



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 disadvantages.

# ENDA EM SERIES DIGITAL TIMER

Thank you for choosing ENDA EM Series Digital Timer.

- ▶ 48x48mm and 72x72mm sized.
- ▶ 2x4 line display.
- ▶ Easy to use .
- ▶ 9 Level time intervals. (Between 0-99.99sec. and 0-9999 hours).
- ▶ Sensor type selection (PNP, NPN).
- ▶ Up/Down counting selection.
- ▶ Adjustable input signal, pulse and void duration.
- ▶ With/Without memory operating feature.
- ▶ 14 Different output mode.
- ▶ Two N.O. contact outputs and two NPN 50mA current limited SSR outputs.
- ▶ Adjustable display brightness.
- ▶ Security access levels for parameters.
- ▶ Easy installation and service operations with terminal plug-in connectors.
- ▶ RS485 Modbus communication input. (Specify at order).
- ▶ CE marked according to European Norms.



Order Code : EM <input type="text"/> <input type="text"/> 0 <input type="text"/> 1 - <input type="text"/> - <input type="text"/> <input type="text"/>		
1	2	3
<b>1 - Size</b> 4401.....48x48x87mm 7701.....72x72x97mm	<b>2 - Supply Voltage</b> UV...90-250V AC LV.....10-30V DC / 8-24V AC	<b>3 - Modbus (Optional)</b> RS ....RS-485 <b>(Specify at order)</b>

R<sup>o</sup>HS  
Compliant

## TECHNICAL SPECIFICATIONS

### ENVIRONMENTAL CONDITIONS

<b>Ambient / Storage Temperature</b>	0 ... +50 / ° C -25... +70°C
<b>Relative Humidity</b>	Max. humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.
<b>Protection Class</b>	According to EN60529; Front panel: IP65 Rear panel : IP20
<b>Height</b>	Max. 2000m

**KEEP AWAY device from exposed to corrosive, volatile and flammable gases or liquids and DO NOT USE the device in similar hazardous locations.**

### ELECTRICAL CHARACTERISTICS

<b>Supply</b>	90-250V AC 50/60Hz ;10-30V DC / 8-24V AC SMPS
<b>Power Consumption</b>	Max. 5VA
<b>Wiring</b>	2.5mm <sup>2</sup> Screw-terminal power connection, 1,5mm <sup>2</sup> Terminal plug-in signal connection.
<b>Date Retention</b>	EEPROM (Min. 10 years)
<b>EMC</b>	EN 61326-1: 2013 (Performance criterion B is satisfied for EN 61000-4-3)
<b>Safety Requirements</b>	EN 61010-1: 2010 (Pollution degree 2, overvoltage category II)

### INPUTS

<b>Start, Gate, Reset input</b>	Input types can be adjusted as PNP or NPN in "Programming Mode". Minimum pulse and void duration times can be adjusted between 5 and 100ms. Active level is between 4V and 30V pulse in PNP inputs, Active level is between 0V and 2V in NPN inputs.
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### OUTPUTS

<b>Control Output OUT1,OUT2</b>	<b>EM4401</b> : <b>OUT1</b> ; 250V AC, 10A (for resistive load), NO+NC. <b>OUT2</b> : 250V AC, 5A (for resistive load), NO.
<b>SSR1, SSR2 Output</b>	<b>EM7701</b> : <b>OUT1, OUT2</b> ; 250V AC, 8A (for resistive load), NO+NC
<b>Auxiliary Power Supply</b>	Open collector output (S.S. OUT) : Max. 30V DC, 50mA.
<b>Life Expectancy for Relay</b>	12V DC, max. 50mA (without regulation).
<b>Accuracy</b>	5.000.000 Switching for no-load operation; 100.000 switching for 5A resistive load at 250VAC. 30.000.000 Switching for no-load operation; 300.000 switching for 8A resistive load at 250VAC. 30.000.000 Switching for no-load operation; 100.000 switching for 10A resistive load at 250VAC.
<b>Accuracy</b>	±0.01% ±1ms

**Note :**  
Relay and S.S.OUT outputs run simultaneously. ie, when the OUT 1 or OUT2 relay is energized, the SSR1 or SSR2 transistor also turns on.

