



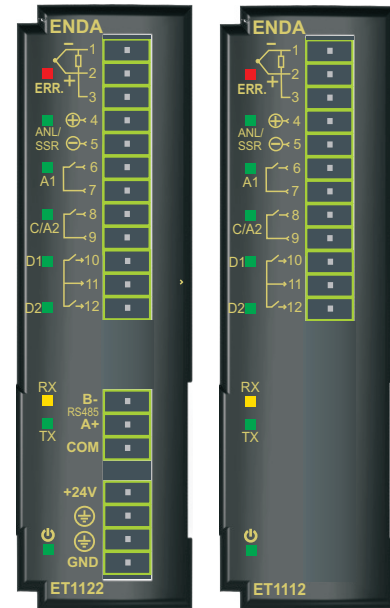
Read this document carefully before using this device. The guarantee will be expired by damaging of the device if you don't attend to the directions in the user manual. Also we don't accept any compensations for personal injury, material damage or capital disadvantages.

ENDA ET1122 (MASTER) DIN RAIL MOUNTING PID UNIVERSAL STEP CONTROLLER

Thank you for choosing ENDA ET1122 PID universal step controller.

GENERAL FEATURES

- * DIN rail mounting box.
- * Selectable dual-set value.
- * Selectable PT100, J, K, L, T, S, R sensor typeS.
- * Selectable 0-20mA, 4-20mA, 0-10V, 2-10V, 0-25mV and 0-50mV input.
- * Programmable D1 and D2 digital contact input.
- * **Automatic calculation of PID parameters (SELF TUNE).**
- ⚠ **Selftune for automatic PID calculation or manually enter PID parameters if known.**
- * Control outputs can be cancelled. (To use for measurement purposes).
- * Possible to control C/A2 or ANL/SSR outputs manually.
- * Soft-Start.
- * Communication via RS-485 ModBus protocol.
- * Programmable and firmware update via ModBus.
- * Selectable analog, SSR or relay control output.
- * Selectable 0-20mA, 4-20mA, 0-10V and 2-10V analog control output.
- * C/A2 Relay output can be programmed as secondary alarm or control output.
- * A1 relay output can be programmed as PID cooling or Primary alarm output.
- * Selectable Heating/Cooling control.
- * Zero point input shift (Offset feature for input)
- * In the case of sensor failure, periodical running or relay state selection.
- * Up to 7 slave devices can be connected simultaneously.
- * Profile control up to 16 steps.
- * On-demand relay output at profile steps.
- * Timer and thermostat feature can be used in profile control mode.
- * CE marked according to European Norms.



**RoHS
Compliant**

ENVIRONMENTAL CONDITIONS

Ambient/storage temperature	0 ... +50°C/-25... +70°C (with no icing)
Max. Relative humidity	80% Relative humidity for temperatures up to 31°C, decreasing linearly to 50% at 40°C.
Protection rating	According to EN 60529 Ip20
Height	Max. 2000m

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

ELECTRICAL CHARACTERISTICS

Supply	24V DC \pm 2%
Power consumption	Max. 5VA
Wiring	1.5mm ² screw-terminal connections
Line resistance	For thermocouple max.100ohm, for 3 wired PT100 max. 20ohm
Data retention	EEPROM (minimum 10 years)
EMC	EN 61326-1: 2012 (Performance criterion B for standard EN 61000-4-3)
Safety requirements	EN 61010-1: 2010 (Pollution degree 2, overvoltage category II)

INPUTS

D1 Input	Programmable 1st. input control button.
D2 Input	Programmable 2nd. input control button.

OUTPUTS

C/A2	Relay : 250V AC, 2A (for resistive load), N.O. or Alarm2 Selectable as Control or Alarm2 output.
A1	Relay : 250V AC, 2A (for resistive load), NO/NC selectable. (Alarm1 output).
ANL/SSR	0-20mA, 4-20mA, 0-10V, 2-10V analog output and selectable as SSR. Max. load resistance 600 ohms for mA output and SSR mode. Source resistance 500 ohms for V output.
Life expectancy for relay	Mechanical 10.000.000 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	14 bits
Sampling time	100ms (minimum)
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	Rail - mounted box according to DIN 43 700.
Dimensions	W29xH90xD64mm
Weight	Approx. 200g (after packing)
Enclosure material	Self extinguishing plastics used.

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



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ET1122-E-01-150618

TECHNICAL SPECIFICATIONS

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
0-20mA input	-10000...+10000 (max. scale range 10000)		± 0,2% (of full scale) ± 1 Digit
4-20mA input	-10000...+10000 (max. scale range 10000)		± 0,2% (of full scale) ± 1 Digit
0-10V input	-10000...+10000 (max. scale range 10000)		± 0,2% (of full scale) ± 1 Digit
2-10V input	-10000...+10000 (max. scale range 10000)		± 0,2% (of full scale) ± 1 Digit
0-25mV input	-10000...+10000 (max. scale range 10000)		± 0,2% (of full scale) ± 1 Digit
0-50mV input	-10000...+10000 (max. scale range 10000)		± 0,2% (of full scale) ± 1 Digit

CONNECTION DIAGRAM



ENDA ET1122 and ET1112 is intended for installation within 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 electrical power. The device must be protected against inadmissible humidity, vibrations, severe soiling. 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 out 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.



