



Read this document carefully before using this device. The guarantee will be expired by damaging of the device if you don't attend to the directions in the user manual. Also we don't accept any compensations for personal injury, material damage or capital disadvantages.

ENDA EPC4420 PID PROFILE CONTROLLER

Thank you for choosing ENDA EPC4420 profile controller.

- * 48 x 48mm sized.
- * Selectable sensor type.
- * Automatic calculation of PID parameters (SELF TUNE).
 - ⚠ Enter PID parameters of the system if they are known at the beginning. Otherwise, Self-Tune should be activated.
- * Communication via RS-485 ModBus protocol (Optional).
- * Selectable SSR or relay control output.
- * Selectable 0-20mA or 4-20mA analog control output.
- * Relay output can be programmable as second alarm or control output.
- * AL1 output or Timer output or can be used as control AL1 relay output.
- * Selectable Heat/Cool control.
- * Input offset feature.
- * In the case of sensor failure periodical running or relay state can be selected.
- * Until the eight steps to make the profile control.
- * In each step AL1 and AL2 outputs programming.
- * To continue where it left off in power failure feature.
- * For the keypad security levels.
- * Programming by using keypad or Modbus.
- * CE marked according to European Norms.



TECHNICAL SPECIFICATIONS

Input type		Temperature range		Accuracy	
		°C	°F		
Pt 100 Resistance Thermometer	EN 60751	-200...600 °C	-328... +1112 °F	± 0,2% (of full scale)	± 1 digit
Pt 100 Resistance Thermometer	EN 60751	-99.9...300.0 °C	-99.9...+543.0 °F	± 0,2% (of full scale)	± 1 digit
J (Fe-CuNi) Thermocouple	EN 60584	0... 600 °C	+32... +1112 °F	± 0,2% (of full scale)	± 1 digit
K (NiCr-Ni) Thermocouple	EN 60584	0...1200 °C	+32... +2192 °F	± 0,2% (of full scale)	± 1 digit
T (Cu-CuNi) Thermocouple	EN 60584	0... 400 °C	+32... +752 °F	± 0,2% (of full scale)	± 1 digit
S (Pt/0Rh-Pt) Thermocouple	EN 60584	0...1600 °C	+32... +2912 °F	± 0,2% (of full scale)	± 1 digit
R (Pt13Rh-Pt) Thermocouple	EN 60584	0...1600 °C	+32... +2912 °F	± 0,2% (of full scale)	± 1 digit

ENVIRONMENTAL CONDITIONS	
Ambient/storage temperature	0 ... +50 °C/-25... +70 °C (with no icing)
Max. Relative humidity	80% up to 31 °C decreasing linearly 50% at 40 °C.
Rated pollution degree	According to EN 60529 Front panel : IP65 Rear panel : IP20
Height	Max. 2000m

⚠ Do not use the device in locations subject to corrosive and flammable gases.

ELECTRICAL CHARACTERISTICS	
Supply	230V AC +10% -20%, 50/60Hz or 24V AC ±10%, 50/60Hz.
Power consumption	Max. 5VA
Wiring	2.5mm ² screw-terminal connections
Line resistance	For thermocouple max.100ohm, for 3 wired Pt 100 max. 20ohm
Data retention	EEPROM (minimum 10 years)
EMC	EN 61326-1: 2006
Safety requirements	EN 61010-1: 2010 (Pollution degree 2, overvoltage category II)

OUTPUTS	
CONT./AL2	Relay : 250V AC, 2A (for resistive load), NO/NC. Selectable as Control or Alarm2 output.
AL1	Relay : 250V AC, 2A (for resistive load), NO/NC selectable. (Alarm1 output).
ANL/SSR	Selectable logic control output. (Max. 12V, 20mA)
Life expectancy for relay	Mechanical 30.000.000 operation; Electrical 300.000 operation

CONTROL	
Control type	Single set-point and alarm control
Control algorithm	On-Off / P, PI, PD, PID (selectable)
A/D converter	15 bits
Sampling time	500ms
Proportional band	Adjustable between 0% and 100%. If Pb=0%, On-Off control is selected.
Integral time	Adjustable between 0.0 and 100.0 minutes
Derivative time	Adjustable between 0.00 and 25.00 minutes
Control period	Adjustable between 1 and 250 seconds
Hysteresis	Adjustable between 1 and 50 °C/F
Output power	The ratio of power at a set point can be adjusted between 0% and 100%

HOUSING	
Housing type	Suitable for flush-panel mounting according to DIN 43 700.
Dimensions	W48xH48xD87mm
Weight	Approx. 250g (after packing)
Enclosure material	Self extinguishing plastics.



While cleaning the device, solvents (thinner, benzene, acid etc.) or corrosive materials must not be used.

SET (PSET / ASET) key is pressed while holding **ASET** key, the programming mode is enabled.

Entering from the programming mode to the run mode:
 If no key is pressed within 20 seconds during programming mode, the data is stored automatically and the run mode is entered.
 Alternatively, the same function occurs first pressing **ASET** key and then pressing **SET** (PSET / ASET) keys together.

SET (PSET / ASET) key is pressed while holding **ASET** key, the programming mode is enabled.

