

ACC

Anti-sweat controller

CAREL



① User manual

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THESE INSTRUCTIONS



IMPORTANT WARNINGS

CAREL bases the development of its products on decades of experience in HVAC, on the 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 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, acts as a consultant for the positive 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.

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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:

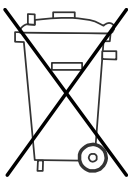
- Prevent the electronic circuits from getting wet. Rain, humidity and all types of liquids or condensate contain corrosive minerals that may damage the electronic circuits. In any case, the product should be used or stored in environments that comply with the temperature and humidity limits specified 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 than described 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 boards, 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.

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Disposal of the parts of the controller:

INFORMATION FOR USERS ON THE CORRECT HANDLING OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

In reference to European Union directive 2002/96/EC issued on 27 January 2003 and the related national legislation, please note that:

1. WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
2. 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.
3. 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;
4. 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;
5. In the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation

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1. Introduction

The ACC device is a microprocessor controller that prevents the formation of condensate on cold surfaces by measuring the ambient dewpoint and heating the cold surface so as to keep it at a higher temperature than the dewpoint. The heating is performed by controlling the voltage applied to special heaters, using the phase control output on the device.

1.1 Models available

Two models are available.

The first is a controller complete with RS485 serial interface.

The second features a socket for an optional RS485 serial interface board.

ACC0082100 Anti-sweat controller with RS485;

ACC0082000 Anti-sweat controller with fitting for RS485 option.

1.2 Main features

Power supply

The supply is 230 Vac mains, 50/60 Hz. Operation is adapted automatically to the mains frequency.

Appearance and ergonomics

The device has been designed so as to also allow outdoor installation, with specific protection against water and dust guaranteed by the case.

Dewpoint measurement

The dewpoint is automatically calculated according to the ambient humidity and temperature, measured by special probe/probes.

Manual setting or configuration by parameter

The operation of the ACC controller can be set as follows:

- manually, using the trimmers and dipswitches (restricted to the main functions);
- using the internal parameters (via programming key or serial line).

In the first case, the main functions are available for the simple use of the controller and setting by non-specialist personnel.

In the second case, the available functions are increased considerably, allowing maximum operating flexibility.

External alarm management/on-off signal

This is used to force the output to a preset value or to enable/disable operation when a protector is activated or upon receiving an external control signal.

PI control (proportional and integral)

This function combines normal proportional control with an integral action that, if correctly set based on the specific operating conditions, allows more accurate temperature control.

Master/Slave mode

This function is used to create small networks of anti-sweat controllers, configuring one controller as the Master, which calculates the dewpoint and then sends this value to the others controllers connected in the network and configured as Slaves. This means that just one humidity and room temperature probe can be used for the entire network.

Serial connection

An RS485 serial output is available for connection via two wires plus shield to the supervisor or telemaintenance network that support the Carel supervisor protocol or for the construction of Master/Slave networks.

Phase control function

The control of the power section can be modified to adapt it to the type of load.

Index of protection

The gasket inside and the materials used to make the case guarantee the controller IP43 index of protection, which can be increased to IP54 when using suitable cable glands and cables.

Fastening

The device is fastened using 4 screws.

CE mark/Electromagnetic compatibility

The ACC controller is compliant with the EU standards on electromagnetic compatibility, while quality and safety are ensured by the CAREL ISO 9001 certified design and production system and by the CE mark on the product.

2. User interface

The status of the controller is displayed using LEDs that are only visible with the cover open.

The LEDs indicate:

- power on;
- serial connection status;
- alarm status.

To set the operation of the controller, 1 trimmer and 4 dipswitches are available for the main functions, while internal parameters are used to set all the other functions. The parameters can be set using the programming key, while access to the parameters for display and setting, as well as access to the variables that represent the status of the controller, is available via serial line.

3. Installation

To install the controller, proceed as follows, with reference to the connection diagrams shown at the end of the manual.

IMPORTANT: 230 Vac mains voltage present on the board.

1. Connect the power supply:
Fit a 10A T (or lower rating) fuse in the power supply line (live L), based on the maximum current expected.
2. Connect the probes and control signals: the probes can be installed at a maximum distance of 10 m from the controller, as long as cables with a minimum cross-section of 1 mm² are used. To improve immunity to disturbance, use shielded cables (connect just one end of the shield to the earth).
3. Program the instrument: for a more detailed description see the chapter "Programming the instruments".
4. Connect the actuators: the actuators should only be connected after having programmed the controller. In this regard, the maximum current indicated in the "technical specifications" must be considered.
If the controller is used in residential environments (IEC-EN55014-1) a shielded cable must be used.
5. Connect to the serial network: the controller is fitted with a connector for housing a serial interface board, FCSE00000, for connection to the supervisor network. Use a shielded cable with the shield connected to GNX.

WARNINGS:

The controller must be installed so as to ensure normal cooling, according to the flow of air. Normally, if there are no cooling fans, it is installed vertically, with the cable outlets downwards.

The temperature of the surface the control is mounted on must not exceed 70° C.

The index of protection is guaranteed only if the following precautions are heeded:

- only use one cable in each cable gland
- perforate the membrane of the cable gland based on the diameter of the cable used; to ensure tightness, the hole must be significantly smaller than the diameter of the cable used. Use the pre-cut sections on the membrane where possible
- pass the cable through the cable gland, ensuring tightness
- if the installation requires more than one cable in the same cable gland or cables with a smaller diameter than the hole made, it is the installer's responsibility to guarantee the appropriate index of protection; for example, using a sheath to increase the thickness or to hold the cables together, making sure there are not gaps.

The maximum length of the connection cables is 10 m except where specified otherwise.

Size the cross-section of the power wires based on the current input of the load and the length of the cables.

If a shielded cable is used to connect the load, both ends of the shield should be earthed. On the controller side, the shield should be earthed using a metal cable clamp screwed to the earth bar before the terminals (Fig.3.a).

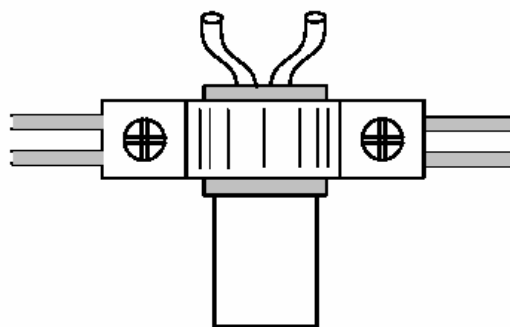


Fig. 3.a

To ensure compliance with the safety standards, the electrical system must be fitted with a suitable switch or disconnector (compliant with standards IEC 60947-1 and IEC 60947-3), located near the appliance.

If the appliance is used in a manner that is not specified by the manufacturer, the protection featured for the appliance may be compromised and the appliance may be seriously damaged.

