PID TEMPERATURE CONTROL UNIT

Eco PID

Eco PID, PID Temperature Control Unit
- 3 digit process (PV) and 4 digit set (SV) display
- Temperature sensor input (TC,RTD)
- Programmable ON/OFF, P, PI, PD and PID control forms
- Adaptation of PID Coefficients to the system with Self-Tune and Auto-Tune
- Programmable Heating or Cooling Functions for Control Output
- Selectable Alarm Functions for Alarm Output
- Serial RS485 Communication (optional)

Eco series temperature controllers are designed for measuring and controlling a temperature value. They can be used in many applications with their TC and RTD temperature measurement input, multi-function control outputs, selectable alarm functions.
They are mainly used in glass, plastic, petro-chemistry, textile, automotive and machine production industries. Accurate and advanced controlling is performed with selectable ON-OFF, P, PI, PD, PID and Self Tune/Auto Tune PID functions.

SPECIFICATIONS
Process Input: Thermocouple (TC): J, K, R, S, T and L (IEC584.1)(ITS90)
Thermoresistance (RTD): Cu-50 and PT-100 (IEC751)(ITS90)
Measurement Range: Please refer to process input type selection in process menu parameters section.
Accuracy:
Thermocouple (TC):(±0.25% of full scale or ±3ºC, which one is greater) ±1 digit max.
Thermoresistance (RTD):(±0.25% of full scale or ±2ºC, which one is greater) ±1 digit max.
Cold Junction Compensation: Automatically ±0.1°C/1°C
Line Compensation: Maximum 10 Ohm
Sensor Break Protection: Upscale
Sampling Cycle: 0.1 second
Input Filter: Programmable
Control Form: ON/OFF, P, PI, PD or PID (Control form can be programmed by the user)

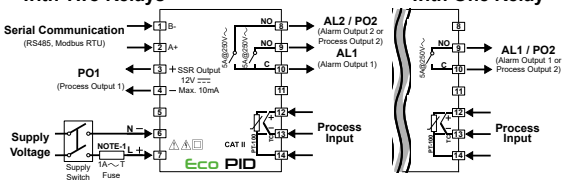
OUTPUT
Process Output: Relay (5A@250V~ at resistive load) or SSR Driver Output (Maximum 10mA, Max. 12V⎓)
Alarm Output: Relay (5A@250V~ at resistive load)

SUPPLY VOLTAGE (It must be determined in order)
230V~ (±15%) 50/60Hz - 4VA
115V~ (±15%) 50/60Hz - 4VA
100-240V~ 50/60Hz - 4VA
24V~ (±%15) 50/60Hz - 4VA
24V⎓ (±%15) 50/60Hz - 4VA
10...30V⎓ - 4W

DISPLAY
Process Display: 16 mm Red 3 digit LED Display
Set Value Display: 9 mm Orange 4 digit LED Display
Led Indicators: PO1 (SSR Process Output Status Led), PO2 (Relay Process Output Status Led), AL1, AL2 (Alarm Output Status Leds), ºC, ºF LEDs

ENVIRONMENTAL RATINGS and PHYSICAL SPECIFICATIONS
Operating Temperature: 0...50ºC
Humidity : 0-90%RH (none condensing)
Mechanical Impacts: 1Joule (IK06)
Protection Class: NEMA4X (IP65 at front, IP20 at rear)
Weight: 150 gr.
Dimension: 48 x 48 mm, Depth: 86,5 mm
Panel CutOut: 46 x 46 mm

Electrical Wirings

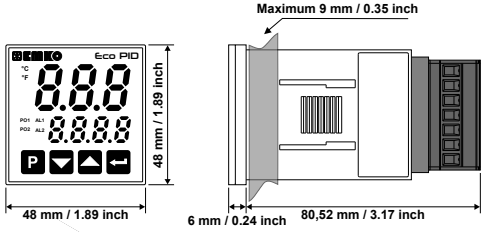


Note-1: External Fuse is recommended.
Note-2: Stranded cable cross section: 1,5mm², Solid cable cross-section: 2,5mm²
The stripping length is 7mm to 9mm.
Note-3: Supply cables must comply with the requirements of IEC 60277 or IEC 60245.