Con.0

Pb = Proportional band. Adjustable between 0% and 100%. Setting $Pb = 0\%$ On-Off control is selected.

ti = Integral time. Adjustable between 0.0 and 100.0 minutes. If $ti = 0.0$, integral effect is not used. Setting $Pb = 0$ this parameter is not seen.

td = Derivative time. Adjustable between 0.00 and 25.00 minutes. If $td = 0.00$, derivation effect is not used. Setting $Pb = 0$ this parameter is not seen.

Ct = Control period. Adjustable between 1 and 250 seconds. Setting $Pb = 0$ and $Cont.5$ $Out1$ this parameter is not seen.

PSEt = The ratio of output power at the set point. Adjustable between 0% and 100%. If this parameter is set to 0, the output power becomes 0 at the set point. If it is adjusted to 50% output power becomes 50% at the set point. Using this parameter the energy requirements of the system is adjusted at the set point. So the set point can be achieved by minimum fluctuations and in the shortest time. Setting $Pb = 0$, this parameter is not seen.

CHYS = Hysteresis of the control output. Adjustable between 1 and 50 °C/F. Setting $Pb = 0$ this parameter is not seen.

CSEr = Configuration of the control output. **CSEr** = **HErE** means heating control. **CSEr** = **cooL** means cooling control.

PrEr = This parameter is used to adjust the control output during a sensor failure. Adjustable between 0% and 100%. If this parameter is adjusted to a value closer to the energy requirements of the system at the set point, process temperature is prevented to rise drop to dangerous levels.

Cont.5 = Type of control output. $Out1 = 0-20$ = Analog control output. (0mA %0 energy, 20mA %100 energy) $Out1 = Alarm2$ output. $4-20$ = Analog control output. (4mA %0 energy, 20mA %100 energy) $Out1 = Alarm2$ output. $55r$ = SSR control output. $Out1 = Alarm2$ output.

CCon = Consistently control selection. **oFF** = At the end of the profile, temperature control is turned off. **on** = At the end of the profile, temperature is kept constant in last set value.

R.oLL = Minimum analog output value (% output) ,adjustable between 0 and 100.

R.oHL = Minimum analog output value (% output) ,adjustable between 0 and 100.

ALr.1

RIHY = Hysteresis of the Alarm1 output. Adjustable between 1 and 50°C.

RIEP = Function of Alarm1 output. Four kinds of functions can be selected. $indE = Independent$ $dE = Deviation$ $BAnd = Band$ $BAInH = Band with inhibition$ $ProF = Profile of control during the current segment AL2 output according to program behaves.$

RISt = The state of Alarm1. If independent or deviation alarm is selected, this parameter can be Lo and Hil . For Lo alarm output is energized below the alarm set point. For Hil alarm output is energized above the alarm set point. If band alarm is selected, this parameter can be $b.Hi$ or $bo.Hi$. $b.Hi$ means alarm is activated inside the band. $bo.Hi$ means alarm is activated outside the band.

RIPE = State of Alarm1 output in the case of sensor failure. If $RIPE = On$, the alarm output is energized during the sensor failure. If $RIPE = oFF$, the alarm output is not energized during the sensor failure.

RIHL = Alarm1 value upper limit. If inP or $UnIt$ parameters are changed, the maximum value of the **RIHL** parameter changes to the maximum scale value of the selected input type. Minimum of **RIHL** parameter is the value of **RIIL** parameter.

RIIL = Alarm1 value lower limit. If inP or $UnIt$ parameters are changed, the minimum value of the **RIIL** parameter changes to the minimum scale value of the selected input type. The maximum value is the value of **RIHL** parameter.

dAdr. = Device address. Adjustable between 1 and 247. Difference addresses should be selected for every device.

bAud = Modbus baud rate. Selectable 1200, 2400, 4800 and 9600. If **bAud** = **oFF**, Modbus communication will be disable. Note: The parameter appears at the devices which become ModBus.

ALr.2

RIHY = Hysteresis of the Alarm2 output. Adjustable between 1 and 50°C.

RIEP = Function of Alarm2 output. Four kinds of functions can be selected. $indE = Independent$ $dE = Deviation$ $BAnd = Band$ $BAInH = Band with inhibition$ $ProF = Profile of control during the current segment AL2 output according to program behaves.$

RISt = The state of Alarm2. If independent or deviation alarm is selected, this parameter can be Lo and Hil . For Lo alarm output is energized below the alarm set point. For Hil alarm output is energized above the alarm set point. If band alarm is selected, this parameter can be $b.Hi$ or $bo.Hi$. $b.Hi$ means alarm is activated inside the band. $bo.Hi$ means alarm is activated outside the band. NOTE! If $Cont.5 = out1$, this parameter is not seen.

RIPE = State of Alarm2 output in the case of sensor failure. If $RIPE = On$, the alarm output is energized during the sensor failure. If $RIPE = oFF$, the alarm output is not energized during the sensor failure. NOTE! If $Cont.5 = out1$, this parameter is not seen.

