



PID TEMPERATURE CONTROL UNIT



Eco PID+

Eco PID+, PID Temperature Control Unit

- 4 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): ($\pm 0.25\%$ of full scale or $\pm 3^\circ\text{C}$, which one is greater) ± 1 digit max.
Thermoresistance (RTD): ($\pm 0.25\%$ of full scale or $\pm 2^\circ\text{C}$, which one is greater) ± 1 digit max.

Cold Junction Compensation: Automatically $\pm 0.1^\circ\text{C}/1^\circ\text{C}$

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~ ($\pm 15\%$) 50/60Hz - 4VA

115V~ ($\pm 15\%$) 50/60Hz - 4VA

100-240V~ 50/60Hz - 4VA

24V~ ($\pm 15\%$) 50/60Hz - 4VA

24V~ ($\pm 15\%$) 50/60Hz - 4VA

10...30V= -4W

DISPLAY

Process Display: 16 mm Red 4 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),

$^\circ\text{C}$, $^\circ\text{F}$ LEDs

ENVIRONMENTAL RATINGS and PHYSICAL SPECIFICATIONS

Operating Temperature: 0...50 $^\circ\text{C}$

Humidity: 0-90%RH (none condensing)

Mechanical Impacts: 1 Joule (IK06)

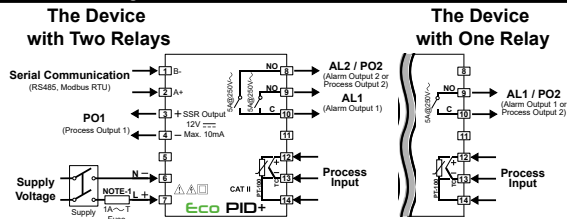
Protection Class: NEMA 4X (IP65 at front, IP20 at rear)

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.

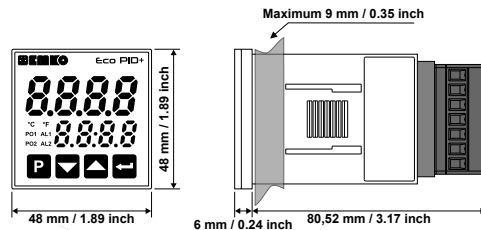
== External fuse must be on (+) line connection of the supply input.

Make sure that the power supply voltage range is suitable for the device.

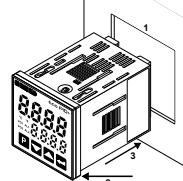
Switch on the power supply only after all the electrical connections are in place.

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

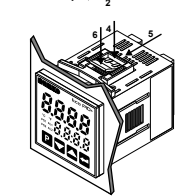
Dimensions



Panel Mounting

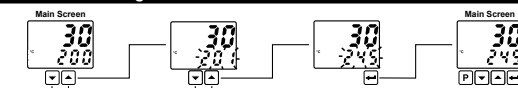


- 1- Before mounting the device in your panel, make sure that the cutout is of the right size.
- 2- Check front panel gasket position.
- 3- Insert the device through the cutout. If the mounting clamps are on the unit, put them before inserting the unit to the panel.



- 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.

