ENGLISH

Operating instructions
mounting & installation

CAREL

DPWQ 502000

Room air quality (VOC) and CO_2 sensor,
with self-calibrating,
with multi-range switching,
active and switching output

DPDQ 502000 including mounting flange

Duct air quality (VOC) and CO_2 sensor,
with self-calibrating,
with multi-range switching,
active and switching output

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DPWQ 502000

APPLICATION:

The maintenance-free, microprocessor-controlled room sensor is used to monitor the CO_2 concentration as well as air quality (VOC). All measurands are converted to standard signals (0-10 V or 4...20 mA). The room sensor measures CO_2 in the range of 0...2000 ppm or 0...5000 ppm, VOC at one of three selectable sensitivity levels LOW / MEDIUM (default) / HIGH. Elegant enclosure made of plastic, with snap-on lid, base with 4-hole attachment, for installation on vertically or horizontally installed in-wall flush boxes, with predetermined breaking point for on-wall cable entry. The air quality is determined based on a (VOC) gas mixture sensor. The CO_2 content of the air is measured using an optical NDIR sensor (non-dispersive infra-red technology).

DPWQ 502000

TECHNICAL DATA:

Power supply:	24 V AC / DC (± 10 %)
Power consumption:	< 4.4 W / 24 V DC typical; < 6.4 VA / 24 V AC typical; peak current 200 mA
Outputs:	**0-10 V** or **4...20 mA** (selectable via DIP switches, selected variant applies for all outputs), working resistance < 800 Ω
AIR QUALITY (VOC)	
Sensor, VOC:	VOC sensor (metal oxide) **with automatic calibration** (VOC = volatile organic compounds)
Measuring range, VOC:	0...100 % air quality; referred to calibrating gas; **multi-range switching** (selectable via DIP switches) VOC sensitivity low, medium, high
Output, VOC:	**0-10 V** (0 V = clean air, 10 V = polluted air) or **4...20 mA** (selectable via DIP switches, switchpoint can be adjusted from 0...100 % of the output signal)
Measuring accuracy, VOC:	± 20 % of final value (referred to calibrating gas)
Service life:	> 60 months (under normal load conditions)
CARBON DIOXIDE (CO_2)	
Sensor, CO_2:	optical NDIR sensor (non-dispersive infra-red technology) **with automatic and manual calibration**
Measuring range, CO_2:	**multi-range switching** (selectable via DIP switches) 0...2000 ppm; 0...5000 ppm
Output, CO_2:	**0-10 V** or **4...20 mA** (selectable via DIP switches)
Measuring accuracy, CO_2:	± 30 ppm ± 3 % of measured value
Temperature dependence, CO_2:	± 5 ppm / °C or ± 0.5 % of measured value / °C (whichever is higher)
Pressure dependence:	± 0.13 % / mm Hg
Long-term stability:	< 2 % in 15 years
Gas exchange:	by diffusion
Relay output:	with potential-free changeover contact 24 V (assignment selectable via DIP switches)
Ambient temperature:	0...+ 50 °C
Operating range, humidity:	0...95 % r.H. (without dew formation)
Warm up time:	approx. 1 hour
Response time:	< 2 minutes
Electrical connection:	0.14 - 1.5 mm^2, via screw terminals
Enclosure:	plastic, material ABS, colour pure white (similar to RAL 9010)
Dimensions:	98 x 98 x 33 mm
Installation:	wall mounting or on in-wall flush box, Ø 55 mm, base with 4 holes, for attachment to vertically or horizontally installed in-wall flush boxes for rear cable entry, with predetermined breaking point for cable entry from top / bottom in case of plain on-wall installation
Protection class:	III (according to EN 60 730)
Protection type:	IP 30 (according to EN 60 529)
Standards:	CE conformity, electromagnetic compatibility according to EN 61 326, EMC Directive 2014 / 30 / EU, Low Voltage Directive 2014 / 35 / EU

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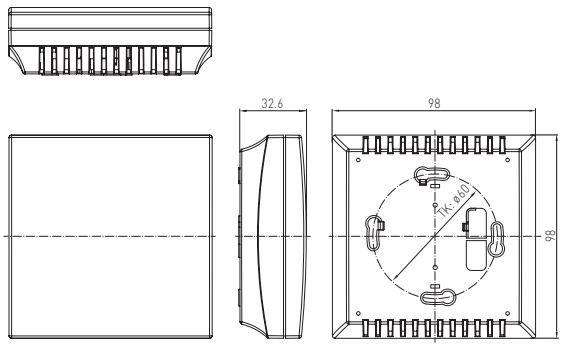
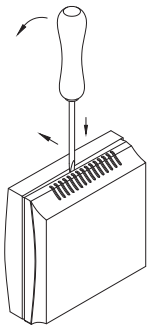
Dimensional drawing **DPWQ 502000**