Equipment is protected throughout by DOUBLE INSULATION.

Holding screw
0.4-0.5Nm

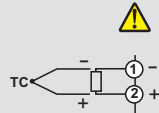


RoHS
Compliant

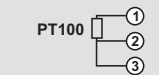
SENSOR INPUT



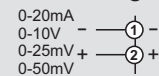
For J-K-T-S-R Type Thermocouples :
Use the correct compensation cables for thermocouples. Do not use jointed cables. Make sure to connect to the right place and right polarities at the input terminals as shown in the figure.



For Resistance Thermometer :
When 2 wired PT100 is used, terminals 2 and 3 must be short circuited.



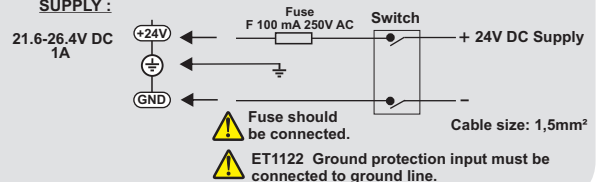
For 0-20mA, 4-20mA, 0-10V, 2-10V, 0-25mV and 0-50mV Inputs :
Make sure to connect to the right place and right polarities at the input terminals as shown in the figure.



D1 and D2 Function Button Inputs :
Mechanical switch must be used.



NOTE : SUPPLY :



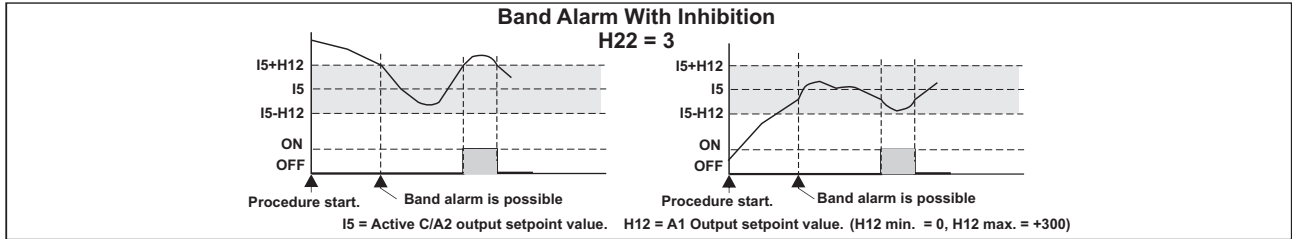
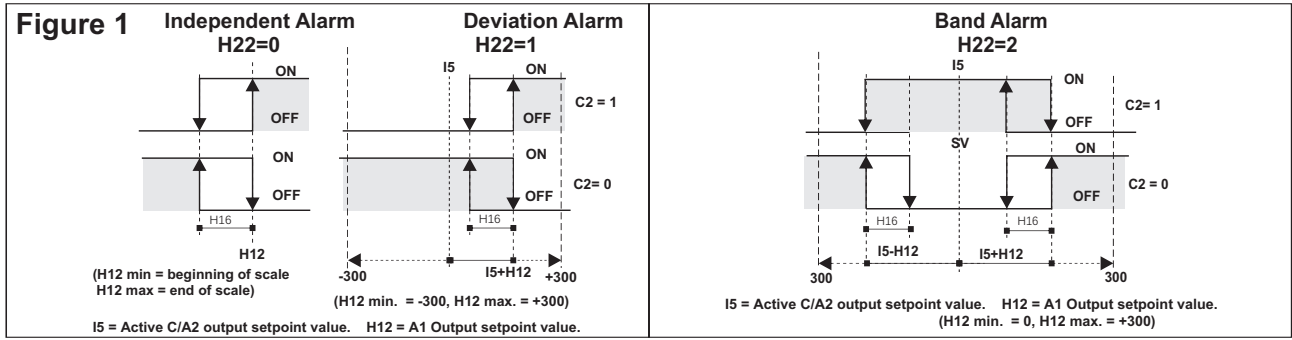
Order Code : ET1122 (Master)
ET1112 (Slave)



