

PID TEMPERATURE CONTROL UNIT



mL -PIDTC

- mL-PIDTC, 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)

mL-PIDTC 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: TC, RTD

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. 12VDC)

Alarm Output: Relay (5A@250V~ at resistive load)

SUPPLY VOLTAGE

230V~ ($\pm 15\%$) 50/60Hz - 2VA

115V~ ($\pm 15\%$) 50/60Hz - 2VA

10...30VDC - 2W

(It must be determined in order)

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

ENVIRONMENTAL RATINGS and PHYSICAL SPECIFICATIONS

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

Humidity: 0-90%RH (none condensing)

Protection Class: IP65 at front, IP20 at rear

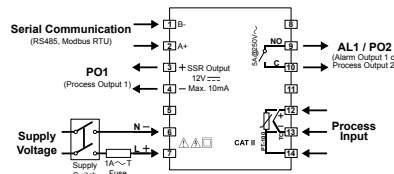
Weight: 150 gr.

Dimension: 48 x 48 mm, Depth: 86.5 mm

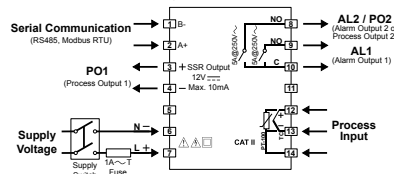
Panel CutOut: 46 x 46 mm

Electrical Wirings

The Device with One Relay:

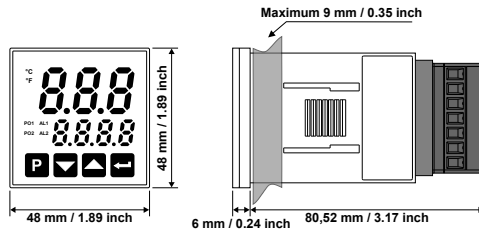


The Device with Two Relays:

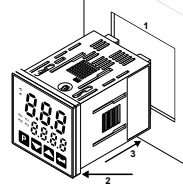


To reduce the effect of electrical noise on device, low voltage line (especially sensor input cable) wiring must be separately from high current and voltage line. If possible, use shielded cable and shield must be connected to ground only one side.

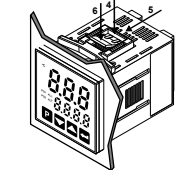
Dimensions



Panel Mounting

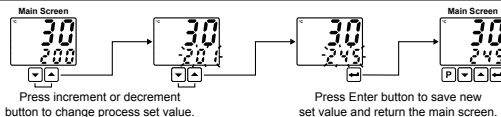


- 1- Before mounting the device in your panel, make sure that the cutout is of the right size.
- 2- Check front panel gasket position.
- 3- Insert the device through the cutout. If the mounting clamps are on the unit, put them before inserting the unit to the panel.