Avoid assembling the controllers in environments with the following characteristics:

- relative humidity greater than 90% non-condensing;
- strong vibrations or knocks;
- exposure to continuous water sprays;
- exposure to aggressive or pollutant atmospheres (e.g. sulphur or ammonia fumes, saline mist, smoke) so as to avoid corrosion and oxidation;
- strong magnetic and/or radio interference (for example, near transmitting antennae);
- exposure of the controllers to direct sunlight or the elements in general.

Observe the following warnings when connecting the controllers:

- The incorrect connection of the power supply may seriously damage the system.
- Use cable ends suitable for the corresponding terminals.
Loosen each screw and insert the cable ends, then tighten the screws and slightly tug the cables to check that they are sufficiently tight; to tighten the screws, do not use automatic screwdriver, or alternatively adjust to a torque of less than 50 Ncm. If spring terminals are used, compress the spring using a screwdriver, insert the stripped wire then release the spring and slightly tug the cables to check that they are sufficiently tight.
- Separate as much as possible (at least 3 cm) the signal cables from the cables carrying inductive loads and power cables to avoid possible electromagnetic disturbance.
Never lay power cables (including the electrical cables) and probe signal cables in the same conduits.
Do not install the probe cables in the immediate vicinity of power devices (contactors, circuit breakers or similar). Reduce the path of the probe cables as much as possible, and avoid spiral paths that enclose power devices.

Remember that the NTC temperature probes do not have polarity, and therefore the order the ends are connected is indifferent.

CLEANING THE INSTRUMENT.

When cleaning the instrument do not use ethyl alcohol, hydrocarbons (petrol), ammonia and derivatives. Use neutral detergents and water.

4. Programming the instruments

The instruments are programmed by dipswitches and trimmer, and by setting the internal parameters accessible via programming key or via serial line. The functions that can be set manually are shown in the tables below:

Dipswitch			
Dip1	Select Master/Slave mode	OFF:	Master
		ON:	Slave
Dip2	Select Supervisor/LAN mode (Master only)	OFF:	Supervisor
		ON:	LAN
Dip3	Select Trimmer mode (Master only)	OFF:	local manual offset
		ON:	LAN manual offset
Dip4	Select digital input ID1 mode	OFF:	external alarm
		ON:	external enabling signal

Trimmer	Function	range
SET	Manual offset	0.0 – “OFST par.” °C

Configuration	Status of input ID1	Description
ID1=External alarm (Dip4 OFF)	Open	Alarm not active
	Closed	alarm active
ID1=External enabling signal (Dip4 ON)	Open	Controller enabled
	Closed	Controller disabled, output 0%

Digital input ID1 is normally open by default. A parameter can be set to change the operating logic and manage it as a normally closed contact, in which case the meaning of “Open” and “Closed” must be reversed.

4.1 Default settings

The functions that are available by setting the parameters are mostly disabled by default, as they need to be set based on the specific application.

Offset setting by trimmer	from 0 to 5°C
Differential setting	2°C
Digital input ID1	external alarm (modifiable by dipswitch)
Digital input ID1	Normally open
Output in the event of alarms	100%
Master/Slave mode	Master (modifiable by dipswitch)
Supervisor/LAN mode	Supervisor (modifiable by dipswitch)
Trimmer mode	Local offset (modifiable by dipswitch)
PI control	inactive
Phase control function	short impulse
Output ramp	5 seconds
Output linearisation	active

5. Accessories

5.1 Parameter copying key

Programming key PSOPZKEY00/A0

The programming keys PSOPZKEY00 (Figure 5.1.a) and PSOPZKEYA0 (Figure 5.1.b) are used to copy the complete set of parameters relating to the CAREL ACC controller parameters. The keys must be connected to the PROG KEY connector (4 pin AMP) fitted on the controllers, and work even without switching the controller on (see the summary diagram in Figure 5.1.c).



Fig. 5.a

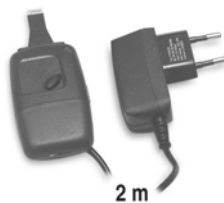


Fig. 5.b



Fig. 5.c

Two functions are available, and are selected by using the two supplied dipswitches; these can be accessed by removing the battery cover:

- load the parameters for a controller onto the key (UPLOAD - Fig. 5.1.d);
- copy from the key to a controller (DOWNLOAD - Fig. 5.1.e);

Warning: the parameters can only be copied between instruments with the same code and compatible software release. The UPLOAD operation can, however, always be performed.

The following operations are used for the UPLOAD and/or DOWNLOAD functions, simply by changing the settings of the dipswitches on the key:

- open the rear cover on the key and position the 2 dipswitches according to the desired operation;
 - close the rear cover on the key and insert the key in the connector on the controller;
 - press the button and check the LED: red for a few seconds, then green, indicates that the operation was completed correctly.
- Other signals or the flashing of the LED indicates that problems have occurred: refer to the table below;
- at the end of the operation, release the button, after a few seconds the LED goes OFF;
 - remove the key from the controller.



LED signal	Cause	Meaning and solution
Red LED flashing	Batteries discharged at start copy	The batteries are discharged, the copy operation cannot be performed. Replace the batteries.
Green LED flashing	Batteries discharged during copy or at end of copy	During the copy operation or at the end of the operation the battery level is low. Replace the batteries and repeat the operation.
Red/green LED flashing (orange signal)	Instrument not compatible	The parameter set-up cannot be copied as the connected controller model is not compatible. This error only occurs for the DOWNLOAD function; check the code of the controller and run the copy only for compatible codes.
Red and green LEDs on	Error in data being copied	Error in the data being copied. The instrument's EEPROM is corrupted, and therefore the key cannot be copied.
Red LED on steady	Data transfer error	The copy operation was not completed due to a serious error when transferring or copying the data. Repeat the operation, if the problem persists check the key connections.
LEDs off	Batteries disconnected	Check the batteries.

Table 5.a

5.2 RS485 serial interface board

The RS485 serial interface option (FCSER00000) shown in Figure 5.2.a is used to connect the instrument to the RS 485 serial network for supervision. Figures 5.2.b and 5.2.c show the assembly of the interface in the instrument. Observe the correct polarity of the connector, making sure the protrusion on the serial board matches the notch on the controller, without forcing the board.

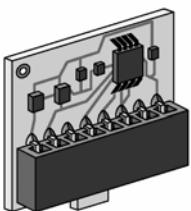


Fig. 5.2.a

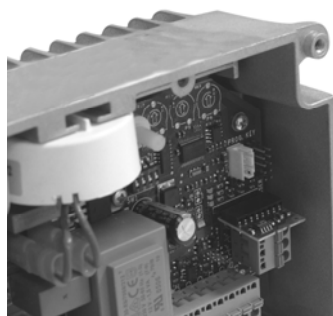


Fig. 5.2.b

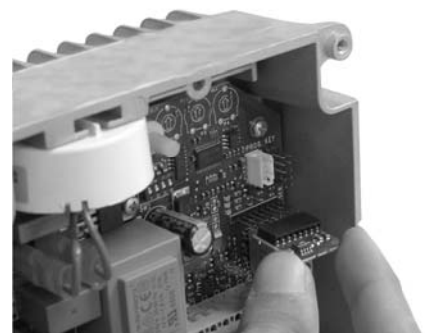


Fig. 5.2.c

6. Description of the functions

6.1 Dewpoint calculation

The dewpoint is only calculated in Master mode, based on values measured by the humidity and room temperature probes B1 and B2. In Slave mode, the dewpoint is updated via serial by the Master or by the external supervisor and probes B1 and B2 are ignored (the inputs can be disconnected).

