

## Operating instructions, mounting &amp; installation

**DPWQ 502000**  
**DPWQ 402000**

Room air quality CO<sub>2</sub> sensor respectively  
measuring transducer (VOC), self-calibrating

**DPDQ 502000**  
**DPDQ 402000**

Duct air quality and CO<sub>2</sub> sensor respectively  
measuring transducer (VOC), self-calibrating

# DPWQ 502000

# DPWQ 402000

Room air quality CO<sub>2</sub> sensor  
respectively measuring transducer (VOC),  
self-calibrating, with active output

# CAREL

#### APPLICATION:

The self-calibrating microprocessor-controlled CO<sub>2</sub> and mixed gas measuring device is used for the detection of air quality and/or CO<sub>2</sub> content in air within a range of 0 ppm to 2000 ppm CO<sub>2</sub>. Measuring signals are converted into standard signals of 0-10V.

The CO<sub>2</sub> content of air is determined by a NDIR sensor. Self-calibration of the CO<sub>2</sub> measurement takes place in cycles of ca. 7 days. In order to ensure this function, it is necessary to provide the device with fresh air [CO<sub>2</sub> content: 300...400 ppm] at least once every 7 days.

The air quality detection range is calibrated for standard applications such as monitoring in residential and conference rooms. The lifetime of the mixed gas sensor used for this purpose is limited. It depends on type and concentration of pollutant gases. When device-specific parameters are observed, the expected lifetime is at least 36 months.

DPWQ 502000  
DPWQ 402000



#### TECHNICAL DATA:

Power supply: ..... 24 V AC/DC

#### CARBON DIOXIDE:

Sensor, CO<sub>2</sub>: ..... optical sensor (NDIR)

Measuring range, CO<sub>2</sub>: ..... 0...2.000 ppm CO<sub>2</sub>

Output, CO<sub>2</sub>: ..... 0 - 10 V

Measuring accuracy, CO<sub>2</sub>: ..... ± 30 ppm, ± 5% of final value

Pressure dependence: ..... ± 1.6% / kPa (referred to normal pressure)

Long-term stability: ..... ± 1% of final value per year

Gas exchange: ..... by diffusion

#### AIR QUALITY:

Air quality sensor: ..... VOC sensor (metal oxide)

Measuring range, air quality: ..... 0...100% (mixed gas pollution referred to calibrating gas)

Output air quality: ..... 0 - 10 V (0V = clean air, 10V = polluted air)

Measuring accuracy, air quality: ..... ± 20% of final value (referred to calibrating gas)

Warm-up period: ..... ca. 1 hour

Ambient temperature: ..... 0...+50 °C

Electrical connection: ..... 0.14 - 1.5 mm<sup>2</sup> via screw terminals on circuit board

Enclosure: ..... plastic, material ABS, RAL9010,

Dimensions: ..... 95 x 97 x 30 mm

Installation: ..... on-wall or on in-wall flush box Ø 55 mm,  
base with 4 holes for mounting on vertically or  
horizontally installed flush boxes, with predetermined breaking  
point for on-wall cable entry

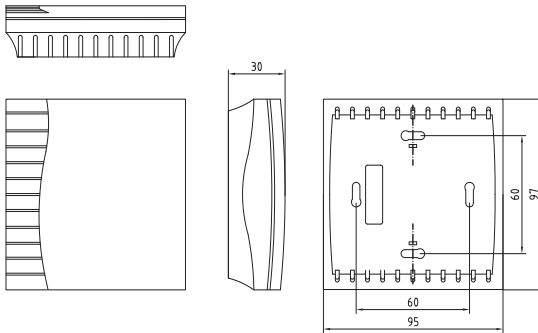
Protection class: ..... III (according to EN 60730)

Protection type: ..... IP 30 (according to IEC 529)

Standards: ..... CE conformity, electromagnetic compatibility  
according to EN 61326 + A1 + A2,  
EMC directive 89/336 / EWG  
low-voltage directive 73/23 / EWG