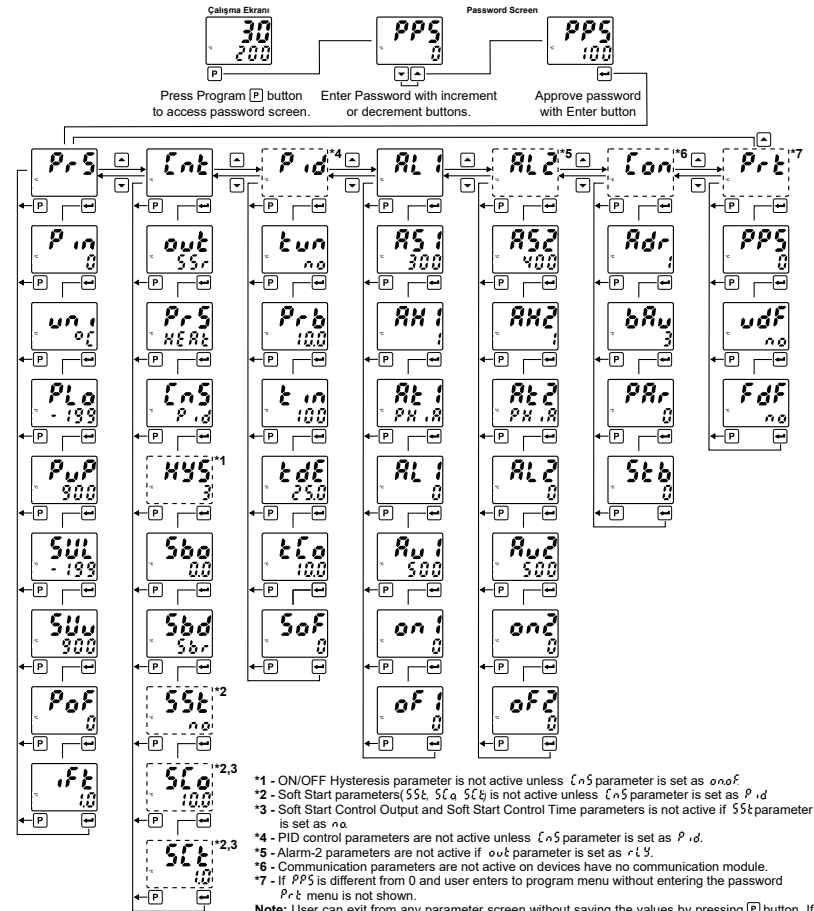
Access and Change Set Values



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

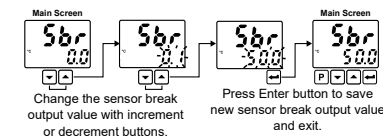
- Note-1: User can exit from set value section without saving the values by pressing [P] button. If no operation for 120 seconds, device automatically exits from Set Value section.
- Note-2: Set value can be adjusted between Set Value Low and High Limit (SvL - SvH).

Easy Access Diagram For Program Parameters



- *1 - ON/OFF Hysteresis parameter is not active unless $\epsilon n5$ parameter is set as onof.
 - *2 - Soft Start parameters (SSt, SSc, SStb) is not active unless $\epsilon n5$ parameter is set as P_id.
 - *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 $\epsilon n5$ parameter is set as P_id.
 - *5 - Alarm-2 parameters are not active if out parameter is set as rL5.
 - *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 $\epsilon n5$ parameter in P_id menu and select SELF or RSt, then press [P] button for saving parameter and turn to main screen. Or easily press [P] button for 3 seconds* in main screen.
 - 2- Observe that $\epsilon n5$ 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 $\epsilon n5$ parameter in P_id menu;
- Then tune operation is canceled, device continues to run with former PID parameters without changing PID parameters.