RIHL = Alarm2 value upper limit. If inP or $UnIt$ parameters are changed, the maximum value of the **RIHL** parameter changes to the maximum scale value of the selected input type. Minimum of **RIHL** parameter is the value of **RIIL** parameter.

RIIL = Alarm2 value lower limit. If inP or $UnIt$ parameters are changed, the minimum value of the **RIIL** parameter changes to the minimum scale value of the selected input type. The maximum value is the value of **RIHL** parameter. NOTE! If $Cont.5 = out1$, this parameter is not seen.

Conf.

inP = Type of input and scale. $Pt = Pt100 -200$ to $+600^{\circ}C$ $Pt = Pt100 -99.0$ to $+300.0^{\circ}C$ $FEcn = J$ (Iron vs. Copper-Nickel) 0 to $+600^{\circ}C$ $ncnR = K$ (Nickel-Cr.vs. Nickel-Alum.) 0 to $+1200^{\circ}C$ $ccn = T$ (Copper vs. Copper-Nickel) 0 to $+400^{\circ}C$ $P10r = S$ (Platinum-10%Rhodium vs. Pt.) 0 to $+1600^{\circ}C$ $P13r = R$ (Platinum-13%Rhodium vs. Pt.) 0 to $+1600^{\circ}C$ Note : If the selected input type is changed, the value of **CHiL**, **CLoL**, **RIHL**, **RIIL**, **RLoL** parameters changes automatically.

CHiL = Set point upper limit. If inP or $UnIt$ parameters are changed, the maximum value of the **CHiL** parameter changes to the maximum scale value of the selected input. The minimum value is the value of **CLoL** parameter.

CLoL = Set point lower limit. If inP or $UnIt$ parameters are changed, the minimum value of the **CLoL** parameter changes to the minimum scale value of the selected input. The maximum value is the value of **CHiL** parameter.

oFFS = Offset value. Offset value is added to the measurement value. Adjusted between -99 and $+99^{\circ}C$. The normal value is 0.

UnIt = The temperature unit. Selectable as °C or °F. Note : If the temperature unit is changed, the value of the **UPL**, **LoL**, **RUPL**, **RLoL** parameters changes automatically. NOTE! If inP parameter is selected TC or Pt100, this parameter is seen.

FLLCo = Coefficient of digital filter. Filter for display value. Adjustable between 1 and 32. If this parameter is 1, digital filter runs most quick. If the parameter is 31, the filter runs most slow. The value of parameter should be increased in interference.

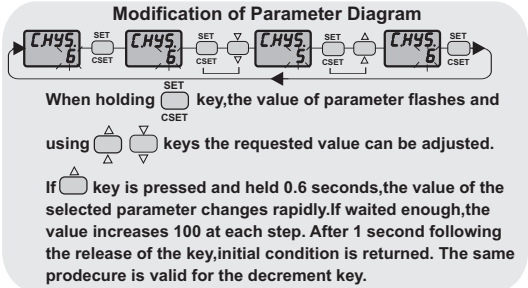
tbRS = Unit of time. As SEc or nIn can be selected. SEc is selected, the time as second is shown. nIn is selected, the time as minute is shown.

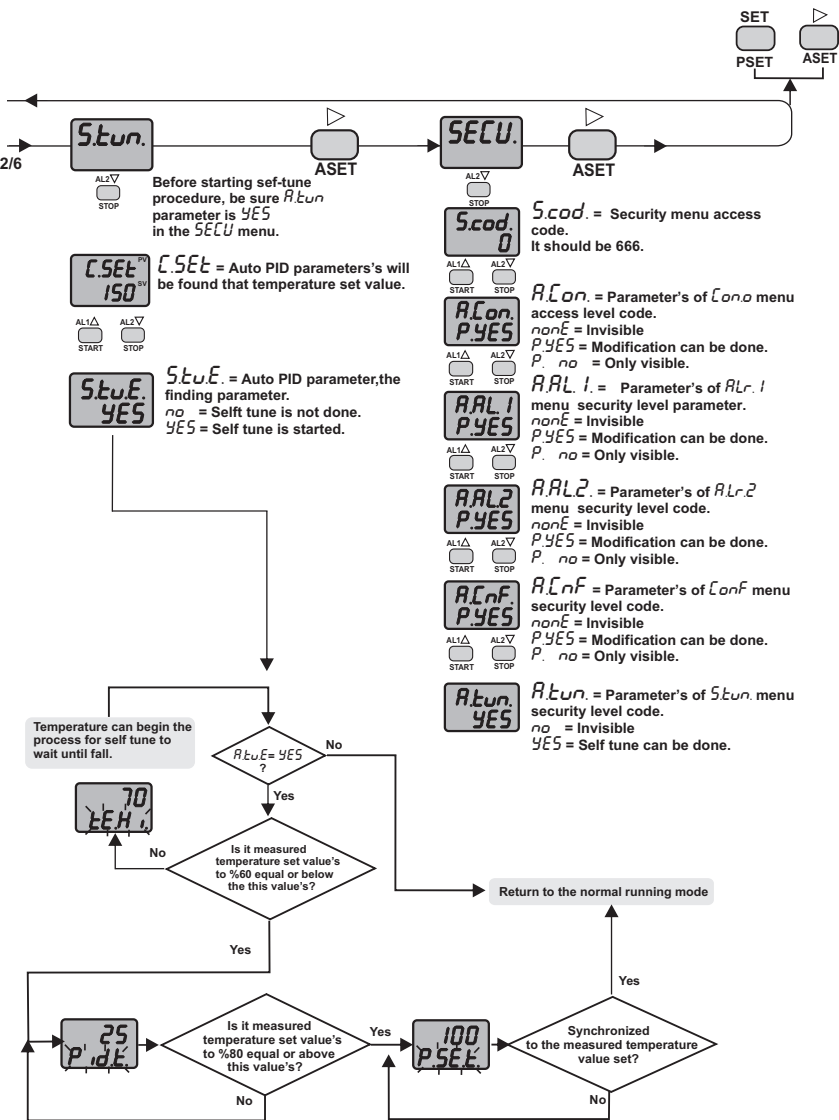
SE.iP = Segment increasing parameter. $SE.iP$ parameter can be set between the value in 0 and **CHiL** parameters. If $SnuN$ is selected between 1 and 8, the time value at the end of the process and the difference between the target temperature value of $SE.iP$ is equal to or smaller than the next segment is passed. If the $SnuN = 0$ is selected, the difference between target temperature with process value until from $SE.iP$ value smaller than or equal ;timer is stopped and it does flash.