Dimensional drawing

DPWQ502000  
DPWQ402000



Connecting diagram

DPWQ502000

- 1 UB-GND
- 2 UB+supply voltage 24V AC / DC
- 3 Output 0-10V CO<sub>2</sub> content 0-2000ppm
- 4 Output 0-10V AQ air quality

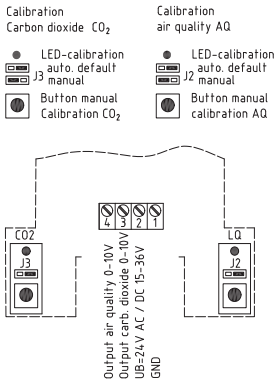
Connecting diagram

DPWQ402000

- 1 UB+ 24V DC/24V AC
- 2 UB- 24V DC/24V AC
- 3 Free
- 4 Free
- 5 Free
- 6 Free
- 7 Free
- 8 Output 0-10V CO<sub>2</sub>- content 0-2000ppm
- 9 Free

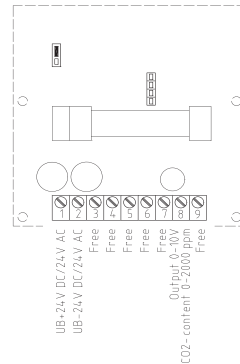
Circuit diagram

DPWQ502000



Circuit diagram

DPWQ402000



Type/WG1	Measuring range CO <sub>2</sub>	Measuring range Air quality	Output CO <sub>2</sub>	Output Air quality
DPWQ 402000	0...2.000 ppm	-	0 -10 V	-
DPWQ 502000	0...2.000 ppm	0...100%	0 -10 V	0 -10 V

Note: This CO<sub>2</sub>+mixed gas measuring transducer must not be used as safety-relevant device!

# DPDQ 502000 including mounting flange

# DPDQ 402000 including mounting flange

Duct air quality and CO<sub>2</sub> sensor  
respectively measuring transducer (VOC),  
self-calibrating, with active output

# CAREL

#### APPLICATION:

The self-calibrating microprocessor-controlled CO<sub>2</sub> and mixed gas measuring device is used for the detection of air quality and/or CO<sub>2</sub> content in air within a range of 0 ppm to 2000ppm CO<sub>2</sub>. Measuring signals are converted into standard signals of 0-10V.

The CO<sub>2</sub> content of air is determined by a NDIR sensor. Self-calibration of the CO<sub>2</sub> measurement takes place in cycles of ca. 7 days. In order to ensure this function, it is necessary to provide the device with fresh air (CO<sub>2</sub> content 300...400ppm) at least once every 7 days.

The air quality detection range is calibrated for standard applications such as monitoring in residential and conference rooms. The lifetime of the mixed gas sensor used for this purpose is limited. It depends on type and concentration of pollutant gases. When device-specific parameters are observed, the expected lifetime is at least 36 months.

#### TECHNICAL DATA:

Power supply: ..... 24 V AC/DC

#### CARBON DIOXIDE:

Sensor, CO<sub>2</sub>: ..... optical sensor (NDIR)

Measuring range, CO<sub>2</sub>: ..... 0...2.000 ppm CO<sub>2</sub>

Output, CO<sub>2</sub>: ..... 0 - 10 V

Measuring accuracy, CO<sub>2</sub>: ..... ± 30ppm, ± 5% of final value

Pressure dependence: ..... ± 1.6% /kPa (referred to normal pressure)

Long-term stability: ..... ± 1% of final value per year

Gas exchange: ..... by diffusion

#### AIR QUALITY:

Air quality sensor: ..... VOC sensor (metal oxide)

Measuring range, air quality: ..... 0...100% (mixed gas pollution referred to calibrating gas)

Output air quality: ..... 0 - 10 V (0V = clean air, 10V = polluted air)

Measuring accuracy, air quality: ..... ± 20% of final value (referred to calibrating gas)

Warm-up period: ..... 1 hour

Ambient temperature: ..... 0...+50 °C

Electrical connection: ..... 0.14 - 1.5 mm<sup>2</sup> via screw terminals on circuit board

