



Read this document carefully before using this device. The guarantee will be expired by device damages 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

ENDA ET SERIES PID TEMPERATURE CONTROLLER

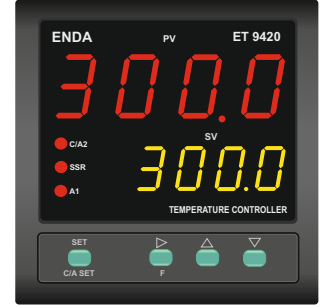
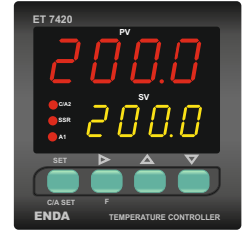
Thank you for choosing ENDA ET SERIES PID temperature controller.

- ▶ Selectable dual setpoint.
- ▶ Selectable thermocouple types.
- ▶ Automatic calculation of PID parameters (SELFTUNE).

⚠ Selftune for automatic PID calculation or manually enter PID parameters if known.

- ▶ Three different specifications can be assigned to digital input.
- ▶ Three different specifications can be assigned to F function key.
- ▶ Soft-Start feature.
- ▶ Selectable SSR control output.
- ▶ C/A2 Relay output programmable as secondary alarm or control output.
- ▶ A1 Relay output programmable as primary alarm or PID cooling output.
- ▶ Selectable heating/cooling control.
- ▶ Zero point input shift.
- ▶ In case of sensor failure, manually, periodical or auto-periodical control can be selected.
- ▶ RS485 ModBus protocol communication feature (optional).
- ▶ CE marked according to European Norms.

| | | | | | | |
|---------------------|----------------------------|---|---------------------------------|---|---|---|
| Order Code : ET | 4 | 2 | 0 | - | - | - |
| | 1 | 2 | 3 | | | |
| 1 - Size | 2 - Supply Voltage | | 3 - Modbus (Optional) | | | |
| 4420.....48x48x87mm | 230VAC...230V AC | | RS..... RS-485 Modbus Available | | | |
| 7420.....72x72x97mm | 110VAC...110V AC | | (Optional / Specify at order) | | | |
| 8420.....48x96x87mm | 24VAC.....24V AC | | Blank.... N/A | | | |
| 9420.....96x96x50mm | SM.....9-30V DC / 7-24V AC | | | | | |



| Input Type | Temperature Range | Accuracy | |
|--|-------------------|-------------------|----------------------------------|
| | °C | °F | |
| PT100 Resistance thermometer EN 60751 | -199.9...600.0 °C | -199.9...999.9 °F | ± 0,2% (of full scale) ± 1 digit |
| PT100 Resistance thermometer EN 60751 | -200...600 °C | -328....1112 °F | ± 0,2% (of full scale) ± 1 digit |
| J (Fe-CuNi) Thermocouple EN 60584 | -30.0....600.0 °C | -22.0....999.9 °F | ± 0,5% (of full scale) ± 1 digit |
| J (Fe-CuNi) Thermocouple EN 60584 | -30....600°C | -22....1112 °F | ± 0,5% (of full scale) ± 1 digit |
| K (NiCr-Ni) Thermocouple EN 60584 | -30.0...999.9°C | -22.0....999.9 °F | ± 0,5% (of full scale) ± 1 digit |
| K (NiCr-Ni) Thermocouple EN 60584 | -30....1300°C | -22....2372 °F | ± 0,5% (of full scale) ± 1 digit |
| L (Fe-CuNi) Thermocouple DIN 43710 | -30.0....600.0°C | -22.0....999.9 °F | ± 0,5% (of full scale) ± 1 digit |
| L (Fe-CuNi) Thermocouple DIN 43710 | -30....600°C | -22....1112 °F | ± 0,5% (of full scale) ± 1 digit |
| T (Cu-CuNi) Thermocouple EN 60584 | -30.0....400.0°C | -22.0....752.0 °F | ± 0,5% (of full scale) ± 1 digit |
| T (Cu-CuNi) Thermocouple EN 60584 | -30....400°C | -22....752 °F | ± 0,5% (of full scale) ± 1 digit |
| S (Pt10Rh-Pt) Thermocouple EN 60584 | -40...1700°C | -40....3092 °F | ± 0,5% (of full scale) ± 1 digit |
| R (Pt13Rh-Pt) Thermocouple EN 60584 | -40...1700°C | -40....3092 °F | ± 0,5% (of full scale) ± 1 digit |
| B (Pt30Rh-Pt6Rh) Thermocouple EN 60584 | 200...1700°C | 392....3092 °F | ± 0,5% (of full scale) ± 1 digit |

ENVIRONMENTAL CONDITIONS

| | |
|-----------------------------|---|
| Ambient/storage temperature | 0 ... +50°C/-25... +70°C (with no icing) |
| Max. Relative humidity | Relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity 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 | 110V AC +%10 -%20, 230V AC +%10 -%20, 50/60Hz or 24V AC %10, ± 50/60Hz |
| Power consumption | Max. 5VA |
| Wiring | Power connector: 2.5mm ² screw-terminal, Signal connector: 1,5mm ² screw-terminal connection. |
| Line resistance | Max. 100ohm |
| Data retention | EEPROM (minimum 10 years) |
| EMC | EN 61326-1: 2013 |
| Safety requirements | EN 61010-1: 2010 (Pollution degree 2, overvoltage category II) |

OUTPUTS

| | |
|---------------------------|---|
| C/A2 output | Relay : 250V AC, 8A (for resistive load), Selectable as NO+NC Control or Alarm2 output. |
| A1 output | Relay : 250V AC, 8A (for resistive load), NO (Selectable as Alarm1 and Cooling Control output). |
| SSR output | Max 20mA 24Volt |
| Life expectancy for relay | Mechanical 30.000.000; Electrical 100.000 operation. 250V AC, 8A (resistive load). |