P.onT = The selection of action that the energy is given. If $StoP$ is selected, the running program is stopped when power is cutted-off and came back ;is returned to beginning of the program.It is expected to run again. If $Cont.$ is selected, the power is cutted-off and came back; running program will continue where it resume.

SnuN = Maximum segment number. Can be selected between the 0-8. Selected numbers between 1-8, shows the step of program to work with. Can be selected "0" is passed to the thermostat and timer mode. In this mode the timer works when the temperature reached the set value at the end of this period and the Alarm1 contact be active.

d.SEL = Display selection parameter. It can take values between the 1-10. Can be selected "1", only the process value is shown. 2 and the above values are selected ;if 2 or more is programmed segment profile, a segment number process value is shown alternately.

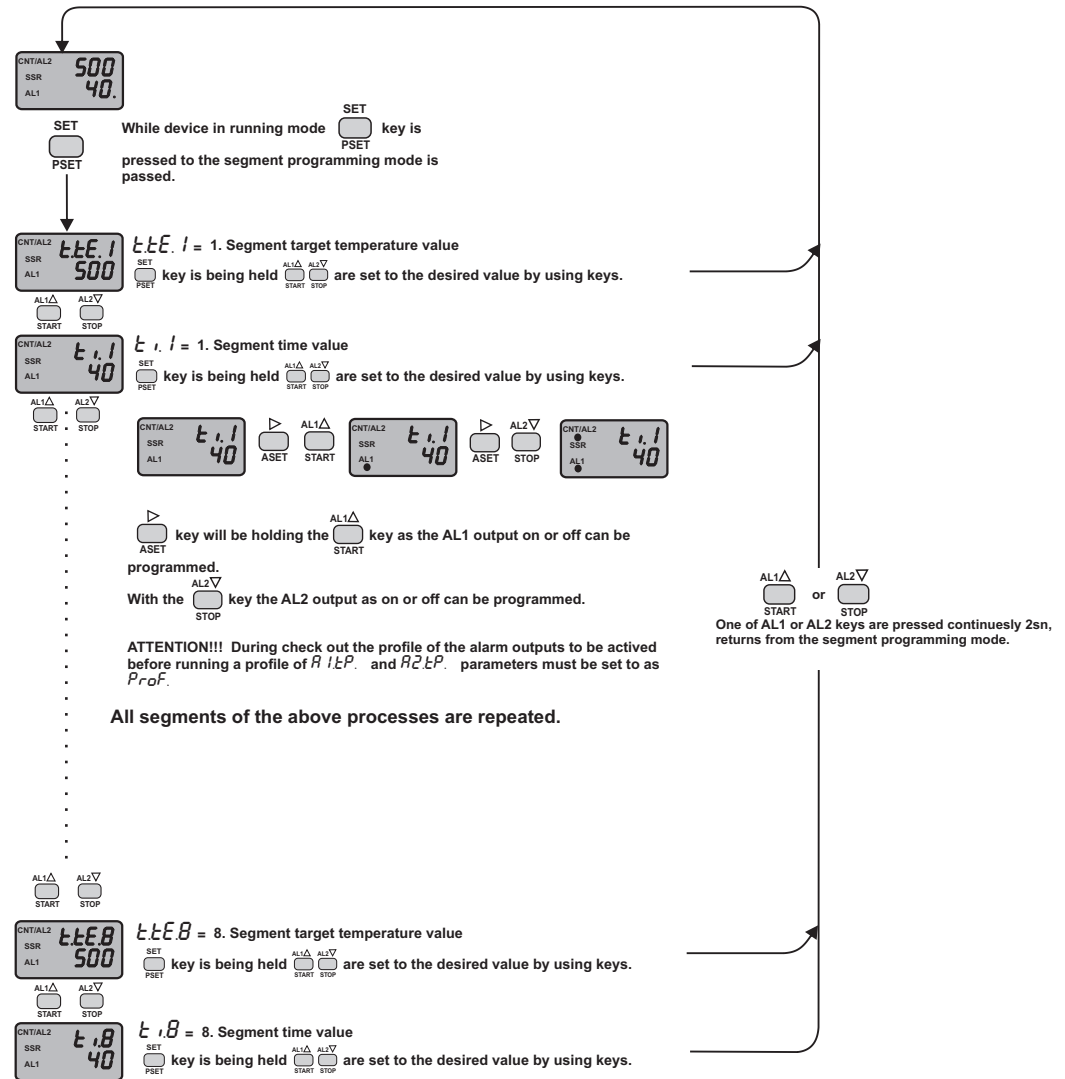




Probe error is not, to the self tune mode is entered. The measured temperature is low enough to make that self tune, *P.idL.* message is seen in sub-indicator and the self tune process starts. For the self tune process to begin, measured temperature must be to % 60 equal or under the set value's. If this condition is not right, in the sub-indicator *tEH.i* message flashes and the device can make self tune waits until the temperature falls. When the temperature decreased, *P.idL.* message starts to flash in the sub-indicator and self tune process is started and PID parameters can be calculated until possible in the sub-indicator of this message continues to flash. After PID parameters found in the sub-indicator *P.SEt.