CHROMALOX

6140

PID temperature controller
Quick Start Guide

QUICK INSTALLATION GUIDE

WARNINGS AND SAFETY

Although all of the information in this manual has been carefully checked, Chromalox assumes no liability regarding the presence of any errors or regarding damage to property and/or harm to individuals due to any improper use of this manual.

Chromalox also reserves the right to make changes to the contents and form of this manual and to the characteristics of the devices illustrated at any time and without prior warning.

The installation of the devices illustrated in the manual must be carried out by qualified technicians in compliance with the laws and standards in force and in agreement with the instructions contained in the manual.

If the PID temperature controllers 1/16 DIN 6140 is used in applications with the risk of damages to persons, machinery or materials, its use in conjunction with alarms is essential. It is advisable to envisage the possibility of checking the intervention of the alarms during regular operation.

Before interacting with the PID temperature controllers 1/16 DIN 6140, the operator must receive full training in the procedures of operation, emergency, diagnosis and maintenance of the system.

More information on the device and procedures of the instalation, maintenance and use can be found in the Installation and Use Controllers 6140-4140, *which is available for free download from the Chromalox website (www.chromalox.com).*

CE EMC (electromagnetic compatibility): conforms to directiv 2014/30/EU with reference to standard EN 61326-1
emission in industrial environment class A for models 6140 LV
emission in residential environment class B for models 6140 HV
Safety LVD: conforms to directiv 2014/35/EU with reference to standard EN61010-1

⚠ This is a class A product intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic

Graphic simbol

☞ Indicates contents of sections, general instructions, notes, and other points to which the reader's attention needs to be called.

⚠ Indicates a particularly delicate situation that could affect the safety or correct operation of the controller, or an instruction that MUST be followed to prevent hazards.

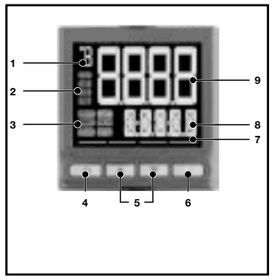
DISPOSAL

Controllers must be disposed of in conformity to current laws and regulations. If not correctly disposed of, some of the components used in the devices may harm the environment.

PACKAGE CONTENTS

n. 1 PID Temperature Cotroller 1/16 DIN model 6140
n. 1 Mounting bracket with screws
n. 1 Rubber gasket 96×96 front-box
n. 1 Instruction sheet

DISPLAY AND KEYS



1. Temperature unit of measurement or number of program running.
2. State of outputs OUT1, OU2, OUT3, OUT4.
3. Controller function states: RUN = setpoint programmer active; _/- = setpoint ramp active; TUN = PID parameters tuning active; MAN = manual/automatic (off = automatic control, on = manual control); REM = remote setpoint enabled; SP1/2 = setpoint active (off = setpoint 1, on = setpoint 2).
4. Work mode key (manual/automatic) in standard mode. A function can be assigned via parameter *but1*. The key is active only when the display shows the process variable.
5. Up/down keys: raise/lower the value of the parameter displayed on the SV or PV display.
6. F key: lets you navigate among controller menus and parameters. Confirms the parameter value and selects the next parameter.
7. Key pressed signals.
8. SV display: setpoint value, description of parameters, diagnostics and alarm messages. Configurable with parameter *dS.SP* (default = setpoint).
9. PV display: process variable, parameter values. If the message *Sbr - Err* means that the sensor is not connected or is shorted.

MOUNTING

⚠ **Attention!** The devices described in this manual must be installed by trained personnel in conformity to current laws and regulations, following all of the instructions in this manual.

Before installing, check that the controller is in perfect condition and was not damaged in shipment. Make sure that the package contains all of the accessories listed on the accompanying document, especially the gasket and the fastening brackets.
Check that the order code matches the configuration required for the intended application (supply voltage, number and type of inputs and outputs).

⚠ **Attention!** If even one of the requirements mentioned above (trained technician in, device in perfect condition, correct configuration) is not satisfied, interrupt the installation and contact Chromalox Customer Service.

The controller is designed for permanent indoor installation. It must be mounted on electrical panels or on panels controlling machines or production process plants that are able to protect the exposed terminals on the rear of the controller.

⚠ **Attention!** DO NOT install the controller in a potentially inflammable or explosive atmosphere. It can be connected to elements that work in such atmospheres only by means of appropriate interfaces that conform to safety regulations in force in the country of installation.

⚠ **Attention!** If the controller is used in applications with risk of harm/damage to persons/property, it MUST be connected to dedicated alarm devices. It is advisable to provide the possibility, during normal functioning of the controller and of the system or equipment that it controls, of checking whether any alarms have tripped.

The controller must be installed in a location that is not subject to sudden temperature changes or to freezing or condensation, and no corrosive gases must be present.
The controller can work in Pollution Degree 2 environments (presence of non-conductive dust, only temporarily conductive due to possible condensation).
Do not allow scrap or metal particles from machining or condensation products to reach the device.

The controller is sensitive to strong electromagnetic fields. Do not position it near radio devices or other equipment that may generate electromagnetic fields, such as power contactors, relays, thyristor power units (especially phase angle), motors, solenoids, transformers, high-frequency welders, etc.

For correct installation, respect the dimensions of each hole and the distance between adjacent holes shown in the figures.

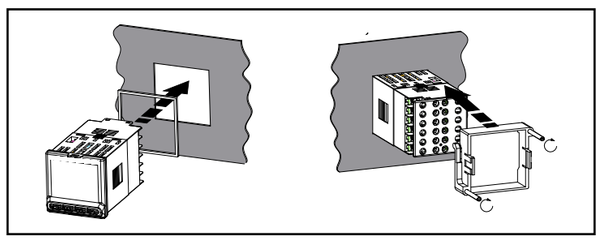
⚠ **Attention!** The support on which the operator panel is mounted must:
- be sufficiently rigid and robust to support the device without bending during use;
- be from 1 to 4 mm thick to allow the device to be fastened with the supplied bracket.

The front of the controller has an IP65 protection index, so the device can be installed without problems in rooms that are very dusty or subject to splashing water provided: the housing in which the device is inserted is dust-tight and watertight; the support on which the device is installed is perfectly smooth and without undulations on the front; the hole on the support scrupulously respects the specified drilling dimensions; the device is fully tightened to the support to ensure that the gasket inserted between the device and the panel is watertight.
If not adequately protected, the controller has an IP20 protection index (rear container and terminal board).