CONTROL

| | |
|-------------------|---|
| Control type | Single set-point and alarm control |
| Control algorithm | On-Off / P, PI, PD, PID (selectable) |
| A/D converter | 12 bit |
| Sampling time | 100ms |
| Proportional band | Adjustable between 0% and 100%. If Pb=0.0%, On-Off control is selected. |
| Control period | Adjustable between 1 and 125 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% |

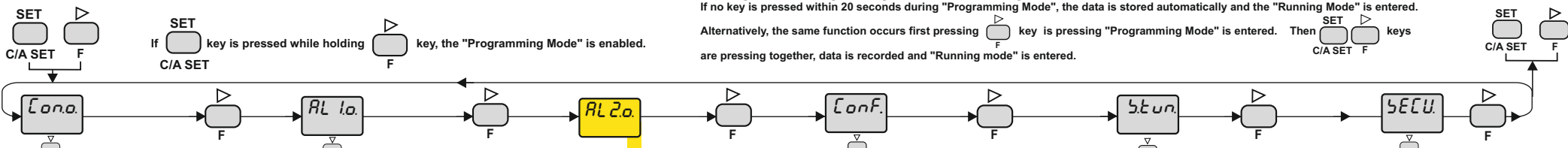
HOUSING

| | |
|--------------------|--|
| Housing type | Suitable for flush-panel mounting according to DIN 43 700. |
| Dimensions | ET4420 : G48XY48XD87MM ET7420 : G72XY72XD97MM ET8420 : G48XY96XD87MM ET9420 : G96XY96XD50MM |
| Weight | Approx. 400g after packing (250g for ET4420). |
| Enclosure material | Self extinguishing plastics. |

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

Entering from the "Programming Mode" to the "Running Mode": If no key is pressed within 20 seconds during "Programming Mode", the data is stored automatically and the "Running Mode" is entered.

Alternatively, the same function occurs first pressing **F** key is pressing "Programming Mode" is entered. Then **SET** **C/A SET** **F** keys are pressing together, data is recorded and "Running mode" is entered.



- C5Lo** C5Lo = C/A1 Output Control setpoint value lower limit. Adjustable between 0 and C5H.
- C5H** C5H = C/A1 Output Control setpoint value upper limit. Adjustable between C5Lo and Upper.
- CPb** CPb = C/A1 Output Proportional band value. Adjustable between %0.0 and %100.0. If CPb = %0.0, On-Off control is selected.
- CHy** CHy = C/A1 Output Hysteresis output value. Adjustable between 1 and 50°C. **!** If CPb = 0, this parameter is active.
- CI** CI = C/A1 Output Integral value. Adjustable between 0 and 100.0 minutes. CI = 0.0, integral impact is disabled. **!** If CPb parameter is different from "0", this parameter appears.
- CD** CD = C/A1 Output Derivative value. Adjustable between 0.00 and 25.00 minutes. CD = 0.0, derivative time is disabled. **!** If CPb parameter is different from "0", this parameter appears.
- CI** CI = C/A1 Output Period time. Adjustable between 1 and 250 second. **!** CPb parameter is different is different from "0", this parameter appears.
- CP%** CP% = At C/A1 Set value, C/A1 percent of power. Adjustable between 0% and 100%.
- CEct** CEct = Faulty sensor control type. If CEct = EP%, in the case of probe failure according to CEP% proportional value of the parameter control is performed. If CEct = Aut o. in the case of probe failure, the fault found and recorded before the last setpoint control with the control percentage is performed.
- CEP%** CEP% = In the case of probe failure, C/A1 output percentage adjustable between %0 and %100. **!** If CEct = EP% or CI = 00 is selected, this parameter is activated. In the case of failure, if CPb = 00 (ON/Off Control) and CEP% = 0 output will be Off, if different from "0" value, output will be ON.
- SSSt** SSSt = Soft Start timer set value. This parameter indicates the time to reach set point value when the device is first energised. Adjustable between 0 and 250 minutes. If 0 is selected, soft start feature will be enabled and the device reaches set point value quickly. **!** Setting Pb = 0, soft start feature will be disabled.
- CTYP** CTYP = Control output type. CTYP = HEAT means heating control. CTYP = Cool means cooling control.

- AL 1.o** **R1L** R1L = Alarm1 set value lower limit. Adjustable between 0 and R1H parameter value.
- R1H** R1H = Alarm1 set value upper limit. Adjustable between R1L parameter value and upper scale value.
- R1Hy** R1Hy = Hysteresis of the Alarm1 output. Adjustable between 1 and 50°C.
- R1tP** R1tP = Type of Alarm1. Six kinds of functions can be selected. indE = Independent alarm dE = Deviation alarm bAnd = Band alarm (Band) bAn i = Band with inhibition inCo = A1 output independent cooling control rELo = A1 output relative cooling control
- R1St** R1St = Alarm1 output situation. If Alarm1 output H = A1 output is above the Alarm1 set value; on. Lo = A1 output is above the Alarm1 set value; off. **!** R1tP parameter, inCo or rELo is selected; this parameter is not seen.
- R1Er** R1Er = Alarm1 probe failure situation. on = A1 output probe failure; off. **!** R1tP parameter, inCo or rELo is selected, this parameter is not seen.
- R1Pb** R1Pb = A1 output, value of proportional band. Adjustable between 0% and 100%. R1Pb = 0%, On-Off control is selected. **!** R1tP parameter, inCo or rELo is selected; this parameter is activated.
- R1It** R1It = A1 output integral value. Adjustable between 0.0 and 100.0 minute. R1It = 0.0 effect of integral disable. **!** R1tP parameter, inCo or rELo is selected and if R1Pb different from "0", this parameter is activated.
- R1Id** R1Id = A1 output derivative value. Adjustable between 0.00 and 25.00 minutes. R1Id = 0.00 effect of derivative disable. **!** R1tP parameter inCo or rELo is selected and if R1Pb different from "0", this parameter is activated.
- R1It** R1It = A1 output period time. Adjustable between 1 and 250sec. **!** R1tP parameter inCo or rELo is selected and if R1Pb different from "0", this parameter is activated.
- R1P%** R1P% = At A1 Set value, A1 output percent of power. Adjustable between 0% and 100%. **!** R1tP parameter inCo or rELo is selected and if R1Pb different from "0", this parameter is activated.
- R1EP** R1EP = At A1 Set value, A1 output percent of power. Adjustable between 0%-100%. **!** R1tP parameter inCo or rELo is selected, this parameter is activated.