Associated parameters

Associated parameters

name	Carel spv var	range	def.	res. UOM.	description		
ADG1	I8	90 to 110	100	1%	Probe B1 gain		
ADG2	I9	90 to 110	100	1%	Probe B2 gain		
FILT	I11	0 to 13	6	1	Probe filter	0= minimum filter 13= maximum filter	
ADO1	A5	-20.0 to 20.0	0.0	0.1%	Probe B1 offset		
ADO2	A6	-10.0 to 10.0	0.0	0.1°C	Probe B2 offset		
DEWP	A8	-50.0 to +99.9	R/W	0.1°C	Dewpoint		
PB1H	A21	0.0 to 100.0	R	0.1rH	Humidity probe B1 reading		
PB2T	A22	-50.0 to +90.0	R	0.1°C	Temperature probe B2 reading		
PB1A	D23	0/1	R	1	Probe B1 fault alarm	0=inactive	1=active
PB2A	D24	0/1	R	1	Probe B2 fault alarm	0=inactive	1=active

6.2 Anti-sweat control

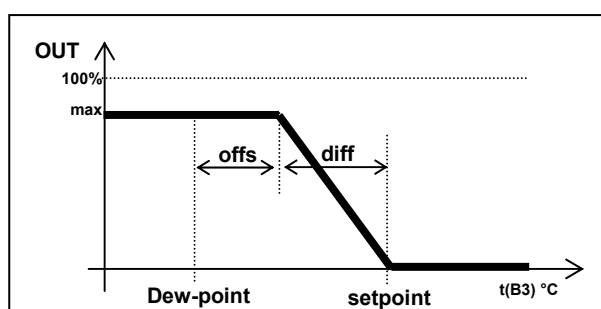
The output is controlled according to the temperature measured by probe B3, as shown in the figure.

The set point is calculated automatically, adding an offset to the dewpoint that is equal to the value set by parameter plus the value set by trimmer (if any), plus the differential.

The end scale of the trimmer is settable by parameter.

The output can be disabled if the temperature measured by probe B3 exceeds a limit value, set by parameter.

The maximum value of the output can be reduced by parameter.



Trimmer	Function	Range
SET	Manual offset	0.0 – "OFST par." °C

Associated parameters

Associated parameters

name	Carel spv var	range	def.	res. UOM	description		
MAX	I4	10 to 100	100	1%	Maximum output		
ADG3	I10	90 to 110	100	1%	Probe B3 gain		
FILT	I11	0 to 13	6	1	Probe filter	0= minimum filter 13= maximum filter	
OFFS	A1	-20.0 to 20.0	0.0	0.1°C	Dewpoint offset		
DIFF	A2	0.0 to 20.0	2.0	0.1°C	Differential		
OFST	A3	0.0 to 20.0	5.0	0.1°C	End scale offset set by trimmer (0.0 = trimmer disabled)		
TMAX	A4	0.0 to 50.0	30.0	0.1°C	Temperature limit		
ADO3	A7	-10.0 to 10.0	0.0	0.1°C	Probe B3 offset		
PB3T	A23	-50.0 to +90.0	R	0.1°C	Temperature probe B3 reading		
TRIM	A24	0.0 to 20.0	R	0.1°C	Reading offset by trimmer		
SETP	A25	-50.0 to +90.0	R	0.1°C	Set point calculated		
PB3A	D25	0/1	R	1	Probe B3 fault alarm	0=inactive	1=active

6.3 Master management

In Master configuration, all three probes are required (B1, B2 and B3). The dewpoint is calculated according to the values measured by probes B1 and B2. The output is controlled according to the value read by probe B3. In the event of alarms on probes B1 or B2, the dewpoint value is forced to 99.9. If the serial connection is configured as LAN, the Master also becomes the network master and sends the value of the dewpoint calculated to any Slaves connected.

The value is set at regular intervals in broadcasting mode, thus without needing to define how many Slaves are connected and their addresses. The dewpoint value sent, when suitably configured by dipswitch, can be increased by the value of an offset set by trimmer, thus allowing simultaneous control of all the Slaves connected.

If the serial connection is configured as Supervisor, the Master becomes a network slave and responds to the queries from the Supervisor.

Dipswitch			
Dip1	Select Master/Slave mode	OFF:	Master
		ON:	Slave
Dip2	Select Supervisor/LAN mode	OFF:	Supervisor
		ON:	LAN
Dip3	Select Trimmer mode (Master only)	OFF:	local manual offset
		ON:	LAN manual offset

6.4 Slave management

In Slave configuration, the value of the dewpoint is received via network (from a controller configured as the LAN master or from the supervisor, which in turn reads the value from a controller configured as the Supervisor master), and consequently probes B1 and B2 do not need to be connected. The output is controlled according to value read by probe B3.

If the dewpoint value is not received via the network or the value received is 99.9, an alarm is activated.

- If the serial connection is configured as LAN, the Slave does not respond when broadcasting mode is used.
- If the serial connection is configured as Supervisor, the Slave responds even when broadcasting mode is used, however generating a conflict with any other Slaves connected to the LAN.

6.5 PI control (proportional and integral)

In addition to the normal contribution of proportional control, the output is also controlled using the integral time on the error (deviation between the value measured and set point). This is used to reduce the error to zero.

$$\text{out} = K_p \cdot \text{err} + K_i \cdot \text{Integral}(\text{err})$$

where err=error, K_p =proportional gain, K_i =integral gain, T_i =integral time, given by:

$$\text{err} = (\text{set point} - \text{measurement})$$

$$K_p = \text{max. output/diff}$$

$$K_i = K_p/T_i$$

By definition the integral time is the time required, when the error is constant, for the integral part to have the same contribution as the proportional part. The integral time can be set by parameter (default 10 minutes). The contribution of the integral part can be reduced so as to avoid the phenomenon of "wind-up" (default 50%), however in this case the error will not be removed in steady operation. Special care is required when setting the T_i , as excessively short times (see the inertia of the system) may lead to instability. For a more detailed explanation of integral control, see the documents available on control theory.

Associated parameters

name	Carel spv var	range	def.	res. UOM	description		
INTT	I6	1 to 30	10	1 min	Integral time for PI control		
AWUP	I7	0 to 100	50	1%	Limitation of the integral action (antiwind-up)		
EPIR	D1	0/1	0	1	Enable PI control (Integral)	0=disabled	1=enabled

To simplify the fine-tuning of the parameters, some variables that are available that describe the control status in terms of the various components:

OUTP	I31	-255 to 255	R	1	proportional component (255 = 100%)
OUTI	I32	-255 to 255	R	1	integral component (255 = 100%)
OUTR	I33	0 to 255	R	1	controller output (255 = 100%)
ERRR	A26	-200.0 to 200.0	R	0.1°C	control error (set point – b3)

The values are expressed with the maximum resolution possible (8 bits plus sign), therefore the value 255 corresponds to 100%.