### HOUSING

<b>Housing Type</b>	Suitable for flush-panel mounting according to DIN 43 700.
<b>Dimensions</b>	<b>EM4401</b> : W48xH48xD87mm, <b>EM7701</b> : W72xH72xD97mm.
<b>Weight</b>	<b>EM4401</b> : Approx. 230g, <b>EM7701</b> : Approx. 380g (After packing).
<b>Enclosure Materials</b>	Self extinguishing plastics

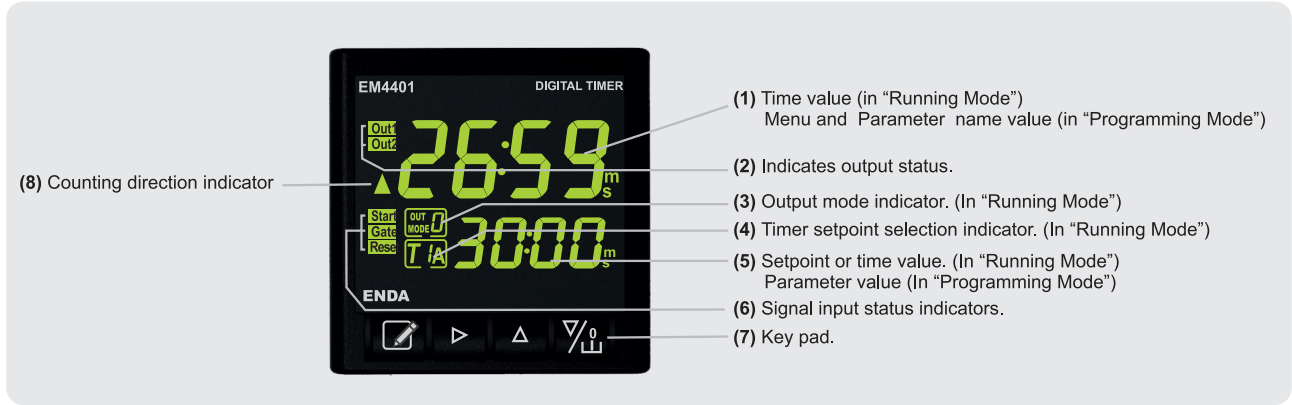
**Avoid any liquid contact when the device is switched on. DO NOT clean the device with solvent (thinner, gasoline, acid etc.) and / or abrasive cleaning agents.**



SİSEL MÜHENDİSLİK ELEKTRONİK SAN. VE TİC. A.Ş.  
Sertifika Mah. Barbaros Cad. No:18 Y.Dudullu 34775  
ÜMRANİYE/İSTANBUL-TÜRKİYE  
Tel : +90 216 499 46 64 Pbx. Fax : +90 216 365 74 01  
url : www.enda.com.tr