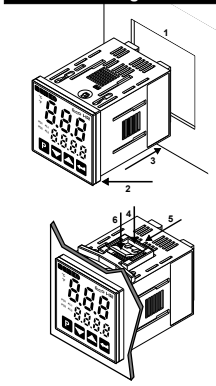
It is advised to use a two-pole supply switch, designated for this device, with open/closed positions marked, in order to cut the power. It must be placed on the supply input of the device at a place where the user can easily reach.
~ External fuse must be on phase connection of the supply input.
⎓ External fuse must be on (+) line connection of the supply input.
Make sure that the power supply voltage range is suitable for the device.
Switch on the power supply only after all the electrical connections are in place.

To reduce the effect of electrical noise on device, low voltage line (especially sensor input cable) wiring must be separetely from high current and voltage line. If possible, use shielded cable and shield must be connected to ground only one side.

Dimensions



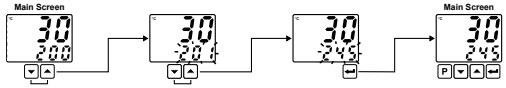
Panel Mounting



1- Before mounting the device in your panel, make sure that the cutout is of the right size.
2- Check front panel gasket position.
3- Insert the device through the cutout. If the mounting clamps are on the unit, put out them before inserting the unit to the panel.

4- Insert the mounting clamps to the two of designated holes that located four sides of device.
5- Drag the mounting clamps in direction 5 until the device completely immobile within the panel.
6- In order to remove device push on the mounting clamp as shown with arrow 6 and pull back.

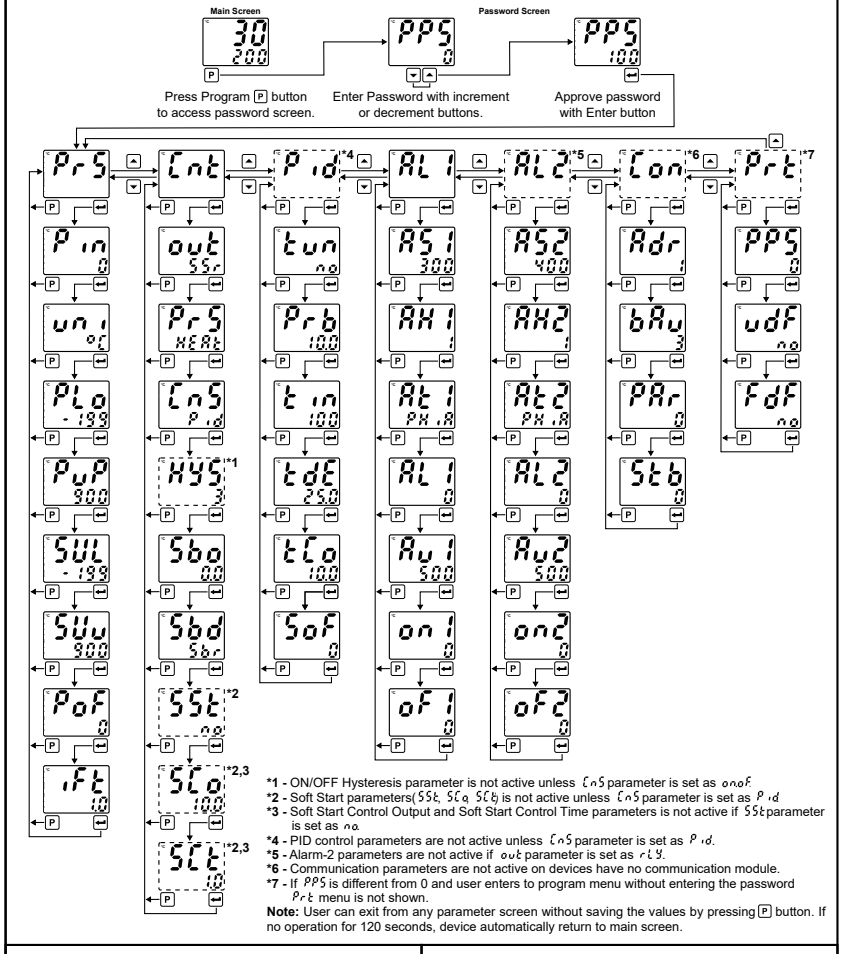
Access and Change Set Values



Temperature Set Value Parameter (Default: 200) MODBUS ADDRESS: 40000

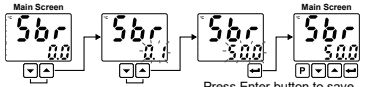
Note-1: User can exit from set value section without saving the values by pressing P button. If no operation for 120 seconds, device automatically exits from Set Value section.
Note-2: Set value can be adjusted between Set Value Low and High Limit (SUL - SUU).