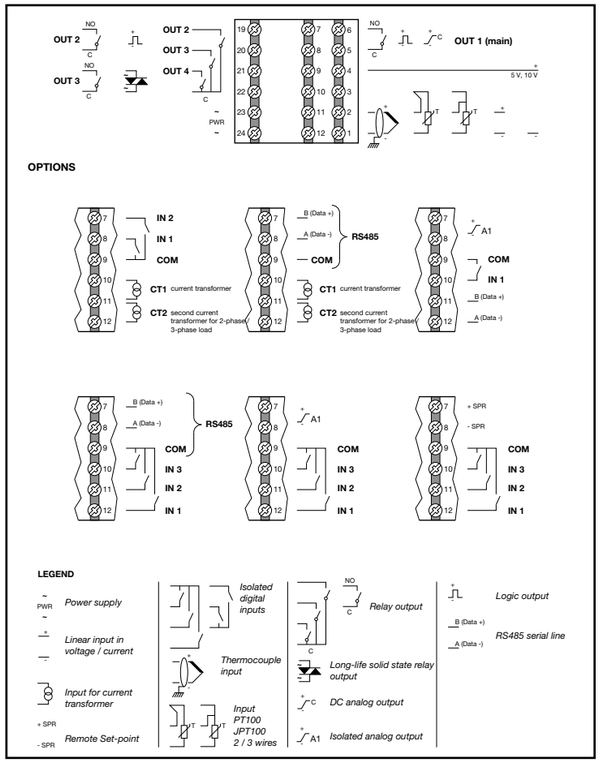
The controller can support vibrations from 10 to 55 Hz, 20 m/s2, in all directions (X, Y and Z). If the device is mounted on a support that exceeds these limits, it is advisable to provide a suspension system to reduce vibrations.

The temperature in the housing containing the controller must NEVER exceed 55°C. NEVER block the ventilation slits.
Forced cooling (for example, with a fan) of the rear of the controller may cause measurement errors.

The controller must be positioned so that the display is not subject to direct sunlight or to very strong sources of light.
If necessary, filter direct light, for example, with a reflective screen.
The controller must be tilted between 30° and 120°.
Fastening to the panel:
1. Insert the die-cut rubber gasket between the controller and the panel. The gasket (supplied) is indispensable for ensuring the declared protection index of the faceplate.
2. Insert the device into the hole previously made on the panel.
3. Place the supplied bracket(s) onto the rear of the controller.
4. Tighten the screws to fasten the device to the panel. The tightening torque must be between 0,3 and 0,4 N m.



CONNECTIONS



Connected external circuits must have double isolation.
In case of shielded cables, the shield must be grounded at a single point, possibly near the controller.
Input cables must be physically separated from power cables, output cables, and power connections.
Do not connect unused terminals.
Tighten the terminals without forcing. Loose terminals may cause sparks and fires. The recommended tightening torque is 0.5 Nm. When making connections, respect polarity where required.
Do not bend or twist the cables beyond the limits specified by the manufacturers.

After connecting the cables, apply the transparent cover to protect the terminals. The terminal teeth limit and define the correct direction for applying the cover. Always use cables appropriate for the voltage and current limits specified in the Technical Characteristics.

Use copper cables with 60/75°C insulation.
Use twisted and shielded cables for non-power connections.

The controller's terminal board has screw terminals (M3) that accept stripped cables and crimped terminals for a tightening torque of 0.5 N m. Two ring or crimped fork terminals can be connected on each terminal.

Cable / terminal	Cable section / terminal	Terminal size
Rigid cable	0,2...2,5 mm² (24...14 AWG)	
Twisted	0,2...2,5 mm² (24...14 AWG)	
Tag terminal (to be crimped)	0,25...2,5 mm² (23...14 AWG)	
Fork terminal (to be crimped)		5,8 mm
Ring terminal (to be crimped)		5,8 mm

Attention! Anchor the cables, at least in pairs, so that mechanical stresses do not discharge on the terminal connections.

Attention! Before powering the controller, make sure that the supply voltage matches the one shown on the controller data plate.

Because the controller does not have a switch, a bipolar switch with fuse must be inserted upline. The switch, or isolator, must be positioned in the immediate vicinity of the device and must be easily reached by the operator. A single switch can control multiple controllers.

The controller must be powered by a line separated from the one used for electromechanical power devices (relays, contactors, solenoids, etc).
It is advisable to install a ferrite core on the power line, as close as possible to the device, to limit the controller's susceptibility to electromagnetic noise.

If the controller's power line is heavily disturbed by the switching of thyristor power units or by motors, it is advisable to use an isolation transformer only for the controller, grounding the shield. Use appropriate line filters in the vicinity of high-frequency generators or arc welders. Use a voltage stabilizer if there are wide shifts in line voltage.

20...27 VAC/VDC models must be powered by a class II or low-voltage limited-energy source. The power supply must use a line separated from the one used for electromechanical power devices, and low-voltage power cables must run along a path separated from the system or machine power cables.

⚠ **Attention!** Make sure the ground connection is efficient.
Absent or inefficient grounding can make the device unstable due to excessive noise. Specifically, check that:
- voltage between mass and ground is < 1 V;
- resistance is < 6 Ω.

⚠ **Attention!** If the controller is connected to devices that are NOT electrically isolated (such as thermocouples), ground with a specific conductor to prevent grounding directly through the machine structure.

The controller's input and output lines must be separated from the power line.
To prevent noise, the controller's input and output cables must be kept away from the power cables (high voltages or high currents).
The input and output cables and the power cables must not be placed parallel to one another. Use shielded cables or separate cable trays.

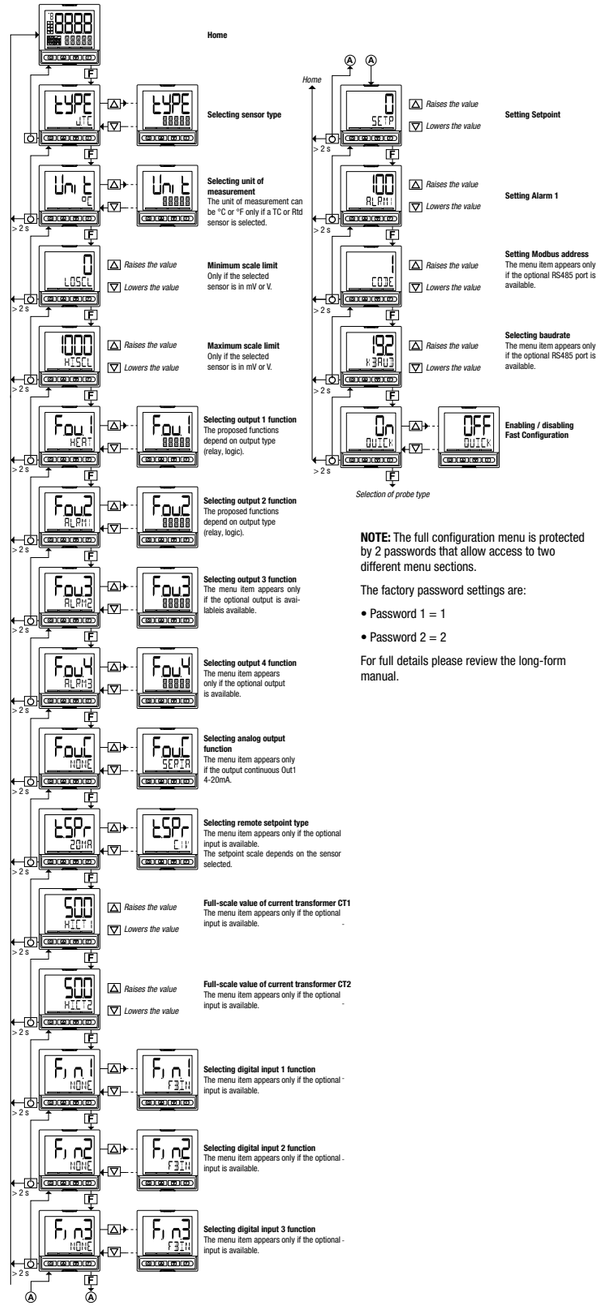
To connect the output to an inductive load (relay, contactor, electrovalve, motor, fan, solenoid, etc.) that works in AC, mount a snubber, i.e., an RC group (resistor and condenser in series) placed parallel to the load.
Installing this filter lengthens the life of the relays.