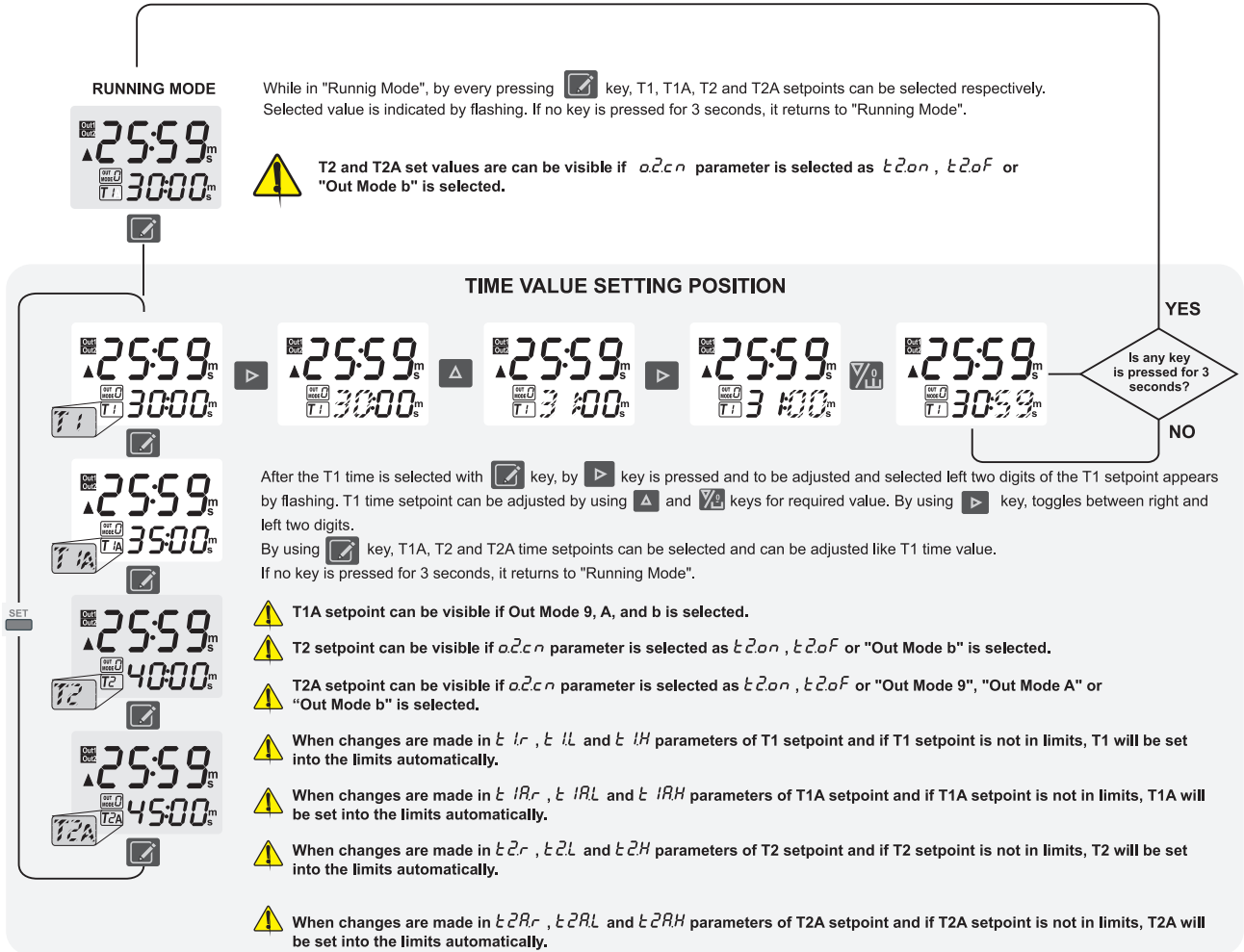
**ENDA**  
EMxx01-EN-03-220908

# TERMS



(1) PV Display	7 Segment, 4 digits green LCD indicator (Character height 10mm)
(5) SV Display	7 Segment, 4 digits green LCD indicator (Character height 7mm)
(2) Output indicators	Two pieces (Green)
(6) Input indicators	Three pieces (Green)
(3) Output mode indicator	Indicates selected output mode number (Green)
(7) Key pad	Micro switch
(4) setpoint information	Indicates setpoint name in SV indicator (Green)