Easy Access Diagram For Program Parameters



*1 - ON/OFF Hysteresis parameter is not active unless CnS parameter is set as onoF.
*2 - Soft Start parameters(SSt, SCo, SCb) is not active unless CnS parameter is set as Pid
*3 - Soft Start Control Output and Soft Start Control Time parameters is not active if SSt parameter is set as no.
*4 - PID control parameters are not active unless CnS parameter is set as Pid.
*5 - Alarm-2 parameters are not active if out parameter is set as rLY.
*6 - Communication parameters are not active on devices have no communication module.
*7 - If PPS is different from 0 and user enters to program menu without entering the password Prt menu is not shown.
Note: User can exit from any parameter screen without saving the values by pressing P button. If no operation for 120 seconds, device automatically return to main screen.

Easy Access Diagram For Sensor Break Output Value From Main Screen



Note1: User can exit from parameter screen without saving the values by pressing P button. If no operation for 120 seconds, device automatically exits from parameter screen.
Note2: Sensor break output value can be adjusted on programming section too.

Tune Operation

Starting the Tune operation
1- Enter to the tunE parameter in Pid menu and select SELF or RUto ,then press ↵ button for saving parameter and turn to main screen. Or easily press ↵ button for 3 seconds* in main screen.
2- Observe that tunE blinks in set display.
*Only Self Tune can be started by this way.

Canceling Tune operation:
1- If sensor breaks;
2- If tune operation can not be completed in 8 hours;
3- While heating self tune is running, if process value becomes greater than process set value;
4- While cooling self tune is running, if process value becomes less than process set value;
5- While tune operation is running, if user changes the process set value;
6- While tune operation is running, if user changes the tunE parameter in Pid menu;
Then tune operation is canceled, device continues to run with former PID parameters without changing PID parameters.

PrS: Process Menu Parameters

P in: Process input type selection; (Default:0) Modbus Address: 40004
- 0: J type (Fe,Cu,Ni) Thermocouple , -199ºC,900ºC ; -199ºF,999ºF
- 1: J type (Fe,Cu,Ni) Thermocouple , -19.9ºC,99.9ºC ; -19.9ºF,99.9ºF
- 2: K type (Ni,Cr,Ni) Thermocouple , -199ºC,999ºC ; -199ºF,999ºF
- 3: K type (Ni,Cr,Ni) Thermocouple , -19.9ºC,99.9ºC ; -19.9ºF,99.9ºF
- 4: R type (Pt13%RhPt) Thermocouple , 0ºC,999ºC ; 32ºF,999ºF
- 5: R type (Pt13%RhPt) Thermocouple , 0.0ºC,99.9ºC ; 32.0ºF,99.9ºF
- 6: S type (Pt10%RhPt) Thermocouple , 0ºC,999ºC ; 32ºF,999ºF
- 7: S type (Pt10%RhPt) Thermocouple , 0.0ºC,99.9ºC ; 32.0ºF,99.9ºF
- 8: T type (Cu,Cu,Ni) Thermocouple , -199ºC,400ºC ; -199ºF,752ºF
- 9: T type (Cu,Cu,Ni) Thermocouple , -19.9ºC,99.9ºC ; -19.9ºF,99.9ºF
- 10: L type (Ni,Cr,Co / Ni,Fe,Mn,Cu) Thermocouple , -150ºC,800ºC ; -199ºF,999ºF
- 11: L type (Ni,Cr,Co / Ni,Fe,Mn,Cu) Thermocouple , -19.9ºC,99.9ºC ; -19.9ºF,99.9ºF
- 12: Cu-50 , -199ºC,200ºC ; -199ºF,392ºF
- 13: Cu-50 , -19.9ºC,99.9ºC ; -19.9ºF,99.9ºF
- 14: Pt-100 , -199ºC,650ºC ; -199ºF,999ºF
- 15: Pt-100 , -19.9ºC,99.9ºC ; -19.9ºF,99.9ºF

Un: Unit Selection. oC or oF can be chosen. (Default: oC) Modbus Address: 40005

PLo: Operation Scale minimum (Low Limit) value. It changes according to the process input type and scale. (Default: -199) Modbus Address: 40006

PuP: Operation Scale maximum (High Limit) value. It changes according to the process input type and scale. (Default: 900) Modbus Address: 40007

