

T5140, T5141

**Programmable transmitter of CO₂ concentration
with 4-20 mA output**

T5240, T5241

**Programmable transmitter of CO₂ concentration
with 0-10 V output**

Instruction Manual

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

device type	construction type	output
T5140	ambient air	4 – 20mA
T5141	probe with a cable	4 – 20mA
T5240	ambient air	0 - 10V
T5241	probe with a cable	0 - 10V

Principle of CO₂ concentration measurement is based on Non-Dispersive Infrared Technology (NDIR). It is maintenance free because of the patented autocalibration feature, compensating for the effects of aging and therefore a guarantee for outstanding long-term stability. If the device is in operation permanently, an auto-adjustment will start automatically after 24 hours operation each. 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 CO₂ 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 - see below.

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.

Devices 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.

All transmitter setting is performed by means of the PC connected via the optional SP003 communication cable (not included in delivery). Program *TSensor* for transmitter setting is available to download free www.cometsystem.cz.

Transmitter version TxxxxL with male connector Lumberg 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.

Please read instruction manual before the first device connection.

Device setting from the manufacturer

Transmitter is set from the manufacturer to the following parameters:

4 - 20 mA output:	corresponds 0 to 2000 ppm (T5140) or 0 to 10 000 ppm (T5141)
0 - 10 V output:	corresponds 0 to 2000 ppm (T5240) or 0 to 10 000 ppm (T5241)
measurement mode:	SLOW
display:	switched ON
LED indication:	up to 1000 ppm lights green LED, between 1000 and 1200 ppm lights yellow LED and 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.

Installation of the transmitter

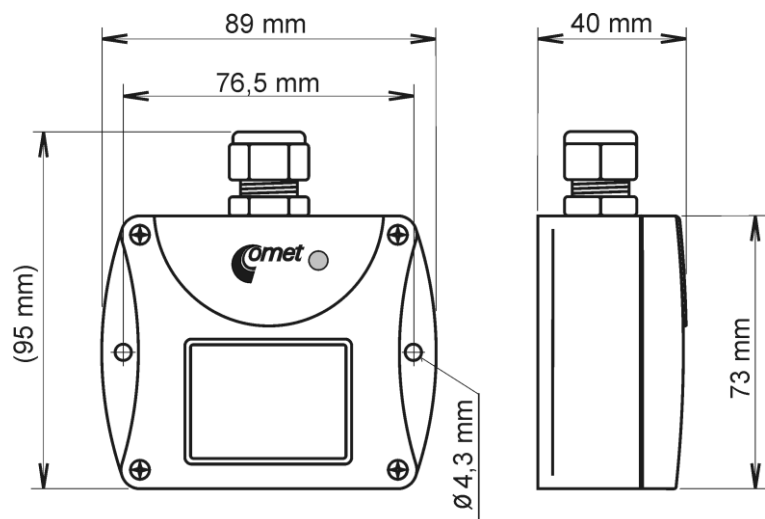
Transmitter case with electronics is designed for wall mounting. There are two mounting holes at the sides of the case. Unpack the external CO₂ probe (T5141, T5241) and connect it to the device. Then place the probe into the measured environment. Don't connect transmitter while power supply voltage is on. Interconnection terminal is accessible after unscrewing four screws and removing the lid. Pass the cable through a released gland at the case wall. Connect the cable to terminals with respecting the signal polarity. By jumper J1 select galvanically or non-galvanically isolated output (T5140, T5141), see „Typical application wiring”. Do not forget to tighten glands and case lid with inserted packing after cables connecting. Complementary female connector for TxxxxL transmitter connect in accordance with the table in Appendix A of this manual.

For transmitter 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.

Electrical system (wiring) may do only worker with required qualification by rules in operation.