## TIME VALUE SETTINGS

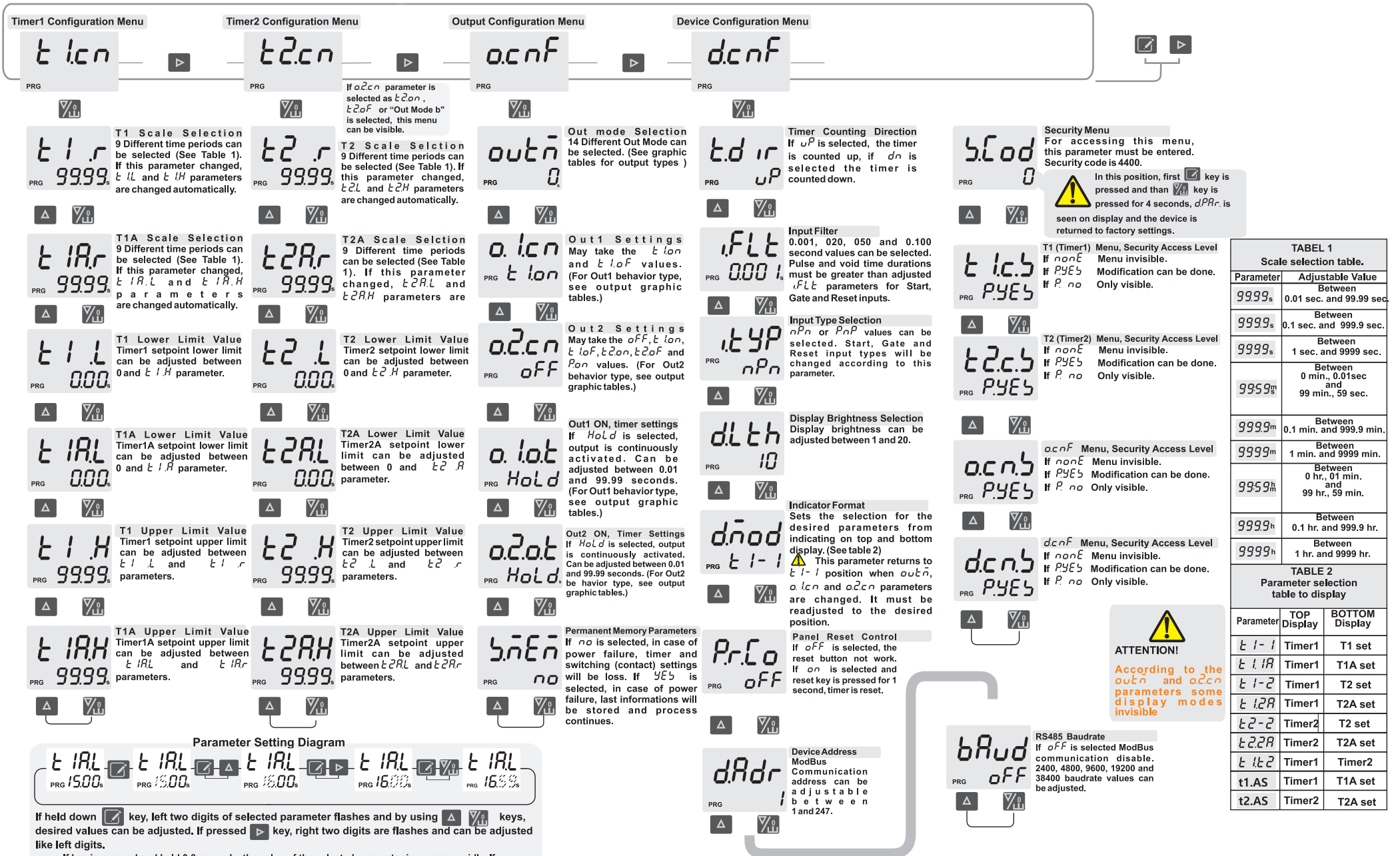


PROGRAMMING DIAGRAM

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 key, Programming Mode is entered. Then keys are pressed, data is recorded and "Running Mode" is entered

if key is pressed while holding down to the key, Programming Mode is entered.



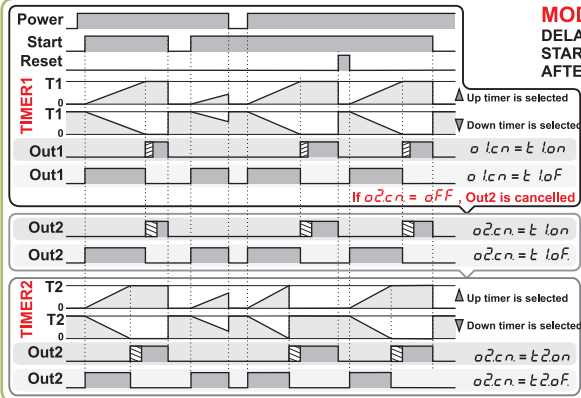
**TABEL 1**  
Scale selection table.

