

Instruction Manual

T5140

T5141

T5145

Programmable transmitter of CO₂ concentration
with 4-20 mA output

T5240

T5241

T5245

Programmable transmitter of CO₂ 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.

Contact address of this device's producer:

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

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General description

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

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

A multiple point CO₂ and temperature adjustment procedure leads 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 ageing 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). 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.

Measured values are displayed on dual line LCD display. The visual indication of CO₂ 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 CO₂ 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.

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 5000 ppm (T5140 a T5145) corresponds 0 to 10 000 ppm (T5141)
0 - 10 V output:	corresponds 0 to 5000 ppm (T5240 a T5245) corresponds 0 to 10 000 ppm (T5241)
measurement mode:	„SLOW“
display:	switched ON
LED indication:	up to 1000 ppm lights green LED from 1000 ppm to 1200 ppm lights yellow LED over 1200 ppm lights red LED

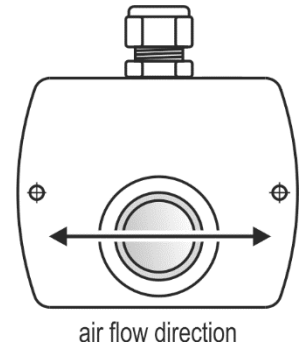
Modification of the setting is possible to do by means of the PC and *TSensor* program.

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 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 CO₂ 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

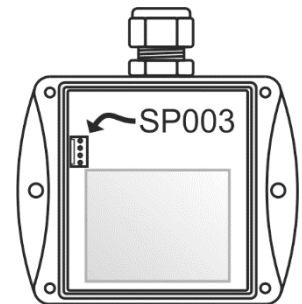
Warning

- 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.
-

Modification of device adjustment

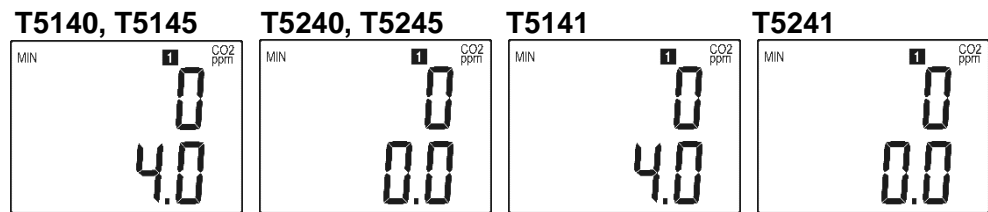
Device adjustment is performed by means of the optional SP003 communication cable, connected to USB port of the PC. It is necessary to have installed configuration program TSensor on the PC (program is free to download at www.cometsystem.com). During installation, please take care about installation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

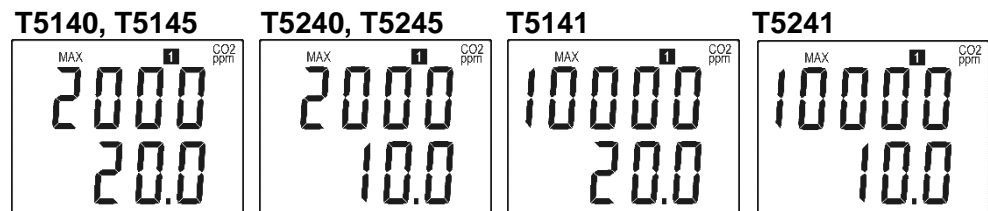


Info mode

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 CO₂ concentration corresponding to output current 4 mA (output voltage 0 V)



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



Press 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 15 s, and then automatically goes back to measuring cycle.

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 CO₂ 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 CO₂ 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 CO₂ sensor. Under this condition device does not measure concentration of CO₂. Value read from device is -9999. CO₂ sensor is probably damaged. It is a serious error, contact distributor of the device. For devices with an external probe CO2G-10 the „Err4“ indicates that the probe is not connected.

Technical support and service

Technical and service is provided by distributor. For contact see warranty certificate.