6.6 Overriding the output

The output can be forced to the desired value required at any time via serial line, irrespective of the value calculated by the controller. This function is temporary and is not saved; it is disabled automatically 10 seconds after the termination of the serial connection.

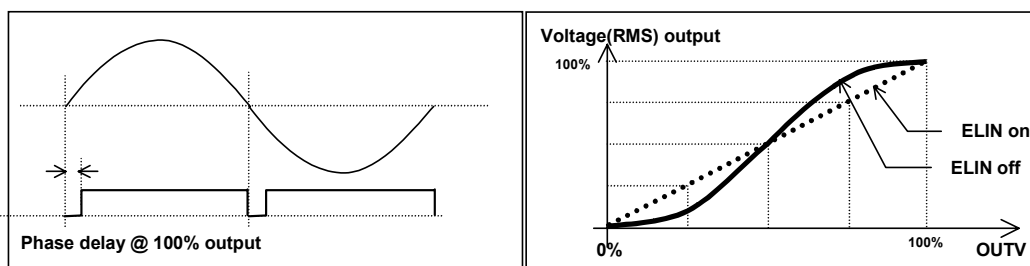
Associated parameters

name	Carel spv var	range	def.	res. UOM	description		
OUTV	I14	0 to 100	R/W	1%	Read/override output		
EOVR	D15	0/1	0	1	Enable override output	0=disabled	1=enabled

6.7 Phase control modes

By default control is based on short impulses. Alternatively, control can be enabled for long impulses (control is maintained until the end of the half period).

The displacement of the phase control function can also be changed with reference to the zero-crossing of the mains voltage, so as to adapt it to the cosφ of the load. The linearisation of the output RMS voltage can also be enabled, rather than use the traditional sinusoidal relationship between phase control and voltage. Finally, the instant variation in the output can be limited so as to optimise operation, and limit peak current.



Associated parameters

name	Carel spv var	range	def.	res. UOM	description		
STEP	I12	0 to 10	5	1sec	Output ramp (minimum time for variation from 0% to 100%)		
DLPL	I13	0 to 100	0	1%	Phase displacement: 100% corresponds to 90°		
ELIN	D2	0/1	1	1	Enable output linearisation	0=disabled	1=enabled
ELPL	D3	0/1	0	1	Enable long impulse phase control	0=disabled	1=enabled

6.8 Automatic adaptation to the mains frequency

At power-on the mains frequency is measured so as to adapt operation to 50Hz or 60Hz

The status of the mains frequency reading is accessible via serial line.

name	Carel spv var	range	def.	res. UOM	description		
OKHZ	D26	0/1	R	1	mains frequency reading status	0=no ok	1=ok
STHZ	D27	0/1	R	1	mains frequency	0=50Hz	1=60Hz

6.9 Alarm situations and alarm management

Alarm status is activated in the event of:

- external alarm (or in any case, closing of the contact connected to the digital input configured as the alarm input)
- fault on probes B1, B2 or B3 in master configuration
- fault on probe B3 in slave configuration
- interruption to the serial connection in slave configuration
- error reading/writing the parameters saved in non-volatile memory (EEPROM)

The alarm status is signalled by the red LED, depending on the causes, in order of priority:

- on steady parameter alarm
- 1 impulse probe alarm or serial connection interruption
- 2 impulses digital alarm input closed

In the event of more than one alarm at the same time, the signal with the highest priority is shown.

Warning: if digital input ID1 is set as normally closed, the alarm is active when ID1 is open

The probe fault alarm is generated if the probe is disconnected or short-circuited. In alarm status, the controller output provides one of three possible voltage values, which can be set by parameter:

- 0%;
- 50% of the maximum output set by parameter;
- 100% of the maximum output set by parameter (default).

Normal operation is restored automatically as soon as the alarm situation is resolved.

In the event of alarms due to errors when reading/writing the parameters, the parameters take the default values. The alarm is reset only when a correct parameter copy operation is performed using the key or the parameters are written from the supervisor. If the alarm persists, the EEPROM is faulty.

Dipswitch			
Dip4	Select digital input ID1 mode	OFF:	external alarm
		ON:	external enabling signal

Associated parameters

name	Carel spv var	range	def.	res. UOM	description		
ALMO	I5	0 to 2	2	1	output in alarm status	0=0% 1=50% MAX 2=100% MAX	
MOID	D4	0/1	1	1	operating logic of digital input ID1	0=normally closed	1=normally open
STID	D17	0/1	R	1	status of digital input ID1	0=open	1=closed
ALRM	D22	0/1	R	1	alarm status	0=inactive	1=active
EEPA	D28	0/1	R	1	parameter error alarm	0=inactive	1=active
ELAN	D29	0/1	R	1	serial connection alarm	0=inactive	1=active

7. Description of the operating parameters

MAC	type of unit	
	type and Carel supervisor address	integer var. 1 (read only)
	resolution and unit of measure	1
	range	143
	default	143

Non-modifiable parameter used to identify the type of controller in supervision network connections or when connected to the programming key.

REL	software release	
	type and Carel supervisor address	integer var. 2 (read only)
	resolution and unit of measure	1
	range	0 to 255
	default	--

Non-modifiable parameter used to identify the software version installed on the controller. The least significant digit is used to identify functional variations that do not imply changes to the parameter structure. The parameters can only be copied using the programming key between two controllers if the REL parameter has the same value or differs only as regards the least significant digit (for example: the parameters can be copied between controllers with REL 12 and 14, while they cannot be copied between controllers with REL 12 and 20).

SADR	serial address	
	type and Carel supervisor address	integer var. 3
	resolution and unit of measure	1
	range	1 to 255
	default	1

Parameter used to identify the individual controller, so as to make it accessible within the supervision network.

MAX	maximum output	
	type and Carel supervisor address	integer var. 4
	resolution and unit of measure	1%
	range	10 to 100
	default	100

Parameter used to set the maximum output value of the controller.
Expressed as a % of the mains voltage.

ALMO	output in alarm status	
	type and Carel supervisor address	integer var. 5
	resolution and unit of measure	1
	range	0 to 2
	default	2

Parameter used to set the value of the output in the event of alarms.

- ALMO=0 output at 0%
- ALMO=1 output at 50%
- ALMO=2 output at 100%

INTT	integral time	
	type and Carel supervisor address	integer var. 6
	resolution and unit of measure	1min
	range	1 to 30
	default	10

Parameter used to set the intensity of the integral action in PI control.
Only used if PI control is enabled.