Parameter	Adjustable Value
9999s	Between 0.01 sec. and 99.99 sec.
9999s	Between 0.1 sec. and 999.9 sec.
9999s	Between 1 sec. and 9999 sec.
9999m	Between 0 min., 0.01sec and 99 min., 59 sec.
9999m	Between 0.1 min. and 999.9 min.
9999m	Between 1 min. and 9999 min.
9999h	Between 0 hr., 01 min. and 99 hr., 59 min.
9999h	Between 0.1 hr. and 999.9 hr.
9999h	Between 1 hr. and 9999 hr.

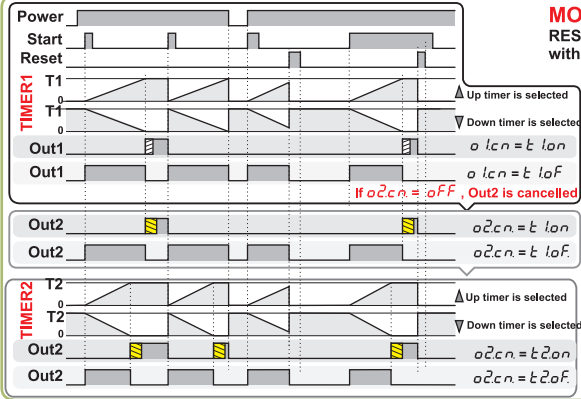
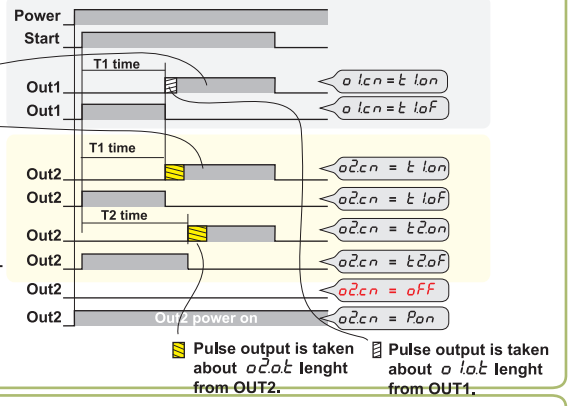
**TABEL 2**  
Parameter selection table to display

Parameter	TOP Display	BOTTOM Display
t1-1	Timer1	T1 set
t1A	Timer1	T1A set
t1-2	Timer1	T2 set
t1A	Timer1	T2A set
t2-2	Timer2	T2 set
t2A	Timer2	T2A set
t1.t2	Timer1	Timer2
t1.AS	Timer1	T1A set
t2.AS	Timer2	T2A set

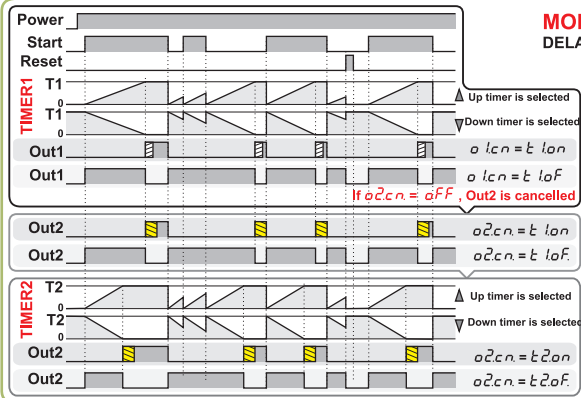
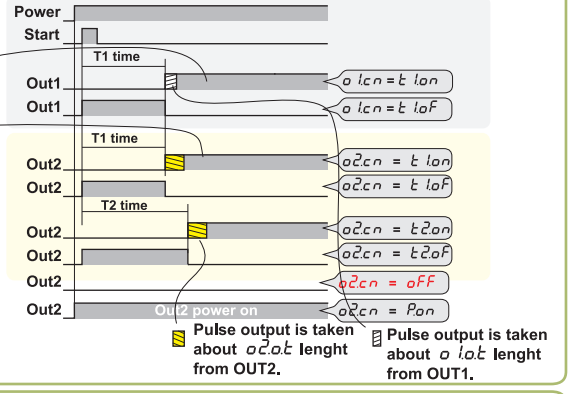
**ATTENTION!**  
According to the outn and o2cn parameters some display modes invisible