- 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

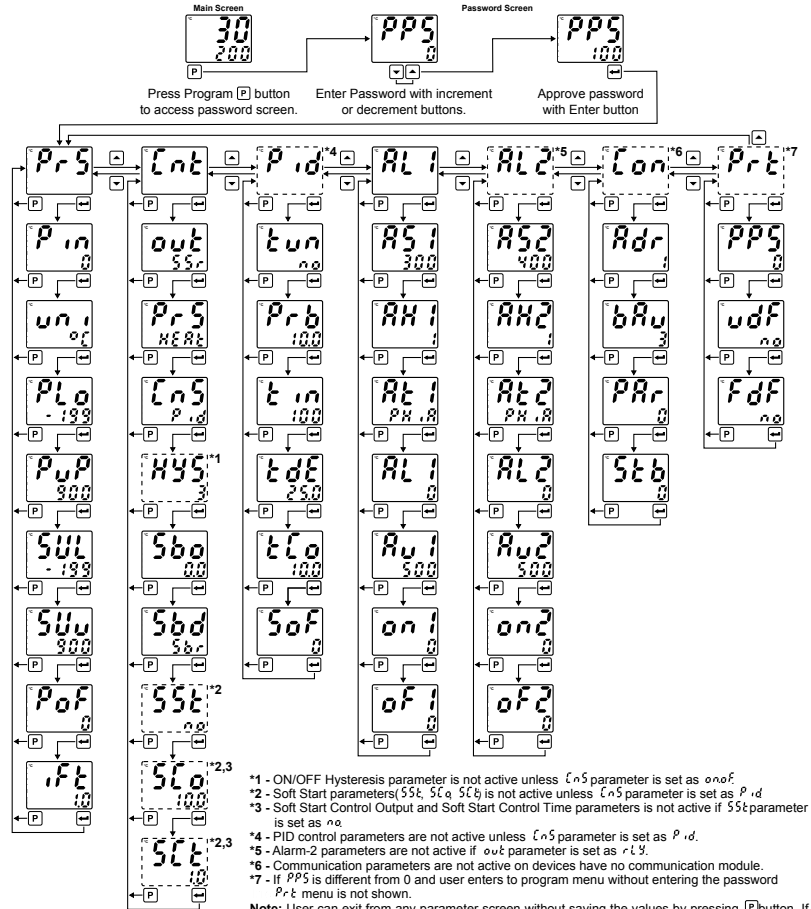


Temperature Set Value Parameter (Default: 200) MODBUS ADDRESS: 40000

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.

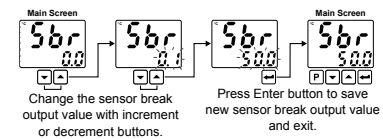
Note-2: Set value can be adjusted between Set Value Low and High Limit (S_{HL} - S_{HL}).

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 (S5t, S5c, S5b) is not active unless $\epsilon n5$ parameter is set as Pid .
 - *3 - Soft Start Control Output and Soft Start Control Time parameters is not active if S5t parameter is set as no .
 - *4 - PID control parameters are not active unless $\epsilon n5$ parameter is set as Pid .
 - *5 - Alarm-2 parameters are not active if out parameter is set as no .
 - *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 ϵunE parameter in Pid menu and select SELF or RUE , 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 ϵunE blinks in set display.
- *Only Auto 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 ϵunE parameter in Pid 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, -199°C, 900°C; -199°F, 999°F
I: I type (Fe,Cu,Ni) Thermocouple, -19.9°C, 99.9°C; -19.9°F, 99.9°F
K: K type (Ni,Cr,Ni) Thermocouple, -199°C, 999°C; -199°F, 999°F
3: K type (Ni,Cr,Ni) Thermocouple, -19.9°C, 99.9°C; -19.9°F, 99.9°F
R: R type (Pt13%RhPt) Thermocouple, 0°C, 999°C; 32°F, 999°F
S: R type (Pt13%RhPt) Thermocouple, 0°C, 99.9°C; 32.0°F, 99.9°F
6: S type (Pt10%RhPt) Thermocouple, 0°C, 999°C; 32°F, 999°F
7: S type (Pt10%RhPt) Thermocouple, 0°C, 99.9°C; 32.0°F, 99.9°F
T: T type (Cu,Cu,Ni) Thermocouple, -199°C, 400°C; -199°F, 752°F
T: T type (Cu,Cu,Ni) Thermocouple, -19.9°C, 99.9°C; -19.9°F, 99.9°F
L: L type (Ni,Cr,Co / Ni,Fe,Mn,Cu) Thermocouple, -150°C, 800°C; -199°F, 999°F
L: L type (Ni,Cr,Co / Ni,Fe,Mn,Cu) Thermocouple, -19.9°C, 99.9°C; -19.9°F, 99.9°F
Cu-50: -199°C, 200°C; -199°F, 392°F
Cu-50: -19.9°C, 99.9°C; -19.9°F, 99.9°F
PT-100: -199°C, 650°C; -199°F, 999°F
PT-100: -19.9°C, 99.9°C; -19.9°F, 99.9°F
U_n: Unit Selection, °C or °F can be chosen. (Default: °C) Modbus Address: 40005
P_{Lo}: Operation Scale minimum (Low Limit) value. It changes according to the process input type and scale. (Default: -199) Modbus Address: 40006
P_{Hi}: Operation Scale maximum (High Limit) value. It changes according to the process input type and scale. (Default: 900) Modbus Address: 40007
SL_L: Process Set value Low Limit. Minimum set value is defined with this parameter. It can be adjusted between Operation Scale minimum and maximum (P_{Lo} - P_{Hi}) values. (Default: -199) Modbus Address: 40008
SL_H: Process Set value High Limit. Maximum set value is defined with this parameter. It can be adjusted between Operation Scale minimum and maximum (P_{Lo} - P_{Hi}) values. (Default: 900) Modbus Address: 40009
PO_F: 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
FL_t: Define filter time(sec) for displayed value. (Default: 1.0) Modbus Address: 40011