SuL: Process Set value Low Limit. Minimum set value is defined with this parameter. It can be adjusted between Operation Scale minimum and maximum (PLo - PuP) values. (Default: -199) Modbus Address: 40008

Suu: Process Set value High Limit. Maximum set value is defined with this parameter. It can be adjusted between Operation Scale minimum and maximum (PLo - PuP) values. (Default: 900) Modbus Address: 40009

PoF: Display offset for process value. It can be adjusted from -10% of scale to 10% of scale. It is added to the process display value. (Default: 0) Modbus Address: 40010

dFt: Define filter time(sec) for displayed value. (Default: 1.0) Modbus Address: 40011

Cnt: Control Menu Parameters

out: This parameter determines, which output will be Process control output. If rLY is chosen, process output is relay output, if SSr is chosen, process output is SSR output. (Default: SSr) Modbus Address: 40015

PrS: Process Type Selection. It can be HEAt(Heating) or Cool(Cooling).(Default: HEAt) Modbus Address: 40016

CnS: Process Control Type Selection. It can be onoF or P id. (Default: P id) Modbus Address: 40017

HYS: Hysteresis value. It can be adjusted from %0 to %50 of the Scale (PuP - PLo). If CnS = onoF, then this parameter can be seen. (Default: 3) Modbus Address: 40018

Sbo: Sensor Break Output Value. It can be adjusted from %0 to %100. (Default: 0.0) Modbus Address: 40019

Sbd: The choice of displayed text on process value display when sensor is broken. It can be Sbr or oPEn. (Default: Sbr) Modbus Address: 40020

SSt: Soft Start Set value. Device operates in Soft Start mode, until the temperature reaches Soft Start set value. If no is selected, Soft Start mode is disabled. (Default: no) Modbus Address: 40021

SCo: Soft Start Control Output. This parameter determines soft start mode control output percentage. It can be adjusted from %10 to %90. (Default: 10.0) Modbus Address: 40022

SCt: Soft Start Control Time. This parameter determines soft start mode control time. (Default: 1.0) Modbus Address: 40023

P id: PID Menu Parameters

PID menu parameters can be seen only if CnS parameter is P id.

tun: If tune parameter is set to SELF or AUto, device start to calculate PID parameters automatically. (Default: no) Modbus Address: 40027

Prb: Proportional band. It can be adjusted from %1.0 to %100.0. (Default: 10.0) Modbus Address: 40028

t in: Integral Time. It can be adjusted from 0 to 3600 second. (Default: 100) Modbus Address: 40029

tdE: Derivative Time. It can be adjusted from 0.0 to 999.9 second. (Default: 25.0) Modbus Address: 40030

tCo: Output Control Period. It can be adjusted from 0.5 to 150 second. (Default: 1.0) Modbus Address: 40031

SoF: Set value offset. (Set +SoF) is used as set value in PID calculations. This parameter is used for shifting the proportional band. It can be adjusted from (-PuP/2) to (PuP/2). (Default: 0) Modbus Address: 40032

AL 1: Alarm-1 Menu Parameters

AS 1: Alarm-1 set value. (Default: 300) Modbus Address: 40036

AH 1: Alarm-1 hysteresis value. It can be adjusted from %0 to %50 of the scale (PuP - PLo). (Default: 0) Modbus Address: 40037

At 1: Alarm-1 type selection. (Default: PH iA) Modbus Address: 40038

AL 1: Alarm-1 set low limit parameter. It can be adjusted from operation scale minimum to alarm-1 set high limit. (Default: 0) Modbus Address: 40039

Au 1: Alarm-1 set high limit parameter. It can be adjusted from alarm-1 set low limit to operation scale minimum. (Default: 500) Modbus Address: 40040

on 1: Alarm-1 on Delay Time. It can be adjusted from 0 to 9999 seconds. (Default: 0) Modbus Address: 40041

oF 1: Alarm-1 off Delay Time. It can be adjusted from 0 to 9998 seconds. If it is higher than 9998, LtCH is seen on the screen and alarm latching output is selected. In alarm latching output mode in order to make passive alarm outputs, press enter ↵ button at main screen. (Default: 0) Modbus Address: 40042

AL2: Alarm-2 Menu Parameters (Only for devices with two relays)

Alarm-2 menu parameters can be seen only if out parameter is SSr.