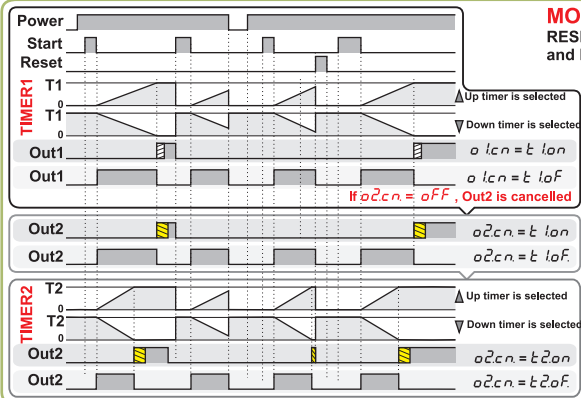
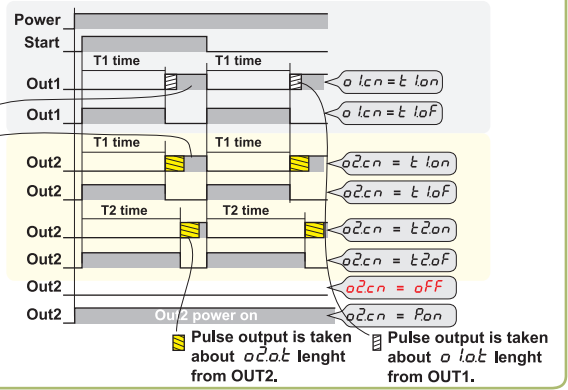
If  $a\ lcn$  or  $a\ lcn$  is selected Hold, output is generated constantly until OFF START Input or RESET Input is taken from OUT1 or OUT2.



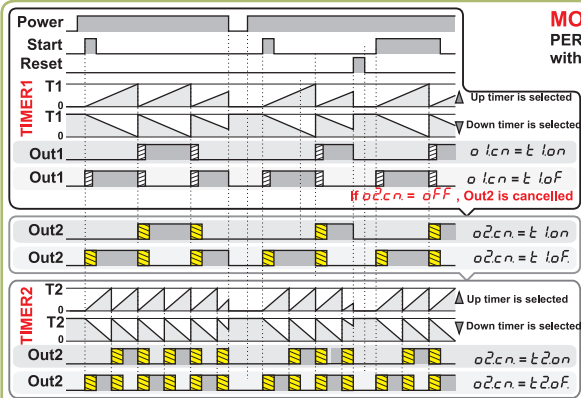
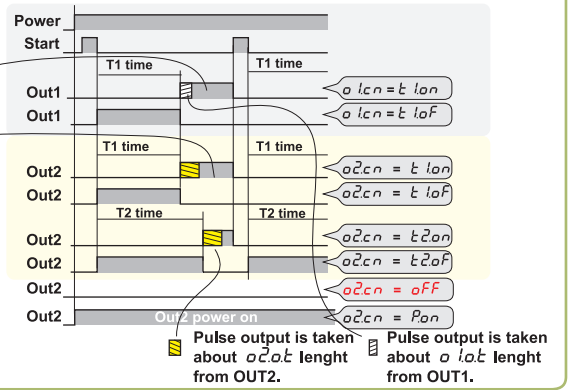
If  $a\ lcn$  or  $a\ lcn$  is selected Hold, output is generated constantly until OFF START Input or RESET Input is taken from OUT1 or OUT2.