Enclosure: ..... plastic, material polyamide, 30% glass-globe-reinforced,  
with quick-locking screws,  
colour pure white (similar RAL9010)

Dimensions: ..... 108 x 72.5 x 70 mm

Cable union: ..... M16, including strain relief

Protective tube: ..... metal, Ø 20 mm, rated length NL = 185 mm

Process connection: ..... by mounting flange, plastic,  
(included in the scope of delivery),  
galvanised steel optional

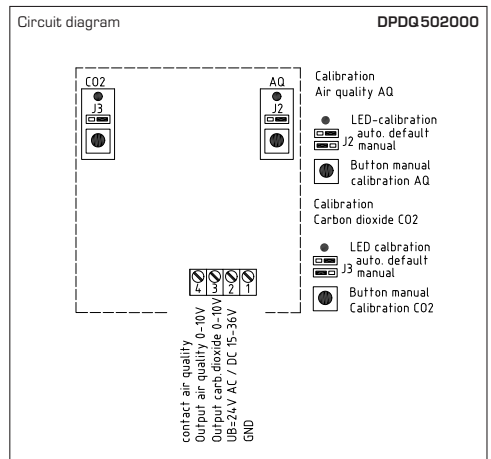
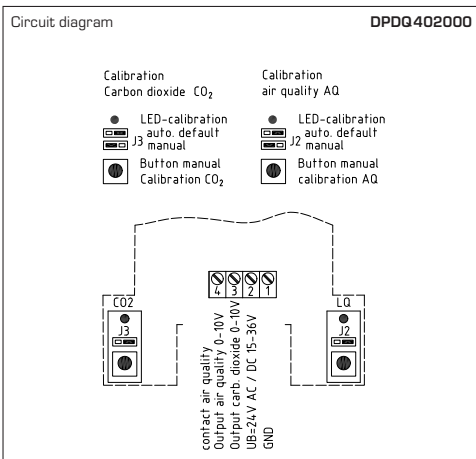
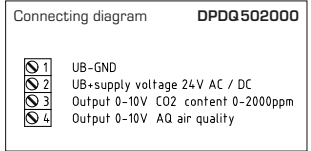
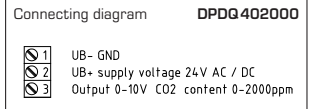
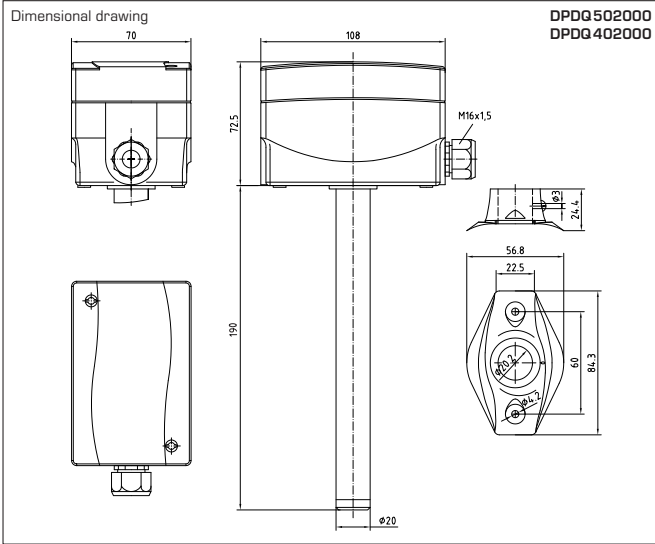
Protection class: ..... III (according to EN 60 730)

Protection type: ..... IP 65 (according to IEC 529)

Standards: ..... CE conformity, electromagnetic compatibility  
according to EN 61 326 + A1 + A2,  
EMC directive 89/336/EWG  
low-voltage directive 73/23/EWG

DPDQ 402000  
DPDQ 502000





Type/WG1	Measuring range CO <sub>2</sub>	Measuring range Air quality	Output CO <sub>2</sub>	Output Air quality
DPDQ402000	0...2.000 ppm	-	0 -10 V	-
DPDQ502000	0...2.000 ppm	0...100%	0 -10 V	0 -10 V

Note: This CO<sub>2</sub>+mixed gas measuring transducer must **not** be used as safety-relevant device!