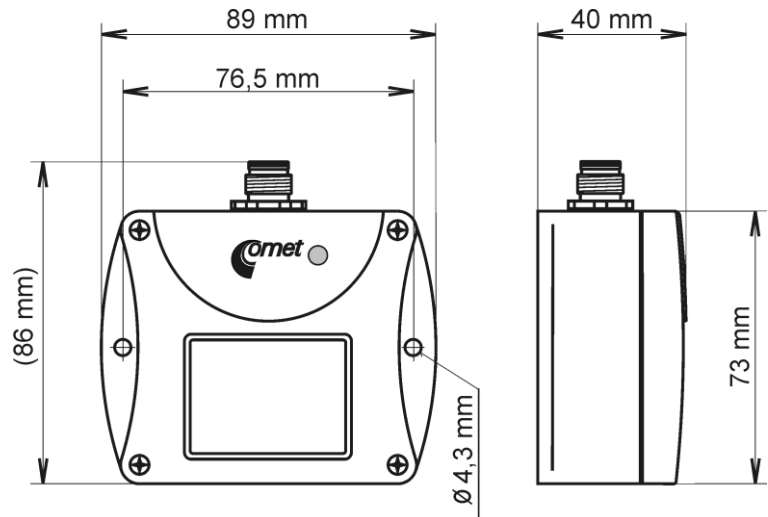
Dimensions

T5140, T5240

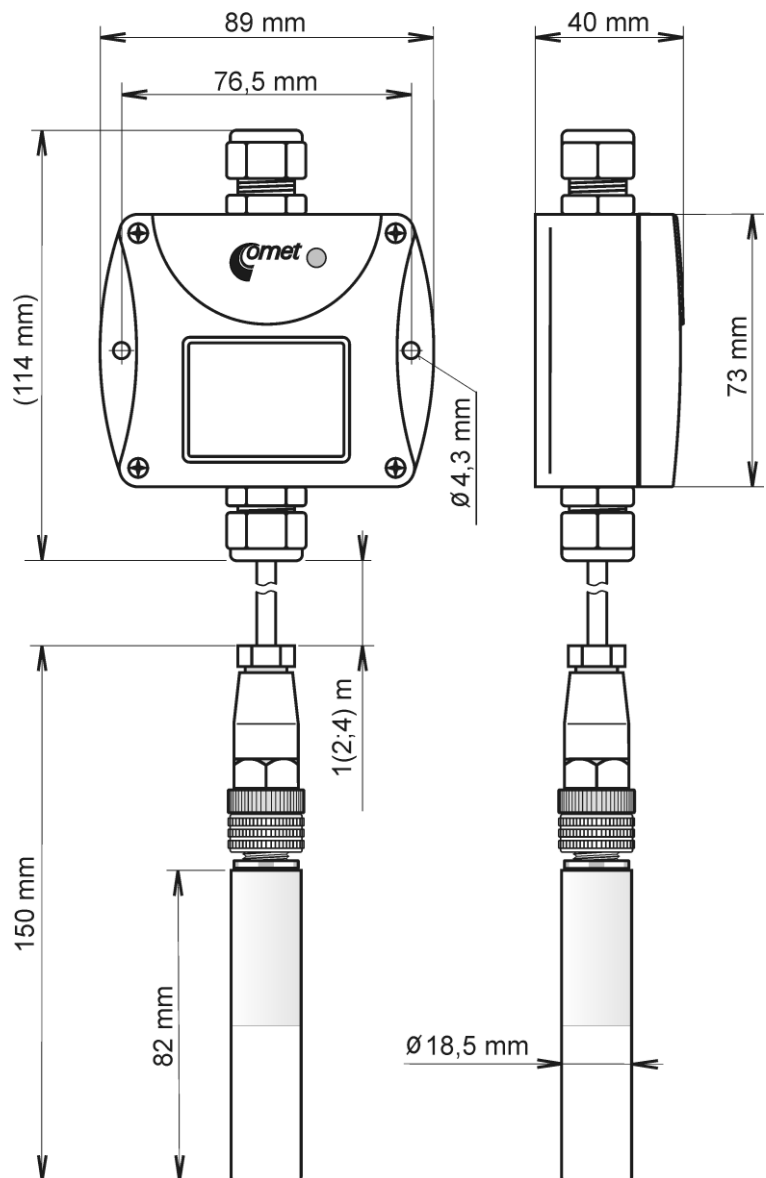


T5140L, T5240L

Connection:
see Appendix A

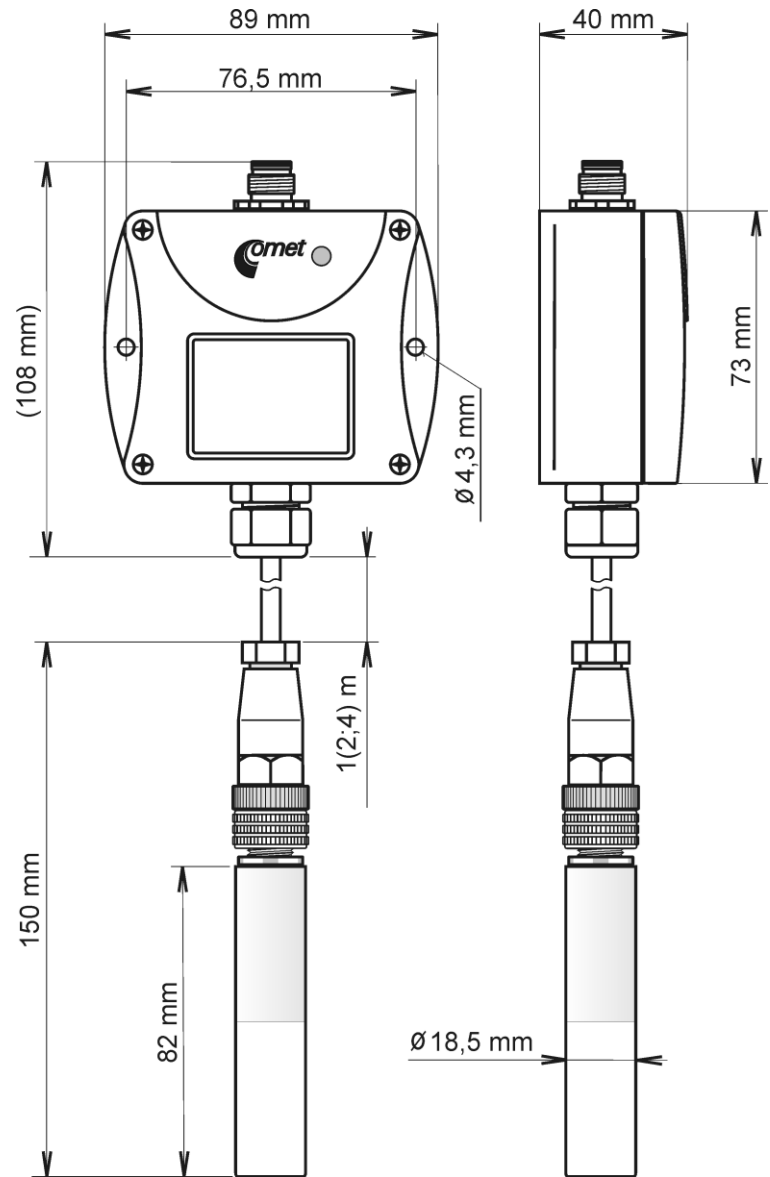


T5141, T5241



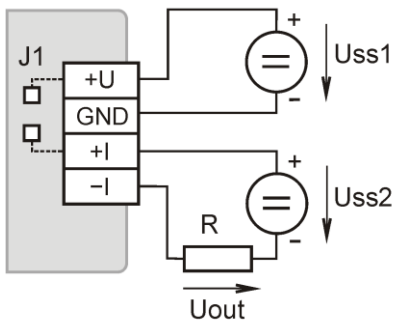
T5141L, T5241L

Connection:
see Appendix A



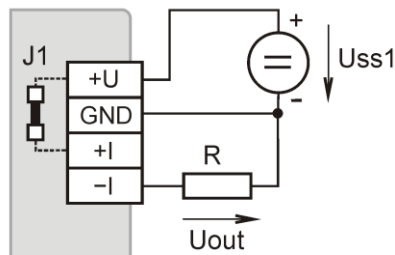
Typical application wiring

4 - 20mA output
galvanically isolated



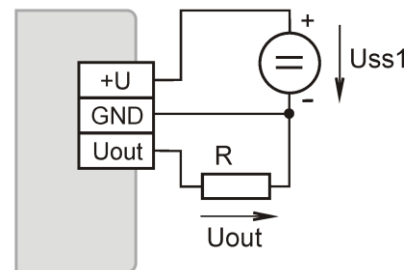
$$R_{max}[\Omega] = 50 \times U_{ss2}[V] - 450$$

4 - 20mA output
galvanically non-isolated



$$R_{max}[\Omega] = 50 \times U_{ss1}[V] - 450$$

0 - 10V output
galvanically non-isolated



$$R > 20 \text{ k}\Omega$$

LCD 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 4mA (output voltage 0V).

T5140



T5240



T5141



T5241



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

T5140



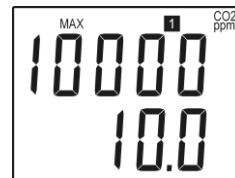
T5240



T5141



T5241



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

Notice: during info mode no measurement and no output current (output voltage) generation proceed. The transmitter stays at info mode 15 s, and then automatically goes back to measuring cycle.

Procedure of modification of transmitter 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. It is free to download at www.cometsystem.cz.
- During installation please take care about installation of driver for USB communication cable.
- Connect SP003 communication cable to the PC. Installed USB driver detect connected cable and create virtual COM port inside the PC.
- Unscrew four screws of the device lid a remove the lid. If device is already installed to measuring system, disconnect leads from terminals.
- Connect SP003 communication cable to the device. Display must light up, or at least must light up all symbols for one second (if LCD was switched OFF by program before).
- Run installed TSensor program and select corresponding communication COM port (as described above).
- When new setting is saved and finished, disconnect the cable from the device, connect leads into its terminals and place the lid back to the device.