AWUP	integral action limit	
	type and Carel supervisor address	integer var. 7
	resolution and unit of measure	1%
	range	0 to 100
	default	50

Parameter used to limit the contribution of the integral action in PI control, with the purpose of avoiding excessive overshoot and delays in the controlled value, in systems whose inertia cannot be accurately defined in advance and therefore when the control function is hard to calibrate (DIFF and INTT).
Only used if PI control is enabled.

ADG1 probe B1 gain

type and Carel supervisor address	integer var. 8
resolution and unit of measure	1%
range	90 to 100
default	100

Parameter used to adjust the value of the probe connected to input B1 using the gain of the measurement amplifier. Effective measurement = (measurement x ADG1)/100. The value calculated can also added to an offset defined by parameter ADO1.

ADG2 probe B2 gain

type and Carel supervisor address	integer var. 9
resolution and unit of measure	1%
range	90 to 100
default	100

Parameter used to adjust the value of the probe connected to input B2 using the gain of the measurement amplifier. Effective measurement = (measurement x ADG2)/100. The value calculated can also added to an offset defined by parameter ADO2.

ADG3 probe B3 gain

type and Carel supervisor address	integer var. 10
resolution and unit of measure	1%
range	90 to 100
default	100

Parameter used to adjust the value of the probe connected to input B3 using the gain of the measurement amplifier. Effective measurement = (measurement x ADG3)/100. The value calculated can also added to an offset defined by parameter ADO3.

FILT probe measurement filter

type and Carel supervisor address	integer var. 11
resolution and unit of measure	1
range	0 to 13
default	6

Parameter used to set the way the values measured by the probes are filtered.

The values shown are typical and may change according to the mode set (CPU workload).

	time const. (s)	meas. update (s)	meas./average
FILT=0	0	0.08	8
FILT=1	0	0.15	16
FILT=2	0.15	0.08	8
FILT=3	0	0.3	32
FILT=4	0.3	0.15	16
FILT=5	0	0.6	64
FILT=6	0.6	0.3	32
FILT=7	0.6	0.15	16
FILT=8	1.2	0.6	64
FILT=9	1.2	0.3	32
FILT=10	2.4	0.6	64
FILT=11	2.4	0.3	32
FILT=12	5	0.6	64
FILT=13	10	0.6	64

STEP output ramp

type and Carel supervisor address	integer var. 12
resolution and unit of measure	1sec
range	0 to 10
default	5

Parameter used to set the minimum time for the variation of the output from 0% to 100% and vice-versa.

DLPL phase displacement

type and Carel supervisor address	integer var. 13
resolution and unit of measure	1
range	0 to 100
default	0

Parameter used to set the displacement in the phase control function with reference to the zero crossing of the mains voltage. Used to optimise the voltage to the load, adapting the displacement to the $\cos\varphi$ of the load. The maximum value of 100 corresponds to a displacement of around 90°. The output should be forced to 100% and parameter DLPL set accordingly to reach the maximum voltage output. For resistive loads ($\cos\varphi=1$), the displacement should be set to zero.

OUTV read/override output

type and Carel supervisor address	integer var. 14
resolution and unit of measure	1%
range	0 to 100
default	-

Variable used to read the output value and, if the Override function is enabled, to override it.
This variable can only be written if parameter EOVR=1.

OUTP proportional component reading

type and Carel supervisor address	integer var. (read only) 31
resolution and unit of measure	1
range	-255 to 255
default	--

Variable used to read the value of the proportional component calculated by the control algorithm.

$$\text{OUTP} = \text{ERRR} * K_p$$

where K_p is the proportional gain defined by

$$K_p = (\text{maxOUT}) / \text{Differential}$$

The value read is the actual value used in the algorithm, expressed in 8 bits plus sign, therefore 255 corresponds to 100% of the maximum output voltage.

OUTI integral component reading

type and Carel supervisor address	integer var. (read only) 32
resolution and unit of measure	1
range	-255 to 255
default	--

Variable used to read the value of the integral component calculated by the control algorithm.

$$\text{OUTI} = K_i * \text{Integral}(\text{ERRR}) = \text{Integral}(K_i * \text{ERRR})$$

where K_i is the integral gain defined by

$$K_i = K_p / T_i$$

where T_i is the integral time (parameter INTT)

The value calculated is in any case limited, as an absolute value, by the AWUP parameter..

The value read is the actual value used in the algorithm, expressed in 8 bits plus sign, therefore 255 corresponds to 100% of the maximum output voltage.

OUTR output reading

type and Carel supervisor address	integer var. (read only) 33
resolution and unit of measure	1
range	0 to 255
default	--

Variable used to read the overall value of the output calculated by the control algorithm.

During control, this value is the sum of the components OUTP and OUTI, limited between 0 and 255.

In the event of active alarms or other conditions that force the output to a preset value, OUTR is not calculated as shown previously, but rather reflects the preset value. If the Override function is enabled, OUTR maintains its normal value, even if the output is set by the OUTV parameter. The value read is the actual value used in the algorithm, expressed in 8 bits plus sign, therefore 255 corresponds to 100% of the maximum output voltage.

OFFS dewpoint offset

type and Carel supervisor address	analogue var. 1
resolution and unit of measure	0.1°C
range	-20.0 to 20.0
default	0.0

Parameter used to set an offset for the dewpoint measured and consequently increase or decrease the working set point.

The effective offset also depends on the value set using the SET trimmer and the settings of the dipswitches.

DIFF differential

type and Carel supervisor address	analogue var. 2
resolution and unit of measure	0.1°C
range	0.0 to 20.0
default	2.0

Parameter used to set the value of the control differential.

OFST SET trimmer end scale

type and Carel supervisor address	analogue var. 3
resolution and unit of measure	0.1°C
range	0.0 to 20.0
default	5.0

Parameter used to set the end scale of the SET trimmer and as a consequence the maximum field of variation for the manually settable offset. The effective offset also depends on the value set using the OFFS parameter and the settings of the dipswitches.

TMAX maximum temperature limit

type and Carel supervisor address	analogue var. 4
resolution and unit of measure	0.1°C
range	0.0 to 90.0
default	30.0

Parameter used to set the maximum temperature value measured by probe B3 beyond which the output is disabled.

ADO1 probe B1 offset

type and Carel supervisor address	analogue var. 5
resolution and unit of measure	0.1% rH
range	-10.0 to 10.0
default	0.0

Parameter used to adjust the value read by the probe connected to input B1 using the offset of the measurement amplifier.

Effective measurement = (measurement x ADG1)/100 + ADO1).

ADO2 probe B2 offset

type and Carel supervisor address	analogue var. 6
resolution and unit of measure	0.1°C
range	-10.0 to 10.0
default	0.0

Parameter used to adjust the value read by the probe connected to input B2 using the offset of the measurement amplifier.

Effective measurement = (measurement x ADG2)/100 + ADO2).

ADO3 probe B3 offset

type and Carel supervisor address	analogue var. 7
resolution and unit of measure	0.1°C
range	-10.0 to 10.0
default	0.0

Parameter used to adjust the value read by the probe connected to input B3 using the offset of the measurement amplifier.