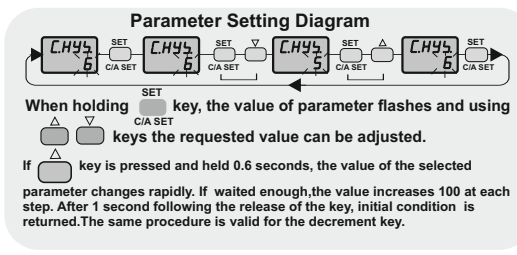
- AL 2.o** **R2L** R2L = Alarm2 set value lower limit. Adjustable between 0 and R2H parameter value.
- R2H** R2H = Alarm2 set value upper limit. Adjustable between R2L parameter value and upper scale value.
- R2Hy** R2Hy = Hysteresis of the Alarm2 output. Adjustable between 1 and 50°C.
- R2tP** R2tP = Type of Alarm2. Four kinds of functions can be selected. indE = Independent alarm dE = Deviation alarm bAnd = Band alarm bAn i = Band with inhibition
- R2St** R2St = Alarm2 output situation. H = A2 output is above the set value; on. Lo = A2 output is above the set value; off.
- R2Er** R2Er = Alarm2 probe failure situation. on = A2 output probe failure; off. oFF = A2 output probe failure; off.

! In SSR output devices, if cobE parameter is different from L-R2, this menu appears.

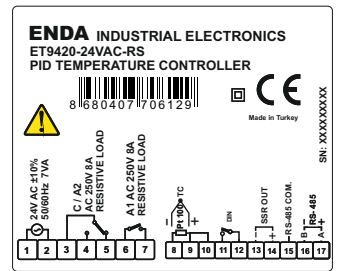
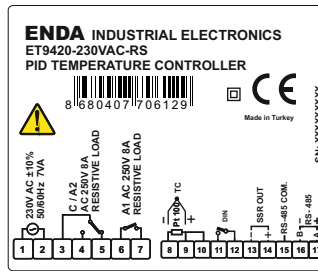
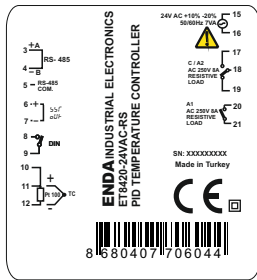
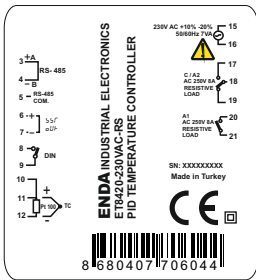
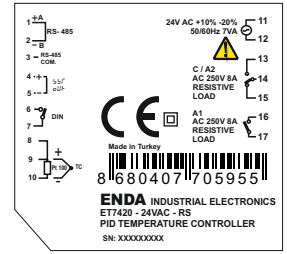
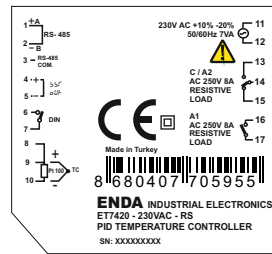
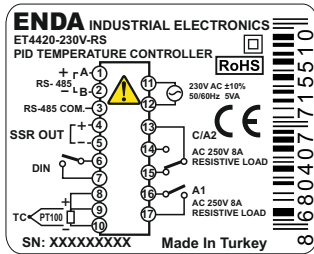
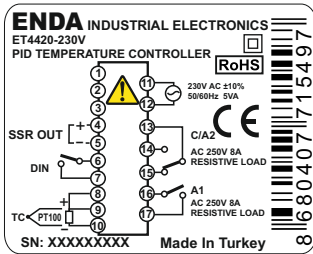
- Conf.** **inPt** inPt = Type of input selection. Pt0 = PT100 decimal, Pt = PT100 Non-decimal, d = J Type decimal, J = J Type Non-decimal, K = K Type decimal, K = K Type Non-decimal, L = L Type decimal, L = L Type Non-decimal, T = T Type, S = S Type, R = R Type, thermocouple selection. **!** This parameter varies when changing some parameters.
- UnIt** UnIt = The temperature unit. oC = °C, oF = °F. **!** This parameter varies when changing some parameters.
- FLtr** FLtr = Coefficient of digital filter. Adjustable between 1 and 200. If this parameter is 1, digital filter runs most quick. If the parameter is 35, the filter run most slow. The value of parameter should be increased in interference.
- CobE** CobE = Control output selection L-R2 = C/A2 (Relay) output selection SSS = SSR output selection
- oFF%** oFF% = Offset value. Offset value is added to the measuring value. This feature which is the point of measurement due to its distance measurement probe, is used to eliminate errors that might occur. Adjustable between -99 and 99°C, for decimal values can be adjusted between -10.0 and 10°C. Normal value = 0.
- dAdr** dAdr = Device address for RS485 connection. Adjustable between 1 and 247. **!** This parameter is active devices with RS485 communications option.
- bAud** bAud = ModBus baud rate for RS485 connection. Selectable as; off, 2, 4, 8, 9.6, 19.20 vs 38.40. **!** This parameter is active devices with RS485 communications option.
- d.inC** d.inC = Digital input setting parameter. nonE = Digital input is closed. L2bA = If digital input is activated, 2nd set value is used. nRnu = Manual mode start in case of digital outputs are active and rational output generated according to period value in LCLt parameter and percentage value in nSEt parameter. dSpa = If the digital input is activated; temperature indicator mode can be exceed.
- F.F.E.C** F.F.E.C = Function key setting parameter. nonE = Function key is closed. L2bA = The function key is used with the 2nd set value. nRnu = Manual mode can be exceed by using the function key. dSpa = Temperature indicator mode can be exceed by using function key.