NOTE: All condensers must conform to VDE (class X2) standards and support voltage ≥ 220 VAC.
The power of the resistor must be ≥ 2 W.

For inductive loads that work in DC, mount a 1N4007 diode parallel to the coil.

The filters must be connected as close as possible to the controller.

FAST CONFIGURATION MENU



NOTE: The full configuration menu is protected by 2 passwords that allow access to two different menu sections.

The factory password settings are:

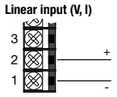
- Password 1 = 1
- Password 2 = 2

For full details please review the long-form manual.

COMMISSIONING WITH QUICK CONFIGURATION

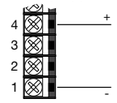
1 INPUT CONNECTION

Linear input (V, I)



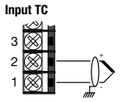
linear input voltage
60 mV (RI > 70 kΩ)
1 V (RI > 15 kΩ)
Linear input in direct current
0/4...20 mA, RI = 50 Ω

Linear input (V)



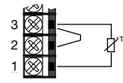
Linear input in direct voltage
5 V, 10 V (RI > 30 kΩ)

Input TC



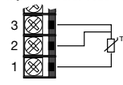
Available thermocouples:
J, K, R, S, T, C, D
ITS90 or custom linearization
Respect polarity
For extensions, use a compensated cable

Input PT100/JPT100 - 2-wire connection



Use wires with adequate section min. 1 mm²

Input PT100/JPT100 - 3-wire connection



Use wires with adequate section min. 1 mm²

The probe type is set with the parameter tyPE

Options:

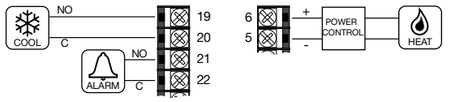
J.TC	= Thermocouple J
K.TC	= Thermocouple K
R TC	= Thermocouple R
S TC	= Thermocouple S
T.TC	= Thermocouple T
C.TC	= Thermocouple C
D.TC	= Thermocouple D
PT2.TC	= Thermocouple Pt20Rh / Pt40Rh
INFR1	= IR Sensor type 1
INFR2	= IR Sensor type 2
INFR3	= IR Sensor type 3
INFR4	= IR Sensor type 4
PT100	= Resistance thermometer Pt100
PT.LIM	= Limitated resist. thermomet. Pt 100
JTP10	= Resistance thermometer JPT100
60MV	= 0...60 mV Sensor
20MA	= 0...20 mA Sensor
4-20M	= 4...20 mA Sensor
10V	= 0...10 V Sensor
2-10V	= 2...10 V Sensor
5V	= 0...5 V Sensor
1-5V	= 1...5 V Sensor
1V	= 0...1 V Sensor
0.2-1V	= 0,2...1 V Sensor

2 OUTPUT CONNECTION

Model 6140-D-RXX...

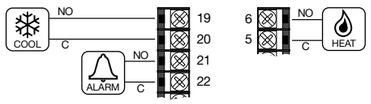
Model 6140-R-RXX...

Model 6140-D-RRX...



To enable the cooling output you need to set the following parameters:
cntr = HC.PID (*menu* PID)
F.ou.2 = COOL (*menu* OUTPU)
F.ou.3 = ALRM1 (*menu* OUTPU)

Model 6140-R-RRX...



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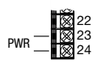
3 POWER SUPPLY



Standard: 100...240 VAC/VDC ±10%
50/60 Hz, max 5 VA

Optional: 20...27 VAC/VDC ±10%
50/60 Hz, max 5 VA

4 POWER-ON

Power to the controller.
If the message appears on the PV display *Sbr-Err:* Sensor broken or input values above maximum limit..
If the display does not show the correct PV input value (eg temperature) check the connections.

5 PROGRAMMING

Configure the controller through the quick setup menu.
The full description of all parameters is available in the *Manual Installation and Operation controllers.*

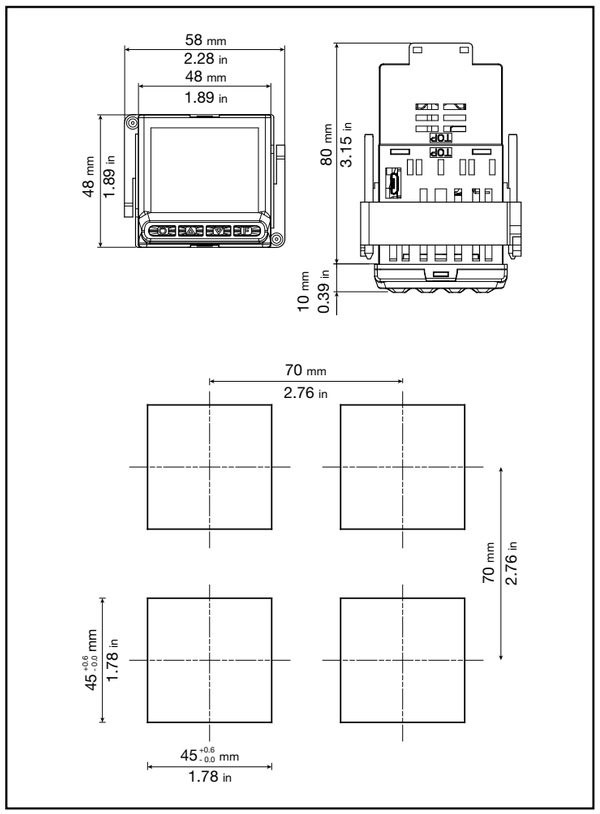
6 VERIFY OPERATION OUTPUT

Set **SP** = **AL1** = **PV + 10** and check the status of the LEDs, which must be:

H (LED Out1): ON
C (LED Out2): OFF
AL1 (LED Out3): OFF

Set **SP** = **AL1** = **PV - 10** and check the status of the LEDs, which must be:
H (LED Out1): OFF
C (LED Out2): ON
AL1 (LED Out3): ON

