ENG

DP-THC Sensors

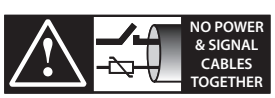
Temperature, Humidity, and CO2 Sensors



USER MANUAL

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS



READ CAREFULLY IN THE TEXT!

DP-THC

+030222230 - ENG

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www.carel.com

GENERAL WARNINGS

CAREL bases the development of its products on decades of experience in HVAC/R, on continuous investments in technological innovations to products, procedures and strict quality processes with in-circuit and functional testing on 100% of its products, and on the most innovative production technology available on the market. CAREL and its subsidiaries/affiliates nonetheless cannot guarantee that all the aspects of the product and the software included with the product respond to the requirements of the final application, despite the product being developed according to start- of- the- art techniques. The customer (manufacturer, developer or installer of the final equipment) accepts all liability and risk relating to the configuration of the product in order to reach the expected results in relation to the specific final installation and/or equipment. CAREL may, based on specific agreements, act as a consultant for the successful commissioning of the final unit/application, however in no case does it accept liability for the correct operation of the final equipment/system. The CAREL product is a state-of-the-art product, whose operation is specified in the technical documentation supplied with the product or can be downloaded, even prior to purchase, from the website www.carel.com. Each CAREL product, in relation to its advanced level of technology, requires setup/configuration/programming/commissioning to be able to operate in the best possible way for the specific application. Failure to complete such operations, which are required/indicated in the user manual, may cause the final product to malfunction; CAREL accepts no liability in such cases. Only qualified personnel may install or carry out technical service on the product.
The customer must only use the product in the manner described in the documentation relating to the product. In addition to observing any further warnings described in this manual, the following warnings must be heeded for all CAREL products:

- prevent the electronic circuits from getting wet. Rain, humidity and all types of liquids or condensate contain corrosive minerals that may damage the electronic circuits. In any case, the product should be used or stored in environments that comply with the temperature and humidity limits specified in the manual;
- do not install the device in particularly hot environments. Too high temperatures may reduce the life of electronic devices, damage them and deform or melt the plastic parts. In any case, the product should be used or stored in environments that comply with the temperature and humidity limits specified in the manual;
- do not attempt to open the device in any way other thandescribed in the manual.
- do not drop, hit or shake the device, as the internal circuits and mechanisms may be irreparably damaged.
- do not use corrosive chemicals, solvents or aggressive detergents to clean the device.
- do not use the product for applications other than those specified in the technical manual.

All of the above suggestions likewise apply to the controllers, serial cards, programming keys or any other accessory in the CAREL product portfolio. CAREL adopts a policy of continual development. Consequently, CAREL reserves the right to make changes and improvements to any product described in this document without prior warning. The technical specifications shown in the manual may be changed without prior warning. The liability of CAREL in relation to its products is specified in the CAREL general contract conditions, available on the website www.carel.com and/or by specific agreements with customers; specifically, to the extent where allowed by applicable legislation, in no case will CAREL, its employees or subsidiaries/affiliates be liable for any lost earnings or sales, losses of data and information, costs of replacement goods or services, damage to things or people, downtime or any direct, indirect, incidental, actual, punitive, exemplary, special or consequential damage of any kind whatsoever, whether contractual, extra- contractual or due to negligence, or any other liabilities deriving from the installation, use or impossibility to use the product, even if CAREL or its subsidiaries/affiliates are warned of the possibility of such damage.

DISPOSAL

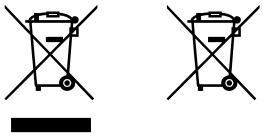


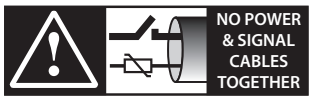
Fig. 1 Fig. 2

INFORMATION FOR USERS ON THE CORRECT HANDLING OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)
The product is made up of metal parts and plastic parts. In reference to European Union directive 2002/96/EC issued on 27 January 2003 and related national legislation, please note that:

- WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
- the public or private waste collection systems defined by local legislation must be used. In addition, the equipment can be returned to the distributor at the end of its working life when buying new equipment;
- the equipment may contain hazardous substances: the improper use or incorrect disposal of such may have negative effects on human health and on the environment;
- the symbol (crossed- out wheeled bin) shown on the product or on the packaging and on the instruction sheet indicates that the equipment has been introduced onto the market after 13 August 2005 and that it must be disposed of separately;
- in the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

Warranty on materials: 2 years (from production date, excluding consumables).
Approval: the quality and safety of CAREL S.p.A. products are guaranteed by the ISO 9001 certified design and production system.

IMPORTANT



READ CAREFULLY IN THE TEXT!

Separate as much as possible the probe and digital input cables from cables to inductive loads and power cables, so as to avoid possible electromagnetic disturbance. Never run power cables (including the electrical panel cables) and signal cables in the same conduits.

Key to the symbols:

Important: to bring critical issues to the attention of those using the product.

Note: to focus attention on important topics; in particular the practical application of the various product functions.

Important: This product is to be integrated and/or incorporated into the final apparatus or equipment. Verification of conformity to the laws and technical standards in force in the country where the final apparatus or equipment will be operated is the manufacturer's responsibility. Before delivering the product, Carel has already completed the checks and tests required by the relevant European directives and harmonised standards, using a typical test setup, which however cannot be considered as representing all possible conditions of the final installation.

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1. INTRODUCTION

For ever greater device integration, Carel supplies complete and advanced solutions capable of responding to most of the applications required by the market.
Carel offers control and humidification systems for the HVAC/R market including controllers, humidifiers, recovery units, supervision instruments and a wide range of accessories, such as sensors for measuring environmental parameters. This is why Carel offers a whole range of sensors that meet the needs of HVAC/R installers and manufacturers implementing innovative technological solutions that fully comply with the most important standards.
The range features sensors for different uses designed to be installed on the wall of the monitored environment, in ducts and in industrial environments, all of which guarantee the specifications, compatibility with controllers and the trademark quality that distinguishes Carel products.
The range includes the DP-THC series, for temperature, humidity, and CO2, with 4... 20mA, 0...10V analog output and RS485 serial outputs (Modbus). The DP* series sensors use digital output sensors for good accuracy at an excellent price/quality ratio. These sensors are typically used together with the Carel controllers but they can also be used with third-party devices because they have standard outputs making them easy to connect and integrate.

1.1 General Features

Carel has designed a whole range of sensors that meet market requirements for controlling HVAC/R units.
In addition to their recognized performance, Carel sensors are very versatile and suited for the most diverse requirements. The range includes a series of sensors for detecting parameters such as: Temperature, Humidity, and CO2. All the sensors are designed to be compatible with all Carel controllers and also with the standards most commonly used in the industry. The following models are available: a) wall, b) outdoor, c) duct for residential or industrial installations, and d) compact.

1.1.1 DP-THC Sensors

By measuring temperature, humidity, and CO2 (carbon dioxide), the Carel DP-THC sensors analyze the main parameters that indicate the pollution level in the environment, providing everything the HVAC/R market needs with a single sensor. Featuring RS485 Modbus serial communication output for connection and integration to the Carel system, DP-THC sensors are available with temperature only or CO2, temperature and humidity in combinations; wall, outdoor, duct, and compact versions.

With display Without display



DPWS* Version Indoor Sensor
These are used in rooms, in ventilation and air conditioning, heating, and refrigeration systems and wherever the air quality must be monitored. They are ready for wall-mounting. Available in versions with and without display.

Fig. 1.a



DPUS* Version Outdoor Sensor
These are used in industrial environments (cold rooms, pools etc.) where a high index of protection is required, both for the case (IP55) and the sensors (IP54). Ready for wall-mounting.

Fig. 1.b



DPDS* Version Duct Sensor
These are used in air-conditioning and air handling, heating and refrigeration systems. Supplied together with a fastening bracket.

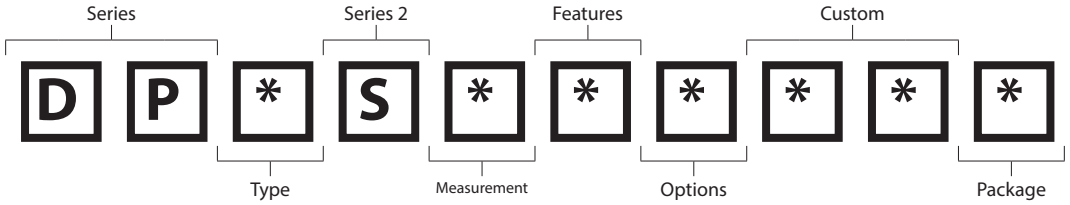
Fig. 1.c



DPRS* Version Compact Sensor
These are used for air-conditioning and air handling applications.

Fig. 1.d

2. CODES AND COMPATIBILITY



Series	DP (Digital Probe/Sensor)
Type	W = Indoor
	U = Outdoor/Industrial
	D = Duct
	R = Compact
Series 2	S = Sensor THC Series
Measurement	1 = Temperature NTC
	2 = Temperature Analog, Humidity Analog (0...10V, 4...20mA)
	3 = Temperature NTC, Humidity Analog (0...10V, 4...20mA)
	4 = Temperature Analog, Humidity Analog, CO2 Analog (0...10V, 4...20mA)
	5 = Temperature RS485, Humidity RS485
	6 = Temperature RS485, Humidity RS485, CO2 RS485
	7 = Temperature NTC, Humidity Analog (0,5V...4,5V)
Features	1 = Without Display, 12...24VDC Power Supply
	2 = With Display LCD, 12...24VDC Power Supply
Options	0 = None
Customizations	00 = Standard Carel
Package	0 = Single Package
	1 = Multi-package
	N = Neutral Version (No Carel Logo)

Tab. 2.a

The following table shows the available codes.