- Stun** Stun = Self tune control parameter. If **SET** **C/A SET** keys are pressed together, the device returns to the main screen and if the temperature is not high, P.dT message flashes on display and self tune process starts automatically. If the initial temperature is higher to self-tune, tEh message appears and the device waits until the temperature goes down. Then P.dT message appears and automatically self tune procedure is starts. After the self tune procedure, CPb, CI, CD, dE and LCLt values are recorded in the memory, then the device returns to "Running mode". After the successful self tune completion, Stun menu is removed automatically. In order to re-tune, Stun parameter should be set to P.YE5 in SECU menu.
- SECU** **SECU** = Security menu access code. If in SECU = 0 position, first held down **SET** key then pressed **F** key for 4 seconds dEFP message is displayed and return to the factory settings.
- CobC** CobC = Parameter of Con.o menu security level. nonE = Menu invisible. P.YE5 = Modification can be done. P.no = Only visible.
- R1Sc** R1Sc = Parameter of AL 1.o menu security level. nonE = Menu invisible. P.YE5 = Modification can be done. P.no = Only visible.
- R2Sc** R2Sc = Parameter of AL 2.o menu security level. nonE = Menu invisible. P.YE5 = Modification can be done. P.no = Only visible.
- LnSc** LnSc = Parameter of Conf. menu security level. nonE = Menu invisible. P.YE5 = Modification can be done. P.no = Only visible.
- StSc** StSc = Parameter of Stun menu security level. nonE = Invisible. P.YE5 = Modification can be done.

STOPPING SELF TUNE
If self tune process wanted to be terminated for any reason, "Programming Mode" entered and Stun menu opened with **SET** and **F** keys, Stun parameter selected with **Y** key, **SET** and **F** keys pressed together in order to stop self tune process and turn to main display.



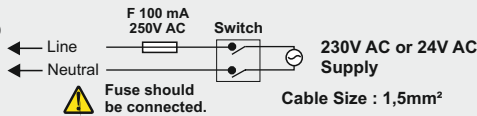
CONNECTION DIAGRAM



NOTE :

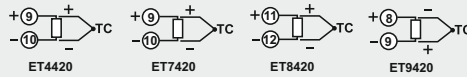
SUPPLY VOLTAGE

| Model | Terminal 11 | Terminal 12 |
|--------|-------------|-------------|
| ET4420 | 11 | 12 |
| ET7420 | 11 | 12 |
| ET8420 | 15 | 16 |
| ET9420 | 1 | 2 |



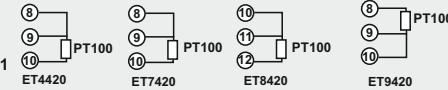
SENSOR INPUT:

For J - K - T - S and R Thermocouples :
Use the correct compensating cable.
Do not make any supplement to cables. Connect the thermocouple cables to the right places at the input terminal.



For resistance (PT100) Sensor :

When using 2-wire PT100 sensor, as shown in the figures, make 8 and 9 terminals short circuit for ET4420, ET7420 and ET9420 devices, make 10 and 11 terminals short circuit for ET8420 devices.



Holding screw
0.4-0.5Nm

Equipment is protected throughout by DOUBLE INSULATION.



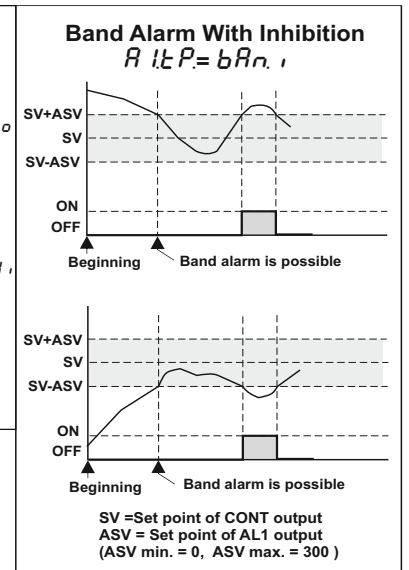
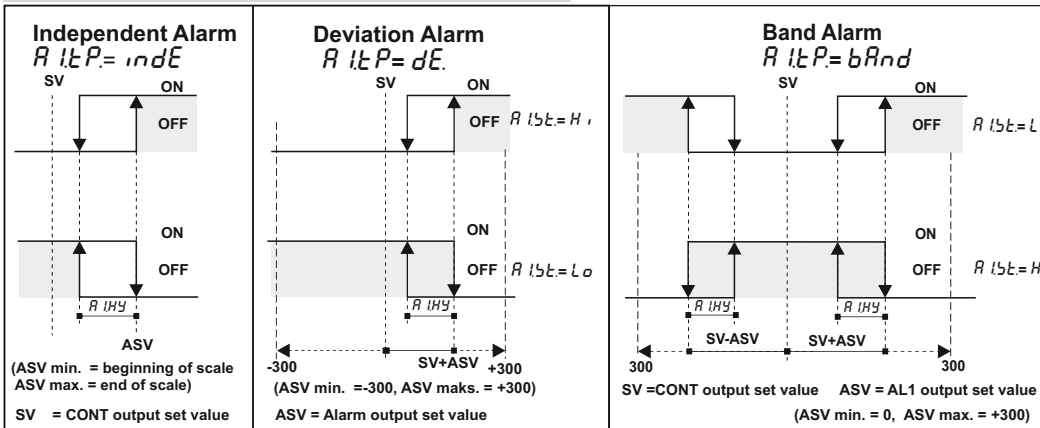
Logic output of the instrument is not electrically insulated from the internal circuits. Therefore, when using a grounding thermocouple, do not connect the logic output terminals to the ground.

