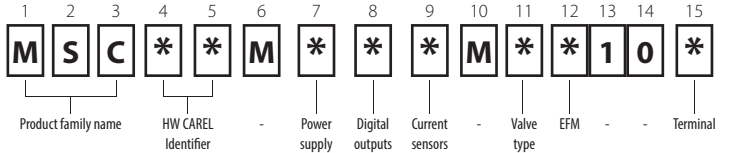




MODELS AND OPTIONS

Model and options present in the control are identified by the characters shown in the technical code printed on the product label.



**Key**

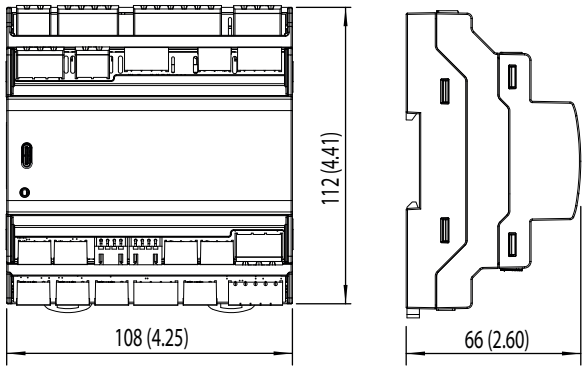
7:      H = 100/ 240 Vac; L = 24 Vac, 48 Vdc  
8:      R = 5 relays with current sensors; P = 6 relays without current sensors  
9:      0 = not present; 1 = present  
11:    D = 1 stepper without integrated ultracap; M = 1 stepper without integrated Ultracap + 1 PWM; 4 = 1 PWM; 5 = 1 stepper + ultracap; 6 = 1stepper + ultracap + 1 PWM  
12:    0 = none; 1 = BMS, Fieldbus, not opto-isolated; 2 = Vcc; 3 = BMS, Fieldbus, opto-isolated; 4 = Fieldbus, opto-isolated  
15:    V = vertical; H = horizontal

Furthermore, the product label contains a data matrix with other important control information:

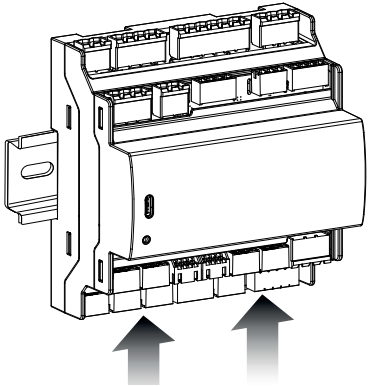
- Finished product code
- Serial Number
- UID identifier
- CCV Control Code
- Production date
- Product Revision

The same information, except the product revision, is also available in the data matrix screened on the front of the control, next to the USB-C port..

DIMENSIONS

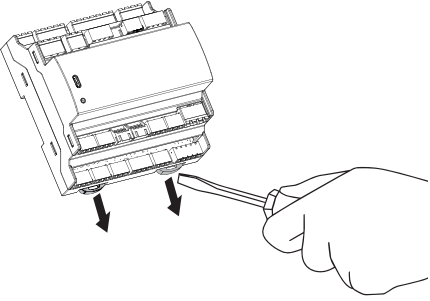


MOUNTING



For mounting: apply slight pressure to the controller resting on the DIN rail until the rear tabs click into place.