P/N	Description	Power supply	Type of installation				Display		Measurements			Output signals		
			Indoor	Outdoor/ ind. env.	Duct	Compact	No display	Display	Temp.	%R.H.	CO2	RS 485	0...10 V, 4...20 mA	NTC 10k
DPWS100000	Indoor Sensor Temperature NTC Output	12-24 Vac/dc	●				●		●					●
DPWS210000	Indoor Sensor Temperature Humidity Analog Output	12-24 Vac/dc	●				●		●	●			●	
DPWS310000	Indoor Sensor Temperature NTC - Humidity Analog Output	12-24 Vac/dc	●				●		●	●			●	●
DPWS410000	Indoor Sensor Temperature Humidity CO2 Analog Output	12-24 Vac/dc	●				●		●	●	●		●	
DPWS420000	Indoor Sensor Temperature Humidity CO2 Analog Output with display	12-24 Vac/dc	●					●	●	●	●		●	
DPWS510000	Indoor Sensor Temperature Humidity Serial Communication RS485	12-24 Vac/dc	●				●		●	●		●		
DPWS520000	Indoor Sensor Temperature Humidity Serial Communication RS485 with display	12-24 Vac/dc	●					●	●	●		●		
DPWS610000	Indoor Sensor Temperature Humidity CO2 Serial Communication RS485	12-24 Vac/dc	●				●		●	●	●	●		
DPWS620000	Indoor Sensor Temperature Humidity CO2 Serial Communication RS485 with display	12-24 Vac/dc	●					●	●	●	●	●		
DPUS100000	Outdoor Sensor Temperature NTC	12-24 Vac/dc		●			●		●					●
DPUS210000	Outdoor Sensor Temperature Humidity Analog Output	12-24 Vac/dc		●			●		●	●			●	
DPUS310000	Outdoor Sensor Temperature NTC Humidity Analog Output	12-24 Vac/dc		●			●		●	●			●	●
DPUS510000	Outdoor Sensor Temperature Humidity Serial Communication RS485	12-24 Vac/dc		●			●		●	●		●		
DPDS100000	Duct Sensor Temperature NTC Output	12-24 Vac/dc			●		●		●					●
DPDS210000	Duct Sensor Temperature Humidity Analog Output	12-24 Vac/dc			●		●		●	●			●	
DPDS310000	Duct Sensor Temperature NTC - Humidity Analog Output	12-24 Vac/dc			●		●		●	●			●	●
DPDS410000	Duct Sensor Temperature Humidity CO2 Analog Output	12-24 Vac/dc			●		●		●	●	●		●	
DPDS510000	Duct Sensor Temperature Humidity Serial Communication RS485	12-24 Vac/dc			●		●		●	●		●		
DPDS610000	Duct Sensor Temperature Humidity CO2 Serial Communication RS485	12-24 Vac/dc			●		●		●	●	●	●		
DPRS510000	Compact Sensor Temperature Humidity Serial Communication RS485 Cable: 3m	5Vdc				●	●		●	●		●		
DPRS710000	Compact Sensor Temperature NTC - Humidity Analog Output Cable: 3m	5Vdc				●	●		●	●			●	●

Tab. 2.b

3. INSTALLATION DP-THC SENSORS

3.1 Assembly and Fastening the instrument

The installation of the instrument depends on the purchased product version.

3.1.1 Indoor Version

To mount the DPW, use the appropriate mounting hardware as described below. It may be mounted directly to a wall or to a switch box with compatible screw locations. For a switch box that is not compatible with the mounting holes provided, the DPTR000001(purchased separately) may be added to installation to allow for adjustable screw pattern.

Removal of the front cover is required to access the wiring terminals and mounting screw locations. Mount the device and then complete the wiring as described in the following section.

The sensor can be installed using the following hardware:
- For a switch box with compatible screw locations, use the 2 screws 3.5x45mm.
- For wall-mounting, use the 2 plugs S5 and 2 screws 3.5x45mm.
- On metal walls, use the 2 screws M3x25mm.
- For switch box not compatible with screw locations, use 1 screw 2.9x6.5mm to fix product to frame DPTR000001 (to purchase separately) and use 2 screws 3.5x45 to fix frame to switch box (Fig. 3.e).

Mounting screws are not included.

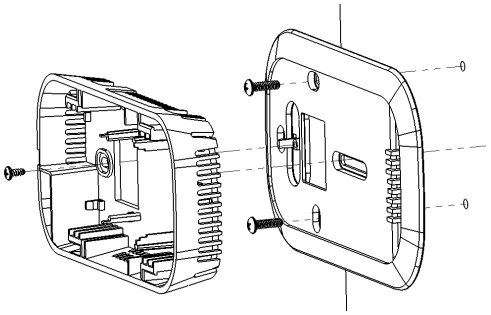
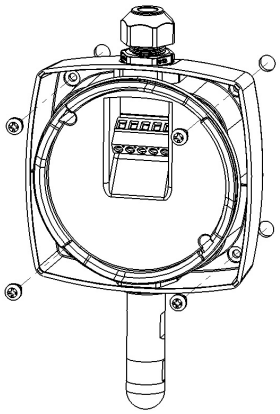


Fig. 3.e Mounting instructions for DPW versions with DPTR00001

3.1.2 Outdoor Version

The outdoor version is wall or panel mounted. Carefully follow the instructions shown below;
•Install the sensors on the panel using the holes on the container. Mount screws not included in the package.
•Avoid direct exposure to the sun and protect it from inclement weather (rain and hail).
•To maintain the IP65 degree of protection, the connection must be made with a multi-core cable with an external sheathing of 8 mm max.
•Provide at least a main insulation related to the mains power supply for the controller where the probe is connected; if the sensor endcap is accessible to the users, double insulation must be provided.
•For wiring, a multi-core cable with 3 to 5 wires with a maximum section of 1.5 mm² is recommended.
•The DPUS enclosure should not be installed in direct sunlight to prevent UV degradation and a decrease of temperature sensor accuracy.



Mounting Holes

Fig. 3.f

Assembly Notes

1. Open the case by turning the top cover anticlockwise.



Fig. 3.g

2. Fasten the rear of the sensor case to the panel or the wall placing the screws in the holes provided.



Fig. 3.h

3. Make sure that the screws that hold the board protective cover are fastened tightly.



Fig. 3.i

4. Close the sensor by turning the cover clockwise.



Fig. 3.j

For the electrical connections, remove the top cover of the sensor. For the wiring and configuration, see the instructions in the following sections.

3.1.3 Duct Version

The duct version is connected to the air duct using the special fastening bracket.

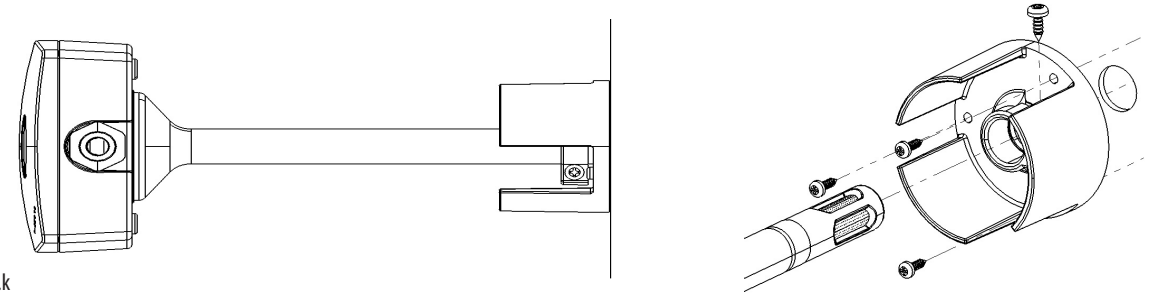
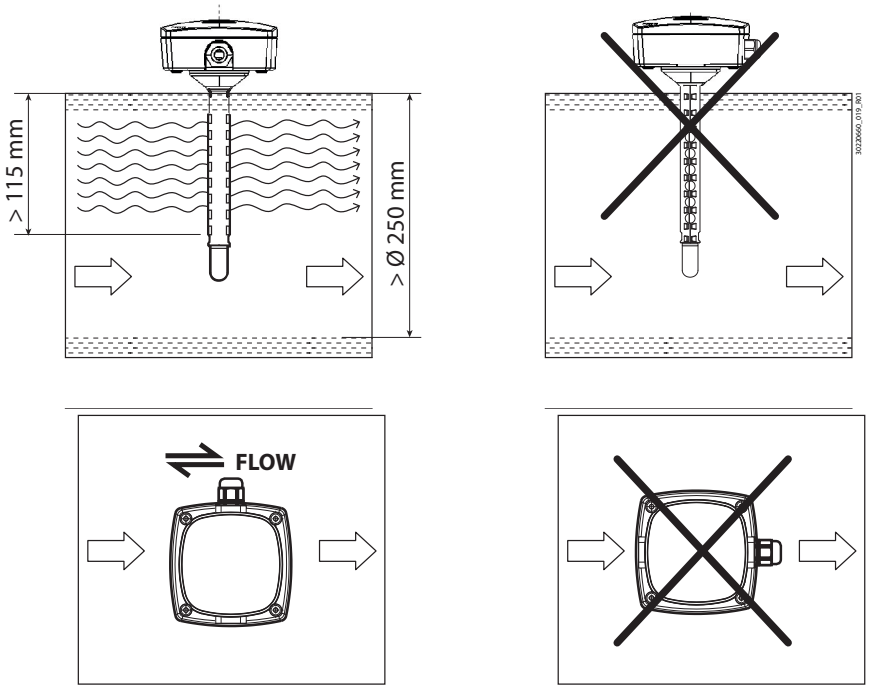


Fig. 3.k

For the electrical connections, remove the top cover of the sensor. For the wiring and configuration, see the instructions in the following sections.

Mounting Diagram *Attention: This is only for the CO2 product.*



3.1.4 Compact Version

Sensor has been designed for panel installation, as shown in Fig 3.o. Depending on requirements, it can be panel-mounted using screws or the ring nut supplied in the packaging. The device must be installed in environments without condensation and/or occasional presence of moisture. Perform all the installation and maintenance operations with the unit disconnected form the power supply.

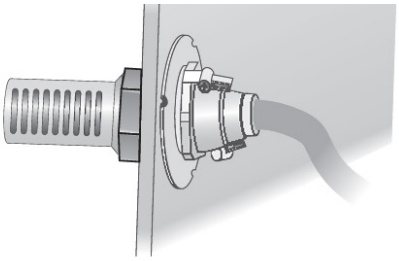


Fig. 3.l Suggested mounting for panel thickness <2mm
Mounting screws are not included in the package.