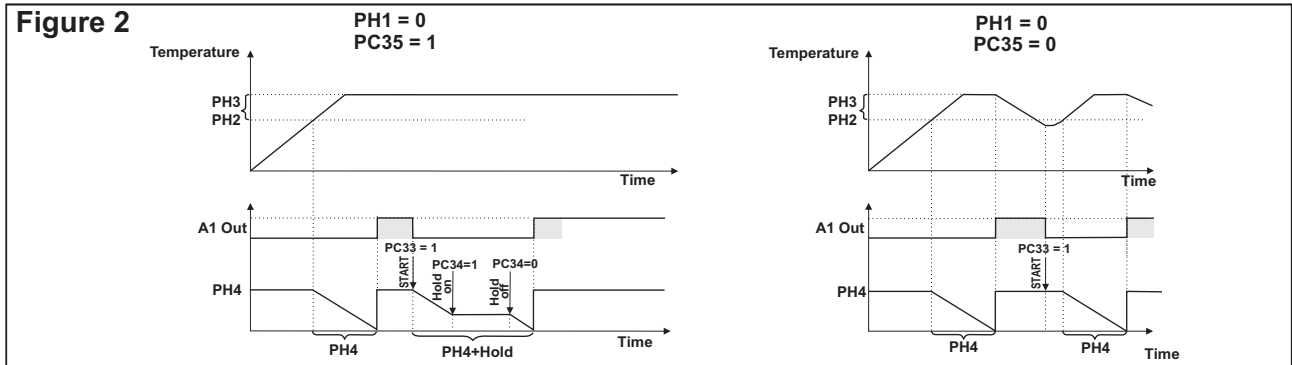
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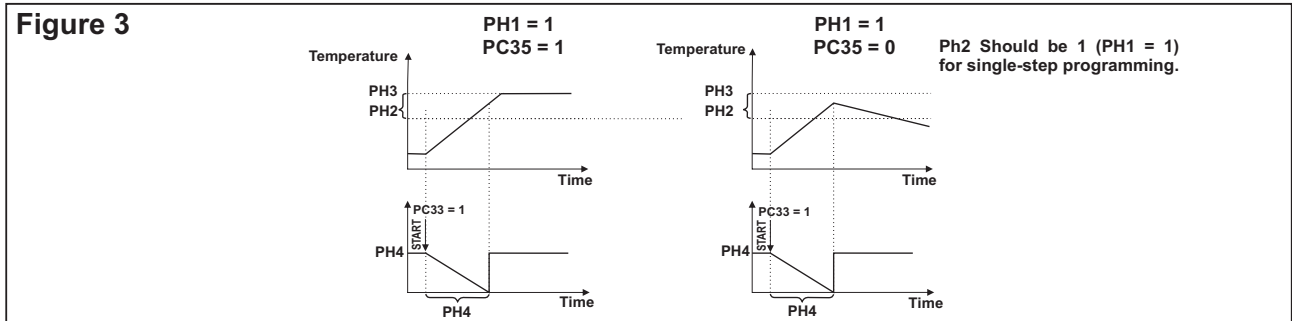
ALARM1 AND ALARM2 OUTPUT TYPES (Diagrams are shown for Alarm1)