* message starts to flash. In this case, device PID controlled the heating till the set value and finding the required amount of energy for being established on the set level heating; returned quitting the self tune mode and writing the *P.SEt.* parameter as %.

If pressed on any keys while the *P.idL.* message flashes on sub-indicator, self tune mode is quitted without accounting display PID parameters.

SEGMENTS OF PROGRAMMING



While device in running mode **SET** key is pressed to the segment programming mode is passed.

t.tE.i = 1. Segment target temperature value
SET key is being held **AL1** are set to the desired value by using keys.

t.i.i = 1. Segment time value
SET key is being held **AL1** are set to the desired value by using keys.

ASET key will be holding the **AL1** key as the AL1 output on or off can be programmed.

With the **AL2** key the AL2 output as on or off can be programmed.

ATTENTION!!! During check out the profile of the alarm outputs to be activated before running a profile of *R1tP.* and *R2tP.* parameters must be set to as *ProF.*

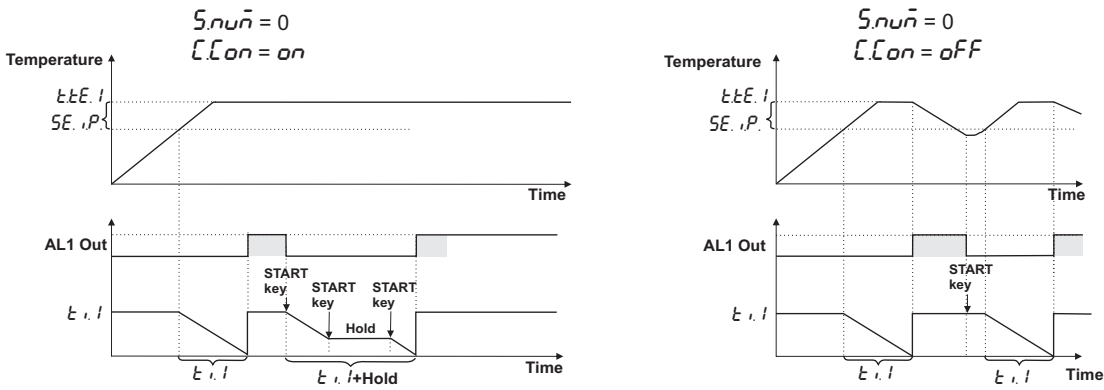
All segments of the above processes are repeated.

t.tE.B = 8. Segment target temperature value
SET key is being held **AL1** are set to the desired value by using keys.

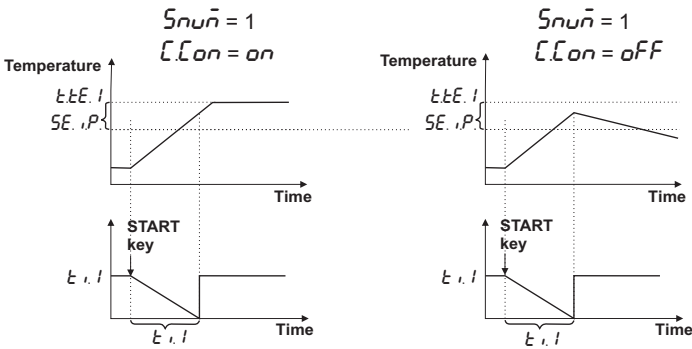
t.i.B = 8. Segment time value
SET key is being held **AL1** are set to the desired value by using keys.

AL1 or **AL2**
START or **STOP**
 One of AL1 or AL2 keys are pressed continuously 2sn, returns from the segment programming mode.