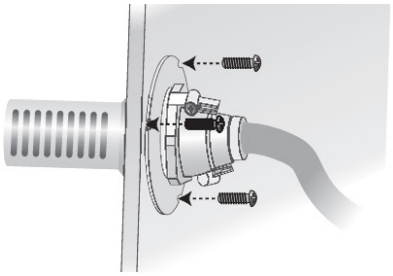


Fig. 3.m Suggested mounting for panel thichness <10mm

3.2 Electrical Connections and Sensor Wiring

Make the electrical connections as shown below, taking care to follow the polarities indicated.

3.2.1 Indoor Version

Inside the product, there is a terminal block on top for the power connection and each analog or Modbus output connection. On NTC versions, there is a second terminal block on the bottom for the NTC output connection.

Analog Versions

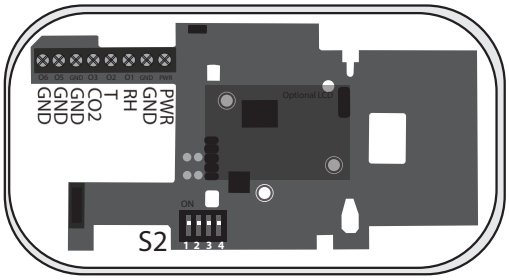


Fig. 3.n Terminal layout for DPWS4*0000 versions

Key:

PWR:	12...24 Vac/dc
GND:	Reference for power supply. In the case of Vac power supply, connect one of the 2 transformer wires.
RH:	Signal wire for RH reading
T:	Signal wire for T reading
CO2:	Signal wire for CO2 reading
GND:	Reference for RH, T, or CO2 analog signals (not included in DPWS3*0000 versions)
NT1, NT2:	NTC output
S2:	DIP switch for setting the analog parameters.

Tab. 3.c

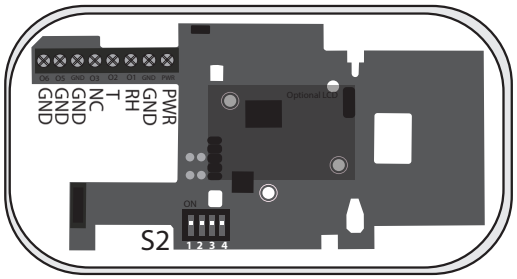


Fig. 3.o Terminal layout for DPWS2*0000 versions

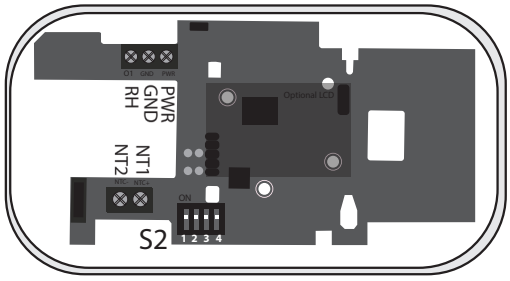


Fig. 3.p Terminal layout for DPWS3*0000 versions

NTC only Versions

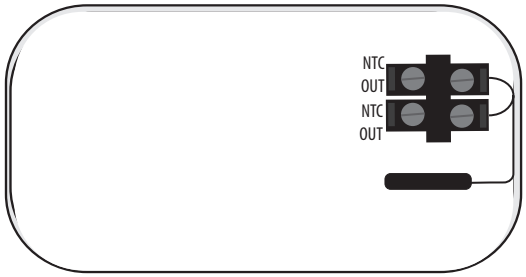


Fig. 3.q Terminal layout for NTC-only versions DPWS100000

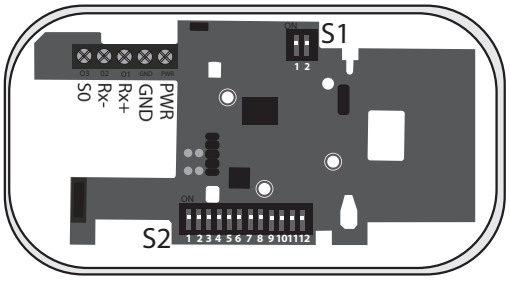


Fig. 3.r Terminal layout for DPWS5*0000 and DPWS6*0000

RS485 Versions

Key:

PWR:	12...24 Vac/dc
GND:	Reference for power supply. In the case of Vac power supply, connect one of the 2 transformer wires.
Rx+:	TxRx+ RS485 positive serial output
Rx-:	TxRx- RS485 negative serial output
SO:	Reference for TxRx RS485 serial output
S2:	DIP switch for setting the serial parameters.
S1:	DIP switch for setting termination resistor and display units

Tab. 3.d

A 2-wire shielded multi-core cable with the following characteristics must be used for the serial connection:

- two-twisted wires;
- shielded, preferably with earth wire;
- section AWG20 (diam. 0.7-0.8 mm; area 0.39-0.5 mm^2) or AWG22 (diam. 0.55-0.65 mm; area 0.24-0.33 mm^2);
- rated capacitance between the wires <100 pF/m.

A 2-core cable with 2 wires and a maximum cross-section of 1.5 mm^2 is recommended for the power supply.

3.2.2 Duct and Outdoor Versions

Inside the product, there is a single terminal block on the bottom for power connection and each analog, NTC, or Modbus output connection.

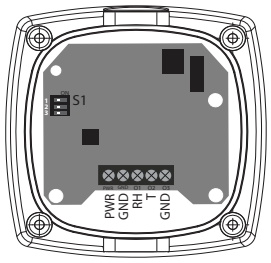


Fig. 3.s Terminal layout for DPUS21000, DPDS210000

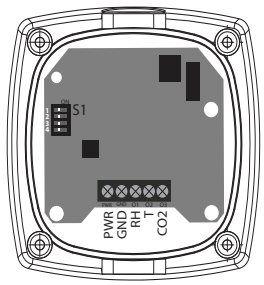


Fig. 3.t Terminal layout for DPDS410000

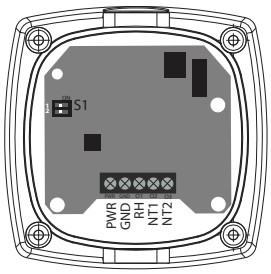


Fig. 3.u Terminal layout for DPUS310000, DPDS310000

Analog Versions

Key:

PWR:	12...24 Vac/dc
GND:	Reference for power supply. In the case of Vac power supply, connect one of the 2 transformer wires.
RH:	Signal wire for RH reading, use GND terminal for reference.
T:	Signal wire for T reading, use GND terminal for reference.
CO2:	Signal wire for CO2 reading, use power supply GND terminal for reference.
NT1, NT2:	NTC output
S2:	DIP switch for setting the analog parameters.

Tab. 3.e

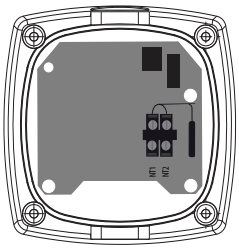


Fig. 3.vTerminal layout for DPUS100000, DPDS100000

NTC Only Versions

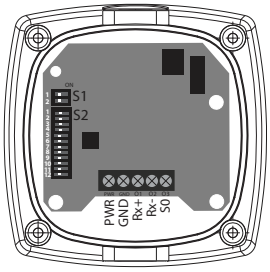


Fig. 3.w Terminal layout for DPUS510000, DPDS510000, DPDS610000

RS485 Versions

Key:

PWR:	12...24 Vac/dc
GND:	Reference for power supply. In the case of Vac power supply, connect one of the 2 transformer wires.
Rx+:	TxRx+ RS485 positive serial output
Rx-:	TxRx- RS485 negative serial output
SO:	Reference for TxRx RS485 serial output
S1:	DIP switch for setting the serial parameters.
S2:	DIP switch for setting termination resistor and display units

Tab. 3.f

A 2-wire shielded multi-core cable with the following characteristics must be used for the serial connection:

- two-twisted wires;
- shielded, preferably with earth wire;
- section AWG20 (diam. 0.7-0.8 mm; area 0.39-0.5 mm^2) or AWG22 (diam. 0.55-0.65 mm; area 0.24-0.33 mm^2);
- rated capacitance between the wires <100 pF/m.

A 2-core cable with 2 wires and a maximum cross-section of 1.5 mm^2 is recommended for the power supply.

3.2.3 Compact Version

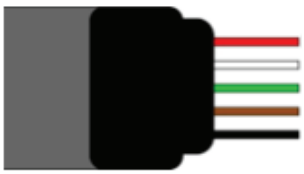


Fig. 3.x

DPRS510000

Key:

RED:	Power supply 5Vdc
WHITE:	Reference for power supply/NT2
GREEN:	Signal wire for RH reading
BROWN:	NT1
BLACK:	Cable shield (*)

Tab. 3.g

DPRS710000

Key:

RED:	Power supply 5Vdc
WHITE:	Reference for power supply
GREEN:	TxRx- RS485 negative serial output
BROWN:	TxRx+ RS485 positive serial output
BLACK:	Cable shield (*)

Tab. 3.h

(*) Connect shield to earth, to improve EMC performance

3.3 Power Supply Connection

For alternating current power supply (12…24 VAC) a single transformer can be used to power multiple sensors. In this case, special care should be taken so that the GND terminal on all of the sensors are tied to the same lead of the alternating current power supply. Alternately, an isolation transformer can be used for each individual sensor. This should be done for all versions.

For the serial sensors, the type of power supply depends on the model of sensor used:

- Sensors with optical isolation can be powered with one power supply, for all the sensors as well as for the controller. In this case, make sure that the cable shield on the controller side is connected to EARTH, directly or via the G0-Earth connection on the controller. This refers to the isolated ground terminal for the RS485.
- Sensors that are NOT isolated: for short distances, these can be powered with one power supply, for distances over 10 m, an isolating transformer may be required for each sensor. DPRS510000 is the only model without any isolation on the RS485 output.

3.3.1 Output Wiring Connections

Analog versions

For sensors with analog outputs, wiring of a shielded multicore cable with 3 to 5 wires will depend on the model. The maximum cross-section of the wires allowable for the terminals is 1.5 mm2. In versions DPD* and DPU*, the maximum inside diameter of the cable gland is 8 mm.

Serial versions

For sensors with serial connection, the cable used must have the following characteristics:

- twisted pair;
- shielded, preferably with earth wire; size AWG20 (diam. 0.7 to 0.8mm; area 0.39 to 0.5 mm2) or AWG22 (diam 0.5 to 0.65 mm; area 0.24 to 0.33 mm2);
- rated capacitance between the wires <100pF/m.