## Mounting information DPWQ402000 and DPDQ402000:

The sensor element is connected to the electronic component assembly by a plug connector. When removing the cover and internal wiring, make sure not to loosen this connector. To connect the electric leads, the terminal is pulled off the component assembly. The cable is lead through the cable union and connected to the terminal. After tightening the connections, the plug connector is put back on again (ensure correct polarity!). The connecting cable is carefully pulled back while putting the cover back on and then is fixed by the cable union. Watch for the wire connections inside the device during mounting.

**Automatic calibration of carbon dioxide measurement (default):** The device calibrates itself at an interval of 7 days. To ensure this function, the device needs to be supplied with fresh air (CO<sub>2</sub> content 300 ppm...400 ppm) at least for 10 minutes during each 7-day period. For self-calibration, the devices memorises device-internally the CO<sub>2</sub> content minimum value measured during a 7-day period. After 7 days, this minimum value is standardised to 350 ppm CO<sub>2</sub> and the output signal is corrected accordingly. The maximum amount of correction is here limited to 40 ppm/interval.

**Manual calibration of carbon dioxide measurement:** Manual calibration can be started independently from the position of jumper J3 by pushing the button. After connecting the device, a period of at least 10 minutes of continuous operation of the device at fresh air (CO<sub>2</sub> content 300 ppm...400 ppm) is to be ensured. Manual calibration of the output signal to 1.75 V (350 ppm = zero-point) is started by pressing the button "Manual calibration CO<sub>2</sub>" (for ca. 5 seconds). Preparing for calibration is indicated by a blinking LED. Setting the output to 1.75 V at actual ambient conditions follows automatically thereafter. During this phase, the LED is permanently activated. After calibration is completed, the LED is deactivated.

**Putting in operation:** After switching on the device, a self-test and tempering period follows. This procedure takes 3 to 5 minutes, depending on ambient conditions. During this time, the output analog voltage differs from the actual measured value.

## General notes on DPWQ502000/DPDQ502000:

**Automatic calibration of air quality (default):** The minimum initial value for air quality is memorized within a period of ca. 4 weeks. After that period has lapsed, the output signal is standardised to zero-point (1.0 V). The maximum amount of correction is thereby limited to 1 V/interval. In this way, long-term drifts and operational aging effects of the sensor element are completely eliminated.

**Manual calibration of air quality:** Manual calibration can be started independently from the position of jumper J2 by pushing the button. After connecting the device, a period of at least 2 hours of continuous operation of the device at "normal" air quality is to be ensured. Manual calibration of the output signal to 1 V (zero-point) is started by pressing the button "Manual calibration" (for ca. 5 seconds). Preparing for calibration is indicated by a blinking LED. Setting the output to 1 V at actual ambient conditions follows automatically thereafter. During this phase, the LED is permanently activated. After calibration is completed, the LED is deactivated.

**General information of air quality:** Due to its functional principle, the lifetime of the sensor depends on nature and concentration of the pollutant gas burden. The sensitive layer of the sensor element reacts with all volatile organic compounds and is thereby modified in its electrical properties or "exhausted". This process results in a displacement of the characteristic curve. Such characteristic curve displacement however amounts to less than 15 %/year under normal burden. In measuring air quality, the general condition of air quality is detected. Whether air quality is "good" or "bad" is differently interpreted by each person. Different pollution burdens and concentrations influence the air quality signal (0...10 Volt) in different ways. Examples for this are cigarette smoke, deodorant sprays, cleaning agents, or also various adhesive materials for floor and wall coverings as well as dustfuels. Increased burdens e.g. by solvents, nicotine, hydrocarbons, aerosol propellants etc. intensify consumption /aging of the sensor element. Particularly under high pollutant gas burdens – also during non-operational idle state periods of the devices (transport and storage) – zero-point drift will occur. Consequently, this must be corrected at site according to the respective circumstances or basic burdens. Air quality measuring instruments of different manufacturers cannot directly be compared because of different functional principles, preset basic burdens (zero-point), and permitted burdens (amplification /sensitivity). Devices are preset respectively calibrated according to the sensor manufacturer's specifications. Here, a zero-point and a final value is determined and thus a maximum burden. In particular cases, exceeding measuring ranges or excessive basic burdens on the devices will occur (outgassing floor carpeting, wall paint, etc.). In order to enable distinguishing different air qualities, devices need to be adjusted by the customer according to the conditions existing on site that do not correlate to the factory-preset definition range and calibration. Please note that factory calibration is thereby lost and compliance with technical data can no longer be guaranteed.