Pr5 : Process Menu Parameters

P.in : Process input type selection; (Default: 0) Modbus Address: 40004
J : J type (Fe,Cu,Ni) Thermocouple , -200°C,900°C ; -328°F,1652°F
I : J type (Fe,Cu,Ni) Thermocouple , -199.9°C,900.0°C ; -199.9°F,999.9°F
K : K type (Ni,Cr,Ni) Thermocouple , -200°C,1300°C ; -328°F,2372°F
Z : K type (Ni,Cr,Ni) Thermocouple , -199.9°C,999.9°C ; -199.9°F,999.9°F
R : R type (Pt13%RhPt) Thermocouple , 0°C,1700°C ; 32°F,3092°F
S : R type (Pt13%RhPt) Thermocouple , 0.0°C,999.9°C ; 32.0°F,999.9°F
G : S type (Pt10%RhPt) Thermocouple , 0°C,1700°C ; 32°F,3092°F
T : S type (Pt10%RhPt) Thermocouple , 0.0°C,999.9°C ; 32.0°F,999.9°F
T : T type (Cu,Cu,Ni) Thermocouple , -200°C,400°C ; -328°F,752°F
T : T type (Cu,Cu,Ni) Thermocouple , -199.9°C,400.0°C ; -199.9°F,752.0°F
L : L type (Ni,Cr,Co / Ni,Fe,Mn,Cu) Thermocouple , -150°C,800°C ; -238°F,1472°F
L : L type (Ni,Cr,Co / Ni,Fe,Mn,Cu) Thermocouple , -150.0°C,800.0°C ; -199.9°F,999.9°F
I2 : Cu-50 , -199.9°C,200.0°C ; -199.9°F,392°F
I3 : Cu-50 , -199.9°C,200.0°C ; -199.9°F,392.0°F
I4 : Pt-100 , -200°C,650°C ; -328°F,1202°F
I5 : Pt-100 , -199.9°C,650.0°C ; -199.9°F,999.9°F
Un : Unit Selection, °C or °F can be chosen. (Default: °C) Modbus Address: 40005
PL : Operation Scale minimum (Low Limit) value. It changes according to the process input type and scale. (Default: -199) Modbus Address: 40006
PH : Operation Scale maximum (High Limit) value. It changes according to the process input type and scale. (Default: 900) Modbus Address: 40007
SL : Process Set value Low Limit. Minimum set value is defined with this parameter. It can be adjusted between Operation Scale minimum and maximum (PLo - PHo) values. (Default: -199) Modbus Address: 40008
SU : Process Set value High Limit. Maximum set value is defined with this parameter. It can be adjusted between Operation Scale minimum and maximum (PLo - PHo) 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
FT : Define filter time(sec) for displayed value. (Default: 1.0) Modbus Address: 40011

Cr6 : Control Menu Parameters

oUL : This parameter determines, which output will be Process control output. If **UL1** is chosen, process output is relay output, if **UL2** is chosen, process output is SSR output. (Default: 55r) Modbus Address: 40015
PS : Process Type Selection. It can be **HE** (Heating) or **CO** (Cooling). (Default: HE) Modbus Address: 40016
CS : Process Control Type Selection. It can be **oNF** or **PoF**. (Default: PoF) Modbus Address: 40017
HY : Hysteresis value. It can be adjusted from %0 to %50 of the Scale (PHoP - PLo). If **CS** = **oNF**, then this parameter can be seen. (Default: 3) Modbus Address: 40018
Sb : 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 **Pr**. (Default: Sbr) Modbus Address: 40020
SS : 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

Prd : PID Menu Parameters

PID menu parameters can be seen only if **CS5** parameter is **PoF**.
Ln : If time parameter is set to **SELF** or **RSto**, 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
Ln : Integral Time. It can be adjusted from 0 to 3600 second. (Default: 100) Modbus Address: 40029
Ed : Derivative Time. It can be adjusted from 0.0 to 999.9 second. (Default: 25.0) Modbus Address: 40030
ELo : 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 (-PHo/2) to (PHo/2). (Default: 0) Modbus Address: 40032

RL1 : Alarm-1 Menu Parameters

RS : Alarm-1 set value. (Default: 300) Modbus Address: 40036
RH : Alarm-1 hysteresis value. It can be adjusted from %0 to %50 of the scale (PHoP - PLo). (Default: 0) Modbus Address: 40037
RL : Alarm-1 type selection. (Default: PH,R) Modbus Address: 40038
RL : 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
RL : Alarm-1 set high limit parameter. It can be adjusted from alarm-1 set low limit to operation scale maximum. (Default: 500) Modbus Address: 40040
oN : Alarm-1 on Delay Time. It can be adjusted from 0 to 9999 seconds. (Default: 0) Modbus Address: 40041
oF : Alarm-1 off Delay Time. It can be adjusted from 0 to 9998 seconds. If it is higher than 9998, **LELH** 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

RL2 : Alarm-2 Menu Parameters (Only for devices with two relays)