4. CONFIGURATION DP-THC SENSOR

4.1 DIP Switch Configuration

The DIP switch configuration depends on whether the version has analog output signal or a serial communication output. The DIP configuration does not vary between the indoor, duct, and outdoor enclosures. No DIP configuration is necessary on the compact version or NTC only versions.

4.1.1 Compact Versions

Compact product does not contain DIP switch for settings; please refer to the Modbus register to configure the product. The default Modbus address is 100. To update it, use "Modbus address" and "Modbus RS485 settings" registers and confirm with "confirm Modbus settings" register. In case of forgotten settings, it is possible to restore factory settings. The device will initiate a factory reset if the power cycle threshold of 10 power cycles is reached within 5 seconds after device powers on. If the threshold of 10 power cycles is not reached before the timeout occurs, the threshold counter will reset.

4.1.2 Analog Versions

On analog versions, it is necessary to configure only one set of 4 DIP switches. Fig 4.y (wall) and Fig 4.z (duct/outdoor) show the location of the DIP switches on each version of product. Tab 4.i (indoor) and Tab 4.j (outdoor) show how each switch should be configured for each desired setting.

Indoor

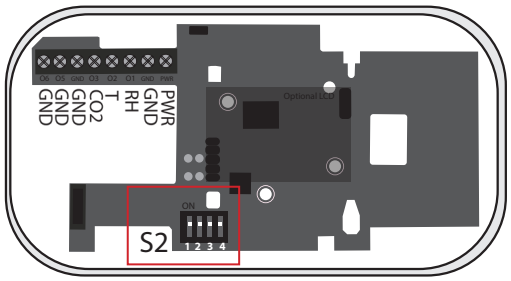
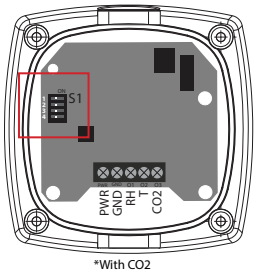


Fig. 4.y

Duct/Outdoor



*With CO2

Fig. 4.z

Switch S2 Indoor

DIP	Function
1	**Display Temp. Units** On/Up = Celsius Off/Down = Fahrenheit
2	**Humidity Mode** On/Up = Voltage Off/Down = Current
3	**Temperature Mode** On/Up = Voltage Off/Down = Current
4	**CO2 Mode** On/Up = Voltage Off/Down = Current

Tab. 4.i

Switch S1 Duct/Outdoor

DIP	Function
1	**Display Temp. Units** On/Right = Celsius Off/Left = Fahrenheit
2	**Humidity Mode** On/Right = Voltage Off/Left = Current
3	**Temperature Mode** On/Right = Voltage Off/Left = Current
4	**CO2 Mode** On/Right = Voltage Off/Left = Current

Tab. 4.j

4.1.3 RS485 Versions

On RS485 versions, two sets of DIP switches will need to be considered for setup. S1 is a set of 2 DIP switches needed to either activate a termination resistor or adjust the temperature units being displayed on an LCD version. S2 is a set of 12 DIP switches needed to configure the serial communication parameters.

For indoor versions, UP is ON and DOWN is OFF. For Duct/Outdoor versions, RIGHT is ON and LEFT is OFF.

Compact product doesn't contains dip switch for setting, refer to Modbus register to configure the product in the proper way.
The default Modbus address is 100, to update it use "Modbus address" and "Modbus RS485 settings" registers and confirm with "Confirm Modbus settings" register. In case of forgotten settings it's possible to restore factory settings.
The device will initiate a factory reset if the power cycle threshold of 10 power cyles is reached within 5 seconds after device powers on.
If the threshold of 10 power cycles is not reached before the timeout occurs, the threshold counter will reset.

Indoor

For indoor versions, UP is ON (1) and DOWN is OFF (0).

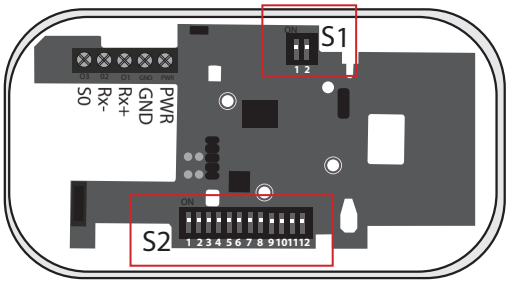


Fig. 4.aa

Duct/Outdoor

For Duct/Outdoor versions, RIGHT is ON (1) and LEFT is OFF (0).

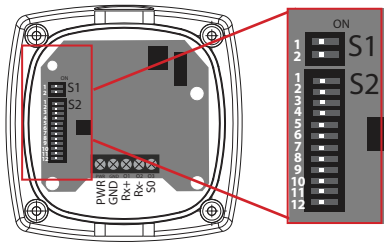


Fig. 4.ab

Switch S1

DIP	Function
1	**Termination Resistor** Off = No termination On = 120Ω terminated
2	**Display Temp. Units (Only on DPW models)** Off = Fahrenheit On = Celsius

Tab. 4.k

Activating DIP1 on S1 will add a 120 Ω termination resistor into the RS485 line to indicate the end of line. Take care to activate this resistor only on the last instrument in the line and not on the intermediate ones to ensure the correct operation of the system.

DIP2 on S1 will be present on all RS485 versions, but will only affect the operation of models that include an LCD display.

Switch S2

DIP	Function
1-8	**Modbus Address** 0-247 (binary)
9-10	**Baud Rate** 0(Off, Off) = 9600 1(Off, On) = 19200 2(On, Off) = 38400 3(On, On) = Reserved
11-12	**Data/Parity/Stop** 0(Off, Off) = 8N1 1(Off, On) = 8N2 2(On, Off) = 8O1 3(On,On) = 8E1

Tab. 4.l

For DIP1-DIP8, set the Modbus address to a value 1-247 using Table 4.o for reference. For DIP9-12, see Tab 4.m and Tab 4.n.

Baud rate (selectable)	SW9	SW10
9600 baud	OFF	OFF
19200 baud	OFF	ON
38400 baud	ON	OFF
Reserved	ON	ON

Tab. 4.m

For DIP9-10, set the desired baud rate using the following table for reference.

Data/Parity/Stop (selectable)	SW11	SW12
8 bits/None/1stop	OFF	OFF
8 bits/None/2stop	OFF	ON
8 bits/Odd/1stop	ON	OFF
8 bits/Even/1stop	ON	ON

Tab. 4.n

For DIP11-12, set the desired baud rate using the following table for reference.

4.2 S2 Address Setting

The rule for setting the address follows the binary coding rule, see the table below for an easy and safe selection of the address you want to give the instrument.

Serial address

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
4	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON
6	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF
7	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
8	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
9	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON
10	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF
11	OFF	OFF	OFF	OFF	ON	OFF	ON	ON
12	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
13	OFF	OFF	OFF	OFF	ON	ON	OFF	ON
14	OFF	OFF	OFF	OFF	ON	ON	ON	OFF
15	OFF	OFF	OFF	OFF	ON	ON	ON	ON
16	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
17	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
18	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF
19	OFF	OFF	OFF	ON	OFF	OFF	ON	ON
20	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF
21	OFF	OFF	OFF	ON	OFF	ON	OFF	ON
22	OFF	OFF	OFF	ON	OFF	ON	ON	OFF
23	OFF	OFF	OFF	ON	OFF	ON	ON	ON
24	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF
25	OFF	OFF	OFF	ON	ON	OFF	OFF	ON
26	OFF	OFF	OFF	ON	ON	OFF	ON	OFF
27	OFF	OFF	OFF	ON	ON	OFF	ON	ON
28	OFF	OFF	OFF	ON	ON	ON	OFF	OFF

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
29	OFF	OFF	OFF	ON	ON	ON	OFF	ON
30	OFF	OFF	OFF	ON	ON	ON	ON	OFF
31	OFF	OFF	OFF	ON	ON	ON	ON	ON
32	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
33	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON
34	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
35	OFF	OFF	ON	OFF	OFF	OFF	ON	ON
36	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
37	OFF	OFF	ON	OFF	OFF	ON	OFF	ON
38	OFF	OFF	ON	OFF	OFF	ON	ON	OFF
39	OFF	OFF	ON	OFF	OFF	ON	ON	ON
40	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF
41	OFF	OFF	ON	OFF	ON	OFF	OFF	ON
42	OFF	OFF	ON	OFF	ON	OFF	ON	OFF
43	OFF	OFF	ON	OFF	ON	OFF	ON	ON
44	OFF	OFF	ON	OFF	ON	ON	OFF	OFF
45	OFF	OFF	ON	OFF	ON	ON	OFF	ON
46	OFF	OFF	ON	OFF	ON	ON	ON	OFF
47	OFF	OFF	ON	OFF	ON	ON	ON	ON
48	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
49	OFF	OFF	ON	ON	OFF	OFF	OFF	ON
50	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
51	OFF	OFF	ON	ON	OFF	OFF	ON	ON
52	OFF	OFF	ON	ON	OFF	ON	OFF	OFF
53	OFF	OFF	ON	ON	OFF	ON	OFF	ON
54	OFF	OFF	ON	ON	OFF	ON	ON	OFF
55	OFF	OFF	ON	ON	OFF	ON	ON	ON
56	OFF	OFF	ON	ON	ON	OFF	OFF	OFF