DRILLING DIMENSIONS AND TEMPLATES



TECHNICAL DATA

OPERATOR INTERFACE		
DISPLAY	Type	LCD black background
	Screen area (L x H)	35 × 30 mm
	Lighting	Backlit with LEDs, life > 40.000 hours @ 25 °C
	PV display	Number of digits: 4 to 7 segments, with decimal point Digit height: 17 mm Color: white or "custom"
	SV display	Number of digits: 5 to 14, segments, with decimal point Digit height: 7,5 mm Color: green or "custom"
	Unit of measurement	Selectable, °C, °F or custom [1] Color: same as PV display
	Controller state signals	Number: 6 (RUN, MAN, _/-, REM, SP1/2) Color: ambra
	Output state signals	Number: 4 (1, 2, 3, 4) Color: red
KEYPAD		Keys number: 4, silicone (Man/Auto, INC, DEC, F) Type: mechanical
INPUTS		
MAIN INPUT	Sensor type	TC, RTD (PT100, JPT100), IR ES1B, DC linear sensor
	Accuracy	**TC inputs**: Calibration accuracy: < +/- (0,25% of reading value in °C +0,1°C) Linearization accuracy: 0,1% of reading value Cold junction accuracy: < +/- 1,5°C a 25°C room temperature) Cold junction compensation: > 30:1 rejection to the change of the ambient temperature **RTD input**: Calibration accuracy: < +/- (0,15% of reading value in °C +1°C) Temperature drift: < +/- (0,005% of reading value in °C +0,015°C)/°C from 25°C room temperature Linearization accuracy: 0,1% of reading value **Linear inputs**: Calibration accuracy:< 0,1% full scale Temperature drift: < +/- 0,005% full scale /°C at 25°C room temperature
	Sampling time	60 ms / 120 ms, selectable
	Digital filter	0,0...20,0 s
	Temperature unit of measurement	Degrees C / F, selectable from keypad
	Signal interval	Type: linear Scale: -1999...9999, settable decimal point
	TC (thermocouple) input	Thermocouple: J, K, R, S, T, C, D Linearization: ITS90 o custom
	RTD (resistance thermometer) input	Resistance thermometer: PT100, JPT100 Input impedance (Ri): ≥ 30 kΩ Linearization: DIN 43760 or custom Max. line resistance: 20 Ω
	DC linear input	0...60 mV input impedance (Ri): > 70 kΩ 0...1 V input impedance (Ri): > 15 kΩ 0...5 V / 0...10 V input impedance (Ri): > 30 kΩ 0/4...20 mA input impedance (Ri): 50 Ω Linearization: linear or custom
AUXILIARY INPUT	Remote set point	0...1 V, 0...10 V, 0/4...20 mA
	Scale	0...1 V input impedance (Ri): > 15 kΩ 0...10 V input impedance (Ri): > 30 kΩ 0/4...20 mA input impedance (Ri): 50 Ω
	Accuracy	0,1% f.s. ±1 digit @25 °C
CT (ammeter) INPUT	Type	Isolated via external transformer
		Number: 2 max Max. capacity: x / 50 mA AC Line frequency: 50/60 Hz Input impedance (Ri): 10 Ω
	Accuracy	±2% f.s. ±1 digit @25 °C
DIGITAL INPUTS	Type	voltage-free contact, or NPN 24 V - 4,5 mA, o PNP 12/24 V - max 3,6 mA *(for detail see electrical connections)*
	Isolation	500 V
OUTPUTS		
	Relay (R)	Number: 4 max Type of relay contact: NO Max. current: 5 A, 250 VAC Minimum load: 5 V, 10 mA Life cycle: > 100.000 operations Double isolation
	Logic (D)	Number: 2 max Type: for solid-state relays Voltage: 24 V ±10% (min 10 V @20 mA) Isolated from main input
	Triac (long life relè) (T)	Number: 1 max Load: resistive Voltage: 75...264 VAC Current max: 1 A Isolation 3 kV snubber circuit integrated zero crossing switching
	Continuous (C)	Number: 1 max Current: 4...20 mA Rout : < 500 Ω Resolution: 12 bit Isolated from main input
	Analog retransmission (A1)	Number: 1 max 0...10 V, max 20 mA, Rout: > 500 Ω 0...20 mA, 4...20 mA, Rout: < 500 Ω Resolution: 12 bit Isolated from main input
ALARMS	Number of alarm functions	4 max, assignable to an output
	Possible configurations	Maximum, minimum, symmetric, absolute/relative, exclusion at firing, memory, reset from keypad and/or contact, LBA, HB, HBB Hold Back Band if enabled with Programmer function

CONTROL FUNCTIONS		
CONTROL	Type	Single loop
	Control	PID, ON/OFF, single action heat or cool, double action heat/cool
	Control output	Continuous or ON/OFF Cycle time: constant or optimized (BF)
	Control output for motorized valves	OPEN/CLOSE for floating motorized valve on Relay, Solid-state, Triac outputs
SETPOINT PROGRAMMER	Number of programs	Max 4 Start / Stop / Reset / Skip via digital inputs and/or outputs from logic operations Output state: Run /Hold / Ready / End
	Number of setpoints	Max 12, each with own setpoint, ramp time and hold time Times settable in HH:MM or MM:SS Max 4 consents, configurable for ramp and for hold Max 4 events, configurable in ramp and in hold
MULTIPLE SETPOINTS	Number of setpoints	Max 4, selectable from digital input Each setpoint change is subject to set ramp, different for up and down ramp
LOGIC OPERATIONS [1]	Function blocks	Max 16, with 4 input variables per block. The result can act on the state of the controller, of the programmer on alarms and outputs. Each function contains an incorporated timer block timer.
TIMER FUNCTION	Modes	START / STOP STABILIZATION (timer is on when PV enters a band set around setpoint; at end of count you can activate an output, shut down SW or change SP1/SP2) FIRING (timed activation of control after power on)
ENERGY COUNTER		Calculation done on nominal line voltage and nominal load power or on rms current measured on load via CT
DIAGNOSTIC		Short circuit or open circuit (LBA alarm) Interrupted or partially interrupted load (HB alarm) Short circuit of control output (SSR alarm)
RETENTIVE MEMORY	Type	EEPROM
	Max. number of writes	1.000.000
SERIAL INTERFACE		
	Type	RS485
	Baudrate	1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s
	Protocol	MODBUS RTU
		Isolated from main input
GENERAL DATA		
POWER SUPPLY	Operating voltage	100...240 VAC/VDC ±10%, 50/60 Hz (on request 20...27 VAC/VDC ±10%)
	Power dissipation	5 W max
	Protections	Overvoltage 300 V / 35 V
	Connection	Screw terminals and crimp connector, max. wire section max 1 mm²
CONNECTIONS	Serial configuration port (for USB connection)	Connector: microUSB
	Inputs and outputs	Screw terminals and crimp connector, max. wire section 2,5 mm²
AMBIENT CONDITIONS	Use	Indoor
	Altitude	2000 m max
	Operating temperature	-10 ... +55 °C (as per IEC 68-2-14)
	Storage temperature	-20 ... +70 °C (as per IEC 68-2-14)
	Relative humidity	20...85% RH non-condensing (as per IEC 68-2-3)
PROTECTION LEVEL		IP 65 on front panel (as per IEC 68-2-3)
ASSEMBLY	Positioning	On panel, removable faceplate
	Installation regulations	Installation category: II Pollution degree: 2 Isolation: double
WEIGHT		0,16 kg

1) Programming is done with the C-PWR configuration program.