Alarm-2 menu parameters can be seen only if **oUL** parameter is **55r**.
RS2 : Alarm-2 set value. (Default: 400) Modbus Address: 40046
RH2 : Alarm-2 hysteresis value. It can be adjusted from %0 to %50 of the Scale (PHoP - PLo). (Default: 0) Modbus Address: 40047
RL2 : Alarm-2 type selection. (Default: PH,R) Modbus Address: 40048
RL2 : 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
RL2 : 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, **LELH** 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

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

RA : Communication accessing address of device. (Default: 1) Modbus Address: 40056
BA : Communication Baud Rate. (Default: 3) Modbus Address: 40057
B : 1200 Baud Rate.
T : 2400 Baud Rate.
Z : 4800 Baud Rate.
Y : 9600 Baud Rate.
X : 19200 Baud Rate.
S : 38400 Baud Rate.
PR : Parity Selection for Communication. (Default: 0) Modbus Address: 40058
N : No Parity.
O : Odd Parity.
E : Even Parity.
Sb : Stop Bit Selection for Communication. (Default: 0) Modbus Address: 40059
1 : 1 Stop Bit.
2 : 2 Stop Bit.

Prk : Protection Menu Parameters

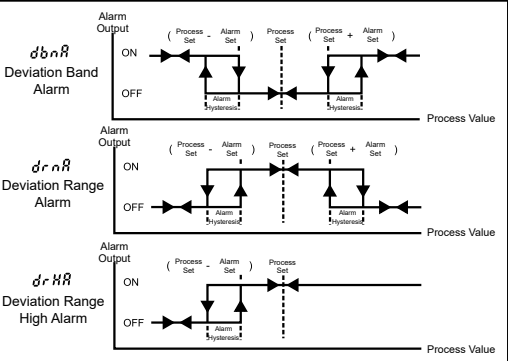
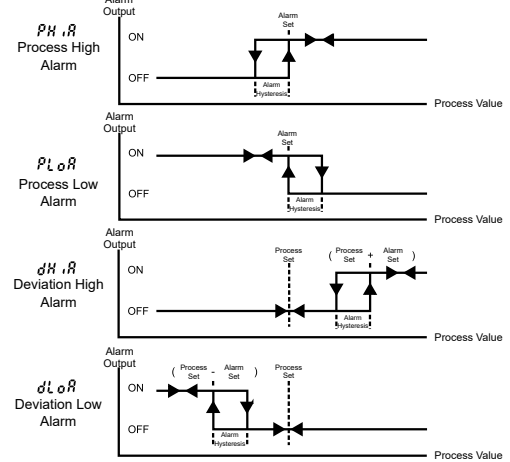
PPS : Password for accessing to the programming section. It can be adjusted from 0 to 9999. If **PPS** is 0, password screen is not seen. If **PPS** is different from 0 and user enters to the menu pages without entering the password, all the menus can be observed except protection menu **Prk**. But device does not allow to do any changes in parameters. (Default: 0) Modbus Address: 40063
uDF : User default parameters. This parameter is used for saving all parameters to restore later or restore all parameters saved before. If **LE** is chosen, all parameters saved before are restored. If **SE** 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 **LE** 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 **FC**, bit.10 **IF**, bit.11 **PO2**, bit.12 **PO1**
 Modbus Address: 30002 Status of Device: bit.0 Sensor Break Status

Alarm Types



Error Messages

- Sbr** 1-Sensor failure in analog inputs. Sensor connection is wrong or there is no sensor connection.
- P.in** 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.
- PL** 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.
- PH** 4-If value that is read from the analog input is higher than process set high limit parameter value (PHo), value on the top display starts to blink as shown on the picture.
- SL** 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.
- SH** 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 occurred 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 result 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.)
 Ali Osman Sönmez Bulvarı, 2.Sokak, No: 3 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.)
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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 situations.
- !** Because of limited mechanical life of relay output contact, SSR output is recommended which the device use PID control algorithm. The device with ON/OFF control algorithm, 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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