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 max. 4 W (for 50 ms with 15 s period)
Output in case of error:	< 3.8 mA or > 24 mA
Concentration of CO₂:	
Accuracy:	± (50 ppm + 3 % of measuring value) (at temperature 25 °C and pressure 1013 hPa)
Range:	0 to 5 000 ppm
Temp. dependence:	± (1 + measured value [ppm]/1000) ppm / °C at the range -20 to 45 °C (-4 to 113 °F)
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t ₉₀ < 105 s in “SLOW” measurement mode t ₉₀ < 60 s in “FAST” measurement mode

T5240 – ambient air CO₂ transmitter

Output:	0 to 10 V
Power:	15 to 30 V dc
Power consumption:	0.5 W during normal operation max. 3 W (for 50 ms with 15 s period)
Output in case of error:	< -0.1 V or > 10.5 V
Concentration of CO₂:	
Accuracy:	± (50 ppm + 3 % of measuring value) (at temperature 25 °C and pressure 1013 hPa)
Range:	0 to 5 000 ppm
Temp. dependence:	± (1 + measured value [ppm]/1000) ppm / °C at the range -20 to 45 °C (-4 to 113 °F)
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t ₉₀ < 105 s in “SLOW” measurement mode t ₉₀ < 60 s in “FAST” measurement mode

T5141 – CO₂ transmitter with external probe

Output:	4 to 20 mA
Power:	9 to 30 V dc
Power consumption:	1 W during normal operation max. 4 W (for 50 ms with 15 s period)
Output in case of error:	< 3.8 mA or > 24 mA
Concentration of CO₂:	
Accuracy:	± (100 ppm + 5 % of measuring value) (at temperature 25 °C and pressure 1013 hPa)
Range:	0 to 10 000 ppm
Temp. dependence:	± (1 + measured value [ppm]/1000) ppm / °C at the range -20 to 45 °C (-4 to 113 °F)
Resolution:	1 ppm
Response time:	t ₆₃ < 140 s in “SLOW” measurement mode t ₆₃ < 75 s in “FAST” measurement mode

T5241 – CO₂ transmitter with external probe

Output:	0 to 10 V
Power:	15 to 30 V dc
Power consumption:	0.5 W during normal operation max. 3 W (for 50 ms with 15 s period)
Output in case of error:	< -0.1 V or > 10.5 V
Concentration of CO₂:	
Accuracy:	± (100 ppm + 5 % of measuring value) (at temperature 25 °C and pressure 1013 hPa)
Range:	0 to 10 000 ppm
Temp. dependence:	± (1 + measured value [ppm]/1000) ppm / °C at the range -20 to 45 °C (-4 to 113 °F)
Resolution:	1 ppm
Response time:	t ₆₃ < 140 s in “SLOW” measurement mode t ₆₃ < 75 s in “FAST” measurement mode

T5145 – CO₂ duct mount transmitter

Output:	4 to 20 mA
Power:	9 to 30 V dc
Power consumption:	1 W during normal operation max. 4 W (for 50 ms with 15 s period)
Output in case of error:	< 3.8 mA or > 24 mA
Concentration of CO₂:	
Accuracy:	± (50 ppm + 3 % of measuring value) (at temperature 25 °C and pressure 1013 hPa)
Range:	0 to 5 000 ppm
Temp. dependence:	± (1 + measured value [ppm]/1000) ppm / °C at the range -20 to 45 °C (-4 to 113 °F)
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t ₉₀ < 105 s in "SLOW" measurement mode t ₉₀ < 60 s in "FAST" measurement mode

T5245 – CO₂ duct mount transmitter

Output:	0 to 10 V
Power:	15 to 30 V dc
Power consumption:	0.5 W during normal operation max. 3 W (for 50 ms with 15 s period)
Output in case of error:	< -0.1 V or > 10.5 V
Concentration of CO₂:	
Accuracy:	± (50 ppm + 3 % of measuring value) (at temperature 25 °C and pressure 1013 hPa)
Range:	0 to 5 000 ppm
Temp. dependence:	± (1 + measured value [ppm]/1000) ppm / °C at the range -20 to 45 °C (-4 to 113 °F)
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t ₉₀ < 105 s in "SLOW" measurement mode
rozsah:	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 (CO₂ external probe -25 to 60 °C)

Storage relative humidity range:

5 to 95 %RH (CO₂ external probe 0 to 95 %RH) no condensation

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:

ASA

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:

-25 to +60 °C T5141(L), T5241(L) - fixed installation

-5 to +60 °C T5141(L), T5241(L) - moving use

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)

0 to 95 %RH (no condensation) external CO₂ probe

Operating pressure range:

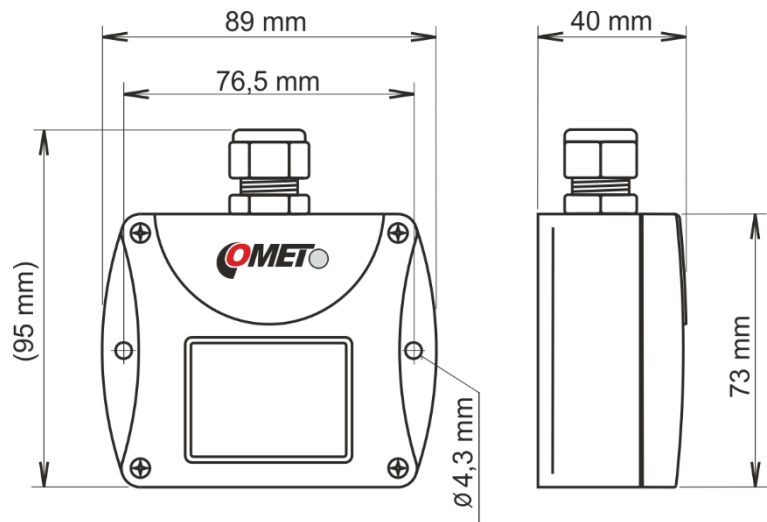
850 to 1100 hPa

End of operation

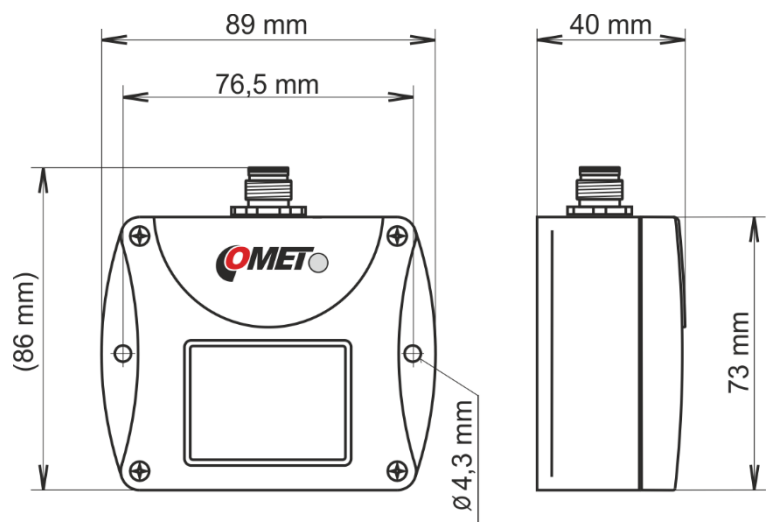
Dispose of the device according to statutory regulations.