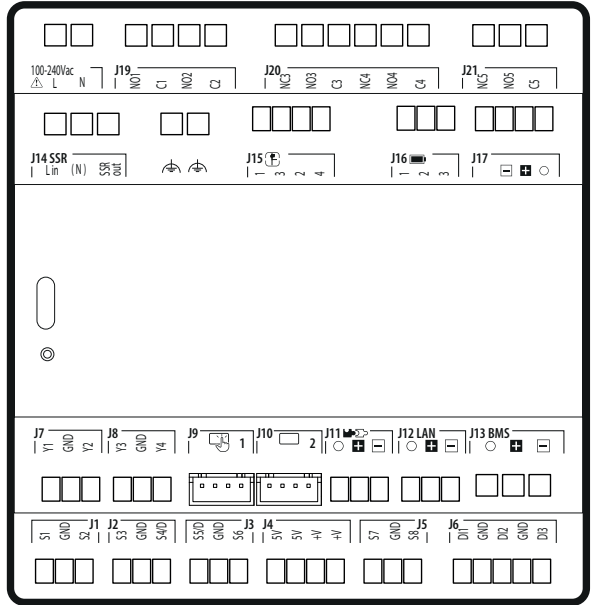
REMOVAL



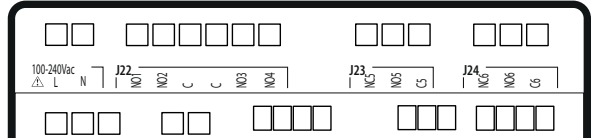
Use a screwdriver as a lever in the hole to lift and release the tab. The tab is held in the locked position by return springs.

TERMINAL DESCRIPTION

5-relay models



6-relay models

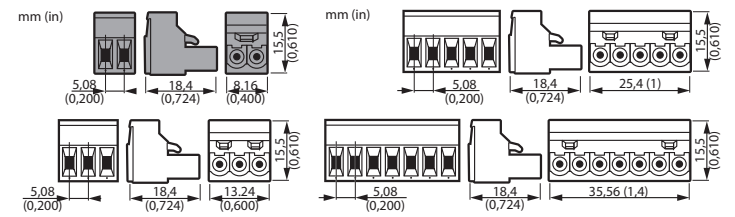
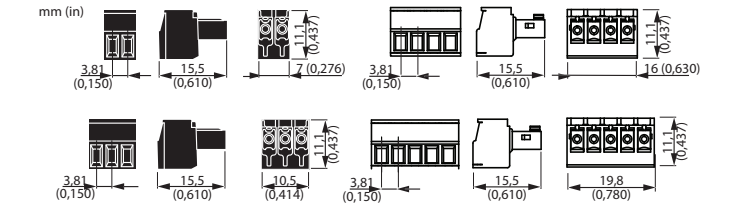


Ref.	Description	Ref.	Description
115-230 VAC	Power supply	J14	Lin (N) SSR line connection
J1	Analogue input 1 (NTC, PT1000)		SSR neutral terminal (optional)
	GND Reference for probes, digital inputs and analogue outputs	SSR out	SSR output
S2	Analogue input 2 (NTC, PT1000)	-	Connector for connection to the system earth / Valve cable shield connector
J2	Analogue input 3 (NTC, PT1000)	J15	Carel ExV bipolar valve JST connector
	GND Reference for probes, digital inputs and analogue outputs	J16	Not used
S4/D	Digital input 4 voltage-free contact not opto-isolated/ analogue input 4 (NTC, PT1000) (*)	J17	Not used
J3	S5/D Digital input 5 voltage-free contact not opto-isolated/ analogue input 5 (NTC, PT1000) (*)	-	Optional serial port (RS485, opto-isolated): Rx-/Tx-
	GND Reference for probes, digital inputs and analogue outputs	+	Optional serial port (RS485, opto-isolated): Rx+/Tx+
S6	Analogue input 6 (NTC, PT1000, 4...20 mA, 0...10 V, NTC-HT, 0,5...4,5 Vrat)	O	Optional serial port (RS485, opto-isolated): GND
J4	5 Vdc power supply for ratiometric probes		
+V	11-13 V power supply for 4-20 mA probes		