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
57	OFF	OFF	ON	ON	ON	OFF	OFF	ON
58	OFF	OFF	ON	ON	ON	OFF	ON	OFF
59	OFF	OFF	ON	ON	ON	OFF	ON	ON
60	OFF	OFF	ON	ON	ON	ON	OFF	OFF
61	OFF	OFF	ON	ON	ON	ON	OFF	ON
62	OFF	OFF	ON	ON	ON	ON	ON	OFF
63	OFF	OFF	ON	ON	ON	ON	ON	ON
64	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
65	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON
66	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF
67	OFF	ON	OFF	OFF	OFF	OFF	ON	ON
68	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
69	OFF	ON	OFF	OFF	OFF	ON	OFF	ON
70	OFF	ON	OFF	OFF	OFF	ON	ON	OFF
71	OFF	ON	OFF	OFF	OFF	ON	ON	ON
72	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF
73	OFF	ON	OFF	OFF	ON	OFF	OFF	ON
74	OFF	ON	OFF	OFF	ON	OFF	ON	OFF
75	OFF	ON	OFF	OFF	ON	OFF	ON	ON
76	OFF	ON	OFF	OFF	ON	ON	OFF	OFF
77	OFF	ON	OFF	OFF	ON	ON	OFF	ON
78	OFF	ON	OFF	OFF	ON	ON	ON	OFF
79	OFF	ON	OFF	OFF	ON	ON	ON	ON
80	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
81	OFF	ON	OFF	ON	OFF	OFF	OFF	ON
82	OFF	ON	OFF	ON	OFF	OFF	ON	OFF
83	OFF	ON	OFF	ON	OFF	OFF	ON	ON
84	OFF	ON	OFF	ON	OFF	ON	OFF	OFF
85	OFF	ON	OFF	ON	OFF	ON	OFF	ON
86	OFF	ON	OFF	ON	OFF	ON	ON	OFF
87	OFF	ON	OFF	ON	OFF	ON	ON	ON
88	OFF	ON	OFF	ON	ON	OFF	OFF	OFF
89	OFF	ON	OFF	ON	ON	OFF	OFF	ON
90	OFF	ON	OFF	ON	ON	OFF	ON	OFF
91	OFF	ON	OFF	ON	ON	OFF	ON	ON
92	OFF	ON	OFF	ON	ON	ON	OFF	OFF
93	OFF	ON	OFF	ON	ON	ON	OFF	ON
94	OFF	ON	OFF	ON	ON	ON	ON	OFF
95	OFF	ON	OFF	ON	ON	ON	ON	ON
96	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
97	OFF	ON	ON	OFF	OFF	OFF	OFF	ON
98	OFF	ON	ON	OFF	OFF	OFF	ON	OFF
99	OFF	ON	ON	OFF	OFF	OFF	ON	ON
100	OFF	ON	ON	OFF	OFF	ON	OFF	OFF
101	OFF	ON	ON	OFF	OFF	ON	OFF	ON
102	OFF	ON	ON	OFF	OFF	ON	ON	OFF
103	OFF	ON	ON	OFF	OFF	ON	ON	ON
104	OFF	ON	ON	OFF	ON	OFF	OFF	OFF
105	OFF	ON	ON	OFF	ON	OFF	OFF	ON
106	OFF	ON	ON	OFF	ON	OFF	ON	OFF
107	OFF	ON	ON	OFF	ON	OFF	ON	ON
108	OFF	ON	ON	OFF	ON	ON	OFF	OFF
109	OFF	ON	ON	OFF	ON	ON	OFF	ON
110	OFF	ON	ON	OFF	ON	ON	ON	OFF
111	OFF	ON	ON	OFF	ON	ON	ON	ON
112	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
113	OFF	ON	ON	ON	OFF	OFF	OFF	ON
114	OFF	ON	ON	ON	OFF	OFF	ON	OFF
115	OFF	ON	ON	ON	OFF	OFF	ON	ON
116	OFF	ON	ON	ON	OFF	ON	OFF	OFF
117	OFF	ON	ON	ON	OFF	ON	OFF	ON
118	OFF	ON	ON	ON	OFF	ON	ON	OFF
119	OFF	ON	ON	ON	OFF	ON	ON	ON
120	OFF	ON	ON	ON	ON	OFF	OFF	OFF
121	OFF	ON	ON	ON	ON	OFF	OFF	ON
122	OFF	ON	ON	ON	ON	OFF	ON	OFF
123	OFF	ON	ON	ON	ON	OFF	ON	ON
124	OFF	ON	ON	ON	ON	ON	OFF	OFF
125	OFF	ON	ON	ON	ON	ON	OFF	ON
126	OFF	ON	ON	ON	ON	ON	ON	OFF
127	OFF	ON	ON	ON	ON	ON	ON	ON
128	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
129	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
130	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
131	ON	OFF	OFF	OFF	OFF	OFF	ON	ON
132	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
133	ON	OFF	OFF	OFF	OFF	ON	OFF	ON
134	ON	OFF	OFF	OFF	OFF	ON	ON	OFF
135	ON	OFF	OFF	OFF	OFF	ON	ON	ON
136	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
137	ON	OFF	OFF	OFF	ON	OFF	OFF	ON
138	ON	OFF	OFF	OFF	ON	OFF	ON	OFF
139	ON	OFF	OFF	OFF	ON	OFF	ON	ON
140	ON	OFF	OFF	OFF	ON	ON	OFF	OFF
141	ON	OFF	OFF	OFF	ON	ON	OFF	ON
142	ON	OFF	OFF	OFF	ON	ON	ON	OFF
143	ON	OFF	OFF	OFF	ON	ON	ON	ON
144	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF
145	ON	OFF	OFF	ON	OFF	OFF	OFF	ON
146	ON	OFF	OFF	ON	OFF	OFF	ON	OFF
147	ON	OFF	OFF	ON	OFF	OFF	ON	ON
148	ON	OFF	OFF	ON	OFF	ON	OFF	OFF
149	ON	OFF	OFF	ON	OFF	ON	OFF	ON
150	ON	OFF	OFF	ON	OFF	ON	ON	OFF
151	ON	OFF	OFF	ON	OFF	ON	ON	ON
152	ON	OFF	OFF	ON	ON	OFF	OFF	OFF
153	ON	OFF	OFF	ON	ON	OFF	OFF	ON
154	ON	OFF	OFF	ON	ON	OFF	ON	OFF
155	ON	OFF	OFF	ON	ON	OFF	ON	ON
156	ON	OFF	OFF	ON	ON	ON	OFF	OFF
157	ON	OFF	OFF	ON	ON	ON	OFF	ON
158	ON	OFF	OFF	ON	ON	ON	ON	OFF
159	ON	OFF	OFF	ON	ON	ON	ON	ON
160	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
161	ON	OFF	ON	OFF	OFF	OFF	OFF	ON
162	ON	OFF	ON	OFF	OFF	OFF	ON	OFF
163	ON	OFF	ON	OFF	OFF	OFF	ON	ON
164	ON	OFF	ON	OFF	OFF	ON	OFF	OFF
165	ON	OFF	ON	OFF	OFF	ON	OFF	ON
166	ON	OFF	ON	OFF	OFF	ON	ON	OFF
167	ON	OFF	ON	OFF	OFF	ON	ON	ON
168	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
169	ON	OFF	ON	OFF	ON	OFF	OFF	ON
170	ON	OFF	ON	OFF	ON	OFF	ON	OFF
171	ON	OFF	ON	OFF	ON	OFF	ON	ON
172	ON	OFF	ON	OFF	ON	ON	OFF	OFF
173	ON	OFF	ON	OFF	ON	ON	OFF	ON
174	ON	OFF	ON	OFF	ON	ON	ON	OFF
175	ON	OFF	ON	OFF	ON	ON	ON	ON
176	ON	OFF	ON	ON	OFF	OFF	OFF	OFF
177	ON	OFF	ON	ON	OFF	OFF	OFF	ON
178	ON	OFF	ON	ON	OFF	OFF	ON	OFF
179	ON	OFF	ON	ON	OFF	OFF	ON	ON
180	ON	OFF	ON	ON	OFF	ON	OFF	OFF
181	ON	OFF	ON	ON	OFF	ON	OFF	ON
182	ON	OFF	ON	ON	OFF	ON	ON	OFF
183	ON	OFF	ON	ON	OFF	ON	ON	ON
184	ON	OFF	ON	ON	ON	OFF	OFF	OFF
185	ON	OFF	ON	ON	ON	OFF	OFF	ON
186	ON	OFF	ON	ON	ON	OFF	ON	OFF
187	ON	OFF	ON	ON	ON	OFF	ON	ON
188	ON	OFF	ON	ON	ON	ON	OFF	OFF
189	ON	OFF	ON	ON	ON	ON	OFF	ON
190	ON	OFF	ON	ON	ON	ON	ON	OFF
191	ON	OFF	ON	ON	ON	ON	ON	ON
192	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
193	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
194	ON	ON	OFF	OFF	OFF	OFF	ON	OFF
195	ON	ON	OFF	OFF	OFF	OFF	ON	ON
196	ON	ON	OFF	OFF	OFF	ON	OFF	OFF
197	ON	ON	OFF	OFF	OFF	ON	OFF	ON
198	ON	ON	OFF	OFF	OFF	ON	ON	OFF
199	ON	ON	OFF	OFF	OFF	ON	ON	ON
200	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
201	ON	ON	OFF	OFF	ON	OFF	OFF	ON
202	ON	ON	OFF	OFF	ON	OFF	ON	OFF
203	ON	ON	OFF	OFF	ON	OFF	ON	ON
204	ON	ON	OFF	OFF	ON	ON	OFF	OFF
205	ON	ON	OFF	OFF	ON	ON	OFF	ON
206	ON	ON	OFF	OFF	ON	ON	ON	OFF
207	ON	ON	OFF	OFF	ON	ON	ON	ON

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
208	ON	ON	OFF	ON	OFF	OFF	OFF	OFF
209	ON	ON	OFF	ON	OFF	OFF	OFF	ON
210	ON	ON	OFF	ON	OFF	OFF	ON	OFF
211	ON	ON	OFF	ON	OFF	OFF	ON	ON
212	ON	ON	OFF	ON	OFF	ON	OFF	OFF
213	ON	ON	OFF	ON	OFF	ON	OFF	ON
214	ON	ON	OFF	ON	OFF	ON	ON	OFF
215	ON	ON	OFF	ON	OFF	ON	ON	ON
216	ON	ON	OFF	ON	ON	OFF	OFF	OFF
217	ON	ON	OFF	ON	ON	OFF	OFF	ON
218	ON	ON	OFF	ON	ON	OFF	ON	OFF
219	ON	ON	OFF	ON	ON	OFF	ON	ON
220	ON	ON	OFF	ON	ON	ON	OFF	OFF
221	ON	ON	OFF	ON	ON	ON	OFF	ON
222	ON	ON	OFF	ON	ON	ON	ON	OFF
223	ON	ON	OFF	ON	ON	ON	ON	ON
224	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
225	ON	ON	ON	OFF	OFF	OFF	OFF	ON
226	ON	ON	ON	OFF	OFF	OFF	ON	OFF
227	ON	ON	ON	OFF	OFF	OFF	ON	ON