Note :

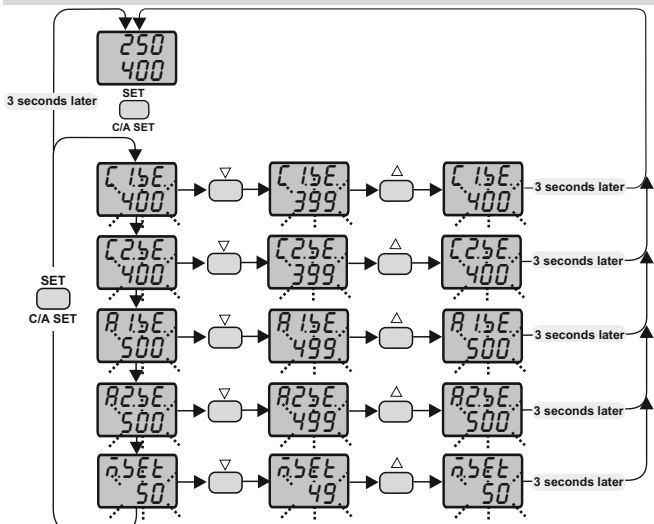
- 1) Mains supply cords shall meet the requirements of IEC 60227 or IEC 60245.
- 2) In accordance with the safety regulations, the power supply switch shall bring the identification of the relevant instrument and it should be easily accessible by the operator.

Please see page 7 for Modbus Connection Diagram

ALARM1 AND ALARM2 OUTPUT TYPES



SETTING UP ALARM CONTROL AND SETPOINT VALUES



If one of the d_{inc} or F_{Fec} parameters are set to the C_{25E} value, this parameter is seen.

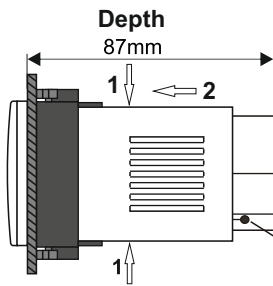
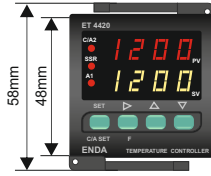
If the C_{05E} parameter is set to SSR out, this parameter is seen.

If one of the d_{inc} or F_{Fec} parameters are set to the n_{Rnu} value and if C_{Pb} is different from 0, this parameter is seen.

ERROR MESSAGES

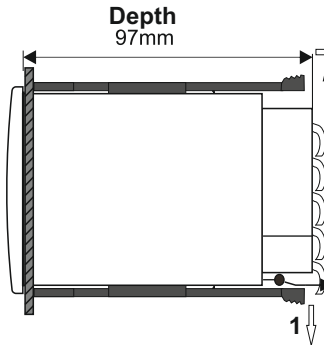
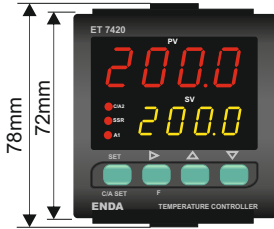
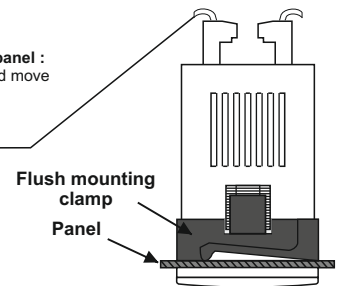
- PFR 400: Temperature sensor is broken.
- 400: Temperature value is higher than the scale.
- 400: Temperature value is broken or over temperature.
- LotE: The temperature read on type B sensors is below 200°C.

DIMENSIONS



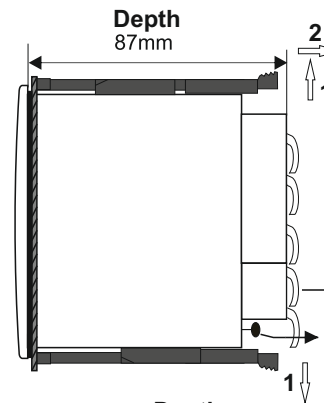
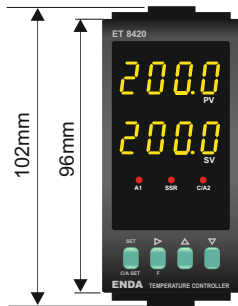
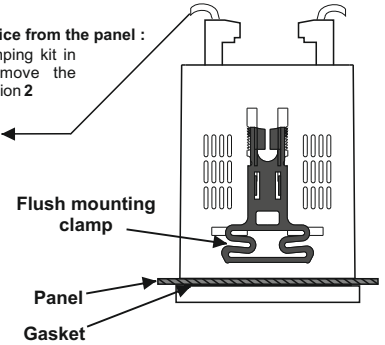
To removing the device from the panel :
- Push both sides in direction 1 and move the device in direction 2

Connection Cables
Ambient temperature sensor



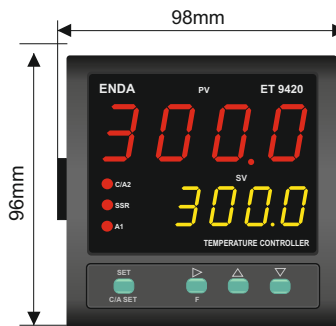
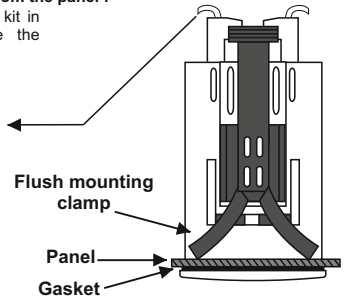
To removing the device from the panel :
- Pull up the clamping kit in direction 1 and move the clamping kit in direction 2

Connection Cables
Ambient temperature sensor

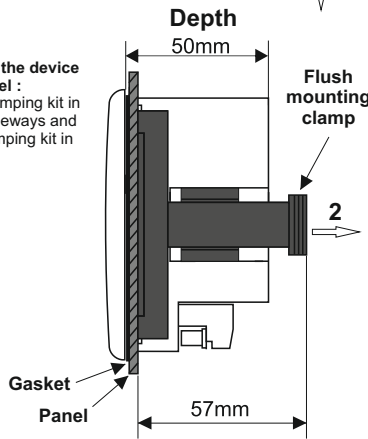


To removing the device from the panel :
- Pull up the clamping kit in direction 1 and move the clamping kit in direction 2