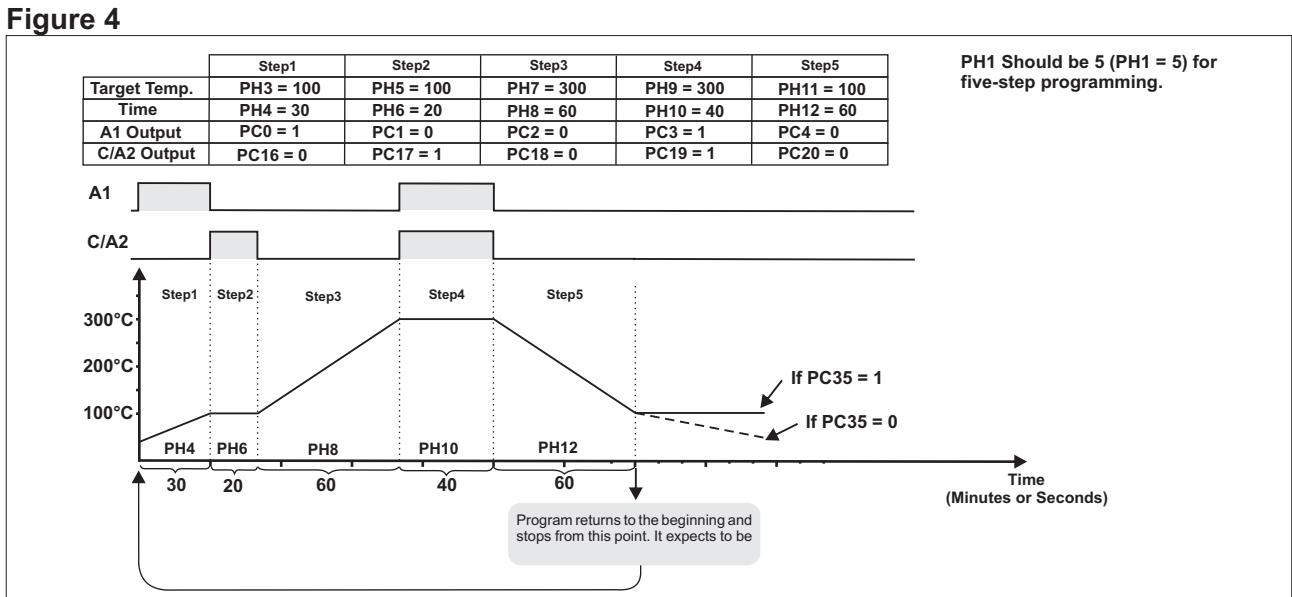
TIMER / THERMOSTAT OUTPUT SAMPLES



PROFILE CONTROL OUTPUT SAMPLES



MULTI-STEP PROFILE CONTROL OUTPUT SAMPLES



ENDA ET1122 (MASTER) and ET1112 (SLAVE) PID UNIVERSAL STEP CONTROLLER MODBUS ADDRESS MAP

1.1 Memory Map for Thermostat Holding Registers

Parameter Number	Holding Register addresses Decimal (Hex)	Data type	Data content	Read / Write Permission	Factory defaults	
Control Output Parameters	H0	0000d (0000h)	Word	Control output, temperature set value.	R W	400
	H1	0001d (0001h)	Word	Control output, second temperature set value.	R W	500
	H2	0002d (0002h)	Word	Control output, minimum set value limit.	R W	0
	H3	0003d (0003h)	Word	Control output, maximum set value limit.	R W	600
	H4	0004d (0004h)	Word	Control output, proportional band set value (Adjustable between 0% - 100%).	R W	4.0
	H5	0005d (0005h)	Word	Control output, hysteresis value (Adjustable 1 - 50 °C/°F.).	R W	2
	H6	0006d (0006h)	Word	Control output, integral time value (Adjustable between 0.1 - 100.0 min.).	R W	4.0
	H7	0007d (0007h)	Word	Control output, derivative time (Adjustable between 0.01 - 25.00 min.).	R W	1.00
	H8	0008d (0008h)	Word	Control output, period time set value (Adjustable between 1 - 250 sec.).	R W	1
	H9	0009d (0009h)	Word	Energy value of the control output set value (Adjustable between 0% - 100%).	R W	0
	H10	0010d (000Ah)	Word	Control output energy percentage value in case of sensor failure (Adjustable between 0% - 100%).	R W	0
A1 Output Parameters	H11	0011d (000Bh)	Word	Soft start time for control output (Adjustable between 1 - 250 sec.).	R W	0
	H12	0012d (000Ch)	Word	Alarm1 output, temperature set value.	R W	500
	H13	0013d (000Dh)	Word	Alarm1 output, minimum set value limit.	R W	0
	H14	0014d (000Eh)	Word	Alarm1 output, maximum set value limit.	R W	600
	H15	0015d (000Fh)	Word	Alarm1 output, proportional band set value (Adjustable between 0.0 % - 100.0 %).	R W	0.0
	H16	0016d (0010h)	Word	Hysteresis value of the Alarm1 output (Adjustable between 1 - 50 °C/°F).	R W	2
	H17	0017d (0011h)	Word	Integral time value of the Alarm1 output (Adjustable between 0.1 - 100.0 min.).	R W	0.0
	H18	0018d (0012h)	Word	Derivative time value of the Alarm1 output (Adjustable between 0.01 - 25.00 min.).	R W	0.0
	H19	0019d (0013h)	Word	Period time value of the Alarm1 output (Adjustable between 1 - 250 sec.).	R W	1
	H20	0020d (0014h)	Word	Energy value of the Alarm1 output set value (Adjustable between 0%-100%).	R W	0
	H21	0021d (0015h)	Word	Alarm1 output energy percentage value in case of sensor failure (Adjustable between 0% - 100%).	R W	0
	H22	0022d (0016h)	Word	Alarm1 output type selection. 0 = Independent alarm. 1 = Deviation alarm. 2 = Band alarm. 3 = Band activity alarm after the entering into bandwidth. 4 = Independent cooling control selection for Alarm1 output. 5 = Dependent to Alarm1 output setpoint value, cooling control.	R W	0
A2 Output Parameters	H23	0023d (0017h)	Word	Alarm2 output, temperature set value.	R W	500
	H24	0024d (0018h)	Word	Alarm2 output, minimum set value limit.	R W	0
	H25	0025d (0019h)	Word	Alarm2 output, maximum set value limit.	R W	600
	H26	0026d (001Ah)	Word	Alarm2 output, hysteresis value (Adjustable between 1 and 50 °C/°F).	R W	2
	H27	0027d (001Bh)	Word	Alarm2 output type selection. 0 = Independent alarm. 1 = Deviation alarm. 2 = Band alarm. 3 = Band activity alarm after the entering into bandwidth.	R W	0
Configuration Parameters	H28	0028d (001Ch)	Word	Input Selections : 0 = PT100 (Decimal) 1 = PT100, 2 = J (Decimal) 3 = J, 4 = K (Decimal) 5 = K, 6 = L (Decimal) 7 = L, 8 = T (Decimal) 9 = T, 10 = S, 11 = R, 12 = 0-20mA, 13 = 4-20mA, 14 = 0-10V, 15 = 2-10V, 16 = 0-30mV, 17 = 0-60mV	R W	3
	H29	0029d (001Dh)	Word	Device address value for Modbus (Adjustable between 1-247.) (Only valid for master device).	R W	1
	H30	0030d (001Eh)	Word	Modbus communication rates: 0 = 1200 bps, 1 = 2400 bps, 2 = 4800 bps, 3 = 9600 bps, 4 = 14400 bps, 5 = 19200 bps, 6 = 38400 bps, 7 = 57600 bps	R W	3
	H31	0031d (001Fh)	Word	Digital filter coefficient (Adjustable between 1-100. If digital filter coefficient is 1,digital filter disabled).	R W	20
	H32	0032d (0020h)	Word	Control output selection value : If 0 = C/A2 output is control output, If 1 = SSR/ANL output is SSR output, If 2 = SSR/ANL output is 0-20mA output, If 3 = SSR/ANL output is 4-20mA output.	R W	0
	H33	0033d (0021h)	Word	Minimum percentage of analog output value.	R W	0

IMPORTANT ! : In order to access to slave registers, the "Slave_Number" X 1000 (03E8H) offset is added.

EXAMPLE : Slave number is 2, the filter coefficient parameter address is H32 .