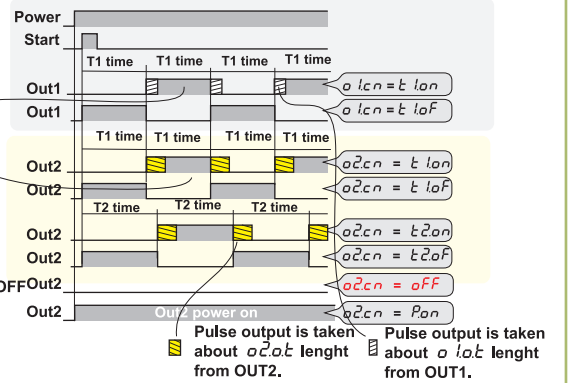
If  $a\ lcn$  or  $a\ lcn$  is selected Hold, output is generated constantly until OFF START Input or RESET Input is taken from OUT1 or OUT2.



If  $a\ lcn$  or  $a\ lcn$  is selected Hold, output is generated constantly until OFF START Input or RESET Input is taken from OUT1 or OUT2.

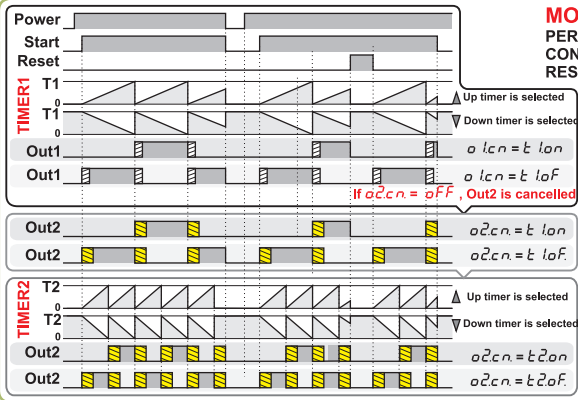


If  $a\ lcn$  or  $a\ lcn$  is selected Hold, Periodically OUT1 is set to ON or OFF with every T1 time, OUT2 is set to ON or OFF with every T2 time.



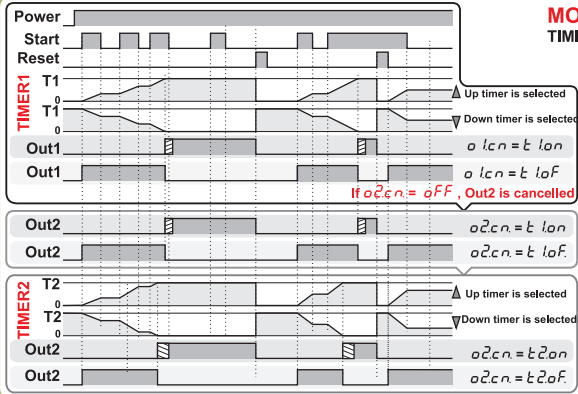
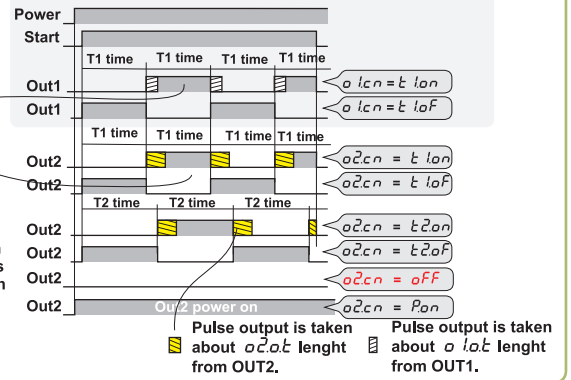
NOTE : All operations will be switched to standby if the Gate input is active.