Effective measurement = (measurement x ADG3)/100 + ADO3).

DEWP dewpoint

type and Carel supervisor address	analogue var. 8
resolution and unit of measure	0.1°C
range	-50.0 to 99.9
default	--

Variable that depending on the operating mode set represents the dewpoint calculated or used.

Master mode:

- read only variable that represents the value calculated based on the values read by probes B1 and B2 and used for control
- the value is forced to 99.9 in the event of alarms on probes B1 or B2
- the value is sent in broadcasting mode via serial line if LAN mode is selected

Slave mode:

- read/write variable sent via serial line used for control
- the failed update of the dewpoint or reception of the value 99.9 causes an alarm

PB1H probe B1 reading

type and Carel supervisor address	analogue var. (read only) 21
resolution and unit of measure	0.1% rH
range	0.0 to 100.0
default	--

Variable used to read the humidity value in rH measured by probe B1.

PB2T probe B2 reading

type and Carel supervisor address	analogue var. (read only) 22
resolution and unit of measure	0.1°C
range	-50.0 to 90.0
default	--

Variable used to read the temperature value in °C measured by probe B2.

PB3T probe B3 reading

type and Carel supervisor address	analogue var. (read only) 23
resolution and unit of measure	0.1°C
range	-50.0 to 90.0
default	--

Variable used to read the temperature value in °C measured by probe B3.

TRIM SET trimmer reading

type and Carel supervisor address	analogue var. (read only) 24
resolution and unit of measure	0.1°C
range	0 to "OFST" par.
default	--

Variable used to read the offset value set manually by trimmer.

The effective offset also depends on the value set using the OFFS parameter and the settings of the dipswitches.

SETP set point calculated reading

type and Carel supervisor address	analogue var. (read only) 25
resolution and unit of measure	0.1°C
range	-50.0 to 90.0
default	--

Variable used to read the value of the set point calculated.

ERRR error reading

type and Carel supervisor address	analogue var. (read only) 26
resolution and unit of measure	0.1°C
range	-200.0 to 200.0
default	--

Variable used to read the value of the error (difference between the set point and the measurement of the controlled value B3) calculated by the control algorithm and based on which the proportional and integral components are calculated. The error is equal to: error= B3 reading-set point

EPIR enable PI control

type and Carel supervisor address	digital var. 1
resolution and unit of measure	1
range	0 /1
default	0

Parameter used to enable PI control (proportional + integral).

EPIR=0	disabled
EPIR=1	enabled

ELIN enable output linearisation

type and Carel supervisor address	digital var. 2
resolution and unit of measure	1
range	0 /1
default	1

Parameter used to enable the linearisation of the output voltage, compensating the sinusoidal relationship between phase and voltage.

ELIN=0	disabled
ELIN=1	enabled

ELPL select phase control function

type and Carel supervisor address	digital var. 3
resolution and unit of measure	1
range	0 /1
default	0

Parameter used to select the type of phase control..

ELPL=0	short impulse (around 3 ms)
ELPL=1	impulse long (from the moment of switching until the end of the mains half period)

MOID operating logic of ID1

type and Carel supervisor address	digital var. 4
resolution and unit of measure	1
range	0 /1
default	1

Parameter used to select the operating logic of digital input ID1.

MOID=0 normally closed

MOID=1 normally open

EOVR enable Override function

type and Carel supervisor address	digital var. 15
resolution and unit of measure	1
range	0 /1
default	0

Variable used to enable the Override function and consequently force the output to the value defined by the OUTV parameter, irrespective of the value calculated by the control algorithm

EOVR=0 disabled

EOVR=1 enabled

The variable is forced to zero (Override disabled) on power-up and in any case 10 seconds after no more data is received from the serial line.

FDEF reset parameter default values

type and Carel supervisor address	digital var. 16
resolution and unit of measure	1
range	0 /1
default	0

Variable used to reset the default values of the parameters.

FDEF=0 no action

FDEF=1 reset default

The value is automatically set back to 0 when the function is activated. It is not saved in the EEPROM.

STID input ID1 status

type and Carel supervisor address	digital var. (read only) 17
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the status of digital input ID1.

STID=0 open

STID=1 closed

STD1 dipswitch 1 status

type and Carel supervisor address	digital var. (read only) 18
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the position of dipswitch 1.

STD1=0 Off

STD1=1 On

STD2 dipswitch 2 status

type and Carel supervisor address	digital var. (read only) 19
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the position of dipswitch 2.

STD2=0 Off

STD2=1 On

STD3 dipswitch 3 status

type and Carel supervisor address	digital var. (read only) 20
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the position of dipswitch 3.

STD3=0 Off

STD3=1 On

STD4 dipswitch 4 status

type and Carel supervisor address	digital var. (read only) 21
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the position of dipswitch 4.

STD4=0 Off

STD4=1 On

ALRM alarm status

type and Carel supervisor address	digital var. (read only) 22
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the status of the alarm.

ALRM=0 inactive

ALRM=1 active

The alarm may be signalled externally, associated with the digital input, or due to a fault on probes B1 or B2.

PB1A probe B1 alarm status

type and Carel supervisor address	digital var. (read only) 23
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the status of the probe B1 fault alarm.

PB1A=0 inactive

PB1A =1 active

The alarm is activated automatically if the value read by probe B1 is outside of the range of possible values, typically due to disconnection or short-circuit.

The alarm is not detected if slave mode is selected.

PB2A probe B2 alarm status

type and Carel supervisor address	digital var. (read only) 24
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the status of the probe B2 fault alarm.

PB2A=0 inactive

PB2A =1 active

The alarm is activated automatically if the value read by probe B2 is outside of the range of possible values, typically due to disconnection or short-circuit.

The alarm is not detected if slave mode is selected.

PB3A probe B3 alarm status

type and Carel supervisor address	digital var. (read only) 25
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the status of the probe B3 fault alarm.

PB3A=0 inactive

PB3A =1 active

The alarm is activated automatically if the value read by probe B3 is outside of the range of possible values, typically due to disconnection or short-circuit.

OKHZ mains frequency reading status

type and Carel supervisor address	digital var. (read only) 26
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the status relating to the reading of the mains frequency.

OKHZ=0 reading in progress

OKHZ =1 reading completed

At the end of the reading, the variable STHZ signals the frequency, 50 or 60Hz.

STHZ mains frequency

type and Carel supervisor address	digital var. (read only) 27
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the mains frequency detected by the controller.

STHZ=0 50Hz

STHZ=1 60Hz

The value of the variable is only meaningful after the mains frequency has been read by the controller (see parameter OKHZ).

EEPA invalid parameter alarm status

type and Carel supervisor address	digital var. (read only) 28
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the status of the parameter read/write error alarm.

EEPA=0 inactive

EEPA =1 active

ELAN LAN connection alarm status

type and Carel supervisor address	digital var. (read only) 29
resolution and unit of measure	1
range	0 /1
default	--

Variable used to read the status of the alarm relating to the interruption of the serial connection.