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4140

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CE

EMC (electromagnetic compatibility): conforms to directiv 2014/30/EU with reference to standard EN 61326-1
emission in industrial environment class A
Safety LVD: conforms to directiv 2014/35/EU with reference to standard EN61010-1

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Graphic simbol

☞ Indicates contents of sections, general instructions, notes, and other points to which the reader's attention needs to be called.
⚠ Indicates a particularly delicate situation that could affect the safety or correct operation of the controller, or an instruction that MUST be followed to prevent hazards.

DISPOSAL

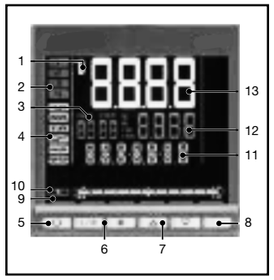
The controllers must be disposed of in conformity to current laws and regulations.

If not correctly disposed of, some of the components used in the devices may harm the environment.

PACKAGE CONTENTS

n. 1 PID Temperature Cotroller 1/4 DIN model
n. 2 Mounting bracket with screws
n. 1 Rubber gasket 48×96 front-box
n. 1 Instruction sheet

DISPLAY AND KEYS



1. Temperature unit of measurement or number of program running.
2. State of outputs OUT1, OUT2, OUT3, OUT4.
3. Displays program number, step number, unit of measurement (%, A, kW, kWh).
4. Controller function states: RUN = setpoint programmer active; _/- = setpoint ramp active; TUN = PID parameters tuning active; MAN = manual/automatic (off = automatic control, on = manual control); REM = remote setpoint enabled; SP1/2 = setpoint active (off = setpoint 1, on = setpoint 2).
5. Work mode key (manual/automatic) in standard mode. A function can be assigned via parameter but1. The key is active only when the display shows the process variable.
6. Key function configurable with parameters but2 and but3. The keys are active only when the display shows the process variable.
7. Up/down keys: raise/lower the value of the parameter displayed on the SV or PV display.
8. F key: lets you navigate among controller menus and parameters. Confirms the parameter value and selects the next parameter.
9. Key pressed signals.
10. Displays percentage of power or current, configurable with parameter bArG.
11. Display F: parameters, diagnostics and alarm messages. Configurable with parameter dS.F (default = setpoint).
12. SV display: parameter values. Configurable with parameter dS.SP (default = setpoint).

MOUNTING

⚠ **Attention!** The devices described in this manual must be installed by trained personnel in conformity to current laws and regulations, following all of the instructions in this manual.

Before installing, check that the controller is in perfect condition and was not damaged in shipment. Make sure that the package contains all of the accessories listed on the accompanying document, especially the gasket and the fastening brackets.

Check that the order code matches the configuration required for the intended application (supply voltage, number and type of inputs and outputs).

⚠ **Attention!** If even one of the requirements mentioned above (trained technician in, device in perfect condition, correct configuration) is not satisfied, interrupt the installation and contact your Gefran dealer or Gefran Customer Service.

The controller is designed for permanent indoor installation. It must be mounted on electrical panels or on panels controlling machines or production process plants that are able to protect the exposed terminals on the rear of the controller.

⚠ **Attention!** DO NOT install the controller in a potentially inflammable or explosive atmosphere. It can be connected to elements that work in such atmospheres only by means of appropriate interfaces that conform to safety regulations in force in the country of installation.

⚠ **Attention!** If the controller is used in applications with risk of harm/damage to persons/property, it MUST be connected to dedicated alarm devices. It is advisable to provide the possibility, during normal functioning of the controller and of the system or equipment that it controls, of checking whether any alarms have tripped.

The controller must be installed in a location that is not subject to sudden temperature changes or to freezing or condensation, and no corrosive gases must be present.
The controller can work in Pollution Degree 2 environments (presence of non-conductive dust, only temporarily conductive due to possible condensation).
Do not allow scrap or metal particles from machining or condensation products to reach the device.

The controller is sensitive to strong electromagnetic fields. Do not position it near radio devices or other equipment that may generate electromagnetic fields, such as power contactors, relays, thyristor power units (especially phase angle), motors, solenoids, transformers, high-frequency welders, etc.

For correct installation, respect the dimensions of each hole and the distance between adjacent holes shown in the figures.

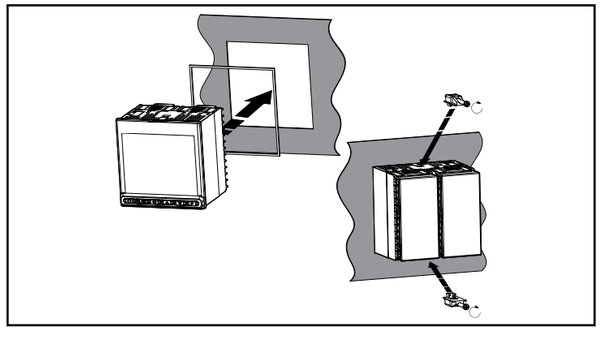
⚠ **Attention!** The support on which the operator panel is mounted must:
- be sufficiently rigid and robust to support the device without bending during use;
- be from 1 to 4 mm thick to allow the device to be fastened with the supplied bracket.

The front of the controller has an IP65 protection index, so the device can be installed without problems in rooms that are very dusty or subject to splashing water provided: the housing in which the device is inserted is dust-tight and watertight; the support on which the device is installed is perfectly smooth and without undulations on the front; the hole on the support scrupulously respects the specified drilling dimensions; the device is fully tightened to the support to ensure that the gasket inserted between the device and the panel is watertight.
If not adequately protected, the controller has an IP20 protection index (rear container and terminal board).