Dimensions

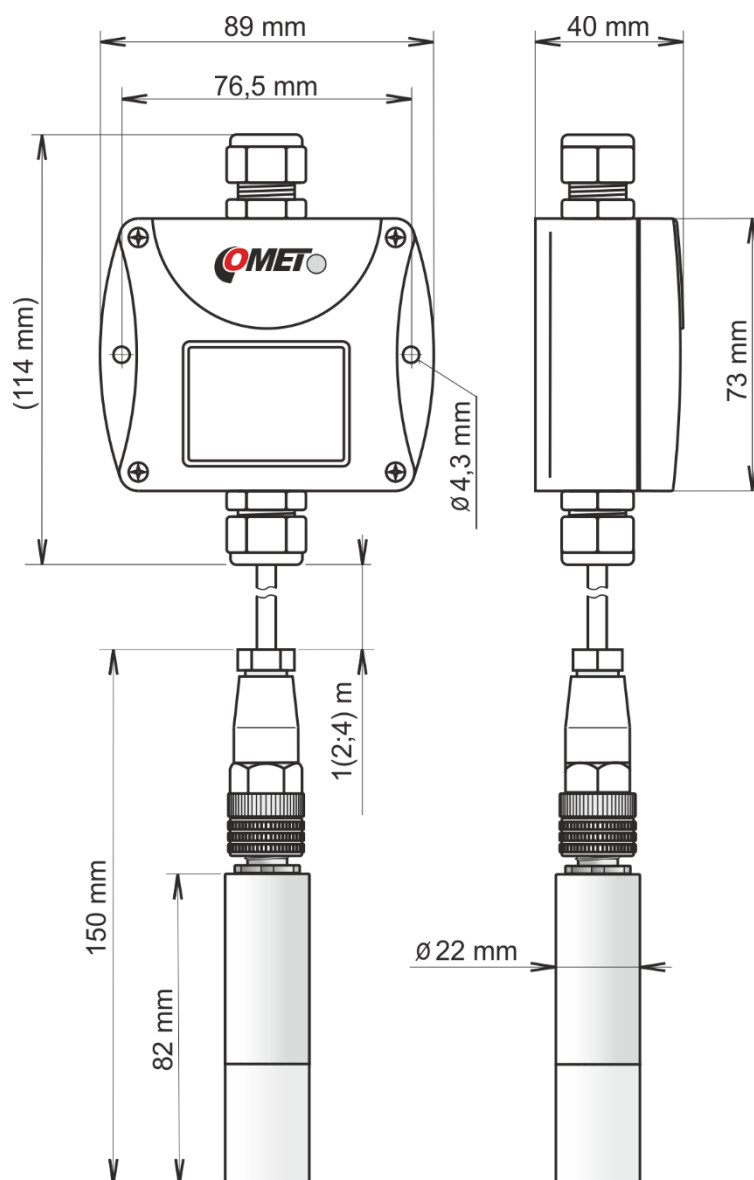
**T5140
T5240**



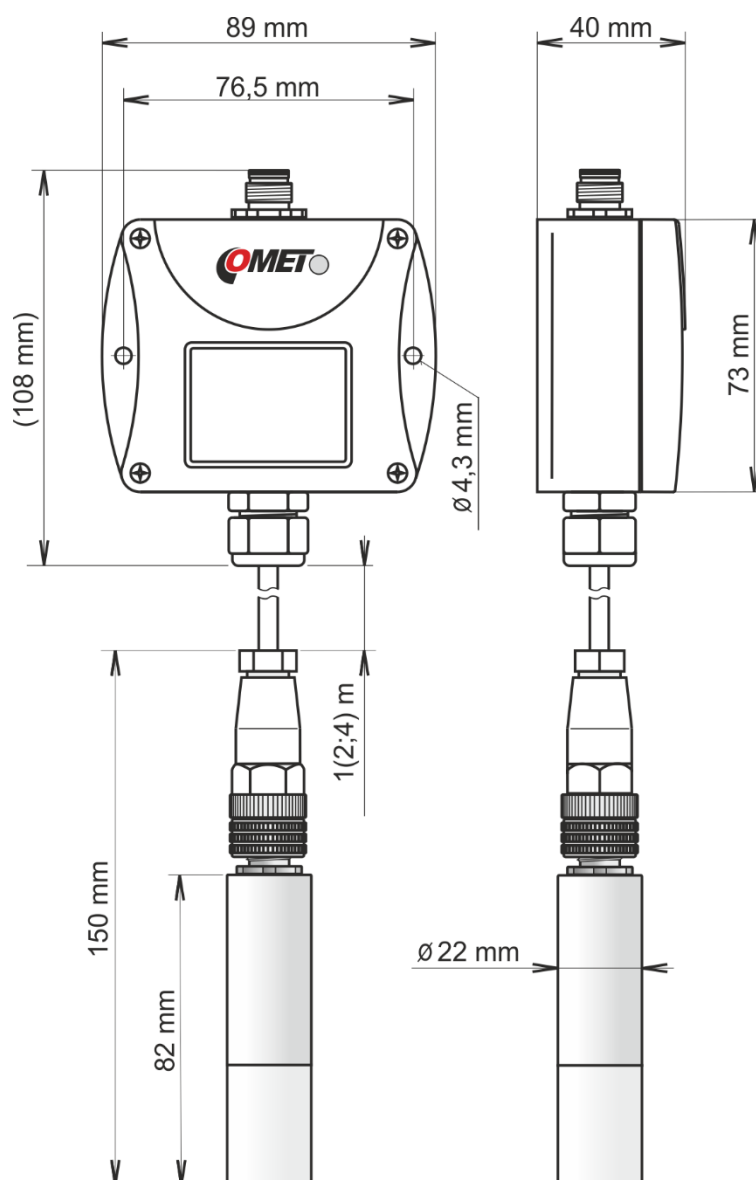