ELAN=0 inactive

ELAN =1 active

The alarm is disabled in master mode.

7.1 Summary table of operating parameters

name	add.	range	def.	User value	res. UOM	description	
MAC	I1	143	R	-	1	Type of unit	
REL	I2	0 to 255	R	-	1	FW release	
SADR	I3	1 to 255	1		1	Serial address (note 1)	
MAX	I4	10 to 100	100		1%	Maximum output	
ALMO	I5	0 to 2	2		1	Output in alarm status	0=0% 1=50% MAX 2=100% MAX
INTT	I6	1 to 30	10		1min	Integral time in PI control	
AWUP	I7	0 to 100	50		1%	Limitation of the integral action (antiwind-up)	
ADG1	I8	90 to 110	100		1%	Probe B1 gain	
ADG2	I9	90 to 110	100		1%	Probe B2 gain	
ADG3	I10	90 to 110	100		1%	Probe B3 gain	
FILT	I11	0 to 13	6		1	Probe filter	0= minimum filter 13= maximum filter
STEP	I12	0 to 10	5		1sec	Output ramp (minimum time for variation from 0% to 100%)	
DLPL	I13	0 to 100	0		1%	Phase displacement: 100% corresponds to 90°	
OUTV	I14	0 to 100	R/W	-	1%	Read/Override output (NOTE 2)	
	I15 to I30	0	R	-		not used	
OUTP	I31	-255 to 255	R	-	1	proportional component (255 = 100%)	
OUTI	I32	-255 to 255	R	-	1	integral component (255 = 100%)	
OUTR	I33	0 to 255	R	-	1	controller output (255 = 100%)	
	I34 to I50	0	R	-		not used	
OFFS	A1	-20.0 to 20.0	0.0		0.1°C	Dewpoint offset	
DIFF	A2	0.0 to 20.0	2.0		0.1°C	Differential	
OFST	A3	0.0 to 20.0	5.0		0.1°C	End scale for offset set by trimmer (0.0 = trimmer disabled)	
TMAX	A4	0.0 to 50.0	30.0		0.1°C	Temperature limit	
ADO1	A5	-20.0 to 20.0	0.0		0.1%	Probe B1 offset	
ADO2	A6	-10.0 to 10.0	0.0		0.1°C	Probe B2 offset	
ADO3	A7	-10.0 to 10.0	0.0		0.1°C	Probe B3 offset	

name	add.	range	def.	User value	res. UOM	description		
DEWP	A8	-50.0 to +99.9	R/W	-	0.1°C	Dewpoint (NOTE 3)		
	A9 to A20	0	R	-		not used		
PB1H	A21	0.0 to 100.0	R	-	0.1rH	Humidity probe B1 reading		
PB2T	A22	-50.0 to +90.0	R	-	0.1°C	Temperature probe B2 reading		
PB3T	A23	-50.0 to +90.0	R	-	0.1°C	Temperature probe B3 reading		
TRIM	A24	0.0 to "OFST"	R	-	0.1°C	Offset by trimmer reading		
SETP	A25	-50.0 to +90.0	R	-	0.1°C	Set point calculated		
ERRR	A26	-200.0 to 200.0	R	-	0.1°C	Control error (set point – B3)		
	A14 to A40	0	R	-		not used		
EPIR	D1	0/1	0		1	Enable PI control (Integral)	0=disabled	1=enabled
ELIN	D2	0/1	1		1	Enable output linearisation	0=disabled	1=enabled
ELPL	D3	0/1	0		1	Enable long impulse phase control	0=disabled	1=enabled
MOID	D4	0/1	1		1	Operating logic of digital input ID1	0=normally closed	1=normally open
	D5 to D14	0	R	-		not used		
EOVR	D15	0/1	0	-	1	Enable override output (NOTE 2)	0=disabled	1=enabled
FDEF	D16	0/1	0	-	1	Reset default values (NOTE 4)	0=no action	1=enabled
STID	D17	0/1	R	-	1	digital input ID1 status	0=open	1=closed
STD1	D18	0/1	R	-	1	dipswitch 1 status	0=Off	1=On
STD2	D19	0/1	R	-	1	dipswitch 2 status	0=Off	1=On
STD3	D20	0/1	R	-	1	dipswitch 3 status	0=Off	1=On
STD4	D21	0/1	R	-	1	dipswitch 4 status	0=Off	1=On
ALRM	D22	0/1	R	-	1	alarm status	0=inactive	1=active
PB1A	D23	0/1	R	-	1	probe B1 fault alarm	0=inactive	1=active
PB2A	D24	0/1	R	-	1	probe B2 fault alarm	0=inactive	1=active
PB3A	D25	0/1	R	-	1	probe B3 fault alarm	0=inactive	1=active
OKHZ	D26	0/1	R	-	1	mains freq. reading status	0=no ok	1=ok
STHZ	D27	0/1	R	-	1	mains frequency	0=50Hz	1=60Hz
EEPA	D28	0/1	R	-	1	parameter error alarm	0=inactive	1=active
ELAN	D29	0/1	R	-	1	serial connection alarm	0=inactive	1=active
	D30 to D32	0	R	-		not used		

A indicates analogue variables

I indicates integer variables

D indicates digital variables

R indicates read only variables (no default values, as these are initialised/updated automatically at power-on)

NOTE 1: The parameter should be modified via serial connection with care, as this implies the dynamic management of the address by the Supervisor.**NOTE 2:** The override control is disabled at power-on and when serial communication is interrupted for more than 10 seconds.**NOTE 3:** The value 99.9 is used by the Master to signal to the Slaves that the correct of the dewpoint cannot be calculated due to humidity alarm or room temperature probes.**NOTE 4:** The value is automatically set back to 0 when a command is received.

8. Tables of alarms and signals

8.1 Alarms

The alarm status is indicated by the red LED

status of the red LED	description	possible causes of alarm
off	no alarm	
on	parameter error alarm	non-volatile memory error (EEPROM)
flashing 1 impulse	probe alarm (Master)	probes disconnected or short-circuited
	probe or LAN connection alarm (Slave)	probes disconnected or short-circuited, or failed update of the dewpoint via LAN
flashing 2 impulses	external alarm	closing of the contact connected to the digital input

The status of the digital input that activates the external alarm depends on the operating logic set (by default normally open)

If there are multiple alarms activated at the same time, the first in order shown in the table is signalled.

The active alarm status forces the output to the value defined by the ALMO parameter.

The alarm status is available via serial line.

8.2 Signals

Power is signalled by the green LED.

The status of the serial connection is signalled by the yellow LED.

status of the yellow LED	description	possible causes
off	connection deactivated	cable disconnected supervisor off-line protocol not supported
flashing	data reception	data reception in progress
on	connection active	the connection is active, but no data is being received.

The serial connection is automatically deactivated 10 seconds after the last valid data is received.

9. Supervision

Carel supervisor protocol ver 3.0s is supported (19200 baud).