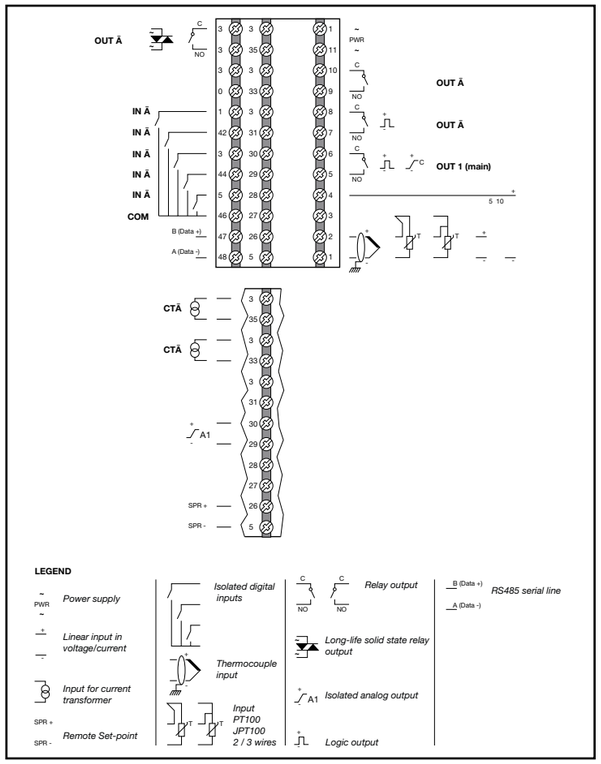
The controller can support vibrations from 10 to 55 Hz, 20 m/s², in all directions (X, Y and Z). If the device is mounted on a support that exceeds these limits, it is advisable to provide a suspension system to reduce vibrations.

The temperature in the housing containing the controller must NEVER exceed 55°C. NEVER block the ventilation slits. Forced cooling (for example, with a fan) of the rear of the controller may cause measurement errors.

The controller must be positioned so that the display is not subject to direct sunlight or to very strong sources of light. If necessary, filter direct light, for example, with a reflective screen.
The controller must be tilted between 30° and 120°. Fastening to the panel:
1. Insert the die-cut rubber gasket between the controller and the panel. The gasket (supplied) is indispensable for ensuring the declared protection index of the faceplate.
2. Insert the device into the hole previously made on the panel.
3. Place the supplied bracket(s) onto the rear of the controller.
4. Tighten the screws to fasten the device to the panel. The tightening torque must be between 0,3 and 0,4 N m.



CONNECTIONS



Connected external circuits must have double isolation.
In case of shielded cables, the shield must be grounded at a single point, possibly near the controller.
Input cables must be physically separated from power cables, output cables, and power connections.
Do not connect unused terminals.
Tighten the terminals without forcing. Loose terminals may cause sparks and fires. The recommended tightening torque is 0.5 Nm. When making connections, respect polarity where required.
Do not bend or twist the cables beyond the limits specified by the manufacturers.

After connecting the cables, apply the transparent cover to protect the terminals. The terminal teeth limit and define the correct direction for applying the cover.
Always use cables appropriate for the voltage and current limits specified in the Technical Characteristics.

Use copper cables with 60/75°C insulation.
Use twisted and shielded cables for non-power connections.

The controller's terminal board has screw terminals (M3) that accept stripped cables and crimped terminals for a tightening torque of 0.5 N m.
Two ring or crimped fork terminals can be connected on each terminal.

Cable / terminal	Cable section / terminal	Terminal size
Rigid cable	0,2...2,5 mm² (24...14 AWG)	
Twisted	0,2...2,5 mm² (24...14 AWG)	
Tag terminal (to be crimped)	0,25...2,5 mm² (23...14 AWG)	
Fork terminal (to be crimped)		5,8 mm
Ring terminal (to be crimped)		5,8 mm

Attention! Anchor the cables, at least in pairs, so that mechanical stresses do not discharge on the terminal connections.

Attention! Before powering the controller, make sure that the supply voltage matches the one shown on the controller data plate.

Because the controller does not have a switch, a bipolar switch with fuse must be inserted upline. The switch, or isolator, must be positioned in the immediate vicinity of the device and must be easily reached by the operator. A single switch can control multiple controllers.

The controller must be powered by a line separated from the one used for electromechanical power devices (relays, contactors, solenoids, etc).
It is advisable to install a ferrite core on the power line, as close as possible to the device, to limit the controller's susceptibility to electromagnetic noise.

If the controller's power line is heavily disturbed by the switching of thyristor power units or by motors, it is advisable to use an isolation transformer only for the controller, grounding the shield.
Use appropriate line filters in the vicinity of highfrequency generators or arc welders. Use a voltage stabilizer if there are wide shifts in line voltage.

20...27 VAC/VDC models must be powered by a class II or low-voltage limited-energy source. The power supply must use a line separated from the one used for electromechanical power devices, and low-voltage power cables must run along a path separated from the system or machine power cables.

⚠ **Attention!** Make sure the ground connection is efficient. Absent or inefficient grounding can make the device unstable due to excessive noise.
Specifically, check that:
- voltage between mass and ground is < 1 V;
- resistance is < 6 Ω.

⚠ **Attention!** If the controller is connected to devices that are NOT electrically isolated (such as thermocouples), ground with a specific conductor to prevent grounding directly through the machine structure.

The controller's input and output lines must be separated from the power line.
To prevent noise, the controller's input and output cables must be kept away from the power cables (high voltages or high currents).
The input and output cables and the power cables must not be placed parallel to one another. Use shielded cables or separate cable trays.

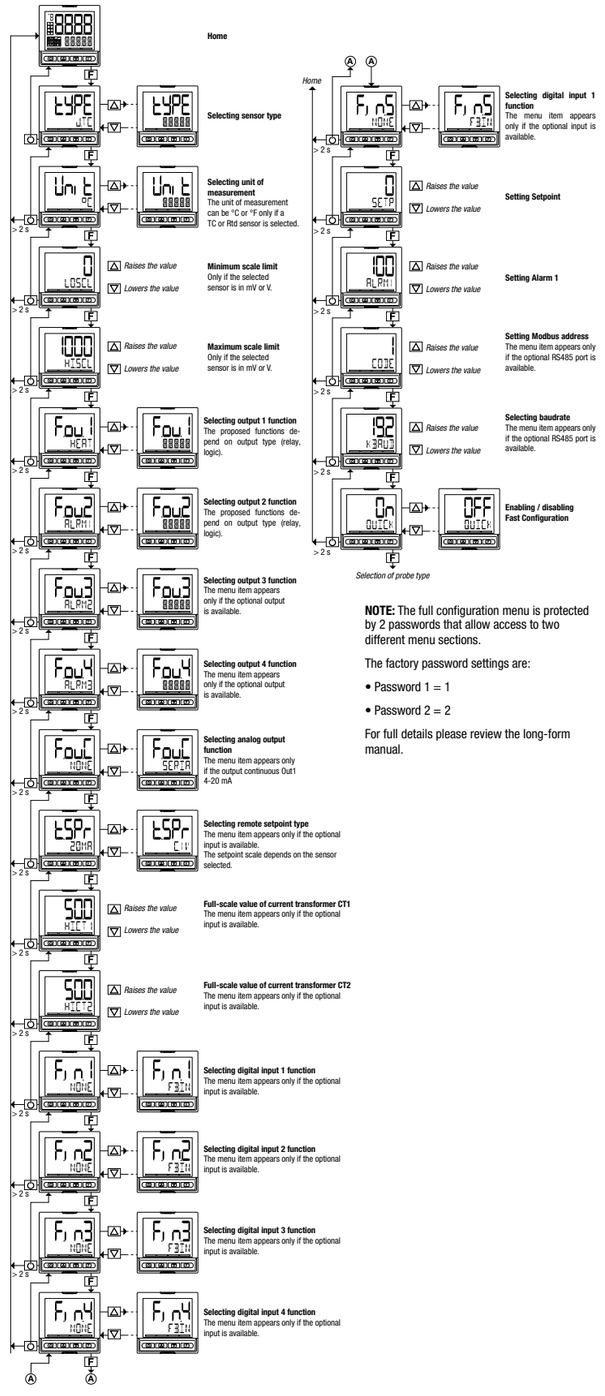
To connect the output to an inductive load (relay, contactor, electrovalve, motor, fan, solenoid, etc.) that works in AC, mount a snubber, i.e., an RC group (resistor and condenser in series) placed parallel to the load.
Installing this filter lengthens the life of the relays.