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
228	ON	ON	ON	OFF	OFF	ON	OFF	OFF
229	ON	ON	ON	OFF	OFF	ON	OFF	ON
230	ON	ON	ON	OFF	OFF	ON	ON	OFF
231	ON	ON	ON	OFF	OFF	ON	ON	ON
232	ON	ON	ON	OFF	ON	OFF	OFF	OFF
233	ON	ON	ON	OFF	ON	OFF	OFF	ON
234	ON	ON	ON	OFF	ON	OFF	ON	OFF
235	ON	ON	ON	OFF	ON	OFF	ON	ON
236	ON	ON	ON	OFF	ON	ON	OFF	OFF
237	ON	ON	ON	OFF	ON	ON	OFF	ON
238	ON	ON	ON	OFF	ON	ON	ON	OFF
239	ON	ON	ON	OFF	ON	ON	ON	ON
240	ON	ON	ON	ON	OFF	OFF	OFF	OFF
241	ON	ON	ON	ON	OFF	OFF	OFF	ON
242	ON	ON	ON	ON	OFF	OFF	ON	OFF
243	ON	ON	ON	ON	OFF	OFF	ON	ON
244	ON	ON	ON	ON	OFF	ON	OFF	OFF
245	ON	ON	ON	ON	OFF	ON	OFF	ON
246	ON	ON	ON	ON	OFF	ON	ON	OFF
247	ON	ON	ON	ON	OFF	ON	ON	ON

Tab. 4.o

4.3 Instrument Calibration

There are several methods of instrument calibration, the main ones are described below.

4.3.1 Automatic CO2 Calibration

The CO2 sensor will automatically baseline calibrate (ABC) CO2 levels and gradually make adjustments to compensate for sensor drift due to long-term aging of the IR light source. This CO2 sensor assumes a baseline of 400 ppm and should be exposed to this minimum level of CO2 at least once every 14 days (default for automatic calibration) to maintain accurate calibration. This baseline is naturally achieved during periods of inoccupation, such as overnight for a typical commercial building. The automatic calibration interval is controlled by the ABC Period register (address 4x0027). This register can be set to any whole number between 1 and 15, representing days. For optimal automatic calibration, expose the sensor to fresh air at least four times over 21 days. This helps minimize deviation errors and maintain sensor accuracy.

Note on Disabling Automatic Calibration: If the "Toggle CO2 ABC" register is set to 0, the automatic calibration cycle will not be performed, and the interval set in the ABC Period register will be ignored.

4.3.2 Manual Calibration using Instrument

The CO_2 sensor includes an automatic periodic calibration function. However, in areas with limited ventilation, it is advisable to perform manual calibration periodically. Follow these steps to perform manual calibration:

1. Prepare the Area. Ensure the area where the instrument is installed is well-ventilated. The CO_2 concentration should be below 500 ppm before, during, and immediately after the calibration.
2. Activate Calibration. Start the calibration by setting the "Force CO_2 ABC" register to high over the serial interface. Once activated, step away from the instrument to avoid influencing the CO_2 readings.
3. Calibration Completion. The calibration completes automatically within 5 seconds. During this time, the "Force CO_2 ABC" coil resets to zero. To confirm the calibration outcome, check the "Force CO_2 Calibration Status" register.
4. The result of the calibration process can be verified by reading the "Force CO2 Calibration Status" register.

The following table describes the meaning of each status code:

Value	Meaning
0	Default status. Forced calibration has not occurred since the last device power-on.
1	Forced calibration is in progress.
3	Forced calibration completed successfully.
4	Forced calibration failed.

Tab. 4.p

4.4 Typical Connection to the RS485 Supervision Network

For correct operation, the DP-THC measuring instrument must be connected on the serial line to a supervisor, which can be a pCO or a BOSS family supervisor. Some typical installations for the indoor and duct versions of connections between DP-THC sensors and the Carel system are shown below.

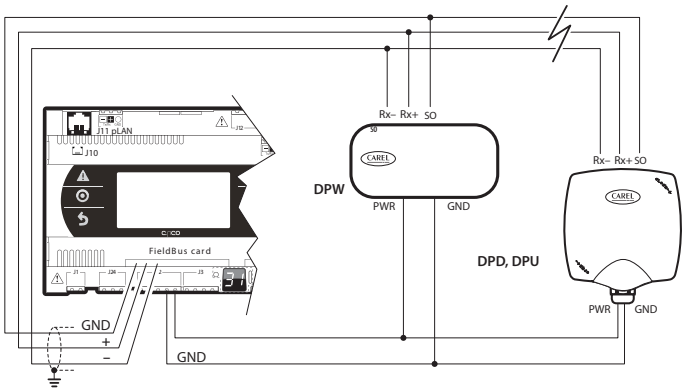


Fig. 4.ac

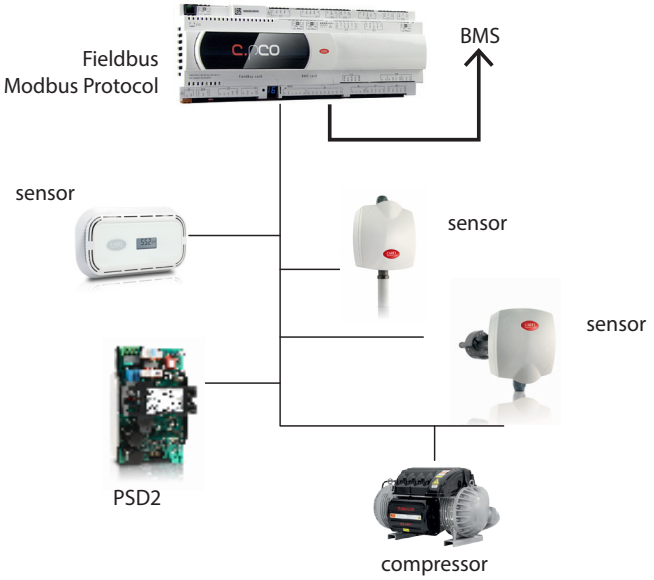


Fig. 4.ad

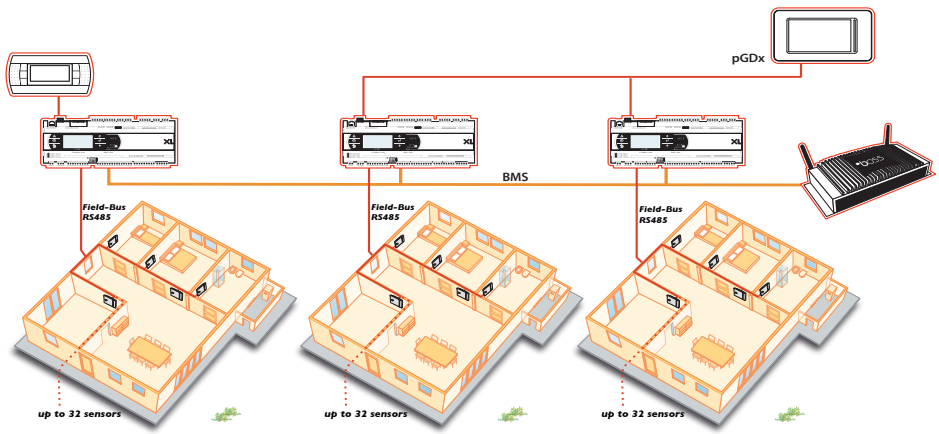


Fig. 4.ae

4.5 Table of Main Variables-Parameters for Serial Sensors

The parameters can be accessed via serial line using the Modbus protocol. Refer to DP-THC Sensor configuration chapter for Modbus settings for all versions of product.
The parameters and status variables table is shown below:

Variables Table

Function code 04 Read Input Register (read only)

Address	Short Description	Description	Min	Max	Default	Scale	Type	Units
3x0000	CO2 value 1s	CO2 value sampled every 1 second	350	5000		1	int16	CO2 ppm
3x0001	CO2 value 5s	CO2 value sampled every 5 seconds (average)	350	5000		1	int16	CO2 ppm
3x0002	Reserved		0	0				
3x0003	Reserved		0	0				
3x0004	Temperature °C 1s	Temparture °C value sampled every 1 second	-400	800		10	int16	°C
3x0005	Temperature °C 5s	Temparture °C value sampled every 5 seconds (average)	-400	800		10	int16	°C
3x0006	RH value 1s	RH value sampled every 1 second	0	1000		10	int16	% Rh
3x0007	RH value 5s	RH value sampled every 5 seconds (average)	0	1000		10	int16	% Rh
3x0008	Reserved		0	0				
3x0009	Firmware version	Product release FW	0	65535		1	Int16	
3x0010	Reserved		0	0				
3x0011	Reserved		0	0				
3x0012	Reserved		0	0				
3x0013	Reserved		0	0				
3x0014	Reserved		0	0				
3x0015	Temperature °F 1s	Temperature °F value sampled every 1 second	-400	1760		10	int16	°F
3x0016	Temperature °F 5s	Temperature °F value sampled every 5 seconds (average)	-400	1760		10	int16	°F
3x0017	Force CO2	Calibration Status:	0	4	0	1	Int16	
		0 = idle						
		1 = ongoing calibration						
		3 = calibration success						
		4 = calibration failed						

Tab. 4.q

Function Code: Read command 0x03, write command 0x06 and 0x10, holding registers (read/write)