J5	S7	Analogue input 7 (NTC, PT1000, 4...20 mA, 0...10 V, NTC-HT, 0,5...4,5 Vrat)	J19	NO1	Digital output (relay) 1
	GND	Reference for probes, digital inputs and analogue outputs		C1	Common for relay 1
S8	Analogue input 8 (NTC, PT1000, 4...20 mA, 0...10 V, NTC-HT, 0,5...4,5 Vrat)			NO2	Digital output (relay) 2
J6	D11	Digital input 1 voltage-free contact not opto-isolated		C2	Common for relay 2
	GND	Reference for probes, digital inputs and analogue outputs	J20	NC3	Digital output (relay) 3 N.C.
D12	Digital input 2 voltage-free contact not opto-isolated			NO3	Digital output (relay) 3 N.O.
	GND	Reference for probes, digital inputs and analogue outputs		C3	Common for relay 3
D13	Digital input 3 voltage-free contact not opto-isolated			NC4	Digital output (relay) 4 N.C.
J7	Y1	Analogue output 1		NO4	Digital output (relay) 4 N.O.
	GND	Reference for probes, digital inputs and analogue outputs		C4	Common for relay 4
Y2	Analogue output 2		J21	NC5	Digital output (relay) 5 N.C.
J8	Y3	Analogue output 3		NO5	Digital output (relay) 5 N.O.
	GND	Reference for probes, digital inputs and analogue outputs		C5	Common for relay 5
Y4	Analogue output 4		J22	NO1	Digital output relay 1
J9	Terminal connector			NO2	Digital output relay 2
J10	Repeater terminal connector			C	Common for relay 1, 2, 3, 4
J11	Not used			NO3	Digital output relay 3 N.O.
J12	O	Main-secondary network serial port (RS485): GND		NO4	Digital output relay 4 N.O.
+	Main-secondary network serial port (RS485): Rx+/Tx+		J23	NC5	Digital output relay 5 N.C.
-	Main-secondary network serial port (RS485): Rx-/Tx-			NO5	Digital output relay 5 N.O.
J13	O	BMS Serial port (RS 485): GND		C5	Common for relay 5
+	BMS Serial port (RS 485): Rx+/Tx +		J24	NC6	Digital output relay 6 N.C.
-	BMS Serial port (RS 485): Rx/Tx -			NO6	Digital output relay 6 N.O.
				C6	Common for relay 6

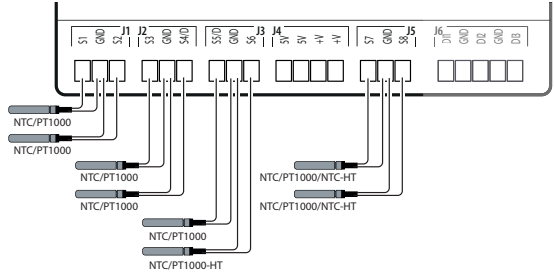
**Notice:** (\*) If used as analog inputs, S1, S2, S3, S4/D and S5/D must be all of the same type.

**Caution:** the meaning of the on-board terminals is the same for models with horizontally/vertically terminals; however due to the orientation of the terminals, it is not possible to use the same wiring for the removable terminals.