**Automatic calibration of carbon dioxide measurement (default):** The device calibrates itself at an interval of 7 days. To ensure this function, the device needs to be supplied with fresh air (CO<sub>2</sub> content 300 ppm...400 ppm) at least for 10 minutes during each 7-day period. For self-calibration, the devices memorises device-internally the CO<sub>2</sub> content minimum value measured during a 7-day period. After 7 days, this minimum value is standardised to 350 ppm CO<sub>2</sub> and the output signal is corrected accordingly. The maximum amount of correction is here limited to 40 ppm/interval.

**Manual calibration of carbon dioxide measurement:** Manual calibration can be started independently from the position of jumper J3 by pushing the button. After connecting the device, a period of at least 10 minutes of continuous operation of the device at fresh air (CO<sub>2</sub> content 300 ppm...400 ppm) is to be ensured. Manual calibration of the output signal to 1.75 V (350 ppm = zero-point) is started by pressing the button "Manual calibration CO<sub>2</sub>" (for ca. 5 seconds). Preparing for calibration is indicated by a blinking LED. Setting the output to 1.75 V at actual ambient conditions follows automatically thereafter. During this phase, the LED is permanently activated. After calibration is completed, the LED is deactivated. Air quality is measured by a chemical sensor.

## Notes regarding DPDQ402000, DPWQ402000

- This device may only be used in non-precipitating air without above-atmospheric or below-atmospheric pressure at the sensor element.
- The voltage output is short-circuit proof.
- Applying overvoltage will destroy the device.
- In case of pollution, we recommend cleaning and recalibration in the factory.
- The device operating range covers 10...95% relative humidity respectively 0...50 °C. Outside of that range, mismeasurements or increased deviations will occur.
- The device calibrates itself at an interval of 7 days. To ensure this function, the device needs to be supplied with fresh air (CO<sub>2</sub> content 300 ppm...400 ppm) at least for 10 minutes during each 7-day period.
- If this device is operated beyond the specified range, all warranty claims are forfeited.

**ATTENTION!** The minimum CO<sub>2</sub> concentration of outdoor air amounts to ca. 350 ppm [output voltage = 1.75 V] in leafy, hardly industrialized areas. A sensor self-test is initiated by above-atmospheric or below-atmospheric pressure or by exposure of the sensor to more than 5000 ppm CO<sub>2</sub>. The output voltage [CO<sub>2</sub> output] amounts to ca. 0.2 Volt during the self-test. Gas inter-exchange in the sensor element happens by diffusion. Depending on changes in the CO<sub>2</sub> concentration and flow velocity of the air surrounding the sensor, the reaction of the device to changes in CO<sub>2</sub> concentration may appear with a delay. It is absolutely necessary to choose the device mounting position so that the air stream "presses" into the duct tube. Otherwise, below-atmospheric pressure will develop in the duct tube that may cause a substantial slow down of gas exchange or even prevent it.

Our "General Terms and Conditions for Business" together with the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry" including supplementary clause "Extended Retention of Title" apply as the exclusive terms and conditions.