Address	Short Description	Description	Min	Max	Default	Scale	Type
4x0000	Display parameter	0 = Cycle between Rh/T or Rh/T/CO2	0	3	0	1	int16
		1 = Display fixed to CO2					
		2 = Display fixed to Temperature					
		3 = Display fixed to Rh					
4x0001	Reserved						
4x0002	Reserved						
4x0003	Reserved						
4x0004	Reserved						
4x0005	Reserved						
4x0006	Reserved						
4x0007	Reserved						
4x0008	Reserved						
4x0009	Reserved						
4x0010	Reserved						
4x0011	Reserved						
4x0012	Reserved						
4x0013	Reserved						
4x0014	Reserved						
4x0015	Reserved						
4x0016	Reserved						
4x0017	Reserved						
4x0018	Reserved						
4x0019	Reserved						
4x0020	Reserved						
4x0021	CO2 Offset ppm	CO2 offset, units in ppm.	-500	500	0	1	int16
4x0022	Temperature Offset °C	Temperature offset, units in °C. Will automatically update °F offset when written.	-100	100	0	10	int16
4x0023	Humidity Offset	Relative humidity offset %	-100	100	0	10	int16
4x0024	Temperature Offset °F	Temperature offset, units in °F. Will automatically update °C offset when written.	-180	180	0	10	int16
4x0025	Modbus address	Sets Modbus address (compact only)	1	247	100 (compact)	1	int16
4x0026	Modbus RS485 settings (Compact only)	Decimal Baud Rate Stop bit/Parity	0	15	1 (compact)	1	int16
		0 9600 8N1					
		1 19200 8N1					
		2 38400 8N1					
		3 Reserved					
		4 9600 8N2					
		5 19200 8N2					
		6 38400 8N2					
		7 Reserved					
		8 9600 8O1					
		9 19200 8O1					
		10 38400 8O1					
		11 Reserved					
		12 9600 8E1					
		13 19200 8E1					
		14 38400 8E1					
4x0027	ABC Period	Set CO2 ABC period in days	1	15	14	1	int16

Tab. 4.r

Function code: read command 0x01, write command 0x05 and 0x0F, coild (read/write)

Address	Name	Description	Default
1	Force CO2 ABC	Forces immediate CO2 ABC when set	0
2	Reserved		0
3	Toggle CO2 ABC	0 = CO2 automatic calibration disabled	1
		1 = CO2 automatic calibration enabled	
4	Factory reset	Restore default configuration when set	0
5	Confirm Modbus settings	Set to save and switch to new Modbus settings (Compact)	0

Tab. 4.s

Function 02 Read Boolean (Discrete)

Address	Name	Description	Default
1x001	Temperature error flag	Set when error in temperature reading	0
1x002	Humidity error flag	Set when error in humidity reading	0
1x003	CO2 error flag	Set when error in CO2 reading	0

Tab. 4.t

5. GENERAL

5.1 General Warnings

- To maintain the index of protection declared in the outdoor versions with "IP65" case, the wiring must use multicore cables, with the outer sheath having a maximum diameter of 8 mm.
- It is recommended to use shielded cables. The cables carrying the temperature and humidity signals must not run near the 115 to 230 or 400 to 480 Vac power cables, or near cables that power from the contactors to the loads. Measurement errors due to electromagnetic coupling must be avoided.
- The sensor power supply and electrical signals are very low voltage, nonetheless for connection to the controllers, remember that supplementary electrical insulation is required. The metal protection on the DPR* is connected to the sensor power supply reference. For conformity to the safety standards, double insulation must be used for the power supply to the sensor and the controller it is connected to, if the sensor zone is accessible to the user in the installation.

The sensors can be integrated into Class 1 or 2 equipment, with the following warnings:

Class I:
the power supply reference GND must be earthed.

Class II:
double insulation or reinforced insulation must be used for the power supply to the sensor and the controller it is connected to. If this is not possible, in normal use, the sensor zone must be made inaccessible to the users.
Do not expose to sources of heat or direct sunlight.

Note: For the connection of the analogue outputs at distances over 30 m, the installer must make sure that the suitable precautions and protectors specified have been applied in compliance with the standards. Depending on the installation, the shield of the analogue signal connection cables may need to be earthed.

5.2 Sensor Chemical Compatibility Table

The sensor elements have undergone chemical compatibility testing under ISO 16750-5:2003
Application method: brushing
Rest time: 1 hour
Check: > 24 hours after application

Five (5) samples were tested for each chemical load. After exposure, the samples were checked for:
- relative humidity measurement within specifications;
- temperature measurement within specifications;

Chemical Load	%RH	T
Diesel	OK	OK
Biodiesel	OK	OK
Ethanol(pure)	OK	OK
Isopropanol	OK	OK
Cockpit spray	OK	OK
Protective lacquer	OK	OK
Protective lacquer remover	OK	OK

Chemical Load	%RH	T
Refreshment containing caffeine and sugar	OK	OK
Cold cleaning agent	OK	OK
Spiritus	OK	OK
Car wash cleaner	OK	OK
Glass cleaner	OK	OK
Interior cleaner	OK	OK

Tab. 5.u

In addition, the following gas concentrations were evaluated regarding their effects on the humidity signal, based on tests and checks in the field.

	Effect in gas concentration		
	No effect	Reversible effect, offset < 5%RH	Non-reversible effect, offset > 5%RH
NH3 100 ppm		X	
CO2 5000ppm	X		
NO2 3ppm		X	
H2S 1ppm	X		
H2 3500 ppm	X		
Cl 1ppm		X	

Tab. 5.v

6. VERSION WITH NTC OUTPUT ONLY

6.1 Terminal Characteristics

The temperature-only version with NTC resistive output uses an NTC sensor 10K@25°C (beta 3435), see the temperature-resistance table shown below, with the following characteristics of the terminal:

Rated cross-section	2.5mm2
Maximum screwdriver size	2.8 mm
Terminal plastic material	Polyamide PA6
Terminal	Chrome-plated brass
Terminal screw	Chrome-plated steel

Tab. 6.w

6.2 Resistance Values of the CAREL NTC Temperature Sensors

Temp.	Resistance value		
	Max.	Std	Min.
°C	KΩ	KΩ	KΩ
-50	220,66	212,34	204,30
-49	216,37	208,22	200,35
-48	212,07	208,22	196,40
-47	207,77	199,97	192,45
-46	203,47	195,85	188,50
-45	199,18	191,73	184,55
-44	194,88	187,61	180,60
-43	190,58	183,49	176,65
-42	186,28	179,37	172,70
-41	181,99	175,25	168,75
-40	219,20	210,51	202,16
-39	207,13	199,04	191,24
-38	195,78	188,24	180,96
-37	185,11	178,07	171,29
-36	175,07	168,51	162,18
-35	165,62	159,50	153,60
-34	156,73	151,03	145,51
-33	148,36	143,04	137,89
-32	140,48	135,51	130,71
-31	133,06	128,42	123,93
-30	126,07	121,74	117,55
-29	119,48	115,43	111,52
-28	113,26	109,49	105,83
-27	107,41	103,88	100,47
-26	101,88	98,59	95,40
-25	96,67	93,60	90,61
-24	91,76	88,89	86,10
-23	87,12	84,44	81,83
-22	82,74	80,23	77,79
-21	78,60	76,26	73,98
-20	74,69	72,50	70,37
-19	71,00	68,95	66,96
-18	67,51	65,60	63,73
-17	64,21	62,42	60,68
-16	61,09	59,42	57,79
-15	58,14	56,58	55,05
-14	55,35	53,89	52,46
-13	52,71	51,34	50,00
-12	50,21	48,93	47,67
-11	47,84	46,64	45,47
-10	45,60	44,48	43,38
-9	43,47	42,42	41,40
-8	41,46	40,48	39,52
-7	39,55	38,63	37,73
-6	37,74	36,88	36,04
-5	36,02	35,22	34,43
-4	34,39	33,64	32,90
-3	32,84	32,14	31,45
-2	31,38	30,72	30,07
-1	29,98	29,37	28,76
0	28,66	28,08	27,52
1	27,40	26,86	26,33
2	26,20	25,70	25,20
3	25,07	24,60	24,13
4	23,99	23,55	23,11
5	22,96	22,55	22,14
6	21,98	21,60	21,22
7	21,05	20,69	20,34
8	20,16	19,83	19,50
9	19,32	19,01	18,70
10	18,52	18,23	17,94
11	17,75	17,48	17,21
12	17,02	16,77	16,52
13	16,33	16,09	15,86
14	15,67	15,45	15,22
15	15,04	14,83	14,62
16	14,43	14,24	14,05
17	13,86	13,68	13,50
18	13,31	13,14	12,97
19	12,79	12,63	12,47
20	12,29	12,14	12,00
21	11,81	11,67	11,54
22	11,35	11,23	11,10
23	10,91	10,80	10,68
24	10,50	10,39	10,28
25	10,10	10,00	9,90
26	9,73	9,63	9,53
27	9,37	9,27	9,17
28	9,03	8,93	8,83
29	8,70	8,60	8,50
30	8,38	8,29	8,19
31	8,08	7,98	7,89
32	7,79	7,70	7,60
33	7,52	7,42	7,32
34	7,25	7,16	7,06
35	7,00	6,90	6,81
36	6,75	6,66	6,57
37	6,52	6,43	6,33
38	6,29	6,20	6,11
39	6,08	5,99	5,90
40	5,87	5,78	5,69
41	5,67	5,58	5,50
42	5,48	5,39	5,31
43	5,30	5,21	5,12
44	5,12	5,04	4,95
45	4,95	4,87	4,78
46	4,79	4,71	4,62
47	4,63	4,55	4,47
48	4,48	4,40	4,32
49	4,33	4,25	4,18
50	4,20	4,12	4,04
51	4,06	3,98	3,91
52	3,93	3,85	3,78
53	3,81	3,73	3,66
54	3,69	3,61	3,54
55	3,57	3,50	3,43
56	3,46	3,39	3,32
57	3,35	3,28	3,21
58	3,25	3,18	3,11
59	3,15	3,08	3,02
60	3,05	2,99	2,92
61	2,96	2,90	2,83
62	2,87	2,81	2,74
63	2,78	2,72	2,66
64	2,70	2,64	2,58
65	2,62	2,56	2,50
66	2,54	2,48	2,42
67	2,47	2,41	2,35
68	2,40	2,34	2,28
69	2,33	2,27	2,21
70	2,26	2,20	2,15
71	2,19	2,14	2,08
72	2,13	2,08	2,02
73	2,07	2,02	1,96
74	2,01	1,96	1,91
75	1,95	1,90	1,85
76	1,90	1,85	1,80
77	1,84	1,80	1,75
78	1,79	1,75	1,70
79	1,74	1,70	1,65
80	1,70	1,65	1,60
81	1,65	1,60	1,56
82	1,60	1,56	1,51
83	1,56	1,51	1,47
84	1,52	1,47	1,43
85	1,48	1,43	1,39
86	1,44	1,40	1,35
87	1,40	1,36	1,32
88	1,36	1,32	1,28
89	1,32	1,28	1,25
90	1,29	1,25	1,21
91	1,26	1,22	1,18
92	1,22	1,19	1,15
93	1,19	1,15	1,12
94	1,16	1,12	1,09
95	1,13	1,09	1,06
96	1,10	1,06	1,03
97	1,07	1,04	1,00
98	1,04	1,01	0,98
99	1,02	0,98	0,95
100	0,99	0,96	0,93
101	0,97	0,94	0,90
102	0,94	0,91	0,88
103	0,92	0,89	0,86
104	0,90	0,87	0,84
105	0,87	0,84	0,81
106	0,85	0,82	0,79
107	0,83	0,80	0,77
108	0,81	0,78	0,76
109	0,79	0,76	0,74
110	0,77	0,74	0,72