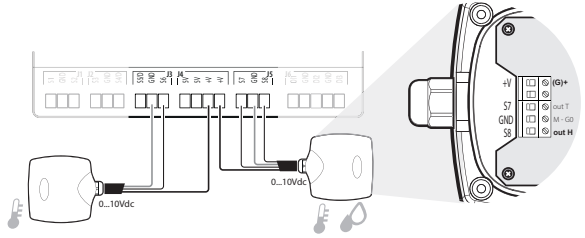
CONNECTIONS

NTC, PT1000 probes

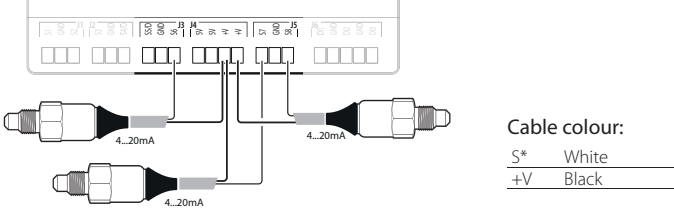


**Notice:** (\*) If used as analog inputs, S1, S2, S3, S4/D and S5/D must be all of the same type.

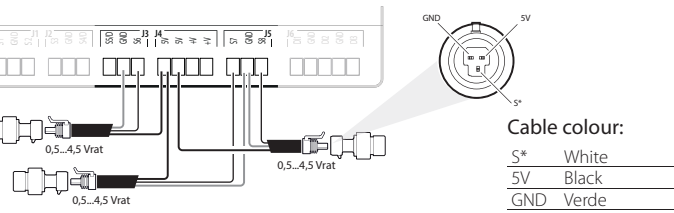
0...10 V probes



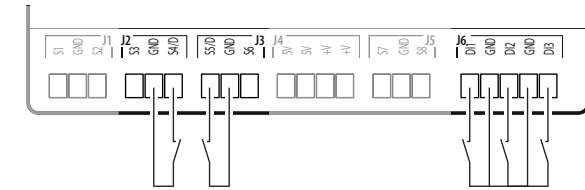
4...20 mA probes



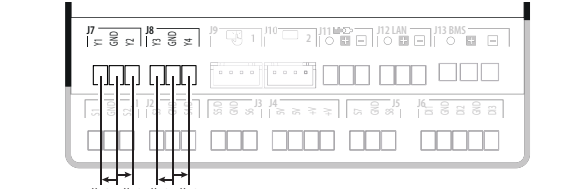
0,5...4,5 Vrat probes



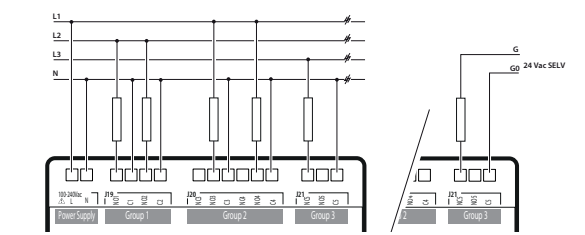
Digital inputs



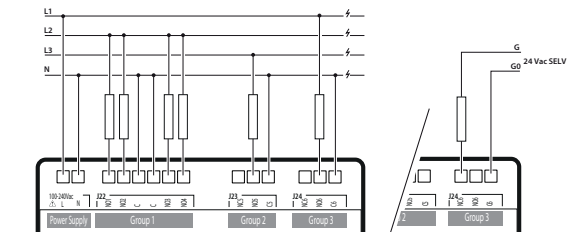
Analogue outputs



Analogue outputs - 5 relays version

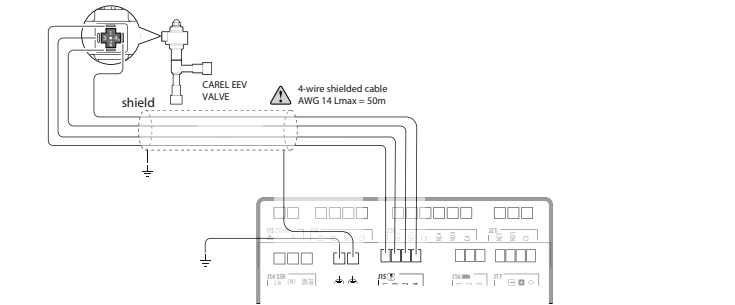


Digital outputs - 6 relays version

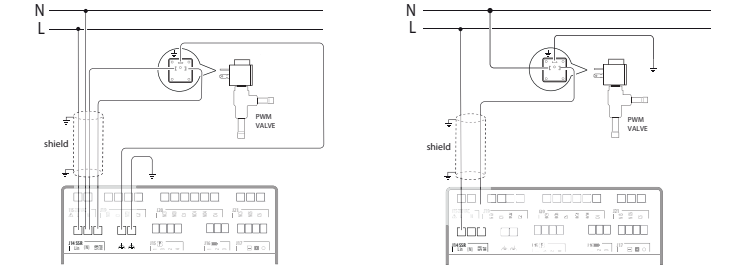


**Notice:** the digital outputs are divided into groups. There is functional isolation between the power supply and the groups and between the groups. There is reinforced isolation between group 2 and group 3. The figures show only one example of a possible connection.