To set the addresses of the individual variables, see the column “Carel spv var” in the table of parameters.

The variables are grouped into blocks: if a variable in a certain block is modified, the entire block is sent down.

Integer variables relating to parameters	I1 – I14
Integer status variables	I31 – I33
Analogue variables relating to parameters	A1 – A8
Analogue status variables	A21 – A26
Digital variables relating to parameters	D1 – D4
Digital status variables/commands	D15 – D29

If an external supervisor is used with a network of Master and Slave controllers, the supervisor is responsible for reading the value of the dewpoint calculated by the Master and sending it to the various Slaves connected.

The supervisor can manage the network in standard mode, that is, assigning each Slave the specific network address, or alternatively in broadcasting mode, in which case the address of the Slave does not need to be assigned, however this does not allow the possibility to read the status of the Slave.

10. Specifications and connections

10.1 Electrical specifications

Power supply	230 Vac single-phase, -15% +10% 50/60 Hz
Analogue outputs	1 phase control 0 to 230 Vac single-phase, 8 A (min 500 mA)
Analogue inputs	1 input for 0 to 10 V humidity probes (Rin: 20 k) precision 5% (typical 2%), excluding the probes 2 inputs for std Carel NTC temp. probes (10 k @25 °C) range of measurement: -50T90 °C precision 1°C [-10T50]; 2°C [-40T-10 and 50T90], excluding the probes
Digital inputs	1 input for voltage-free contact typical voltage 12 V with the contact open, typical current 6 mA with the contact closed.
Serial ports	1 standard two wire RS485 connector (only on some models) CAREL supervisor protocol; baud rate 19200; max length 1 km with shielded cable
Light signals	Green power LED Red alarm LED Yellow serial connection LED (flashing during valid data reception)
Controller setting	1 trimmer for manually setting the offset 4 dipswitches
Terminals and connectors	Power supply and analogue outputs: Screw terminals for cable cross-section min. 2.5 mm ² max 4 mm ² . Signals: Spring terminals for cable cross-section min. 1.5 mm ² max 2.5 mm ² . 4 pin JST connector for the programming key
Operating conditions	-10T50 °C, <90% RH non-condensing
Storage conditions	-20T70 °C, <90% RH non-condensing
Index of protection	IP43 (can reach IP54)
Environmental pollution	Normal
Protection against electric shock	Class I
PTI of the insulating materials	250 V
Period of stress across the insulating parts	Long
Type of action -disconnection	1C
Category of resistance to heat and fire	Category D (UL94 – V0)
Immunity against voltage surges	Category 1
Ageing characteristics	60,000 operating hours
No. of automatic operating cycles	100,000
Software class and structure	Class A
Case	Metallic (Al) with plastic cover (75°C ball pressure test)
Dimensions	140x135x90 mm
Assembly	Metallic case fastened to the panel or wall using 4 screws dia. 3.5/4 mm
Certification	EMC: EN 61326-1, EN 55014-1, EN 55014-2 Safety: EN 60730-1

10.2 Connections

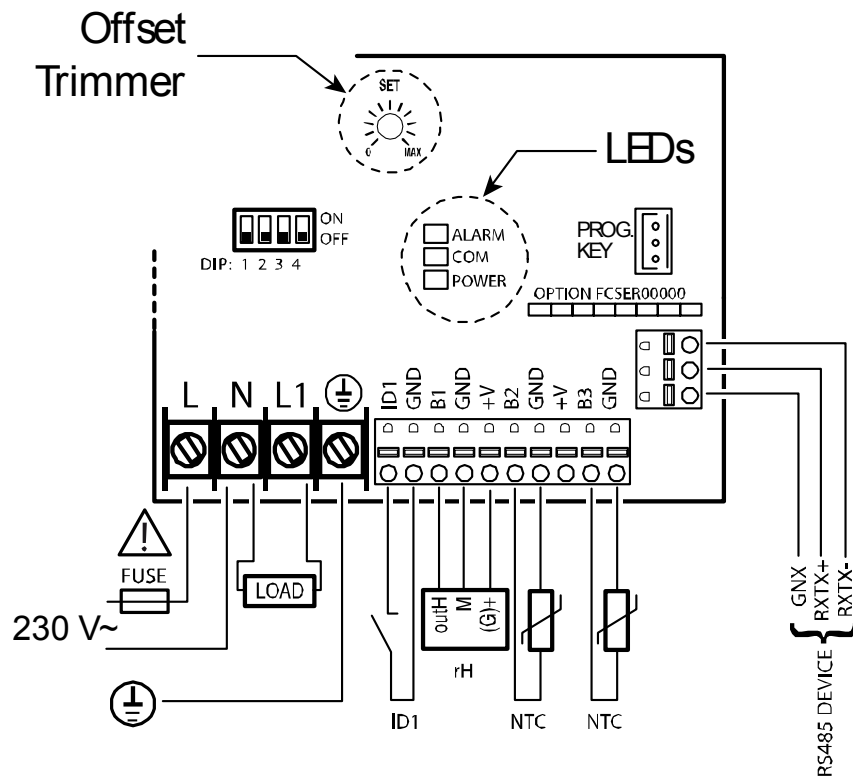


Fig. 10.a

L, N	230 Vac power supply input
L1, N	230 Vac power supply output to load
ID1, GND	Programmable digital input. Alarm or external enabling signal, see dipswitch configuration.
B1, GND, +V	0 to 10 V analogue input for ambient humidity probe reading.
B2, GND	NTC analogue input 10 k•@25 °C for room temperature probe reading.
B3, GND	NTC analogue input 10 k•@25°C for control temperature probe reading.
GNX, RXTX+, RXTX-	RS485 serial (FC SER0000 option required).

10.3 Dimensions and assembly

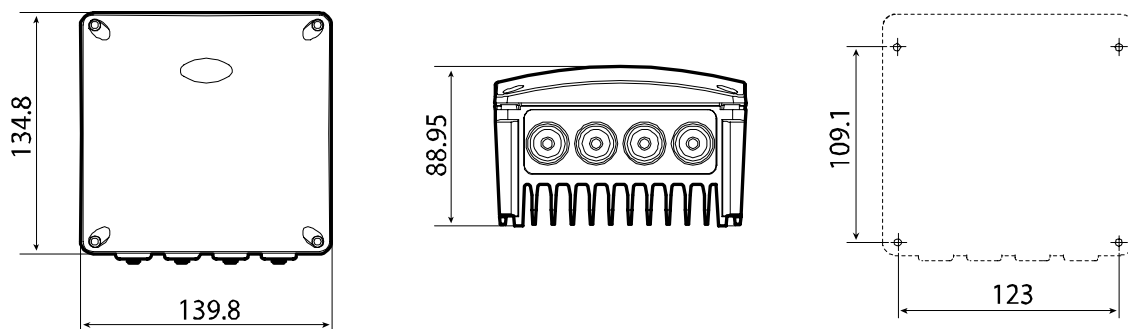


Fig. 10.b

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