NOTE: All condensers must conform to VDE (class X2) standards and support voltage ≥ 220 VAC.
The power of the resistor must be ≥ 2 W.

For inductive loads that work in DC, mount a 1N4007 diode parallel to the coil.

The filters must be connected as close as possible to the controller.

FAST CONFIGURATION MENU



NOTE: The full configuration menu is protected by 2 passwords that allow access to two different menu sections.

The factory password settings are:

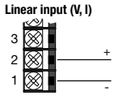
- Password 1 = 1
- Password 2 = 2

For full details please review the long-form manual.

COMMISSIONING WITH QUICK CONFIGURATION

1 INPUT CONNECTION

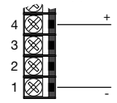
Linear input (V, I)



Linear input voltage
60 mV (RI > 70 kΩ)
1 V (RI > 15 kΩ)

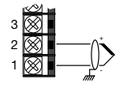
Linear input in direct current
0/4...20 mA, RI = 50 Ω

Linear input (V)



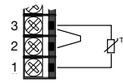
Linear input in direct voltage
5 V, 10 V (RI > 30 kΩ)

Input TC



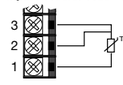
Available thermocouples:
J, K, R, S, T, C, D
ITS90 or custom linearization
Respect polarity
For extensions, use a compensated cable

Input PT100/JPT100 - 2-wire connection



Use wires with adequate section min. 1 mm²

Input PT100/JPT100 - 3-wire connection



Use wires with adequate section min. 1 mm²

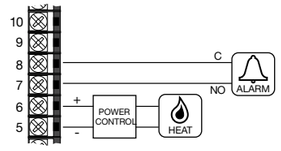
The probe type is set with the parameter tyPE

Options:

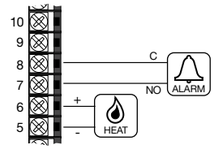
J.TC	= Thermocouple J
K.TC	= Thermocouple K
R TC	= Thermocouple R
S TC	= Thermocouple S
T.TC	= Thermocouple T
C.TC	= Thermocouple C
D.TC	= Thermocouple D
PT2.TC	= Thermocouple Pt20Rh / Pt40Rh
INFR1	= IR Sensor type 1
INFR2	= IR Sensor type 2
INFR3	= IR Sensor type 3
INFR4	= IR Sensor type 4
PT100	= Resistance thermometer Pt100
PT.LIM	= Limitated resist. thermomet. Pt 100
JTP10	= Resistance thermometer JPT100
60MV	= 0...60 mV Sensor
20MA	= 0...20 mA Sensor
4-20M	= 4...20 mA Sensor
10V	= 0...10 V Sensor
2-10V	= 2...10 V Sensor
5V	= 0...5 V Sensor
1-5V	= 1...5 V Sensor
1V	= 0...1 V Sensor
0.2-1V	= 0,2...1 V Sensor

2 OUTPUT CONNECTION

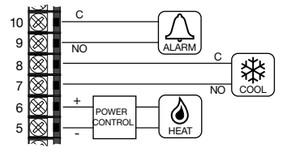
Model 4140-D-RXX...



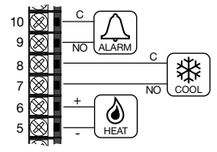
Model 4140-R-RXX...



Model 4140-D-RRX...

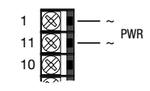


Model 4140-R-RRX...



To enable the cooling output you need to set the following parameters:
cntr = HC.PID (*menu* PID)
F.ou.2 = COOL (*menu* OUTPU)
F.ou.3 = ALRM1 (*menu* OUTPU)

3 POWER SUPPLY



Standard: 100...240 VAC/VDC ±10%
50/60 Hz, 10 VA

Optional: 20...27 VAC/VDC ±10%
50/60 Hz, 10 VA

4 POWER-ON

Power to the controller.
If the message appears on the PV display *Sbr-Err*: Sensor broken or input values above maximum limit.
If the display does not show the correct PV input value (eg temperature) check the connections.

5 PROGRAMMING

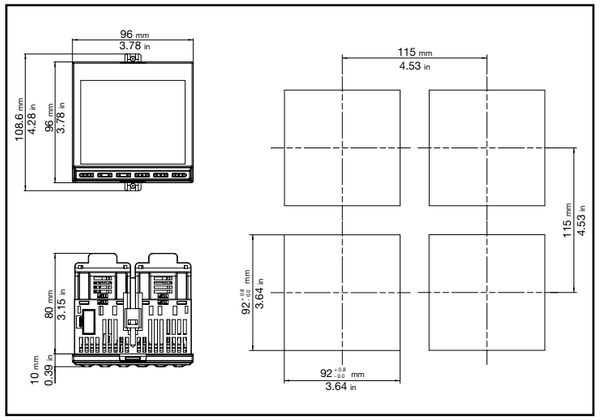
Configure the controller through the quick setup menu. The full description of all parameters is available in the *Manual Installation and Operation controllers.*

6 VERIFY OPERATION OUTPUT

Set **SP** = **AL1** = **PV + 10** and check the status of the LEDs, which must be:
H (LED Out1): ON
C (LED Out2): OFF
AL1 (LED Out3): OFF

Set **SP** = **AL1** = **PV - 10** and check the status of the LEDs, which must be::
H (LED Out1): OFF
C (LED Out2): ON
AL1 (LED Out3): ON