EXV valve



PWM valve



TECHNICAL SPECIFICATIONS

Physical specifications	
Dimensions	See figures
Case	Flame retardant polycarbonate
Mounting	DIN rail
Ball pressure test temperature	125°C
Ingress protection	IEC: IP20 rear; IP40 front UL: type 1
Front cleaning	Use a soft non-abrasive cloth, neutral detergents or water

Environmental conditions	
Storage conditions	-20T70°C, <90 % RH non-condensing
Operating conditions	-20T60°C, <90 % RH non-condensing

Electrical specifications	
Rated power supply	100/240 Vac
Operating power supply voltage	90/264 Vac
Input frequency (AC)	50/60 Hz
Maximum current draw	550 mArms
Min power consumption	3 W
Clock	precision: ±20 ppm at 25 °C; ±100 ppm in the temperature range -10T60°C; min. date/time retention after power off: 21 days
Software class and structure	A
Pollution degree	2
Class of protection against electric shock	To be incorporated in class I or II appliances
Type of action and disconnection	1.C
Rated impulse voltage	115-230 V input and relay outputs: 4 kV
Surge immunity category	115-230 V input and relay outputs: III
Control device construction	Device to be incorporated
Terminal block	L, N, J13, J19, J20, J21, J22, J23, J24,  : male-female removable, 17...13 AWG/ 1...2,5 mm²  J1, J2, J3, J4, J5, J6, J7, J8, J11, J12, J15, J16, J17: male-female removable, 26...15 AWG/ 0,14...1,5 mm²  J9, J10: JST 26...32 AWG/ 0,03...0,13 mm²

User interface	
Buzzer	Not included on the controller, built into the remote HMI
Display	Not included on the controller, built into the remote HMI
Lit brackets (minimal interface)	RGB LED status indicator
Button (minimal interface)	Multifunction button

Connectivity	
NFC	Not included on the controller, built into the remote HMI
Bluetooth™ Low Energy	Not included on the controller, built into the remote HMI
BMS serial interface	Modbus over RS485, not opto-isolated
Serial LAN interface	Modbus over RS485, not opto-isolated
HMI interface	Modbus over RS485, not opto-isolated
HMI repeater interface	Modbus over RS485, not opto-isolated
Serial interface EFM optional	Modbus over RS485, not opto-isolated / opto-isolated, depending on the model

Analogue inputs	
S1, S2, S3, S4/D, S5/D:	NTC: resolution 0.1 °C; 10kΩ@25°C; beta 3435; error: ±1 °C in the range -50T50°C, ±3 °C in the range 50T90°C
NTC / PT1000 / NTC-HT / NTC-LT (not configurable separately)	NTC-HT: resolution 0.1 °C; 50kΩ@25°C; beta 3977; error: ±1,5 °C in the range 0T115°C, ±4 °C in the range 115T150 °C
Notice: S4/D and S5/D can also be used as digital inputs	NTC-LT: resolution 0.1 °C; 750kΩ@25 °C; beta 3969; error: ± 1,5 °C in the range -20T10 °C; ± 4 °C in the range -80T-20 °C and 10T55 °C
S6, S7, S8: NTC / PT1000 / 0,5...4,5Vrat / 0...10V / NTC-HT / 4...20mA / NTC-LT / 0...5V (configurable separately)	PT1000: resolution 0.1 °C; 1kΩ @0°C; error: ±1 °C in the range -60+120°C
	0,5...4,5 Vrat, 0...5 V, 0...10 V: error 2% fs, typical 1% 4...20 mA: error 5% fs, typical 1%

Digital inputs	
ID1, ID2, ID3	Voltage-free contact, not optically-isolated, typical closing current 5.5 mA, voltage with contact open 12 V max contact resistance 50 Ω. Fast digital input 0-2 kHz, error 2% fs
S4/D, S5/D (configurable by parameter)	Voltage-free contact, not optically-isolated, typical closing current 5.5 mA, voltage with contact open 3.3 V max contact resistance 50 Ω.

