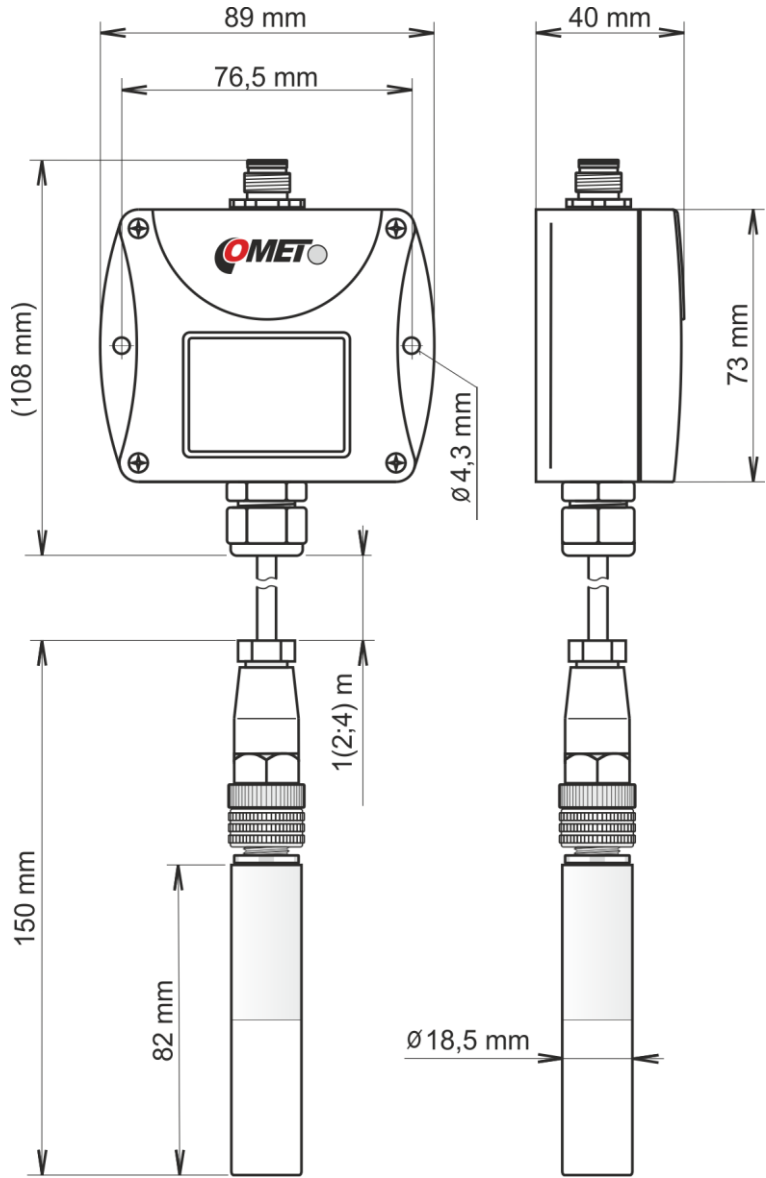




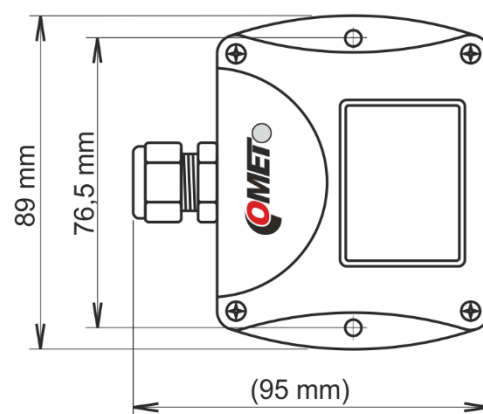
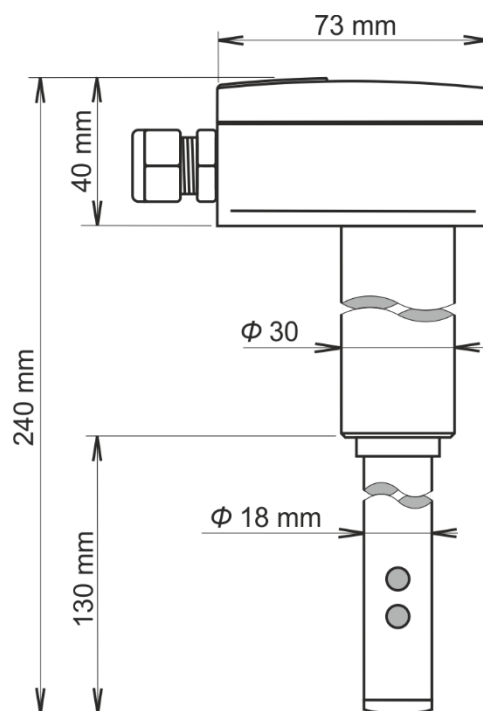
T5141  
T5241