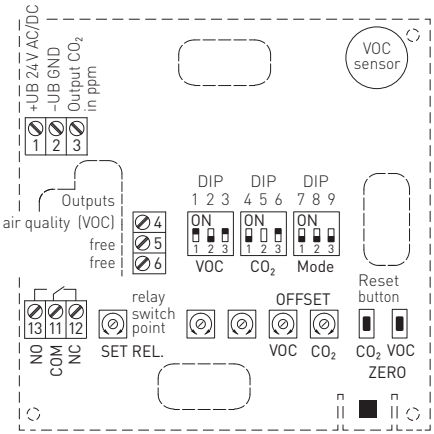


Enclosure **DPWQ 502000**



To open the enclosure, set a screwdriver (2.0) in the groove at centre, press down, and lift up the bottom frame slightly. Pull top cover forward and hold it.

Connecting diagram **DPWQ 502000**



NC = Normally Closed
COM = Common
NO = Normally Open

DIP switches	DPWQ 502000	
VOC sensitivity	**DIP 1**	**DIP 2**
LOW	OFF	OFF
MEDIUM (default)	**ON**	OFF
HIGH	OFF	**ON**
VOC automatic zero point		**DIP 3**
deactivated		OFF
activated (default)		**ON**
CO_2 content		**DIP 4**
0...2000 ppm (default)		OFF
0...5000 ppm		**ON**
CO_2 automatic zero point		**DIP 6**
deactivated		OFF
activated (default)		**ON**
Relay assignment	**DIP 7**	**DIP 8**
CO_2 (default): 600...1900 ppm / 900...4700 ppm	OFF	OFF
VOC: 10...95%	**ON**	OFF
Output		**DIP 9**
Voltage 0-10 V (default)		OFF
Current 4...20 mA		**ON**
Note: **DIP 5** is not assigned!		

Type / WG02	Measuring Range CO_2	Measuring Range VOC	Output VOC + CO_2	Features
DPWQ 502000	0...2000 / 0...5000 ppm	0...100%	0 - 10 V / 4...20 mA	Changeover contact
Note:	This unit **must not** be used as safety-relevant device!			

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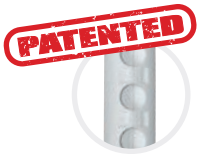
DPDQ 502000 including mounting flange

APPLICATION:

Patented quality product (patent no. DE 10 2014 010 719.1)

The maintenance-free, microprocessor-controlled duct sensor is used to monitor the CO_2 concentration as well as air quality (VOC). All measurands are converted to standard signals (0-10 V or 4...20 mA). The duct sensor measures CO_2 in the range of 0...2000 ppm or 0...5000 ppm, VOC at one of three selectable sensitivity levels LOW / MEDIUM (default) / HIGH. The CO_2 content of the air is measured using an optical NDIR sensor (non-dispersive infra-red technology). The detection range of the sensors is calibrated for standard applications such as monitoring residential rooms and conference rooms. Room ventilation on an as-needed basis, improved well-being and customer benefit, increased comfort as well as reduced operating costs through energy conservation are just some of the benefits of employing the CO_2 sensor. The explanations above demonstrate that there are applications for CO_2 measurements, for VOC measurements, but from our perspective, above all, for a combination of both measurands. The crucial factor in this respect is that both of these measurands are not convertible into each other and derivations to or from one another cannot be made. An NDIR CO_2 measuring instrument measures selectively and cannot detect any VOC; a VOC mixed gas sensor cannot recognize CO_2 molecules.

DPDQ 502000



TECHNICAL DATA:

Power supply:	24 V AC / DC (± 10 %)
Power consumption:	< 4.8 W / 24 V DC typical; < 6.8 VA / 24 V AC typical; peak current 200 mA
Outputs:	**0-10 V** or **4...20 mA** (selectable via DIP switches, selected variant applies for all outputs), working resistance < 800 Ω
AIR QUALITY (VOC)	
Sensor, VOC:	VOC sensor (metal oxide) **with automatic calibration** (VOC = volatile organic compounds)
Measuring range, VOC:	0...100 % air quality; referred to calibrating gas; **multi-range switching** (selectable via DIP switches) – VOC sensitivity low, medium, high
Output, VOC:	**0-10 V** (0 V = clean air, 10 V = polluted air) or **4...20 mA** (selectable via DIP switches, switchpoint can be adjusted from 0...100 % of the output signal)
Measuring accuracy, VOC:	± 20 % of final value (referred to calibrating gas)
Service life:	> 60 months (under normal load conditions)
CARBON DIOXIDE (CO_2)	
Sensor, CO_2:	optical NDIR sensor (non-dispersive infra-red technology) including atmospheric pressure compensation (up to 1100 mbar) **with automatic and manual calibration**
Measuring range, CO_2:	**multi-range switching** (selectable via DIP switches) – 0...2000 ppm; 0...5000 ppm
Output, CO_2:	**0-10 V** or **4...20 mA** (selectable via DIP switches)
Measuring accuracy, CO_2:	± 30 ppm ± 3 % of measured value
Temperature dependence, CO_2:	± 5 ppm / °C or ± 0.5 % of measured value / °C (whichever is higher)
Pressure dependence:	± 0.13 % / mm Hg
Long-term stability:	< 2 % in 15 years
Gas exchange:	by diffusion
Relay output:	with potential-free changeover contact 24 V (assignment selectable via DIP switches)
Ambient temperature:	–10...+60 °C
Operating range, humidity:	0...95 % r.H. (without dew formation)
Response time:	< 2 minutes
Electrical connection:	0.14 - 1.5 mm^2, via screw terminals
Enclosure:	plastic, polyamide, 30 % glass-globe reinforced, with quick-locking screws (slotted / Phillips head combination), colour traffic white (similar to RAL 9016)
Enclosure dimensions:	126 x 90 x 50 mm
Cable gland:	M16 x 1.5; including strain relief, exchangeable
Protective tube:	**PLEUROFORM™**, material polyamide (PA6), with torsion protection, Ø 20 mm, v_{max} = 30 m/s (air), NL = 202.5 mm
Process connection:	via flange made of plastic (included in scope of delivery)
Protection class:	III (according to EN 60730)
Protection type:	IP65 (according to EN 60529) enclosure only! (PLEUROFORM IP30)
Standards:	CE conformity, electromagnetic compatibility according to EN 61 326, EMC Directive 2014 / 30 / EU

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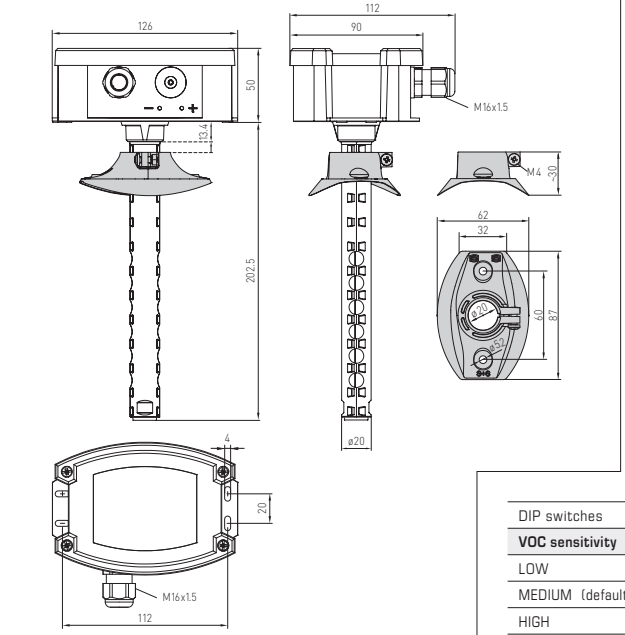
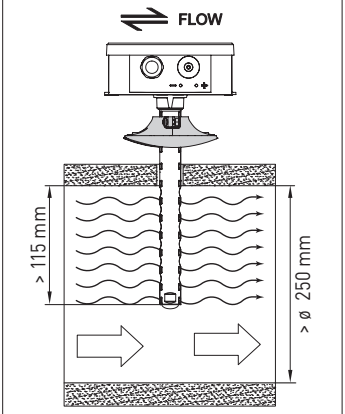
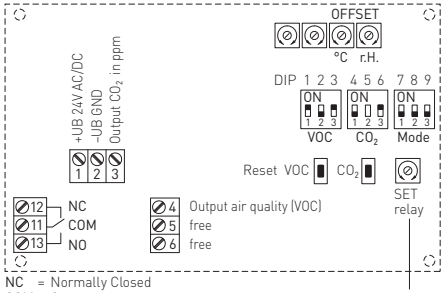
Dimensional drawing **DPDQ502000**