Analogue outputs	
Y1, Y2, Y3, Y4	0-10 V: 1 kΩ ,10 mA max; PWM (variable DC: 0..100%) 100 Hz: max 10 V, max. 10 mA; PWM (variable DC: 10..100%) 2kHz: max 10 V, max. 10 mA; VCC frequency control 0-200 Hz: max 10 V, max 10 mA

Digital outputs	
	Group 1Group 2Group 3
5-relay models	NO1, NO2NO3/NC3, NO4/NC4NO5/NC5
6-relay models	NO1, NO2, NO3, NO4NO5/NC5NO6/NC6

SSR: Maximum current: 0,5 A	
NO1 (SPST)	
IEC60730: purely resistive load: 10 A, 240 Vac, 50.000 cycles; 8 A, 240 Vac, 100.000 cycles; resistive - inductive load (i.e. motor load): 8(4) A, 240 Vac, 100.000 cycles.	
UL60730: purely resistive load: 10 A, 240 Vac, 100.000 cycles; motor load: 5FLA, 30LRA, 240 Vac, 100.000 cycles; pilot duty: B300, 240 Vac, 30.000 cycles; C300, 240 Vac, 100.000 cycles.	
NO2 (SPST)	
IEC60730: purely resistive load: 6 A, 240 Vac, 100.000 cycles; resistive - inductive load (i.e. motor load): 6(6) A, 240 Vac, 100.000 cycles.	
UL60730: purely resistive load: 6 A, 240 Vac, 100.000 cycles; motor load: 6FLA, 60LRA, 240 Vac, 30.000 cycles; 6FLA, 72LRA, 125 Vac, 30.000 cycles; pilot duty: B300, 240 Vac, 30.000 cycles.	
NO3, NC3 (SPDT)	
IEC60730: purely resistive load: 10 A, 240 Vac, 100.000 cycles NO; 10 A, 240 Vac, 30.000 cycles NC; 2 A, 240 Vac, 30.000 cycles CO (both relay contacts with load); resistive - inductive load (i.e. motor load): 10(2) A, 240 Vac, 100.000 cycles NO; 10(2) A, 240 Vac, 30.000 cycles NC; 2(2) A, 240 Vac, 30.000 cycles CO (both relay contacts with load) .	
UL60730: purely resistive load: 10 A, 240 Vac, 100.000 cycles NO; 10 A, 240 Vac, 30.000 cycles NC; motor load: 5FLA, 30LRA, 240 Vac, 30.000 cycles NO; pilot duty: C300, 240 Vac, 30.000 cycles NO.	
NO4, NC4 (SPDT)	
IEC60730: purely resistive load: 7 A, 240 Vac, 100.000 cycles NO; 7 A, 240 Vac, 30.000 cycles NC; 2 A, 240 Vac, 30.000 cycles CO (both relay contacts with load); resistive - inductive load (i.e. motor load): 6(3) A, 240 Vac, 100.000 cycles NO; 6(3) A, 240 Vac, 30.000 cycles NC; 2(2) A, 240 Vac, 30.000 cycles CO (both relay contacts with load) .	
UL60730: purely resistive load: 7 A, 240 Vac, 100.000 cycles NO; 7 A, 240 Vac, 30.000 cycles NC; motor load: 2FLA, 12LRA, 240 Vac, 30.000 cycles NO; pilot duty: C300, 240 Vac, 30.000 cycles NO.	
NO5, NC5 (SPDT)	
IEC60730: purely resistive load: 6 A, 240 Vac, 100.000 cycles NO; 6 A, 240 Vac, 30.000 cycles NC; 2 A, 240 Vac, 30.000 cycles CO (both relay contacts with load); resistive - inductive load (i.e. motor load): 6(3) A, 240 Vac, 100.000 cycles NO; 6(3) A, 240 Vac, 30.000 cycles NC; 2(2) A, 240 Vac, 30.000 cycles CO (both relay contacts with load) .	
UL60730: purely resistive load: 6 A, 240 Vac, 100.000 cycles NO; 6 A, 240 Vac, 30.000 cycles NC; motor load: 2FLA, 12LRA, 240 Vac, 30.000 cycles NO; pilot duty: C300, 240 Vac, 30.000 cycles NO.	