Tab. 6.x

7. TECHNICAL SPECIFICATIONS

	DPW	DPD	DPU	DPR
Power Supply	12 to 24 Vac +15%/-10% or 12 to 24 Vdc +15%/-10% (min-max)			5VDC ±5%
	16 to 24 Vac +15%/-10% or 20 to 24Vdc +15%/-10% for 0 to 10 V out versions			
Frequency	50-60Hz			
Power consumption	RS485: max. 0,4W/ 1,5VA; Analog: max. 0,5W/2VA; CO2 (Analog/RS485): max. 1,4W/4,-5VA			RS485: max. 0,1W; Analog: max. 0,01W
Operating range	Temperature with LCD: -10 °C to +50 °C			
	Temperature: -40 °C to +70 °C			
	Temperature with CO2: -20 °C to +50 °C			
	Humidity: 10 to 100 % RH, non-condensing			
Precision	HUM: ±2% RH@25 °C, in, ±5% RH max			HUM: ±3% RH@25 °C, in, ±5% RH max
	TEMP: ±0.5°C @ 25°C; ±1°C @ -40T70°C			
	CO2: ±(30ppm + 3% of reading) (400-2,000ppm), -10-50°C, 0-85%RH			
	NTC resistive: ±0.3 °C at 25 °C, ±0.9 °C @ -10T60 °C			
Storage	-40T70 °C ; 10-90% RH non-condensing			
Temperature Sensor	Silicon Band-gap			
Humidity sensor	Capacitive sensor			
CO2 Sensor	NDIR Sensor			
Termperature output signals	Range -40T70°C			
	NTC value 42.47 @ -10°C; 3.02K @ 60°C			
	Voltage for 0 to 10 V 90.90 mV/°C (0 V =-40 °C 10 V=+70 °C)			
	Current 4 to 20 mA 0.109 mA/°C (4 =-40 °C 20 mA =+70 °C)			
Humidity output signals	Range 0…100% RH			
	Voltage 0 to 10 V 100mV/% rH (0V = 0% rH 10 V=100% rH)			Voltage for 0.5 to 4.5V; 0.5V = 0% rH, 4.5V = 100% r
	Current 4 to 20 mA 0.16mA/% rH (4 = 0% rH 20 mA =100% rH)			
CO2 output signals	Range 0...2000 PPM			
	Voltage 0 to 10 V 5mV/PPM (0V = 0PPM 10 V=2000 PPM)			
	Current 4 to 20 mA 0.008mA/PPM (4 = 0 PPM 20 mA =2000 PPM)			
Output Voltage	Minimum load resistance 10k Ω			
RS485 output signal	Insulated RS485 Serial, Modbus protocol			RS485 Serial, Modbus protocol
Maximum working altitude	3000 m			
Terminal strip/cable	Screw terminals for cables max. cross-section 1.5 – min. 0.2 mm2			
Product index of protection	IP20	"Case IP55 Probe; IP40/ IP20 (CO2 Version)"	IP65	IP40
Impact protection rating	IK06	IK08		IK06
Temperature time constant	in still air 300 s/ in ventilated air (3 m/s) 60 s			
Humidity time constant	in still air 60 s/ in ventilated air (3 m/s) 20 s			
"Classification according to protection against electric shock (*)"	Class II			
PTI of the insulating materials	250 V			
Period of stress across the insulating parts	Long			
Level of environmental pollution	2			
Category of resistance to heat and fire	Category D (for the case and cover)			
Overvoltage Category	Category 1			



The power supply used must be SELV type.
If the power supply has more than 1A maximum current, insert an appropriately sized external fuse.
Maximum power supply voltage (AC) 30 Vrms or 60 Vdc.

8. CLEANING AND MAINTENANCE

When cleaning the instrument do not use ethyl alcohol, hydrocarbons (petrol), ammonia and derivatives. Use neutral detergents and water. Periodically check the aeration slits on the sensor to make sure that air can flow freely through, without obstructions due to impurities or dust in the site of installation.

9. MECHANICAL DIMENSIONS

9.1 Indoor Version(DPW*)

DPTR000001

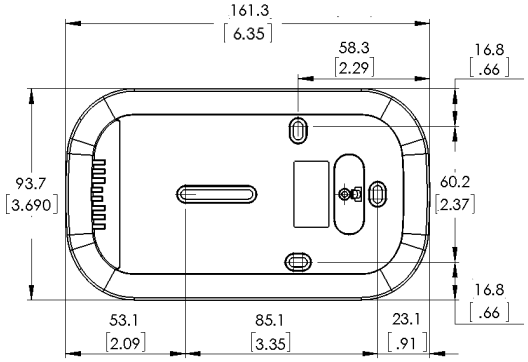


Fig. 9.a

DPWS*

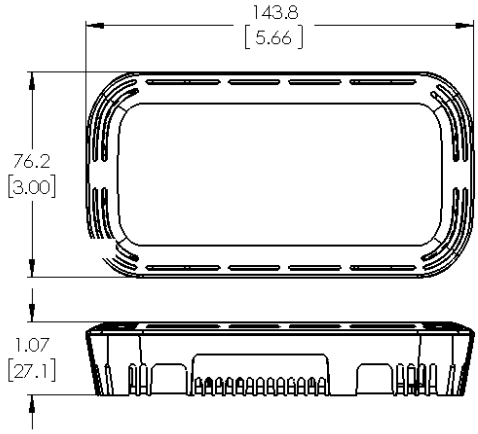


Fig. 9.b

9.2 Duct Version(DPD*)

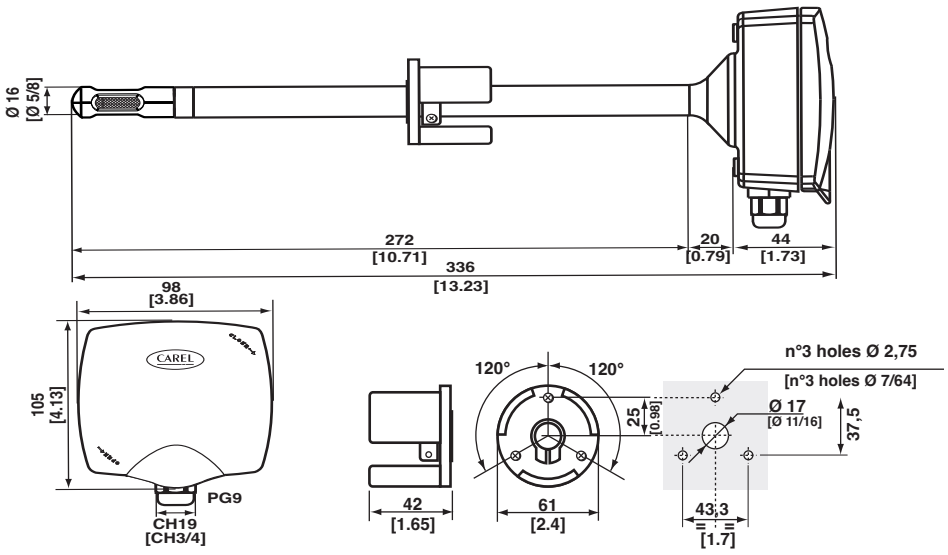


Fig. 9.c

9.3 Outdoor Version (DPU*)

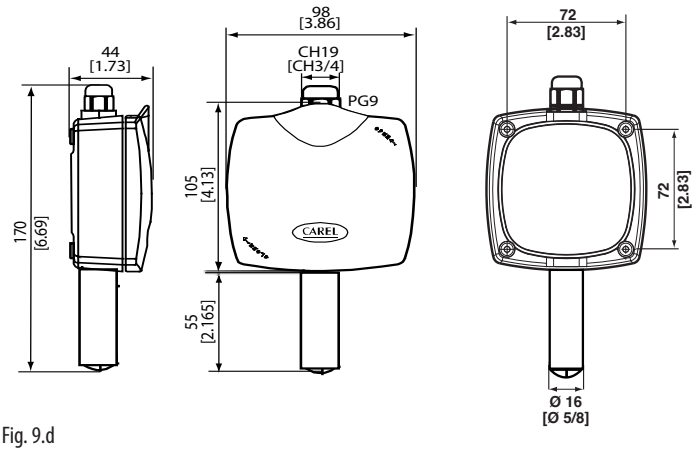


Fig. 9.d

9.4 Compact Version (DPR*)

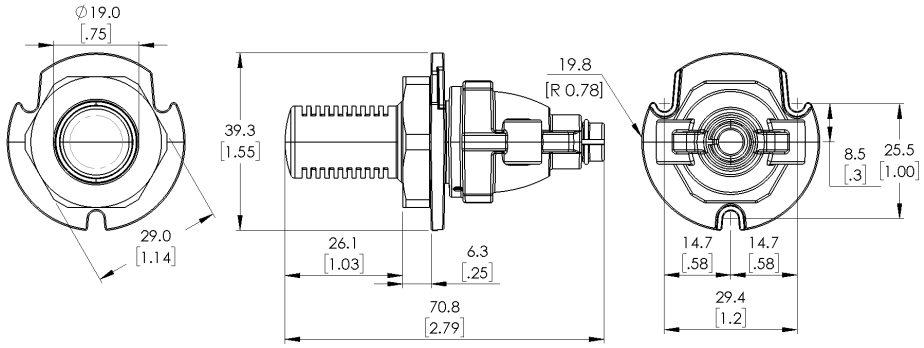


Fig. 9.e

Notes

CAREL

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DP-THC Sensors +030222230 rel 1.0 10/04/2025

ENG





Sonde THC

+030222230- ENG

Up to date version available on

www.carel.com