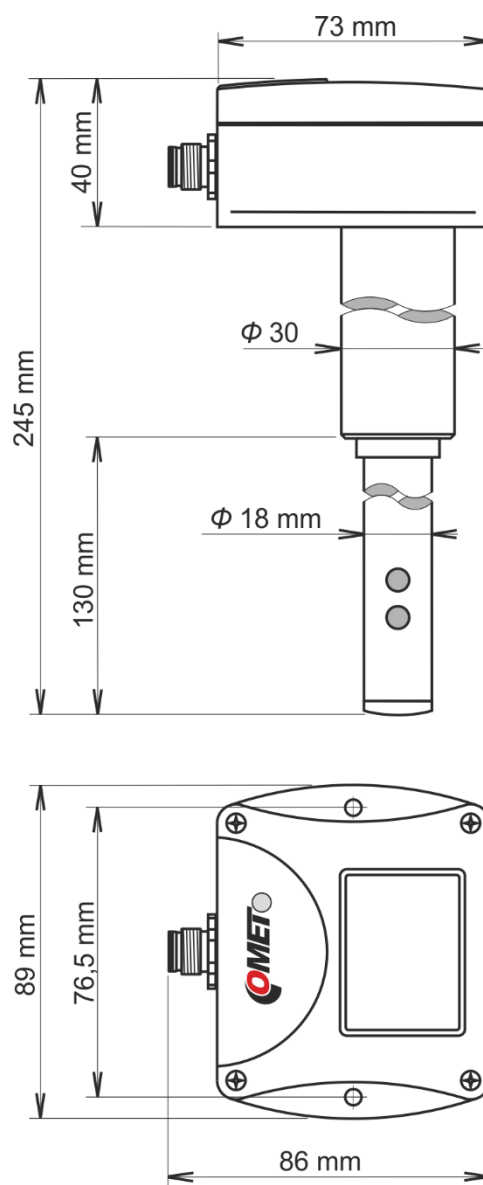
T5141L  
T5241L



T5145  
T5245



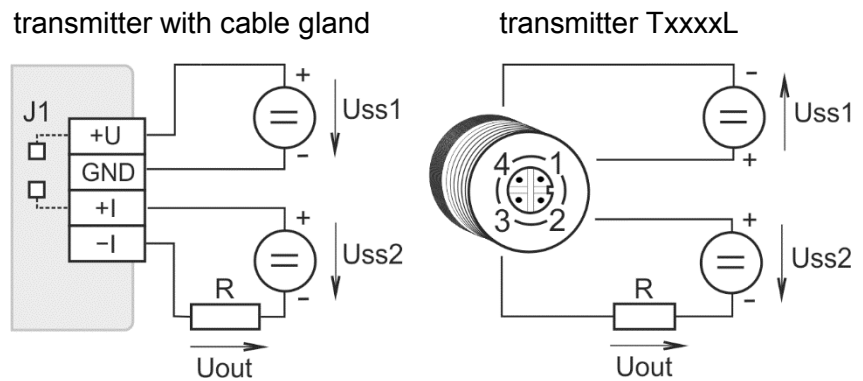
T5145L  
T5245L



## Typical application wiring

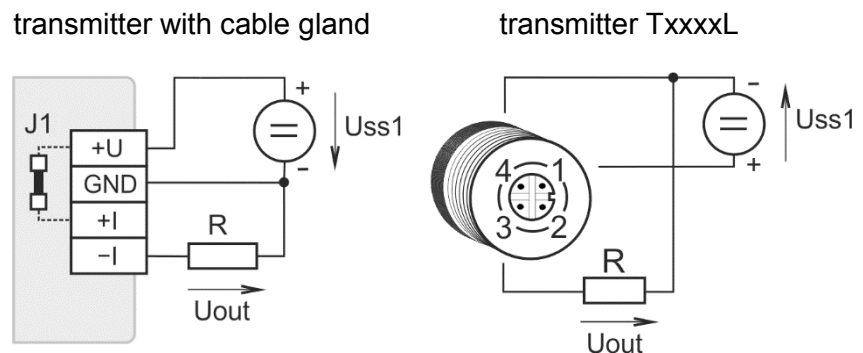
Device with 4-20 mA output can be connected to circuitry by means of galvanically isolated or galvanically non-isolated current loop. Output 0 - 10 V is galvanically non-isolated.

### Galvanically isolated 4 - 20 mA output



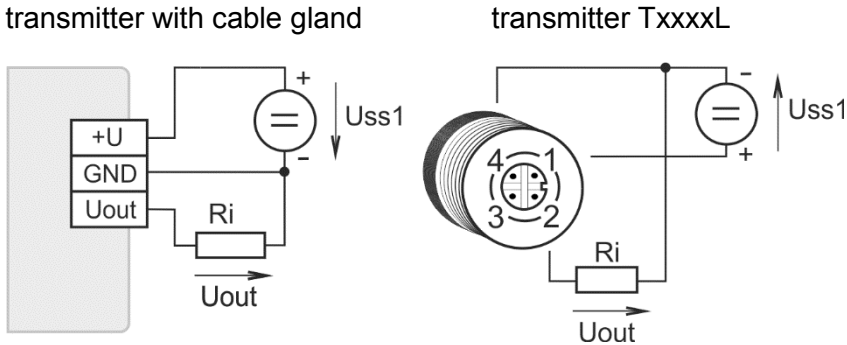
Loop resistance value  $R_c = R + \text{resistance of wires}$  shall fulfill the condition  $R_c[\Omega] < 40 \times U_{ss2}[V] - 360$ .

### Galvanically non-isolated 4 - 20 mA output



Loop resistance value  $R_c = R + \text{resistance of wires}$  shall fulfill the condition  $R_c[\Omega] < 40 \times U_{ss1}[V] - 360$ .

**Galvanically non isolated 0 - 10 V output**

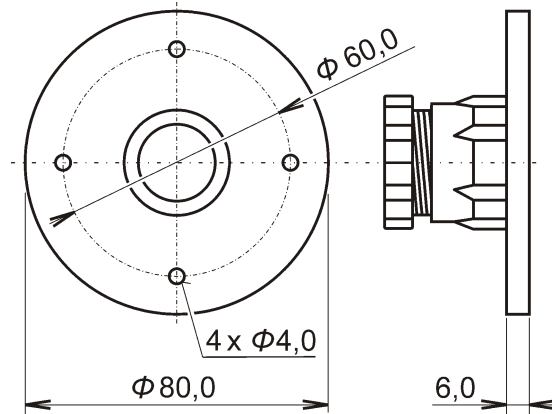


The value of the internal resistance ( $R_i$ ) of the measuring instrument must be greater than 20 k $\Omega$ .

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# Optional accessory

## Mounting flange PP4



## Mounting flange PP90