Pr6 : Control Menu Parameters

o_{ut}: This parameter determines, which output will be Process control output. If **o_{ut}** is chosen, process output is relay output, if **o_{ut}** is chosen, process output is SSR output. (Default: 55r) Modbus Address: 40015
P_S: Process Type Selection. It can be **HE_t** (Heating) or **CO_oL** (Cooling). (Default: **HE_t**) Modbus Address: 40016
CT_S: Process Control Type Selection. It can be **o_{no}F** or **P_od**. (Default: **P_od**) Modbus Address: 40017
H_{YS}: Hysteresis value. It can be adjusted from %0 to %50 of the Scale (P_{Hi} - P_{Lo}). If **CT_S** is **o_{no}F**, then this parameter can be seen. (Default: 3) Modbus Address: 40018
S_{Br}: Sensor Break Output Value. It can be adjusted from %0 to %100. (Default: 0.0) Modbus Address: 40019
S_{bd}: The choice of displayed text on process value display when sensor is broken. It can be **S_{br}** or **P_od**. (Default: **S_{br}**) Modbus Address: 40020
S_{St}: Soft Start Set value. Device operates in Soft Start mode, until the temperature reaches Soft Start set value. If **o_{no}** is selected, Soft Start mode is disabled. (Default: **o_{no}**) Modbus Address: 40021
S_{Co}: 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
S_{CT}: 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 **CT_S** parameter is **P_od**.
t_{un}: If tune parameter is set to **SEL_F** or **RL_t**, device start to calculate PID parameters automatically. (Default: **o_{no}**) Modbus Address: 40027
P_rb: 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
t_{de}: Derivative Time. It can be adjusted from 0.0 to 999.9 second. (Default: 25.0) Modbus Address: 40030
OP_{CP}: Output Control Period. It can be adjusted from 0.5 to 150 second. (Default: 10.0) Modbus Address: 40031
S_{oF}: Set value offset. (Set +5oF) is used as set value in PID calculations. This parameter is used for shifting the proportional band. It can be adjusted from (-P_oP₂) to (P_oP₂). (Default: 0) Modbus Address: 40032

RL1 : Alarm-1 Menu Parameters

RS₁: Alarm-1 set value. (Default: 300) Modbus Address: 40036
RH₁: Alarm-1 hysteresis value. It can be adjusted from %0 to %50 of the scale (P_oP₁ - P_{Lo}). (Default: 0) Modbus Address: 40037
RL₁: Alarm-1 type selection. (Default: **PH₁R**) Modbus Address: 40038
RL₁: 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
R_u1: 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
o_n1: Alarm-1 on Delay Time. It can be adjusted from 0 to 9999 seconds. (Default: 0) Modbus Address: 40041
o_F1: Alarm-1 off Delay Time. It can be adjusted from 0 to 9999 seconds. If it is higher than 9999, **L_tCH** 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 **o_{ut}** 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 (P_oP₂ - P_{Lo}). (Default: 0) Modbus Address: 40047
RL₂: Alarm-2 type selection. (Default: **PH₂R**) 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
R_u2: 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
o_n2: Alarm-2 on delay time. It can be adjusted from 0 to 9999 seconds. (Default: 0) Modbus Address: 40051
o_F2: Alarm-2 off delay time. It can be adjusted from 0 to 9999 seconds. If it is higher than 9999, **L_tCH** 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.)