Connection Cables
Ambient temperature sensor



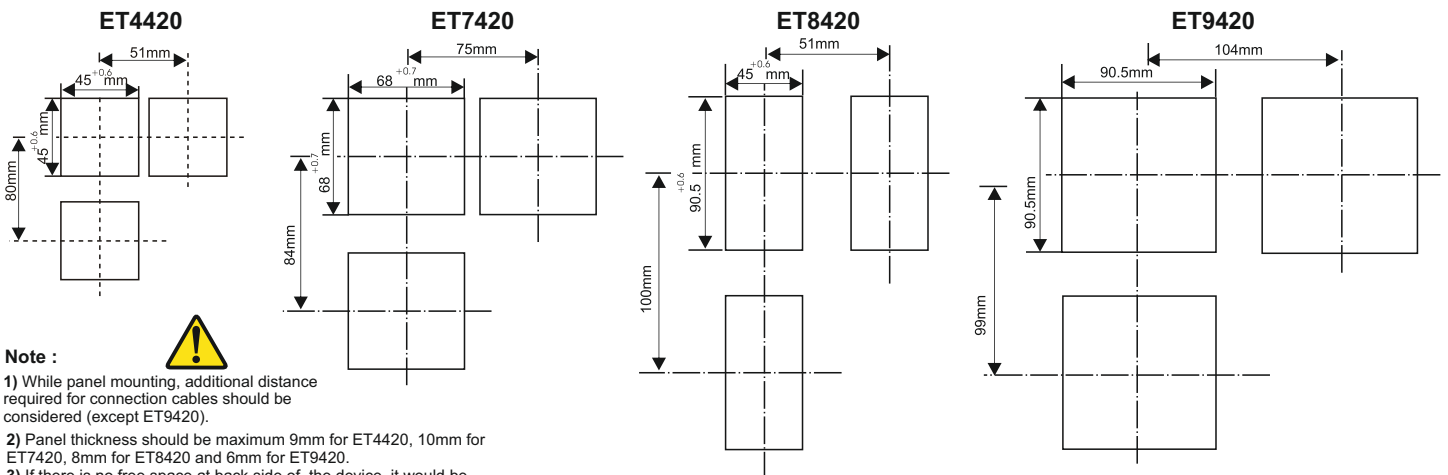
To removing the device from the panel :
- Push the clamping kit in direction 1 sideways and move the clamping kit in direction 2



ENDA ETx420 Series PID Temperature Controllers are 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. 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.

PANEL CUT-OUT



Note :



- 1) While panel mounting, additional distance required for connection cables should be considered (except ET9420).
- 2) Panel thickness should be maximum 9mm for ET4420, 10mm for ET7420, 8mm for ET8420 and 6mm for ET9420.
- 3) If there is no free space at back side of the device, it would be difficult to remove it from the panel. Required minimum free space; ET4420 = 100mm, ET8420 = 90mm, ET9420 = 60mm.