Mounting diagram **DPDQ502000**



Connecting diagram **DPDQ502000**



NC = Normally Closed
COM = Common
NO = Normally Open

SET-Setting relay switchpoint

DIP switches	DPDQ502000	
VOC sensitivity	**DIP 1**	**DIP 2**
LOW	OFF	OFF
MEDIUM (default)	**ON**	OFF
HIGH	OFF	**ON**
VOC automatic zero point		**DIP 3**
deactivated		OFF
activated (default)		**ON**
CO_2 content		**DIP 4**
0...2000 ppm (default)		OFF
0...5000 ppm		**ON**
CO_2 automatic zero point		**DIP 6**
deactivated		OFF
activated (default)		**ON**
Relay assignment	**DIP 7**	**DIP 8**
CO_2 (default): 600...1900 ppm / 900...4700 ppm	OFF	OFF
VOC: 10...95%	**ON**	OFF
Output		**DIP 9**
Voltage 0-10 V (default)		OFF
Current 4...20 mA		**ON**
Note: **DIP 5** is not assigned!		

Type / WG02	Measuring Range CO_2	Measuring Range VOC	Output VOC + CO_2	Features
DPDQ502000	0...2000 / 0...5000 ppm	0...100%	0-10 V / 4...20 mA	Changeover contact
Note:	This unit **must not** be used as safety-relevant device!			

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Notes regarding DPWQ502000 and DPDQ502000

- This device may only be used in pollutant-free non-precipitating air without above-atmospheric or below-atmospheric pressure at the sensor element.
- On outdoor and duct sensors, the sinter filter of the senor element protects the humidity sensor against potential dust exposure. In case of pollution / contamination, this filter should be cleaned on a regular basis.
- Dust and pollution falsify measurement results and are to be avoided. Slight pollution and dust sediments can be removed by using compressed air.
- Touching the humidity element is under any circumstances to be avoided, as that would result in considerable mismeasurements.
- In case of pollution, we recommend cleaning and recalibration in the factory.
- In any case, the sensor must not get in contact with chemicals or other cleaning agents.
- The air quality signal "good"..."bad" is represented by the output signal 0-10 V or 4...20 mA.
- The device operating range covers 10 ... 95 % relative humidity respectively –35...+80 °C. Beyond that range, mismeasurements or increased deviations will occur.
- The chemical sensor is a consumable. The lifetime of the sensor depends on nature and concentration of the pollutant gas burden.
- When several sensors are connected to one voltage supply of 24 V AC, correct polarity must be regarded as otherwise the alternating voltage source may be short-circuited.
- The outputs are short-circuit proof. Applying overvoltage or voltage supply to the output will destroy the device.
- If this device is operated beyond the specified range, all warranty claims are forfeited.

ATTENTION!
The minimum CO_2 concentration of outdoor air amounts to approx. 350 ppm (output voltage = 1.75 V at MR = 2000 ppm or 0.7 V at MR = 5000 ppm) in leafy, hardly industrialised areas. Gas inter-exchange in the sensor element happens by diffusion. Depending on the changes to the concentration and the flow velocity of the air surrounding the sensor, the reaction of the device to the change of concentration may take place with a delay. It is absolutely necessary to choose the device mounting position to ensure that the air stream "presses" into the duct tube. Otherwise, below-atmospheric pressure will develop in the duct tube that may cause a substantial deceleration of gas exchange or even prevent it.

Automatic calibration of the carbon dioxide measurement – ABC logic (default)
The automatic background logic is a self-calibrating mechanism that is suitable for use in applications in which the CO_2 concentration drops to fresh air level (350 - 400 ppm) at least three times in 7 days. This should typically occur during times in which rooms are unoccupied. The sensor reaches its normal accuracy after 24 hours of continuous operation in an environment that has been subjected to a fresh air supply of 400 ppm CO_2. The deviation errors remain minimal if the sensor is exposed to fresh air at least 4 times within 21 days. The ABC logic needs continuous operating cycles of more than 24 hours to operate correctly.

Manual calibration of carbon dioxide measurement
Manual calibration can be carried out independently of the DIP switch position (ABC logic).
Sufficient fresh air (CO_2 content = 500 ppm) must be provided before and after the calibration procedure!
The calibration procedure is started by pressing the "**Reset CO_2**" (for approx. five seconds).
This is signalled by the flashing LED. Then calibration takes place.
During this phase, the LED is constantly active. The LED is deactivated after successful calibration.