AS2: Alarm-2 set value. (Default: 400) Modbus Address: 40046

AH2: Alarm-2 hysteresis value. It can be adjusted from %0 to %50 of the Scale (PuP - PLo). (Default: 0) Modbus Address: 40047

At2: Alarm-2 type selection. (Default: PH iA) Modbus Address: 40048

AL2: Alarm-2 set low limit parameter. It can be adjusted from operation scale minimum to alarm-2 set high limit. (Default: 0) Modbus Address: 40049

Au2: Alarm-2 set high limit parameter. It can be adjusted from alarm-2 set low limit to operation scale maximum. (Default: 500) Modbus Address: 40050

on2: Alarm-2 on delay time. It can be adjusted from 0 to 9999 seconds. (Default: 0) Modbus Address: 40051

oF2: Alarm-2 off delay time. It can be adjusted from 0 to 9998 seconds. If it is higher than 9998, LtCH is seen on the screen and Alarm Latching Output is selected. In alarm latching output mode in order to make passive alarm outputs, press enter ↵ button at main screen. (Default: 0) Modbus Address: 40052

Con: Communication Parameters (Only for devices with RS-485 com.)

Adr: Communication accessing address of device. (Default: 1) Modbus Address: 40056

bAu: Communication Baud Rate. (Default: 3) Modbus Address: 40057
- 0: 1200 Baud Rate.
- 1: 2400 Baud Rate.
- 2: 4800 Baud Rate.
- 3: 9600 Baud Rate.
- 4: 19200 Baud Rate.
- 5: 38400 Baud Rate.

PAr: Parity Selection for Communication. (Default: 0) Modbus Address: 40058
- 0: No Parity.
- 1: Odd Parity.
- 2: Even Parity.

Stb: Stop Bit Selection for Communication. (Default: 0) Modbus Address: 40059
- 0: 1 Stop Bit.
- 1: 2 Stop Bit.

Prt: Protecion Menu Parameters

PPS: Password for accessing to the programming section. It can be adjusted from 0 to 9999. If PPS is 0, password screen is not seen. If PPS is different from 0 and user enters to the menu pages without entering the password, all the menus can be observed except protection menu Prt. But device does not allow to do any changes in parameters. (Default: 0) Modbus Address: 40063

uSF: User default parameters. This parameter is used for saving all parameters to restore later or restore all parameters saved before. If SEt is chosen, all parameters saved before are restored. If SEt is chosen, all parameters saved to restore later. If no is chosen, nothing is changed. (Default: no) Modbus Address: 40064

FdF: This parameter is used for restore factory defaults. If SEt is chosen, factory defaults parameters restored. If no is chosen, nothing is changed. (Default: no) Modbus Address: 40065

⚠ Remove all input/output connections on terminals before restoring parameters to user/factory defaults.

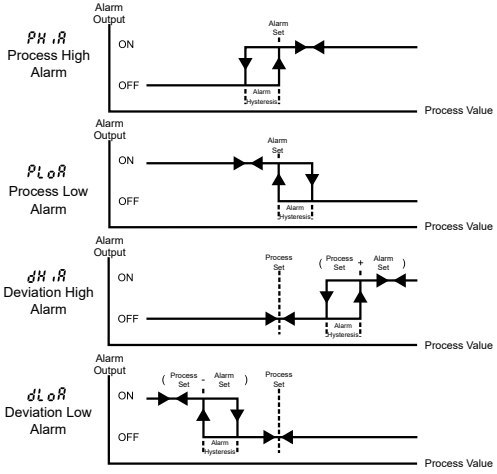
Modbus Addresses of Device Operation Info. (Read Input Register)

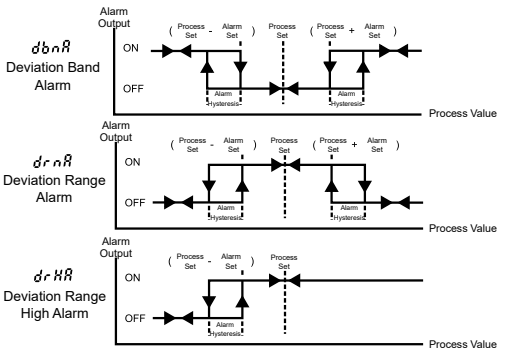
Modbus Address: 30000 Displayed Temperature Value

Modbus Address: 30001 Status of LEDs: bit.1 ALR1, bit.2 ALR2, bit.9 °C, bit.10 °F, bit.11 PO2, bit.12 PO1

Modbus Address: 30002 Status of Device: bit.0 Sensor Break Status

Alarm Types





Error Messages

1-Sensor failure in analog inputs. Sensor connection is wrong or there is no sensor connection.