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 of LCD displays „Err0“. 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 and calculate values. 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). At this state device does not measure temperature and relative humidity. 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.

Technical parameters

T5140 – ambient air CO₂ transmitter

Output:	4 to 20 mA
Power:	9 to 30 V
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 + 2 % of measuring value) at 25°C (77°F) and 1013 hPa
Range:	0 to 2000 ppm
Temp. dependence:	typ. 2 ppm CO ₂ / °C in the range 0 to 50 °C (32 to 122°F)
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t ₉₀ < 195 s in „SLOW“ measurement mode t ₉₀ < 75 s in „FAST“ measurement mode

T5240 – ambient air CO₂ transmitter

Output:	0 to 10 V
Power:	15 to 30 V
Power consumption:	0.5 W during normal operation max. 3 W for 50 ms with 15 s period
Output in case of error:	< -0.1V or >10.5V
Concentration of CO₂:	
Accuracy:	± (50 ppm + 2 % of measuring value) at 25°C (77°F) and 1013 hPa
Range:	0 to 2000 ppm
Temp. dependence:	typ. 2 ppm CO ₂ / °C in the range 0 to 50 °C (32 to 122°F)
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t ₉₀ < 195 s in „SLOW“ measurement mode t ₉₀ < 75 s in „FAST“ measurement mode

T5141 – CO₂ transmitter with external probe

Output:	4 to 20 mA
Power:	9 to 30 V
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:	± (110 ppm + 5 % of measuring value) at 25°C (77°F) and 1013 hPa
Range:	0 to 10 000 ppm
Temp. dependence:	typ. 2 ppm CO ₂ / °C in the range 0 to 50 °C (32 to 122°F)
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t ₉₀ < 195 s in „SLOW“ measurement mode t ₉₀ < 75 s in „FAST“ measurement mode

T5241 – CO₂ transmitter with external probe

Output:	0 to 10 V
Power:	15 to 30 W
Power consumption:	0,5 W during normal operation max. 3 W for 50 ms with 15 s period
Output in case of error:	< -0.1V or >10.5V
Concentration of CO₂:	
Accuracy:	± (110 ppm + 5 % of measuring value) at 25°C (77°F) and 1013 hPa
Range:	0 to 10 000 ppm
Temp. dependence:	typ. 2 ppm CO ₂ / °C in the range 0 to 50 °C (32 to 122°F)
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm
Response time:	t ₉₀ < 195 s in „SLOW“ measurement mode t ₉₀ < 75 s in „FAST“ measurement mode

Operating conditions

Operating temperature range of case with electronics:

T5140(L), T5240(L) -30 to +60 °C (-22 to +140 °F)

T5141(L), T5241(L) -30 to +80°C (-22 to +176 °F)

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

Operating temperature range of CO₂ probe: -40 to +60°C (-40 to +140 °F)

Operating humidity range:

T5140(L), T5240(L) 5 to 95 %RH

T5141(L), T5241(L) 0 to 100 %RH (no condensation)

Operating pressure range: 850 to 1100 hPa

Recommended interval of calibration: 5 year

Protection: **T5140(L), T5240(L)** IP30

T5141(L), T5241(L) IP65 (device with probe)

Working position:

T5140(L), T5240(L) with cable gland (connector) upwards

T5141(L), T5241(L) negligible

EMC: EN 61326-1, EN 55011

Storage conditions:

temperature: -40 to +60 °C (-40 to +140 °F)

relative humidity: 5 to 95 % RH (no condensation)

atmospheric pressure: 700 až 1100 hPa

Dimensions: see dimensional drawings

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

Material of the case with electronics: ABS

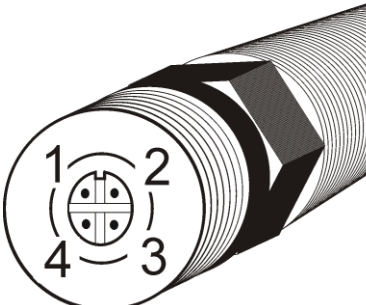
End of operation

Device itself (after its life) is necessary to liquidate ecologically!

Technical support and service

Technical support and service is provided by distributor. For contact see warranty certificate. You can use discussion forum at web address: <http://www.forum.cometsystem.cz/>.

Appendix A



Female Lumberg connector	4 - 20 mA	0 - 10 V
1	+U	+U
2	+I	Uout
3	-I	
4	GND	GND