Automatic calibration of air quality (default)
Within a period of approx. 4 weeks, the minimum output value for air quality is saved. After this period, the output signal is standardised to the zero point (1.0 V). The maximum amount of correction per interval is limited. Long-term drifts and the operation-related ageing of the sensor element are thus completely eliminated.

Manual calibration of air quality
Manual calibration can be carried out independently of the DIP switch position.
Sufficient fresh air must be provided before and after the calibration procedure!
The calibration procedure is started by pressing the "**Reset VOC**" button (for approx. five seconds).
This is signalled by the flashing LED. Then calibration takes place.
During this phase, the LED is constantly active. The LED is deactivated after successful calibration.

General information on air quality
The service life of the sensor depends on its functional principle and the type and concentration of pollutant gas burden. The sensitive layer of the sensor element reacts with all volatile organic compounds and is therefore modified in its electrical properties. This procedure leads to an offset of the characteristic line. When measuring the air quality, the general condition of the air quality is recorded. Whether the air quality is "good" or "bad" depends on the individual interpretation of each individual. Different pollution burdens and concentrations influence the air quality signal (0 - 10 V) in different ways. Examples are cigarette smoke, deodorant sprays, cleaning agents and various adhesive materials for floor and wall coverings, as well as dyes. Increased levels of solvents, nicotine, hydrocarbons, aerosol propellants, etc. intensify the wear/ageing of the sensor element. Especially at high pollutant gas burdens, even when the devices are idle (transport and storage) the zero point is adjusted. This must be corrected on-site depending on the specific conditions or basic burdens. Air quality measuring instruments from various manufacturers cannot be compared directly with each other because of the different functional principles, the pre-set basic burden (zero point) and the permitted burden (amplification/sensitivity). The devices are set or calibrated according to the specifications of the sensor manufacturer. Here, a zero point and end value, and therefore a maximum load, are established. In special circumstances, there is an overrun of the measuring range or an excessively high basic burden on the devices (outgassing carpets, wall paint, etc.) In order to enable a measurement or distinction of different air qualities, the devices must be configured by the client in accordance with the on-site conditions which do not correspond to the function domain and thus the factory calibration. Here, it should be noted that the factory calibration will be lost and technical data compliance can no longer be guaranteed.

Putting in operation
After switching on the device, a self-test and tempering period follows. This procedure takes 30 - 50 minutes, depending on the ambient conditions. During this time the output analogue voltage differs from the actual measured value.

Switching point setting
A switching point between 10 % and 95 % of the measuring range can be selected using the SET potentiometer. The 10 % value is added to the fresh air limit of 400 ppm for CO_2. With other measurands, the corresponding lower limit is used directly as a basis. A potential-free changeover contact is available as a switch output. The assignment of the switch output to measurand is done via DIP switch (DIP 7 and DIP 8).

Offset
Each measuring channel has a separate offset potentiometer for subsequent adjustment of the measurement. The adjusting range is ± 10 % of the measuring range.

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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 additionIn 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 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.

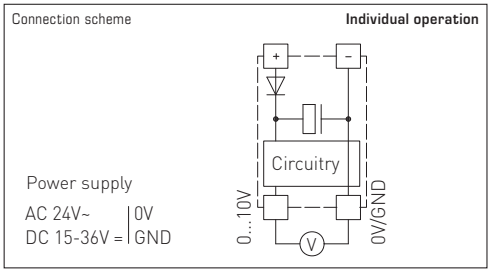
SUPPLY VOLTAGE:

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 on AC supply voltage.

The output signal is to be tapped by a measuring instrument. The output signal is measured her 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!

Connection scheme **Individual operation**

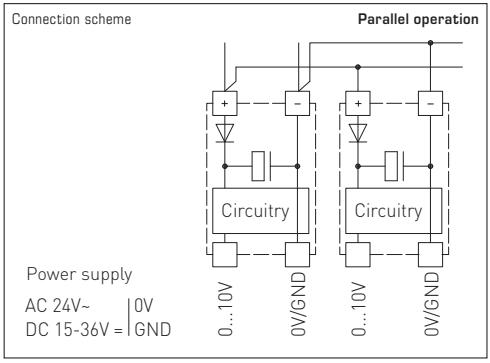


When several devices are supplied by one 24V **AC voltage supply**, it is to be ensured that all "positive" operating voltage input terminals (+) of the field devices are connected with each other and all "negative" operating voltage input terminals (–) (= reference potential) are connected together (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!

Connection scheme **Parallel operation**



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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. 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 and/or by specific agreements with customers.

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