TIMER / THERMOSTAT OUTPUT EXAMPLES



PROFILE CONTROL OUTPUT EXAMPLES

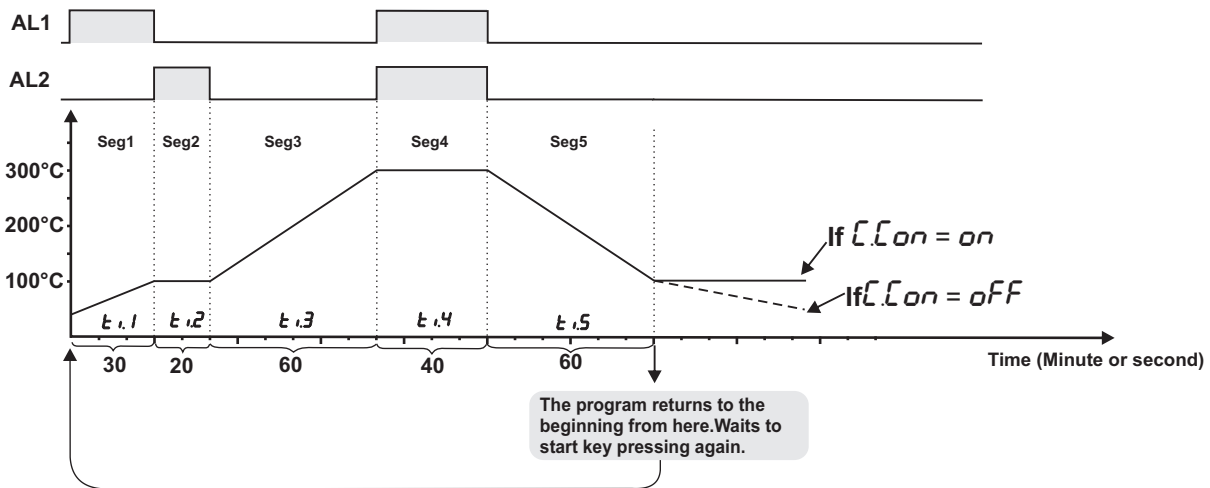


For single-step program $S.nuñ$ should be "1".

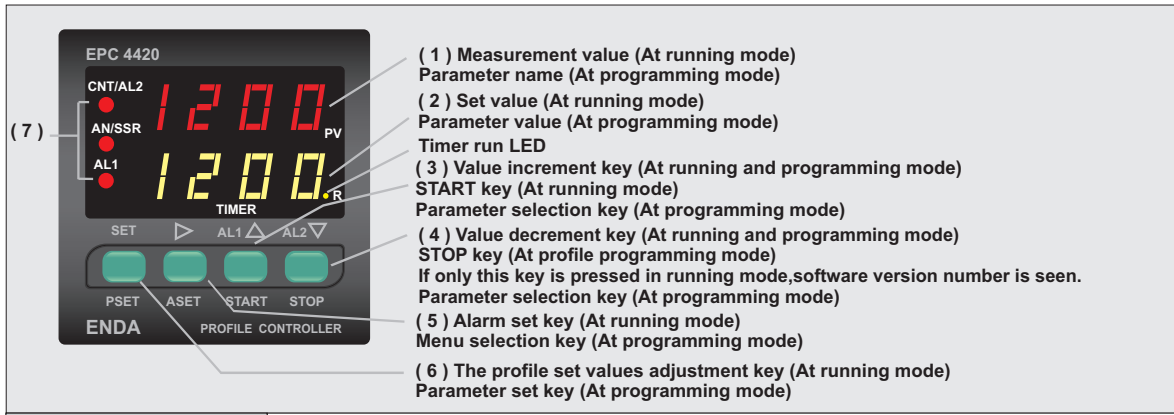
MULTI-STEP PROFILE CONTROL OUTPUT EXAMPLES

	Seg1	Seg2	Seg3	Seg4	Seg5
Target Temperature	$t_{tE,1} = 100$	$t_{tE,2} = 100$	$t_{tE,3} = 300$	$t_{tE,4} = 300$	$t_{tE,5} = 100$
Time	$t_{i,1} = 30$	$t_{i,2} = 20$	$t_{i,3} = 60$	$t_{i,4} = 40$	$t_{i,5} = 60$
AL1	ON	OFF	OFF	ON	OFF
AL2	OFF	ON	OFF	ON	OFF

For five-step program $S.nuñ$ should be "5".