2-If programming section entering password is different from “0” and user accesses to the parameter by enter button without entering the password and wants to change a parameter, the warning message is shown on the bottom display as shown on the left. Device does not allow to do any changes without entering the password correctly.

3-If value that is read from the analog input is lower than process set low limit parameter value (PLo), value on the top display starts to blink as shown on the picture.

4-If value that is read from the analog input is higher than process set high limit parameter value (PuP), value on the top display starts to blink as shown on the picture.

5-If value that is read from the analog input is lower than sensor scale low limit, value on the top display starts to blink as shown on the picture.

6-If value that is read from the analog input is higher than sensor scale high limit, value on the top display starts to blink as shown on the picture.

Installation

⚠ **Before beginning installation of this product, please read the instruction manual and warnings below carefully.**

In package,
-One piece unit
-Two pieces mounting clamp
-One piece instruction manual

A visual inspection of this product for possible damage occured during shipment is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.

If there is danger of serious accident resulting from a failure or defect in this unit, power off the system and the electrical connection of the device from the system.

The unit is normally supplied without a power switch or a fuse. Use power switch and fuse as required.

Be sure to use the rated power supply voltage to protect the unit against damage and to prevent failure.

Keep the power off until all of the wiring is completed so that electric shock and trouble with the unit can be prevented.

Never attempt to disassemble, modify or repair this unit. Tampering with the unit may results in malfunction, electric shock or fire.

Do not use the unit in combustible or explosive gaseous atmospheres. During the equipment is putted in hole on the metal panel while mechanical installation some metal burrs can cause injury on hands, you must be careful.

Montage of the product on a system must be done with it’s mounting clamp. Do not do the montage of the device with inappropriate mounting clamp. Be sure that device will not fall while doing the montage.

It is your responsibility if this equipment is used in a manner not specified in this instruction manual.

Warranty

EMKO Elektronik warrants that the equipment delivered is free from defects in material and workmanship. This warranty is provided for a period of two years. The warranty period starts from the delivery date.

This warranty is in force if duty and responsibilities which are determined in warranty document and instruction manual performs by the customer completely.

Maintenance

Repairs should only be performed by trained and specialized personnel. Cut power to the device before accessing internal parts. Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.

Other Informations

Manufacturer Information:
Emko Elektronik Sanayi ve Ticaret A.Ş.
Bursa Organize Sanayi Bölgesi, (Fethiye OSB Mah.) Turkuaz Cd. No:15 16215
BURSA/TÜRKİYE
Phone : +90 224 261 1900
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Repair and Maintenance Service Information:
Emko Elektronik Sanayi ve Ticaret A.Ş.
Bursa Organize Sanayi Bölgesi, (Fethiye OSB Mah.) Turkuaz Cd. No:15 16215
BURSA/TÜRKİYE
Phone: +90 224 261 1900
Fax : +90 224 261 1912

Ordering Information

Eco PID (48x48 DIN 1/16)

A	B	C	D	E
4	.	.	. S	.

A	Dimension
4	48x48 DIN 1/16

B	Supply Voltage
1	100-240V~ 50/60Hz - 4VA
2	24V≂ (±%15) 50/60Hz - 4VA
3	115V~ (±%15) 50/60Hz - 4VA
5	230V~ (±%15) 50/60Hz - 4VA
6	10...30V⎓ - 4W
7	24V~ (±%15) 50/60Hz - 4VA
9	Customer Specified

C	Outputs-1
1R	1 x Relay Output (5A@250V~ at Resistive Load) (NO,C)
2R	2 x Relay Output (5A@250V~ at Resistive Load) (NO,NO,C)

D	Outputs-2
S	SSR Driver Output (Max. 10mA, Max. 12V⎓)

E	Communication
0	None
485	RS-485 Communication

⚠ Before commissioning the device, parameters must be set in accordance with desired use. Incomplete or incorrect configuration can cause dangerous stiuations.

⚠ Because of limited mechanical life of relay output contact, SSR output is recommended which the device use PID control algoritm. The device with ON/OFF control algoritm, hysteresis parameter must be set a suitable value for your system, to avoid too much relay switching.

⚠ ~ ⇒ Vac,
⎓ ⇒ Vdc,
≂ ⇒ Vdc or Vac can be applied

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