2. Slave filter coefficient address is 2X1000+31=2031



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ENDA ET1122 (MASTER) and ET1112 (SLAVE) PID UNIVERSAL STEP CONTROLLER MODBUS ADDRESS MAP

1.1 Memory Map for Thermostat Holding Registers (continue)

Parameter Number	Holding Register addresses Decimal (Hex)	Data type	Data content	Read / Write Permission	Factory defaults																																
H34	0034d (0022h)	Word	Maximum percentage of analog output value.	R W	100																																
H35	0035d (0023h)	Word	Offset value (Zero point input shift).	R W	0																																
H36	0036d (0024h)	Word	Function control parameters. (If 23040d (5A00h) value is entered, self tune is stopped.) (If 23041d (5A01h) value is entered, self tune is started.) (If 23042d (5A02h) value is entered, H1...H41 and C0...C8 parameters returns to the factory defaults.) (If 23043d (5A03h) value is entered, PH0...PH37 and PC0...PC38 parameters returns to the factory defaults.)	R W	0																																
H37	0037d (0025h)	Word	Not used.	R W	X																																
H38	0038d (0026h)	Word	Not used.	R W	X																																
H39	0039d (0027h)	Word	Manual output percent value (Adjustable between 0% and %100.)	R W	50																																
H40	0040d (0028h)	Word	D1 digital contact input control parameters : If 0, D1 input is not used. If 1 and D1 input is OFF = H0. If 1, D1 input is ON, H2 parameter is used as control set value. If 2 and D1 input is OFF = Auto control. If ON, manual control. If 3 and D1 input is OFF = Thermostat. If ON, indicator mode is entered. If 4 and D1 input is OFF = Profile Start. If ON, Profile Stop. If 5 and D1 input is OFF = Hold OFF. If ON, Hold ON.	R W	0																																
H41	0041d (0029h)	Word	D2 digital contact input control parameters : If 0, D2 input is not used. If 1 and D2 input is OFF = H0. If 1, D2 input is ON, H2 parameter is used as control set value. If 2 and D2 input is OFF = Auto control. If ON, manual control. If 3 and D2 input is OFF = Thermostat. If ON, indicator mode is entered. If 4 and D2 input is OFF = Profile Start. If ON, Profile Stop. If 5 and D2 input is OFF = Hold OFF. If ON, Hold ON.	R W	0																																
H42	0042d (002Ah)	Word	Retransmission output control parameters : If 0, Retransmission output is OFF. If 1, Analog output is 0-20mA Retransmission out. If 2, Analog output is 4-20mA Retransmission out. If 3, Analog output is 0-10V Retransmission out. If 4, Analog output is 2-10V Retransmission out.	R W	0																																
H43	0043d (002Bh)	Word	Retransmission output lower scale value.	R W	0																																
H44	0044d (002Ch)	Word	Retransmission output upper scale value.	R W	600																																
H45	0045d (002Dh)	Word	Decimal point settings for mA, V inputs.	R W	0																																
H46	0046d (002Eh)	Word	User lower scale limit for 0-20mA, 4-20mA, 0-10V and 2-10V input selections.	R W	0																																
H47	0047d (002Fh)	Word	User upper scale limit for 0-20mA, 4-20mA, 0-10V and 2-10V input selections.	R W	10000																																
H48	0048d (0030h)	Word	Not used.	R W	X																																
H49	0049d (0031h)	Word	Not used.	R W	X																																
H50	0050d (0032h)	Word	Not used.	R W	X																																
H51	0051d (0033h)	Word	Configuration registers (Holding registers for C1 - C9 configuration coils). <table border="1" style="margin: 5px auto; border-collapse: collapse;"> <tr> <td>B15</td><td>B14</td><td>B13</td><td>B12</td><td>B11</td><td>B10</td><td>B9</td><td>B8</td><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td> </tr> <tr> <td>C7</td><td>C6</td><td>C5</td><td>C4</td><td>C3</td><td>C2</td><td>C1</td><td>C0</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>C9</td><td>C8</td> </tr> </table> See instructions on chapter 1.3 coil descriptions for the meaning of bits	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0	C7	C6	C5	C4	C3	C2	C1	C0	-	-	-	-	-	-	C9	C8	R W	0
B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0																						
C7	C6	C5	C4	C3	C2	C1	C0	-	-	-	-	-	-	C9	C8																						

IMPORTANT ! : In order to access to slave registers, the "Slave_Number" X 1000 (03E8H) offset is added.
EXAMPLE : Slave number is 3, the filter coefficient value (numbered of PH32 parameter) to read 3 x 1000 = 3000 offset, Filter coefficient by adding to the 102 3rd. Slave's Filter coefficient address is found as of 3102 (0BB8h).
 For 1st. slave this address is found as of (1 x 1000) + 102 = 1102 (04Eh).