**T5140L
T5240L**



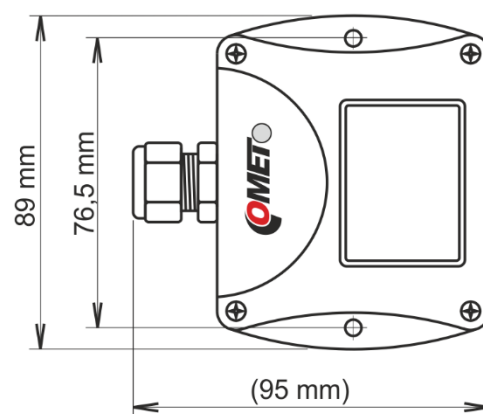
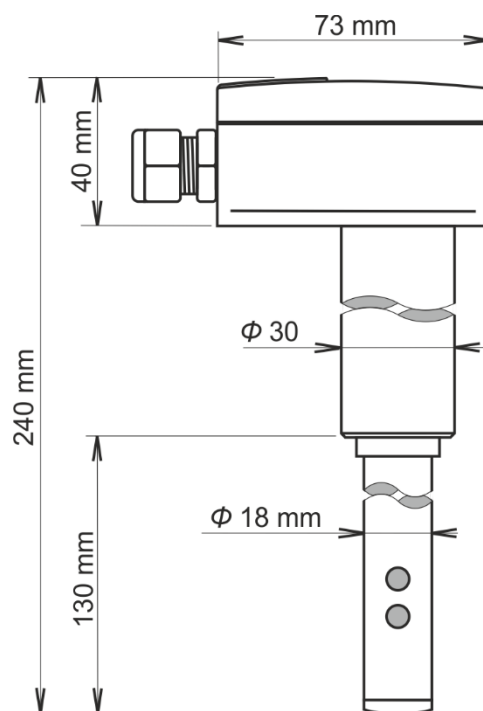
T5141
T5241