DRILLING DIMENSIONS AND TEMPLATES



TECHNICAL DATA

OPERATOR INTERFACE		
DISPLAY	Type	LCD black background
	Screen area (L x H)	83 × 68 mm
	Lighting	Backlit with LEDs, life > 40.000 hours @ 25 °C
	PV display	Number of digits: 4 to 7 segments, with decimal point Digit height: 23 mm Color: white or "custom"
	SV display	Number of digits: 4 to 7 segments, with decimal point Digit height: 11 mm Color: green or "custom"
	F display	Number of digits: 7 to 14 segments, with decimal point Digit height: 9 mm Color: ambra or "custom"
	Unit of measurement	Selectable, °C, °F or custom [1] Color: same as PV display
	Controller state signals	Number: 6 (RUN, MAN, _/-, REM, SP1/2) Color: ambra
	Output state signals	Number: 4 (1, 2, 3, 4) Color: red
KEYPAD		Keys number: 6, silicon (Man/Auto, INC, DEC, F) Type: mechanical
INPUTS		
MAIN INPUT	Sensor type	TC, RTD (PT100, JPT100), IR ES1B, DC linear sensor
	Accuracy	**TC inputs**: Calibration accuracy: < +/- (0,25% of reading value in °C +0,1°C) Linearization accuracy: 0,1% of reading value Cold junction accuracy: < +/- 1,5°C a 25°C room temperature) Cold junction compensation: > 30:1 rejection to the change of the ambient temperature **RTD input**: Calibration accuracy: < +/- (0,15% of reading value in °C +1°C) Temperature drift: < +/- (0,005% of reading value in °C +0,015°C)/°C from 25°C room temperature Linearization accuracy: 0,1% of reading value **Linear inputs**: Calibration accuracy:< 0,1% full scale Temperature drift: < +/- 0,005% full scale /°C at 25°C room temperature
	Sampling time	60 ms / 120 ms, selectable
	Digital filter	0,0...20,0 s
	Temperature unit of measurement	Degrees C / F, selectable from keypad
	Signal interval	Type: linear Scale: -1999...9999, settable decimal point
	TC (thermocouple) input	Thermocouple: J, K, R, S, T, C, D Linearization: ITS90 o custom
	RTD (resistance thermometer) input	Resistance thermometer: PT100, JPT100 Input impedance (Ri): ≥ 30 kΩ Linearization: DIN 43760 or custom Max. line resistance: 20 Ω
	DC linear input	0...60 mV input impedance (Ri): > 70 kΩ 0...1 V input impedance (Ri): > 15 kΩ 0...5 V / 0...10 V input impedance (Ri): > 30 kΩ 0/4...20 mA input impedance (Ri): 50 Ω Linearization: linear or custom
AUXILIARY INPUT	Remote set point	0...1 V, 0...10 V, 0/4...20 mA
	Scale	0...1 V input impedance (Ri): > 15 kΩ 0...10 V input impedance (Ri): > 30 kΩ 0/4...20 mA input impedance (Ri): 50 Ω
	Accuracy	0,1% f.s. ±1 digit @25 °C
CT (ammeter) INPUT	Type	Isolated via external transformer
		Number: 2 max Max. capacity: x / 50 mA AC Line frequency: 50/60 Hz Input impedance (Ri): 10 Ω
	Accuracy	±2% f.s. ±1 digit @25 °C
DIGITAL INPUTS	Type	Number: 5 max voltage-free contact, or NPN 24 V - 4,5 mA, o PNP 12/24 V - max 3,6 mA *(for detail see electrical connections)*
	Isolation	500 V
OUTPUTS		
	Relay (R)	Number: 4 max Type of relay contact: NO Max. current: 5 A, 250 VAC / 30 VDC, cosφ = 1 Minimum load: 5 V, 10 mA Life cycle: > 100.000 operations Double isolation
	Logic (D)	Number: 2 max Type: for solid-state relays Voltage: 24 V ±10% (min 10 V @20 mA) Isolated from main input
	Triac (long life relè) (T)	Number: 1 max Load: resistive Voltage: 75...264 VAC Current max: 1 A Isolation 3 kV snubber circuit integrated zero crossing switching
	Continuous (C)	Number: 1 max Current: 4...20 mA Rout : < 500 Ω Resolution: 12 bit Isolated from main input
	Analog retransmission (A1)	Number: 1 max 0...10 V, max 20 mA, Rout: > 500 Ω 0...20 mA, 4...20 mA, Rout: < 500 Ω Resolution: 12 bit Isolated from main input
ALARMS	Number of alarm functions	4 max, assignable to an output
	Possible configurations	Maximum, minimum, symmetric, absolute/relative, exclusion at firing, memory, reset from keypad and/or contact, LBA, HB, HBB Hold Back Band if enabled with Programmer function

CONTROL FUNCTIONS		
CONTROL	Type	Single loop
	Control	PID, ON/OFF, single action heat or cool, double action heat/cool
	Control output	Continuous or ON/OFF Cycle time: constant or optimized (BF)
	Control output for motorized valves	OPEN/CLOSE for floating motorized valve on Relay, Solid-state, Triac outputs
SETPOINT PROGRAMMER	Number of programs	Max 4 Start / Stop / Reset / Skip via digital inputs and/or outputs from logic operations Output state: Run /Hold / Ready / End
	Number of setpoints	Max 12, each with own setpoint, ramp time and hold time Times settable in HH:MM or MM:SS Max 4 consents, configurable for ramp and for hold Max 4 events, configurable in ramp and in hold
MULTIPLE SETPOINTS	Number of setpoints	Max 4, selectable from digital input Each setpoint change is subject to set ramp, different for up and down ramp
LOGIC OPERATIONS [1]	Function blocks	Max 16, with 4 input variables per block. The result can act on the state of the controller, of the programmer on alarms and outputs. Each function contains an incorporated timer block timer.
TIMER FUNCTION	Modes	START / STOP STABILIZATION (timer is on when PV enters a band set around setpoint; at end of count you can activate an output, shut down SW or change SP1/SP2) FIRING (timed activation of control after power on)
ENERGY COUNTER		Calculation done on nominal line voltage and nominal load power or on rms current measured on load via CT
DIAGNOSTIC		Short circuit or open circuit (LBA alarm) Interrupted or partially interrupted load (HB alarm) Short circuit of control output (SSR alarm)
RETENTIVE MEMORY	Type	EEPROM
	Max. number of writes	1.000.000
SERIAL INTERFACE		
	Type	RS485
	Baudrate	1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s
	Protocol	MODBUS RTU
		Isolated from main input
GENERAL DATA		
POWER SUPPLY	Operating voltage	100...240 VAC/VDC ±10%, 50/60 Hz (on request 20...27 VAC/VDC ±10%)
	Power dissipation	10 W max
	Protections	Overvoltage 300 V / 35 V
	Connection	Screw terminals and crimp connector, max. wire section max 1 mm²
CONNECTIONS	Serial configuration port (for USB connection)	Connector: microUSB
	Inputs and outputs	Screw terminals and crimp connector, max. wire section 2,5 mm²
AMBIENT CONDITIONS	Use	Indoor
	Altitude	2000 m max
	Operating temperature	-10 ... +55 °C (as per IEC 68-2-14)
	Storage temperature	-20 ... +70 °C (as per IEC 68-2-14)
	Relative humidity	20...85% RH non-condensing (as per IEC 68-2-3)
PROTECTION LEVEL		IP 65 on front panel (as per IEC 68-2-3)
ASSEMBLY	Positioning	On panel, removable faceplate
	Installation regulations	Installation category: II Pollution degree: 2 Isolation: double
WEIGHT		0,24 kg

1) Programming is done with the C-PWR configuration program.