ENDA ET1122 (MASTER) and ET1112 (SLAVE) PID UNIVERSAL STEP CONTROLLER MODBUS ADDRESS MAP

1.2 Memory Map for Step Control Holding Registers

Parameter Number	Holding Register addresses Decimal (Hex)	Data type	Data content	Read / Write Permission	Factory defaults																																
PH0	0100d (0064h)	Word	Profile time base set value. (0 = 0000sec, 1 = 00m59sec, 2 = 0000min., 3 = 99m59sec)	R W	0																																
PH1	0101d (0065h)	Word	Maximum number of steps (Adjustable between 0 and 16. If it is 0, in timer/thermostat mode).	R W	0																																
PH2	0102d (0066h)	Word	Temperature differences of step end, can be set between 0 and H3 parameters. (During in profile control, when the target temperature is reached, step time runs out, the differences between the target temperature, the measured temperature is equal to or less than the value of this parameter is pending, so the next step is started. If H43 = 0, the difference between the target temperature and the measured value is less than or equal to this parameter, the timer runs. Please see Figure 2).	R W	0																																
PH3	0103d (0067h)	Word	1st. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH4	0104d (0068h)	Word	1st. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH5	0105d (0069h)	Word	2nd. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH6	0106d (006Ah)	Word	2nd. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH7	0107d (006Bh)	Word	3rd. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH8	0108d (006Ch)	Word	3rd. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH9	0109d (006Dh)	Word	4th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH10	0110d (006Eh)	Word	4th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH11	0111d (006Fh)	Word	5th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH12	0112d (0070h)	Word	5th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH13	0113d (0071h)	Word	6th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH14	0114d (0072h)	Word	6th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH15	0115d (0073h)	Word	7th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH16	0116d (0074h)	Word	7th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH17	0117d (0075h)	Word	8th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH18	0118d (0076h)	Word	8th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH19	0119d (0077h)	Word	9th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH20	0120d (0078h)	Word	9th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH21	0121d (0079h)	Word	10th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH22	0122d (007Ah)	Word	10th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH23	0123d (007Bh)	Word	11th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH24	0124d (007Ch)	Word	11th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH25	0125d (007Dh)	Word	12th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH26	0126d (007Eh)	Word	12th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH27	0127d (007Fh)	Word	13th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH28	0128d (0080h)	Word	13th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH29	0129d (0081h)	Word	14th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH30	0130d (0082h)	Word	14th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH31	0131d (0083h)	Word	15th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH32	0132d (0084h)	Word	15th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH33	0133d (0085h)	Word	16th. Step, set value of target temperature (Parameter set between H2 and H3)	R W	200																																
PH34	0134d (0086h)	Word	16th. Step, time value (In BCD format can be set between 0 and 99m 59s (varies according to H42 parameter))	R W	0																																
PH35	0135d (0087h)	Word	AL1 output control bits in steps <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td>B15</td><td>B14</td><td>B13</td><td>B12</td><td>B11</td><td>B10</td><td>B9</td><td>B8</td><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td> </tr> <tr> <td>PC7</td><td>PC6</td><td>PC5</td><td>PC4</td><td>PC3</td><td>PC2</td><td>PC1</td><td>PC0</td><td>PC15</td><td>PC14</td><td>PC13</td><td>PC12</td><td>PC11</td><td>PC10</td><td>PC9</td><td>PC8</td> </tr> </table> Step Number : 8 7 6 5 4 3 2 1 16 15 14 13 12 11 10 9 Please see description in chapter 1.4 for the meaning of bits coil.	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0	PC7	PC6	PC5	PC4	PC3	PC2	PC1	PC0	PC15	PC14	PC13	PC12	PC11	PC10	PC9	PC8	R W	0
B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0																						
PC7	PC6	PC5	PC4	PC3	PC2	PC1	PC0	PC15	PC14	PC13	PC12	PC11	PC10	PC9	PC8																						
PH36	0136d (0088h)	Word	AL2 output control bits in steps <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td>B15</td><td>B14</td><td>B13</td><td>B12</td><td>B11</td><td>B10</td><td>B9</td><td>B8</td><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td> </tr> <tr> <td>PC23</td><td>PC22</td><td>PC21</td><td>PC20</td><td>PC19</td><td>PC18</td><td>PC17</td><td>PC16</td><td>PC31</td><td>PC30</td><td>PC29</td><td>PC28</td><td>PC27</td><td>PC26</td><td>PC25</td><td>PC24</td> </tr> </table> Step Number : 8 7 6 5 4 3 2 1 16 15 14 13 12 11 10 9 Please see description in chapter 1.4 for the meaning of bits coil	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0	PC23	PC22	PC21	PC20	PC19	PC18	PC17	PC16	PC31	PC30	PC29	PC28	PC27	PC26	PC25	PC24	R W	0
B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0																						
PC23	PC22	PC21	PC20	PC19	PC18	PC17	PC16	PC31	PC30	PC29	PC28	PC27	PC26	PC25	PC24																						
PH37	0137d (0089h)	Word	Step control parameter (Holding register of PC33-PC39 step control coils). <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td>B15</td><td>B14</td><td>B13</td><td>B12</td><td>B11</td><td>B10</td><td>B9</td><td>B8</td><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td> </tr> <tr> <td>PC38</td><td>PC37</td><td>PC36</td><td>PC35</td><td>PC34</td><td>PC33</td><td>PC32</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table> Please see description in chapter 1.4 for the meaning of bits coil.	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0	PC38	PC37	PC36	PC35	PC34	PC33	PC32										R W	0
B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0																						
PC38	PC37	PC36	PC35	PC34	PC33	PC32																															

IMPORTANT ! : In order to access to slave registers, the "Slave_Number" X 1000 (03E8h) offset is added.
EXAMPLE : Slave number is 3, the filter coefficient value (numbered of PH32 parameter) to read 3 x 1000 = 3000 offset, Filter coefficient by adding to the 102 3rd. Slave's Filter coefficient address is found as of 3102 (0BB8h).
 For 1st. slave this address is found as of (1 x 1000) + 102 = 1102 (04Eh).