ENDA ET SERIES PID TEMPERATURE CONTROLLER MODBUS ADDRESS MAP

1.1 Memory Map for Holding Registers

| | Parameter Number | Holding Register Addresses Desimal (Hex) | Data Type | Data Content | Read / Write Permission | Factory Defaults |
|---------------------------|------------------|---|----------------------------------|--|-------------------------|------------------|
| Control Output Parameters | H0 | 0000d (0000h) | Word | Control output, temperature setpoint value | Read / Write | 400 |
| | H1 | 0001d (0001h) | Word | Control output, 2nd temperature setpoint value | Read / Write | 400 |
| | H2 | 0002d (0002h) | Word | Control output, minimum setpoint value | Read / Write | 0 |
| | H3 | 0003d (0003h) | Word | Control output, maximum setpoint value | Read / Write | 600 |
| | H4 | 0004d (0004h) | Word | Control output, proportional band setpoint value (Adjustable between %0.0 and %100.0) | Read / Write | 4 |
| | H5 | 0005d (0005h) | Word | Control output, hysteresis value (Adjustable between 1 and 50 °C or °F) | Read / Write | 2 |
| | H6 | 0006d (0006h) | Word | Control output, integral time (Adjustable between 0.1 and 100.0 minute) | Read / Write | 40 |
| | H7 | 0007d (0007h) | Word | Control output, derivative time (Adjustable between 0.01 and 10.00 minute) | Read / Write | 100 |
| | H8 | 0008d (0008h) | Word | Control output, time period setpoint value (Adjustable between 1 and 125 second) | Read / Write | 20 |
| | H9 | 0009d (0009h) | Word | Control output, set value power ratio (Adjustable between %0 and %100) | Read / Write | 0 |
| | H10 | 0010d (000Ah) | Word | Control output, set value power ratio in case of sensor failure (Adjustable between %0 and %100) | Read / Write | 0 |
| H11 | 0011d (000Bh) | Word | Control output, soft start value | Read / Write | 0 | |
| A1 Output Parameters | H12 | 0012d (000Ch) | Word | Alarm1 output temperature setpoint value | Read / Write | 500 |
| | H13 | 0013d (000Dh) | Word | Alarm1 output minimum setpoint value limit | Read / Write | 0 |
| | H14 | 0014d (000Eh) | Word | Alarm1 output maximum setpoint value limit | Read / Write | 600 |
| | H15 | 0015d (000Fh) | Word | Alarm1 output proportional band set value (Adjustable between %0.0 and %100.0) | Read / Write | 0 |
| | H16 | 0016d (0010h) | Word | Alarm1 output hysteresis value (Adjustable between 1 and 50 °C or °F) | Read / Write | 2 |
| | H17 | 0017d (0011h) | Word | Alarm1 output, integral time (Adjustable between 0.1 and 100.0 minute) | Read / Write | 0 |
| | H18 | 0018d (0012h) | Word | Alarm1 output, derivative time (Adjustable between 0.01 and 10.00 minute) | Read / Write | 0 |
| | H19 | 0019d (0013h) | Word | Alarm1 output, time period setpoint value (Adjustable between 1 and 125 second) | Read / Write | 20 |
| | H20 | 0020d (0014h) | Word | Alarm1 output, set value power ratio (Adjustable between %0 and %100) | Read / Write | 0 |
| | H21 | 0021d (0015h) | Word | Alarm1 output, set value power ratio in case of sensor failure (Adjustable between %0 and %100) | Read / Write | 0 |
| | H22 | 0022d (0016h) | Word | Alarm1 output type selection (Values can be given from 0 to 4) (0 = Independent alarm, 1 = Deviation alarm, 2 = Band alarm, 3 = Active alarm after in band time, 4 = Alarm1 output, cooling control selection) | Read / Write | 0 |
| A2 Output Parameters | H23 | 0023d (0017h) | Word | Alarm2 output, temperature setpoint value | Read / Write | 500 |
| | H24 | 0024d (0018h) | Word | Alarm2 output minimum setpoint value limit | Read / Write | 0 |
| | H25 | 0025d (0019h) | Word | Alarm2 output maximum setpoint value limit | Read / Write | 600 |
| | H26 | 0026d (001Ah) | Word | Alarm2 output, hysteresis value (Adjustable between 1 and 50 °C or °F) | Read / Write | 2 |
| | H27 | 0027d (001Bh) | Word | Alarm2 output type selection (Values can be given from 0 to 3) (0 = Independent alarm, 1 = Deviation alarm, 2 = Band alarm, 3 = Active alarm after in band time) | Read / Write | 0 |
| Configuration Parameters | H28 | 0028d (001Ch) | Word | Input selection number (0 = PT100 Decimal, 1 = Pt100 Non-decimal, 2 = J Decimal, 3 = J Non-decimal, 4 = K Decimal, 5 = K Non-decimal, 6 = L Decimal, 7 = L Non-decimal, 8 = T Decimal, 9 = T Non-decimal, 10= S Non-decimal, 11 = R Non-decimal. | Read / Write | 5 |
| | H29 | 0029d (001Dh) | Word | ModBus device address (Adjustable between 1 and 247) | Read / Write | 1 |
| | H30 | 0030d (001Eh) | Word | Modbus communication speed (Baudrate) (0 = Modbus cancel, 1 = 2400 bps, 2 = 4800 bps, 3 = 9600 bps, 4 =19200 bps, 5 = 38400 bps) | Read / Write | 3 |
| | H31 | 0031d (001Fh) | Word | Digital filter coefficient (Adjustable between 1 and 200, 1 = filter is disable) | Read / Write | 10 |
| | H32 | 0032d (0020h) | Word | Control output, selection value (0 = C/A2 Control output selection, 1 = SSR Output) | Read / Write | 0 |
| | H33 | 0033d (0021h) | Word | Reserved | Read / Write | XX |
| | H34 | 0034d (0022h) | Word | Reserved | Read / Write | XX |
| | H35 | 0035d (0023h) | Word | Offset value | Read / Write | 0 |
| | H36 | 0036d (0024h) | Word | Function control parameter. (23040d (5A00h) self tune stops when this value is entered) (23041d (5A01h) self tune starts when this value is entered) (23042d (5A02h) returns to factory defaults when this value is entered) | Read / Write | 0 |
| | H37 | 0037d (0025h) | Word | Reserved | Read / Write | XX |
| | H38 | 0038d (0026h) | Word | Reserved | Read / Write | XX |
| | H39 | 0039d (0027h) | Word | Manual control output percentage (Adjustable between %0 and %100) | Read / Write | 50 |

ENDA ET SERIES PID TEMPERATURE CONTROLLER MODBUS ADDRESS MAP

1.1 Memory Map for Holding Registers (continue)

| Parameter Number | Holding Register Addresses Desimal (Hex) | Data Type | Data Content | Read / Write Permission | Factory Defaults | |
|---------------------------------|--|---------------|--------------|---|------------------|----|
| Configuration Parameters | H40 | 0040d (0028h) | Word | Digital input control parameter (0 = Digital input off, 1 = 2nd set value is selected with digital input, 2 = Manual mode is entered via digital input, 3 = Digital input is passed to display mode) | Read / Write | 0 |
| | H41 | 0041d (0029h) | Word | Function key control parameter (0 = Function key off, 1 = 2nd Set value is selected with function key, 2 = Manual mode is entered via function key, 3 = With the function key display mode is entered) | Read / Write | 0 |
| | H42 | 0042d (008Ah) | Word | Reserved | Read / Write | XX |
| | H43 | 0043d (002Bh) | Word | Reserved | Read / Write | XX |
| | H44 | 0044d (002Ch) | Word | Reserved | Read / Write | XX |
| | H45 | 0045d (002Dh) | Word | Reserved | Read / Write | XX |
| | H46 | 0046d (002Eh) | Word | Reserved | Read / Write | XX |
| | H47 | 0047d (002Fh) | Word | Reserved | Read / Write | XX |
| | H48 | 0048d (0030h) | Word | Control output menu, security parameter (0 = Menu invisible, 1 = Menu programmable, 2 = Menu only visible) | Read / Write | 1 |
| | H49 | 0049d (0031h) | Word | Alarm1 output menu security parameter (0 = Menu invisible, 1 = Menu programmable, 2 = Menu only visible) | Read / Write | 1 |
| | H50 | 0050d (0032h) | Word | Alarm2 output menu, security parameter (0 = Menu invisible, 1 = Menu programmable, 2 = Menu only visible) | Read / Write | 1 |
| | H51 | 0051d (0033h) | Word | Configuration menu, security parameter (0 = Menu invisible, 1 = Menu programmable, 2 = Menu only visible) | Read / Write | 1 |
| | H52 | 0052d (0034h) | Word | Self tune menu, security parameter (0 = Menu invisible, 1 = Self tune can be done) | Read / Write | 1 |