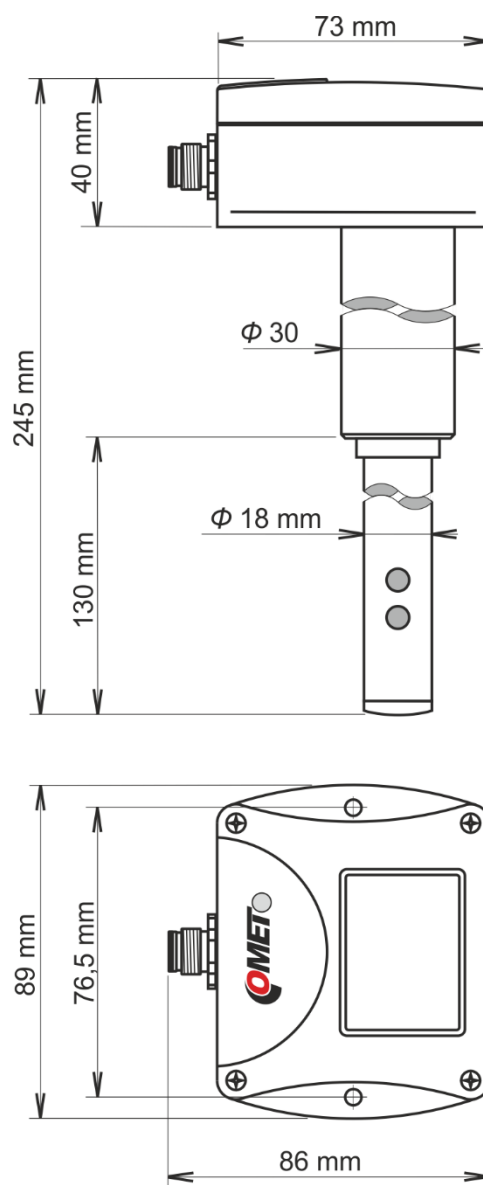
T5141L
T5241L



T5145
T5245



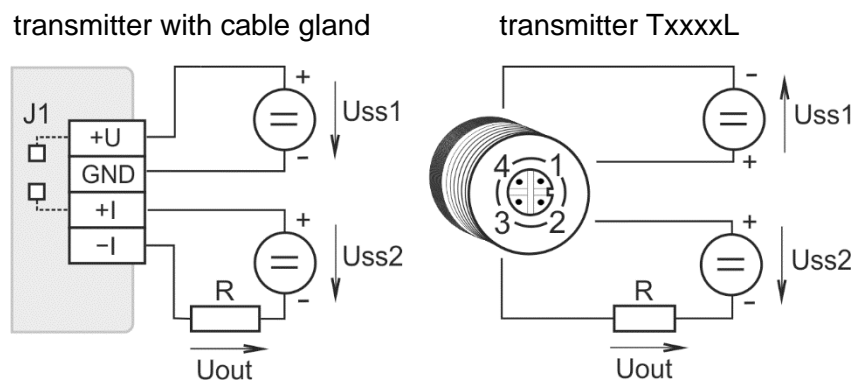
T5145L
T5245L



Typical application wiring

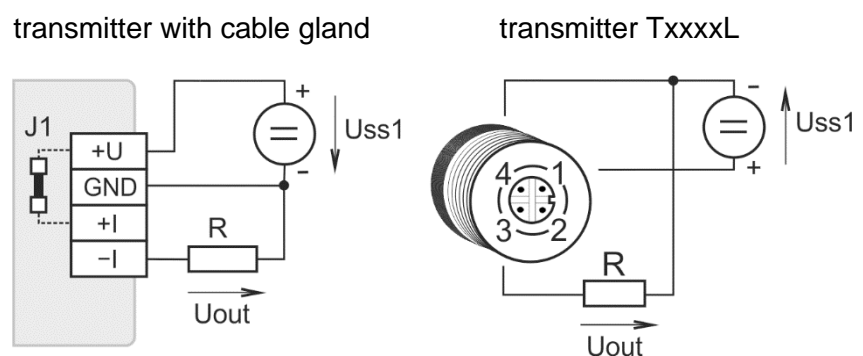
Device with 4-20 mA output can be connected to circuitry by means of galvanically isolated or galvanically non-isolated current loop. Output 0 - 10 V is galvanically non-isolated.

Galvanically isolated 4 - 20 mA output



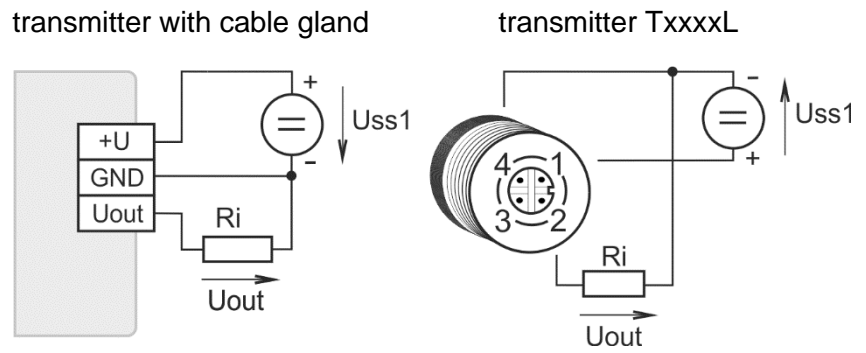
Loop resistance value $R_c = R + \text{resistance of wires}$ shall fulfill the condition $R_c[\Omega] < 40 \times U_{ss2}[V] - 360$.

Galvanically non-isolated 4 - 20 mA output



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

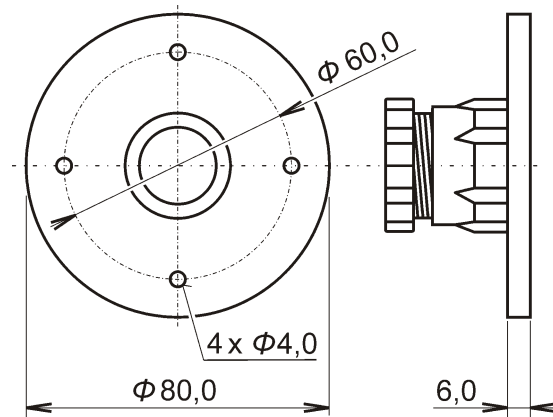
Galvanically non isolated 0 - 10 V output



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

Optional accessory

Mounting flange PP4



Mounting flange PP90