In addition, the following points are to be observed:

- These instructions must be read before installation and putting in operation and all notes provided therein are to be regarded!
- Devices must only be connected to safety extra-low voltage and under dead-voltage condition. To avoid damages and errors the device (e.g. by voltage induction) shielded cables are to be used, laying parallel with current-carrying lines is to be avoided, and EMC directives are to be observed.
- This device shall only be used for its intended purpose. Respective safety regulations issued by the VDE, the states, their control authorities, the TÜV and the local energy supply company must be observed. The purchaser has to adhere to the building and safety regulations and has to prevent perils of any kind.
- No warranties or liabilities will be assumed for defects and damages arising from improper use of this device.
- Consequential damages caused by a fault in this device are excluded from warranty or liability.
- These devices must be installed by authorised specialists only.
- The technical data and connecting conditions of the mounting and operating instructions delivered together with the device are exclusively valid. Deviations from the catalogue representation are not explicitly mentioned and are possible in terms of technical progress and continuous improvement of our products.
- In case of any modifications made by the user, all warranty claims are forfeited.
- This device must not be installed close to heat sources (e.g. radiators) or be exposed to their heat flow. Direct sun irradiation or heat irradiation by similar sources (powerful lamps, halogen spotlights) must absolutely be avoided.
- Operating this device close to other devices that do not comply with EMC directives may influence functionality.
- This device must not be used for monitoring applications, which solely serve the purpose of protecting persons against hazards or injury, or as an EMERGENCY STOP switch for systems or machinery, or for any other similar safety-relevant purposes.
- Dimensions of enclosures or enclosure accessories may show slight tolerances on the specifications provided in these instructions.
- Modifications of these records are not permitted.
- In case of a complaint, only complete devices returned in original packing will be accepted.

**These instructions must be read before installation and putting in operation and all notes provided therein are to be regarded!**

## SUPPLY VOLTAGE:

For operating voltage reverse polarity protection, a one-way rectifier or reverse polarity protection diode is integrated in this device variant. This internal one-way rectifier also allows operating 0-10V devices on AC supply voltage.

The output signal is to be tapped by a measuring instrument. Output voltage is measured here against zero potential (0V) of the input voltage!

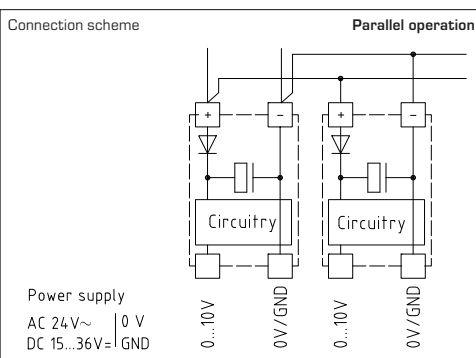
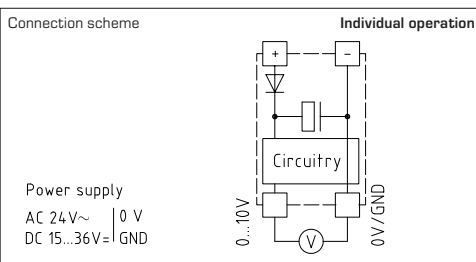
When this device is operated on DC supply voltage, the operating voltage input UB+ is to be used for 15...36V DC supply and UB- or GND for ground wire!

When several devices are supplied by one 24V AC voltage supply, it is to be ensured that all "positive" operating voltage input terminals (+) of the field devices are connected with each other and all "negative" operating voltage input terminals (-) (= reference potential) are connected together (in-phase connection of field devices). All outputs of field devices must be referenced to the same potential!

In case of reversed polarity at one field device, a supply voltage short-circuit would be caused by that device. The consequential short-circuit current flowing through this field device may cause damage to it.

**Therefore, pay attention to correct wiring!**

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## Disposal of the product



The appliance (or the product) must be disposed of separately in accordance with the local waste disposal legislation in force.

### WARNING

The CAREL product is a state-of-the-art device, 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](http://www.carel.com). 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 installation and/or equipment. The failure to complete such phase, which is required/indicated in the user manual, may cause the final product to malfunction; CAREL accepts no liability in such cases. The customer must use the product only in the manner described in the documentation relating to the product.

The liability of CAREL in relation to its products is specified in the CAREL general contract conditions, available on the website [www.carel.com](http://www.carel.com) and/or by specific agreements with customers.