R_{Ad}: Communication accessing address of device. (Default: 1) Modbus Address: 40056
b_R: Communication Baud Rate. (Default: 3) Modbus Address: 40057
B: 1200 Baud Rate.
3: 2400 Baud Rate.
4: 4800 Baud Rate.
5: 9600 Baud Rate.
6: 19200 Baud Rate.
7: 38400 Baud Rate.
PR_r: Parity Selection for Communication. (Default: 0) Modbus Address: 40058
0: No Parity.
1: Odd Parity.
2: Even Parity.
S_tb: Stop Bit Selection for Communication. (Default: 0) Modbus Address: 40059
0: 1 Stop Bit.
1: 2 Stop Bit.

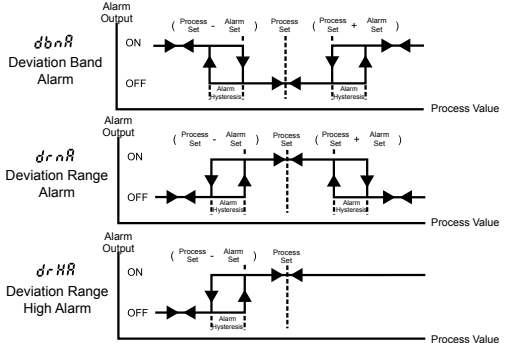
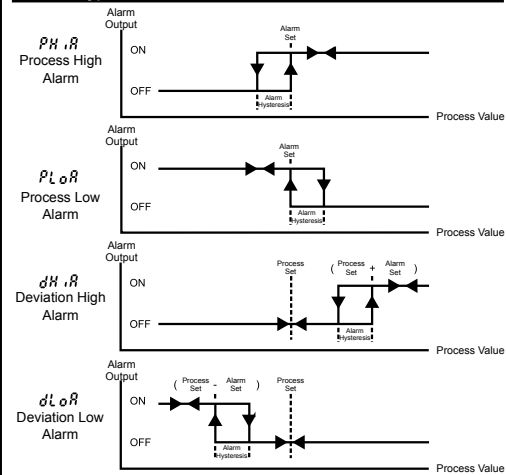
Prk : Protection Menu Parameters

PP_S: Password for accessing to the programming section. It can be adjusted from 0 to 9999. If **PP_S** is 0, password screen is not seen. If **PP_S** 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
u_dF: User default parameters. This parameter is used for saving all parameters to restore later or restore all parameters saved before. If **u_dF** is chosen, all parameters saved before are restored. If **S_{EL}** is chosen, all parameters saved to restore later. If **o_{no}** is chosen, nothing is changed. (Default: **o_{no}**) Modbus Address: 40064
F_oD: This parameter is used for restore factory defaults. If **u_dF** is chosen, factory defaults parameters restored. If **o_{no}** is chosen, nothing is changed. (Default: **o_{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 **TC**, bit.10 **TE**, 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 (P_{Lo}), value on the top display starts to blink as shown on the picture.
- PLH**: 4-If value that is read from the analog input is higher than process set high limit parameter value (P_{Hi}), value on the top display starts to blink as shown on the picture.
- SCL**: 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.
- SCH**: 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

Kessler-Ellis Products 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 Information

Company Information:
 Kessler-Ellis Products
 10 Industrial Way East
 Eatontown, NJ 07724

Phone: 800-631-2165 or 732-935-1320
 Fax: 732-935-9344
 Email: info@kep.com
 Web: www.kep.com

Ordering Information

Model Number
 mL-PIDTC

Description
 ON / OFF Temperature Controller
 1/16 DIN Case
 115VAC Supply Voltage (±15%) 50/60Hz
 TC, RTD Sensor Input
 2 Relay Outputs (5A @ 250VAC with Resistive Load) (NO, NO, C)
 SSR Driver Output (Max. 10mA, Max 12VDC)
 RS-485 Serial Communication with Modbus RTU Protocol

- 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