6-relay models	
SSR: Maximum current: 0,5 A	
NO1, NO2, NO3, NO4 (SPST)	
IEC60730: purely resistive load: 3 A, 240 Vac, 100.000 cycles; resistive - inductive load (i.e. motor load): 3(1) A, 240 Vac, 100.000 cycles.	
UL60730: purely resistive load: 3 A, 240 Vac, 100.000 cycles; motor load: 1.9FLA, 11.4LRA, 240 Vac, 30.000 cycles; pilot duty: C300, 240 Vac, 30.000 cycles.	
NO5, NC5; NO6, NC6 (SPDT)	
IEC60730: resistive - inductive load (i.e. motor load): 2(1) A, 240 Vac, 100.000 cycles; 1(1) A, 240 Vac, 30.000 cycles CO (both relay contacts with load) .	
UL60730: purely resistive load: 2 A, 240 Vac, 100.000 cycles NO; 2 A, 240 Vac, 100.000 cycles NC; pilot duty: C300, 240 Vac, 30.000 cycles NO.	

Power supply to probes and terminals

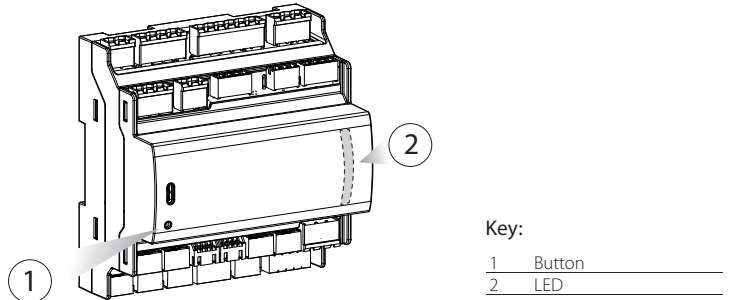
5V	5 Vdc ± 2% to power the 0,5...4,5 V ratiometric probes. Maximum current delivered: 25 mA protected against short-circuits
+V	11...13 V to power the 4...20 mA and 0...10 V probes. Maximum current delivered: 70 mA protected against short-circuits

Conformity	
Electrical safety	LVD directive and UL certification: IEC/EN/UL 60730-1, CSA E60730-1, IEC 60335-1
Electromagnetic compatibility	EMC directive: IEC/EN 61000-6-1, IEC/EN 61000-6-2, IEC/EN 61000-6-3, IEC/EN 61000-6-4
Applications with flammable refrigerants	For use with flammable refrigerants, the controllers described in this document have been tested and found to comply with the following requirements of the IEC 60335 series standards: • Annex CC of IEC 60335-2-24: 2010, referred to in clause 22.109, and Annex BB of IEC 60335-2-89: 2010, referred to in clause 22.108; components that produce arcs or sparks during normal operation have been tested and found to comply with the requirements of UL/ IEC 60079-15; • IEC/EN/UL 60335-2-24 (clauses 22.109, 22.110) for household refrigerators and freezers; • IEC/EN/UL 60335-2-40 (clauses 22.116, 22.117) for electric heat pumps, air conditioners and dehumidifiers • IEC/EN/UL 60335-2-89 (clauses 22.108, 22.109) for commercial refrigerating appliances

CABLE LENGHT

Terminal	Description	Lmax
J1, J2, J3, J5, J6, J7, J8	Analogue inputs/outputs, digital inputs, probe power	< 10 m
J13 BMS	BMS serial port 1	For serial connections (LAN and BMS) the use of cables suitable for the RS485 standard is required (shielded twisted pair cable).
J12 LAN	LAN serial port from main to secondary (Fieldbus 1)	
J17	Optional serial port	<b>Caution:</b> connect the shield to earth, do not connect to the GND on the controller. Connect a 120 Ω terminating resistor between the Tx/Rx+ and Tx/Rx- terminals on the last controller on the RS485 line.  With unshielded cables: in residential/industrial environments: < 10 m; in domestic applications: < 2 m.
J9, J10	HMI and HMI repeater	In residential/industrial environments: < 25 m. In domestic applications: < 2 m.
J14	SSR digital output	Use a shielded cable earthed at both ends.
J15	Valve	In residential/industrial environments: < 2 m with unshielded cable; < 50 m with shielded cable earthed at both ends. In domestic applications: < 2 m.