ENDA ET1122 (MASTER) and ET1112 (SLAVE) PID UNIVERSAL STEP CONTROLLER MODBUS ADDRESS MAP

1.3 Memory Map for Control Coils

Parameter Number	Coil Addresses Decimal (Hex)	Data type	Data content	Read / Write Permission	Factory defaults
C0	0000d (0000h)	Bit	Alarm2 Settings (0 = If Process value lower than set value, alarm is ON. 1 = If Process value higher than set value, alarm is ON.)	R W	1
C1	0001d (0001h)	Bit	Task for Alarm2 output in the case of sensor failure (0 = OFF , 1 = ON).	R W	0
C2	0002d (0002h)	Bit	Alarm1 Settings (0 = If Process value lower than set value, alarm is ON. 1 = If Process value higher than set value, alarm is ON.)	R W	1
C3	0003d (0003h)	Bit	Task for Alarm1 output in the case of sensor failure (0 = OFF , 1 = ON).	R W	0
C4	0004d (0004h)	Bit	Control output configuration (0 = Heating ; 1 = Cooling).	R W	0
C5	0005d (0005h)	Bit	Temperature unit (0 = °C ; 1 = °F)	R W	0
C6	0006d (0006h)	Bit	Control outputs (0 = Indicator mode (Outputs OFF), 1 = Control outputs active)	R W	1
C7	0007d (0007h)	Bit	According to the second set value control (If C7 = 0, H0. If C7 = 1, Temperature control is performed according to the H1 parameters).	R W	0
C8	0008d (0008h)	Bit	Manual control bit (If C8 = 0, Automatic control ; If C8 = 1, according to H9 parameter output percentage value for C/A2 or ANL/SSR output).	R W	0
C9	0009d (0009h)	Bit	Control selection bit incase of probe error. (If C9 = 0, according to H10 parameter output percentage value incase of probe error. If C9 = 1, according to latest proportional output set value	R W	0

1.4 Memory Map for Step Control Coils

Parameter Number	Coil Addresses Decimal (Hex)	Data type	Data content	Read / Write Permission	Factory defaults
PC0-PC15	0100d (0064h) 0115d (0073h)	Bit	A1 alarm output programming coils at profile steps. If PC0 = 1, A1 output is ON at first step. If PC15 = 1, A1 output is ON at 16th step.	R W	0
PC16-PC31	0116d (0074h) 0131d (0083h)	Bit	C/A2 alarm output programming coils at profile steps. If PC16 = 1, C/A2 output is ON at first step. If PC31 = 1, C/A2 output is ON at 16th step.	R W	0
PC32	0132d (0084h)	Bit	Controlled according to the set value or Profile control selection. (If PC32 = 0, Thermostat mode. If PC32 = 1, Profile control mode.	R W	0
PC33	0133d (0085h)	Bit	If PC33 = 0, Profile mode is stopped and returned to first step. If PC33 = 1, Profile mode is started.	R W	0
PC34	0134d (0086h)	Bit	If PC34 = 0 and if Profile mode is started, process runs. If PC34 = 1, profile operation is suspended at the recent point. (Hold mode).	R W	0
PC35	0135d (0087h)	Bit	If PC35 = 0, when profile finished, control process stops. (Control outputs are OFF). If PC35 = 1, when profile finished, control process continues according to last set value.	R W	0
PC36	0136d (0088h)	Bit	If PC36 = 0, when power loss, profile stops and returned to first step. If PC36 = 1, when power up and if temperature setpoint in the current step, Profile continues. If the temperature setpoint is not in the current step, returned to first step.	R W	0
PC37	0137d (0089h)	Bit	If PC37 = 0, A1 output is controlled by according to H22 parameter. If PC37 = 1 and PC32 = 1, A1 output is controlled by according to PH35 parameter for every steps.	R W	0
PC38	0138d (008Ah)	Bit	If PC38 = 0, A2 output is controlled by according to H27 parameter. If PC38 = 1 and PC32 = 1, C/A2 output is controlled by according to PH36 parameter for every steps	R W	0