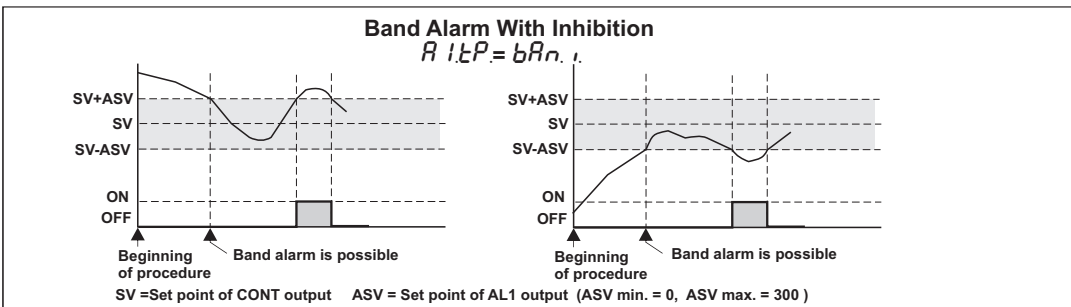
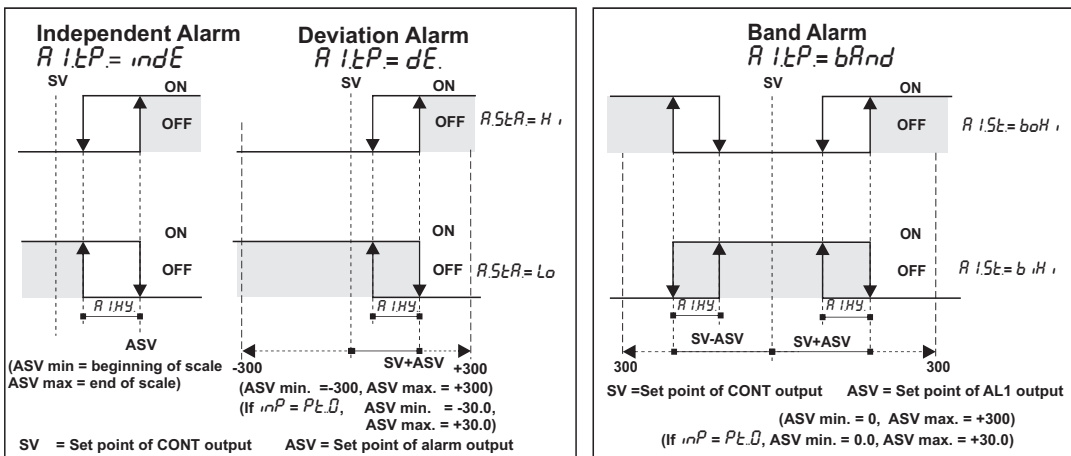


TERMS

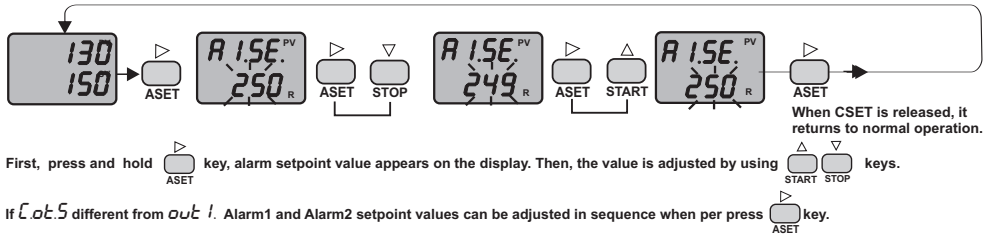


(1) PV display	4 digits 7 segment red LED
(2) TIMER display	4 digits 7 segment yellow LED
Character heights	PV display : 7mm
	TIMER display :7mm
(3),(4),(5),(6) Keypad	Mikro switch
(7) State indicator	3 red LEDs for Control, Alarm1 and SSR outputs