MINIMAL INTERFACE



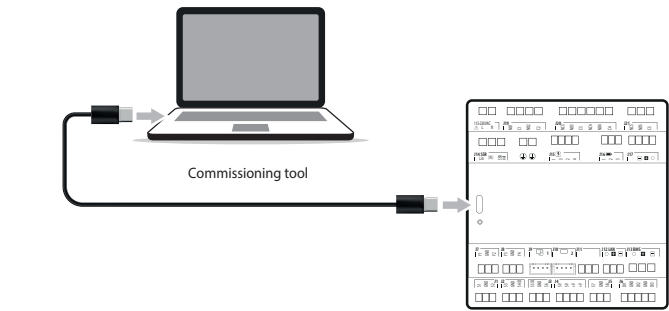
The MSC control has a minimal interface, consisting of an RGB LED and a button, for the meaning and use of which during normal operation please refer to the specific product leaflet.

During startup or update, the RGB LED turns yellow, with the meanings shown in the table.

Yellow LED	Description
ON steady	Boot start
ON alternating to OFF for a short time	OS start
Flashing slowly	Default application running
OFF alternating to ON for a short time	Preparing for the update
Flashing quickly	Update in progress

**Caution:** If the yellow LED remains fixed in one of the previous states, contact CAREL assistance.

COMMISSIONING



The controller can be commissioned, even when the controller is not powered, via the controller's USB-C port, using the PC configuration tools provided by CAREL: APPLICA Desktop, Spark and Sparkly.

Alternatively, if a remote HMI interface is connected, the CAREL "APPLICA" app can be used from a mobile device (Smartphone, Tablet), via NFC (Near Field Communication) or BLE (Bluetooth Low Energy) connection.

**Caution:** the connection to the USB-C port cannot be used to power external devices (e.g. smartphones), but only for commissioning from a PC.

IMPORTANT WARNINGS

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](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 final installation and/or equipment. Failure to complete such operations, which are required/indicated in the user manual, may cause the final product to malfunction; CAREL accepts no liability in such cases. The customer must only use the product 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.

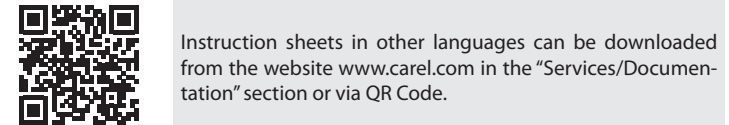
**Important:** Separate as much as possible the probe and digital input cables from cables to inductive loads and power cables, so as to avoid possible electromagnetic disturbance. Never run power cables (including the electrical panel cables) and signal cables in the same conduits.

**Disposal of the product:** The appliance (or the product) must be disposed of separately in compliance with the local standards in force on waste disposal.

DANGER

- This leaflet is part of the product and should be kept near the control for quick reference.
- The control shall not be used for purposes other than those for which it was designed, in particular it can't be used as a safety device.
- In case of failure contact an authorized service center.
- The control must not be opened.
- Check the power supply voltage before installing.
- Use the control inside the operating conditions limits. Do not expose to liquids or steam and avoid sudden temperature changes that might cause condensation.
- Disconnect the power supply before any kind of maintenance.
- Observe the maximum current output value for each relay ( see "Technical specifications" section).
- Do not apply dangerous voltage to the SELV connection terminals ( see "Technical specifications" section).
- Only use cables with a suitable cross-section ( see "Technical specifications" section).
- Separate the probe and digital input cables from output and power cables. Never run power cable and signal cables in the same conduct.
- Some models are equipped with the High and Low Voltage Protection function (HLVP). Power supply voltage reading accuracy: ±5% fs. In any condition of use, HLVP function cannot be considered a compressor safety function. The use of the controller outside the nominal power supply voltage declared on technical specifications is under responsibility of the final client. For serial communication line do not connect GND to PE (Protective Earth); opto-isolated converter is mandatory.

**Caution:** electrical equipment must be installed, used and repaired only by qualified technicians.



Instruction sheets in other languages can be downloaded from the website [www.carel.com](http://www.carel.com) in the "Services/Documentation" section or via QR Code.