1.5 Memory Map for Input Registerlers

Parameter Number	Input Register Addresses Decimal (Hex)	Data type	Data content	Read / Write Permission																																
I0	0000d (0000h)	Word	Measured temperature.	R																																
I1	0001d (0001h)	Word	Analog output percentage.	R																																
I2	0002d (0002h)	Word	Measurement notifications. 0 = No error, 1 = Sensor error (Broken or not connected), 2 = Lower scale error, 3 = Upper scale error, 4 = PT100 short circuited or temperature is too low, 5 = Input selection error.	R																																
I3	0003d (0003h)	Word	Self tune notifications. 0 = No error, 1 = Initial temperature range is higher than 60% of the setpoint, 2 = PID parameters calculating, 3 = Power set parameters calculating.	R																																
I4	0004d (0004h)	Word	In Master, indicates the number of Slaves connected to the Master, In Slave, indicates the Slave's number.	R																																
I5	0005d (0005h)	Word	Active temperature setpoint value.	R																																
I6	0006d (0006h)	Word	Output status indicator input registers (D0-D4 output status indicator bits of holding registers) <div style="text-align: center;"> <table border="1" style="border-collapse: collapse; margin: auto;"> <tr> <td>B15</td><td>B14</td><td>B13</td><td>B12</td><td>B11</td><td>B10</td><td>B9</td><td>B8</td><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td> </tr> <tr> <td>—</td><td>—</td><td>—</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td> </tr> </table> </div> Please see description in chapter 1.7 for the meaning of discrete input bits.	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0	—	—	—	D4	D3	D2	D1	D0	—	—	—	—	—	—	—	—	R
B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0																					
—	—	—	D4	D3	D2	D1	D0	—	—	—	—	—	—	—	—																					

1.6 Memory Map for Step Control Input Registers

Parameter Number	Input Register Addresses Decimal (Hex)	Data type	Data content	Read / Write Permission																																
PI0	0100d (0064h)	Word	Parameter number of active step.	R																																
PI1	0101d (0065h)	Word	Remaining time indication of the active step.	R																																
PI2	0102d (0066h)	Word	Target temperature of the active step.	R																																
PI3	0102d (0067h)	Word	Step control status indicator input registers (D0-D5 Step control status indicator bits of holding registers) <div style="text-align: center;"> <table border="1" style="border-collapse: collapse; margin: auto;"> <tr> <td>B15</td><td>B14</td><td>B13</td><td>B12</td><td>B11</td><td>B10</td><td>B9</td><td>B8</td><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td> </tr> <tr> <td>—</td><td>—</td><td>—</td><td>PD5</td><td>PD4</td><td>PD3</td><td>PD2</td><td>PD1</td><td>PD0</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td> </tr> </table> </div> Please see description in chapter 1.8 for the meaning of discrete input bits.	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0	—	—	—	PD5	PD4	PD3	PD2	PD1	PD0	—	—	—	—	—	—	—	R
B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0																					
—	—	—	PD5	PD4	PD3	PD2	PD1	PD0	—	—	—	—	—	—	—																					

IMPORTANT ! : In order to access to slave registers, the "Slave_Number" X 1000 (03E8H) offset is added.

EXAMPLE : Slave number is 3, the filter coefficient value (numbered of PH32 parameter) to read 3 x 1000 = 3000 offset, Filter coefficient by adding to the 102 3rd. Slave's Filter coefficient address is found as of 3102 (0BB8h).

For 1st. slave this address is found as of (1 x 1000) + 102 = 1102 (04Eh).



ENDA ET1122 (MASTER) and ET1112 (SLAVE) PID UNIVERSAL STEP CONTROLLER MODBUS ADDRESS MAP

1.7 Memory Map for Output Status Indicator Bits

Parameter Number	Discrete input addresses	Data type	Data content	Read / Write Permission
D0	(0000)h	Bit	C/A2 Control output settings (0 = OFF ,1 = ON)	R
D1	(0001)h	Bit	A1 output settings (0 = OFF , 1 = ON)	R
D2	(0002)h	Bit	SSR Output settings (0 = OFF ,1 = ON)	R
D3	(0003)h	Bit	D1 Digital input settings (0 = OFF ,1 = ON)	R
D4	(0004)h	Bit	D2 Digital input settings (0 = OFF ,1 = ON)	R

1.8 Memory Map for Step Control Status Indicators Bits

Parameter Number	Discrete input addresses	Data type	Data content	Read / Write Permission
PD0	0100d (0064h)	Bit	If PD0 = 1, Profile is in constant temperature step.	R
PD1	0101d (0065h)	Bit	If PD1 = 1, Profile is in heating step.	R
PD2	0102d (0066h)	Bit	If PD2 = 1, Profile is in cooling step.	R
PD3	0103d (0067h)	Bit	If PD3 = 1, Profile ended.	R
PD4	0104d (0068h)	Bit	If PD4 = 1, Step timer is 0.	R
PD5	0105d (0069h)	Bit	If Pd5 = 1, Step timer is running.	R

1.9 Memory Map for Software Revision Input Registers

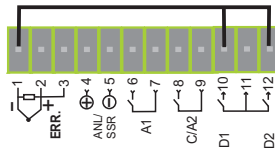
Software revizyon	0920d (0398h)	14 Word	Software name and update date is in ASCII format and 14 word. Example : ET1122-01 09 Feb 2014. Memory Format : Word Word Word Word Word Word Word Word Word Word Word Word Word Word Word 1 2 3 4 5 6 7 8 9 10 11 12 13 14 T E 1 1 2 2 0 - 1 9 0 F b e 2 1 0 . 4	R
NOTE : To view each word correctly by changing the byte sequences should be displayed as ASCII TEXT				



RETURNING TO FACTORY SETTINGS :

In case of communication can not be done or any other reason, may be needed to return to the hardware factory values. In this case, (10), (12) and (1) inputs are short-circuited. Then, power up the device and wait for 2 seconds, devices will have been restored to factory settings.

Hardware connection schema for Factory Settings



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.