ALARM1 AND ALARM2 OUTPUT TYPES



MODIFICATION OF CONTROL AND ALARM SET POINTS

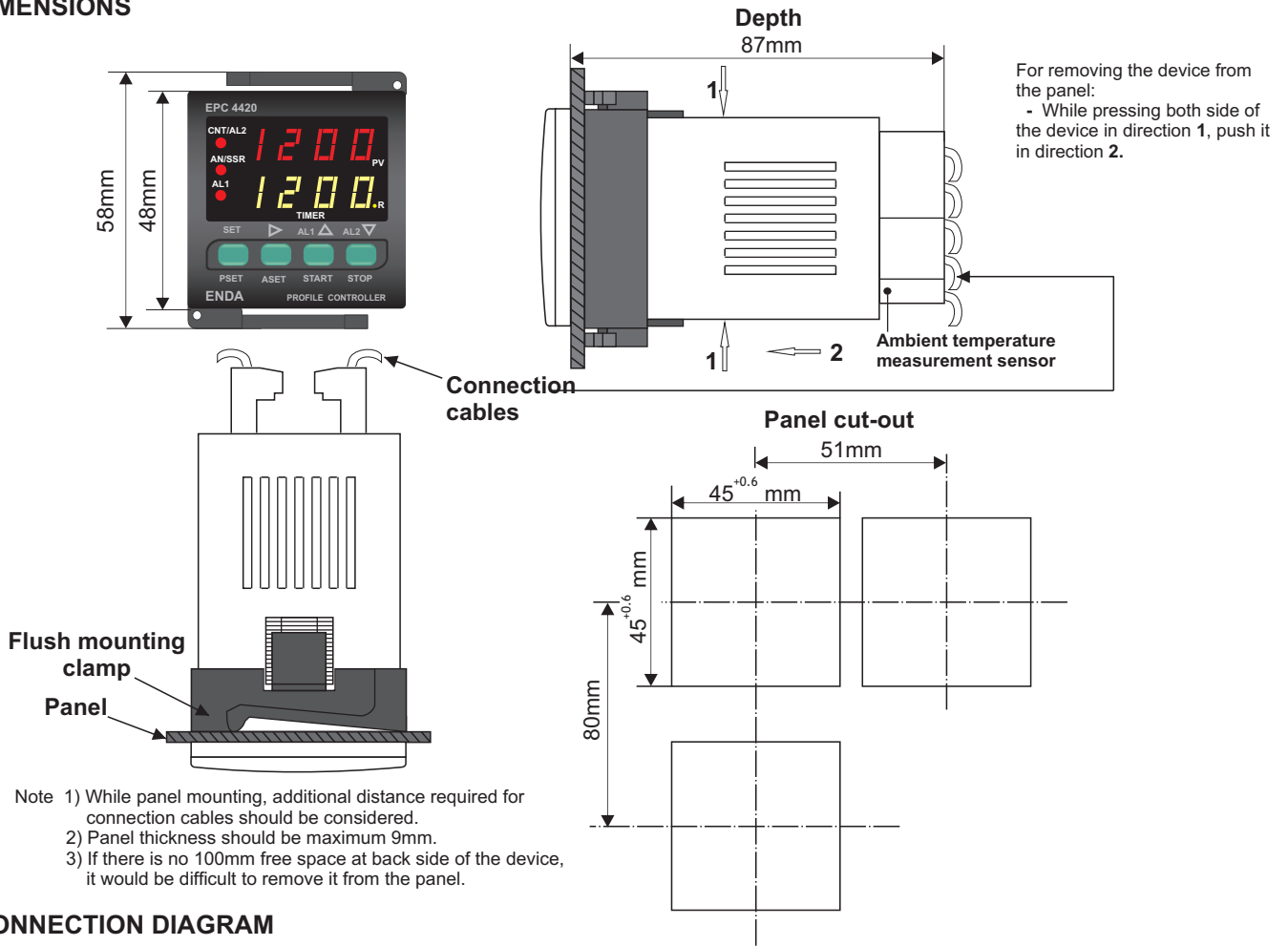


NOTE: The maximum of **CSET** is the value of **CHiL** parameter and the minimum of it is the value of **CLoL** parameter.
If independent alarm is selected, **R1SE** and **R2SE** values can be adjusted between the limits of the full scale.
If deviation alarm is selected, **R1SE** and **R2SE** values can be adjusted between -300 and +300.
If band alarm is selected, **R1SE** and **R2SE** values can be adjusted between 0 and +300.

Error Messages

Temperature value is higher than the scale	Temperature value is lower than the scale	Temperature sensor is broken or over temperature	Pt 100 or a sensor line is short circuited

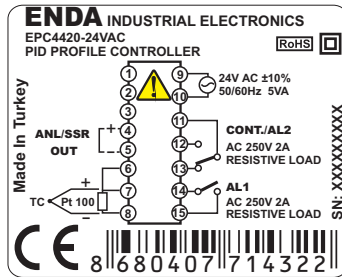
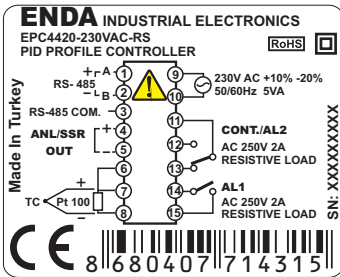
DIMENSIONS



CONNECTION DIAGRAM



ENDA EPC4420 is intended for installation in control panels. Make sure that the device is used only for intended purpose. The shielding must be grounded on the instrument side. During an installation, all of the cables that are connected to the device must be free of energy. The device must be protected against inadmissible humidity, vibrations, severe soiling and make sure that the operation temperature is not exceeded. All input and output lines that are not connected to the supply network must be laid out as shielded and twisted cables. These cables should not be close to the power cables or components. The installation and electrical connections must be carried on by a qualified staff and must be according to the relevant locally applicable regulations.

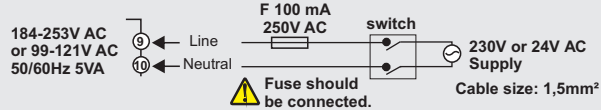


Logic output of the instrument is not electrically insulated from the internal circuits. Therefore, when using a grounding thermocouple, do not connect the logic output terminals to the ground.

Note 1) Mains supply cords shall meet the requirements of IEC 60227 or IEC 60245.
2) In accordance with the safety regulations, the power supply switch shall bring the identification of the relevant instrument and it should be easily accessible by the operator.

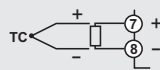
NOTE :

SUPPLY :

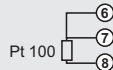


SENSOR INPUT :

For J-K-T-S-R type thermocouple :
Use suitable compensation cables. Don't use jointed cables. Pay attention to the polarities of the thermocouple cables as shown in the figure right are connected to the .



For resistance thermometer :
When 2 wired Pt 100 is used, terminals 6 and 7 must be short circuited.



Holding screw 0.4-0.5Nm

Equipment is protected throughout by DOUBLE INSULATION.

Order Code : EPC4420-□□□□□□-□□
1 2

1 - Supply Voltage

230VAC...230V AC
24VAC.....24V AC
SM.....9-30V DC / 7-24V AC

2- Modbus Option

RS.....RS-485 Modbus communication
None....Don't support RS-485 Modbus communication