1.2 Memory Map for Coils

| Parameter Number | Coil Addresses | Data Type | Data Content | Read / Write Permission | Factory Defaults |
|------------------|----------------|-----------|--|-------------------------|------------------|
| C0 | (0000)h | Bit | Alarm2 Status (0 = Active Low ,1 =Active High) | Read / Write | 1 |
| C1 | (0001)h | Bit | Alarm2 output position in case of Prob failure (0 = Off , 1 = On) | Read / Write | 0 |
| C2 | (0002)h | Bit | Alarm1 Status (0 = Active Low ,1 =Active High) | Read / Write | 1 |
| C3 | (0003)h | Bit | Alarm1 output position in case of Prob failure (0 = Off , 1 = On) | Read / Write | 0 |
| C4 | (0004)h | Bit | Control output configuration (0 = Heat ; 1 = Cool) | Read / Write | 0 |
| C5 | (0005)h | Bit | Temperature unit (0 = °C ; 1 = °F) | Read / Write | 0 |
| C6 | (0006)h | Bit | Control outputs active (0 = Control outputs active, 1 = Only display mode) | Read / Write | 0 |
| C7 | (0007)h | Bit | Controlling according to 2nd temperature setpoint (If C7 = 0 is H0, if C7 = 1 is H1) | Read / Write | 0 |
| C8 | (0008)h | Bit | Auto/Manual selection (0 = Automatic "Running mode", 1 = Manual "Running mode". In this mode, output generated according to H39 parameter.) | Read / Write | 0 |
| C9 | (0009)h | Bit | Control format in case of probe failure (0 = H10 proportional control according to percentage value, 1 = Error found before the setpoint control is done with the value of the proportional control) | Read / Write | 0 |

1.3 Memory Map for Input Registers

| Parameter Number | Input Register Addresses Desimal (Hex) | Data Type | Data Content | Read / Write Permission |
|------------------|--|-----------|---|-------------------------|
| I0 | 0000d (0000h) | Word | Measured temperature | Read Only |
| I1 | 0001d (0001h) | Word | Percentage of analog output | Read Only |
| I2 | 0002d (0002h) | Word | Measurement error codes 0 = No error, 1 = Sensor disconnected or broken, 2 = Lower scale error, 3 = Upper scale error, 4 = PT100 short circuit or temperature too low, 5 = Wrong input selection | Read Only |
| I3 | 0003d (0003h) | Word | Self tune condition codes 0 = No error, 1 = Initial temperature is higher than 60% setpoint value, 2 = Calculating PID parameters, 3 = Calculating power set parameters | Read Only |
| I4 | 0004d (0004h) | Word | Current (active) temperature setpoint. | Read Only |
| I5 | 0005d (0005h) | Word | Reserved | Read Only |
| I6 | 0006d (0006h) | Word | Current (active) decimal point value (0 = No decimal point, 1 = 0.0 Decimal point is tenths) | Read Only |

1.4 Memory Map for Software Revision Input Registers

| | | | | |
|---|----------------|---------|--|-----------|
| Software Revision | 61472d (F020h) | 14 Word | Software name and update is read in ASCII format and as 14 word. Sample : ET4420-01 03 Dec 2013. Memory Formats : Word Word Word Word Word Word Word Word Word Word Word Word Word Word Word 1 2 3 4 5 6 7 8 9 10 11 12 13 14 TE44020-1 30DCE210.3 | Read Only |
| NOTE : To view each word correctly by changing the byte sequences should be displayed as ASCII TEXT | | | | |

ENDA ET SERIES PID TEMPERATURE CONTROLLER MODBUS ADDRESS MAP

1.5 Memory Map for Discrete input

| Parametre Numarası | Discrete Input Addresses | Data Type | Data Content | Read / Write Permission |
|--------------------|--------------------------|-----------|--|-------------------------|
| D0 | (0000)h | Bit | C/A2 Control output status (0 = OFF ,1 = ON) | Read Only |
| D1 | (0001)h | Bit | A1 Output status (0 = OFF , 1 = ON) | Read Only |
| D2 | (0002)h | Bit | SSR Output status (0 = OFF ,1 = ON) | Read Only |
| D3 | (0003)h | Bit | Digital input status (0 = OFF ,1 = ON) | Read Only |

2. MODBUS ERROR MESSAGES

Modbus protocol has two types error, communication error and operating error. Reason of the communication error is data corruption in transmission. Parity and CRC control should be done to prevent communication error. Receiver side checks parity and CRC of the data. If they are wrong, the message will be ignored. If format of the data is true but function doesn't perform for any reason, operating error occurs. Slave realizes error and sends error message. Most significant bit of function is changed '1' to indicate error in error message by slave. Error code is sent in data section. Master realizes error type via this message.

ModBus Error Codes

| Error Code | Name | Meaning |
|------------|----------------------|--|
| 01 | ILLEGAL FUNCTION | The function code received in the query is not an allowable action for the slave. If a Poll Program Complete command was issued, this code indicates that no program function preceded it. |
| 02 | ILLEGAL DATA ADDRESS | The data address received in the query is not an allowable address for the slave. |
| 03 | ILLEGAL DATA VALUE | A value contained in the query data field is not an allowable value for the slave. |

Message example;

Structure of command message (Byte Format)

| | |
|-----------------------------|-----------|
| Device Address | (0A)h |
| Function Code | (01)h |
| Beginning address of coils. | MSB (04)h |
| | LSB (A1)h |
| Number of coils (N) | MSB (00)h |
| | LSB (01)h |
| CRC DATA | LSB (AC)h |
| | MSB (63)h |

Structure of response message (Byte Format)

| | |
|----------------|-----------|
| Device Address | (0A)h |
| Function Code | (81)h |
| Error Code | (02)h |
| CRC DATA | LSB (B0)h |
| | MSB (53)h |

As you see in command message, coil information of (4A1)h = 1185 is required but there isn't any coil with 1185 address. Therefore error code with number (02) (Illegal Data Address) sends.