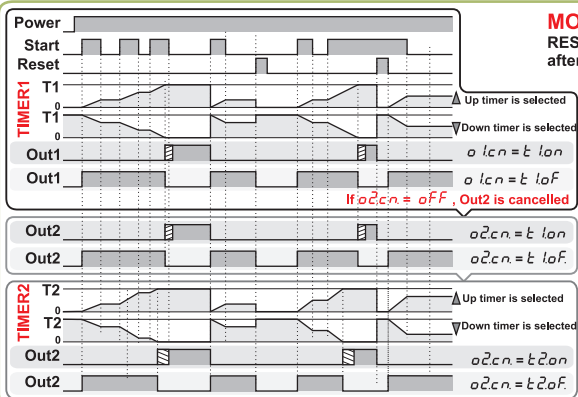
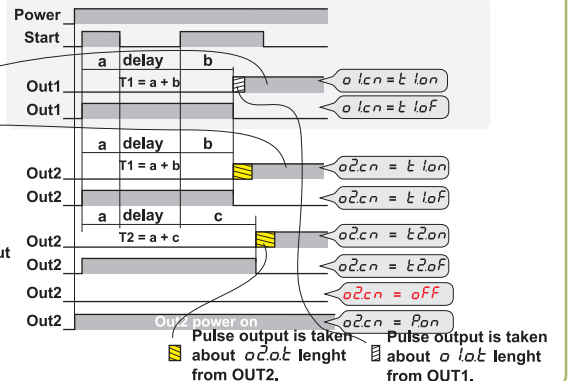
**MODE 5**  
PERIODIC PROCESS with  
CONSTANT START and  
RESET AFTER START

If  $a_{lat}$  or  $a_{2at}$  is selected Hold, Periodically OUT1 is set to ON or OFF with every T1 time, OUT2 is set to ON or OFF with every T2 time while START signal is ON.



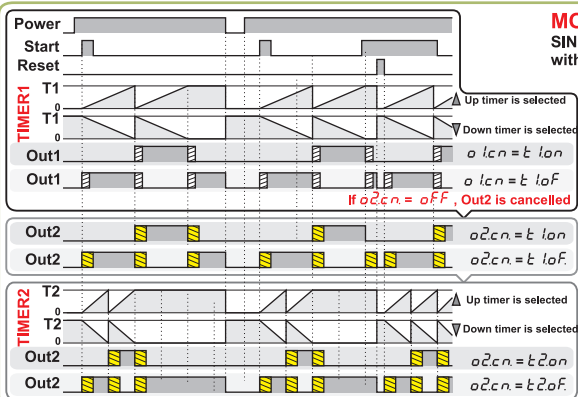
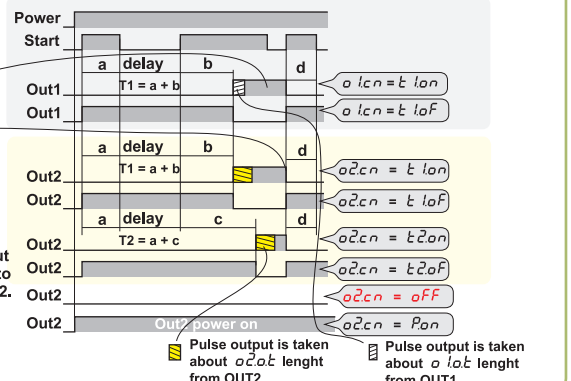
**MODE 6**  
TIMING with START

If  $a_{lat}$  or  $a_{2at}$  is selected Hold, Constant output is taken until RESET Input is set to ON from OUT1 or OUT2.



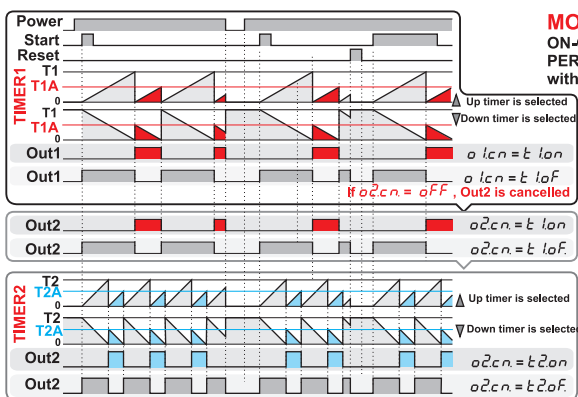
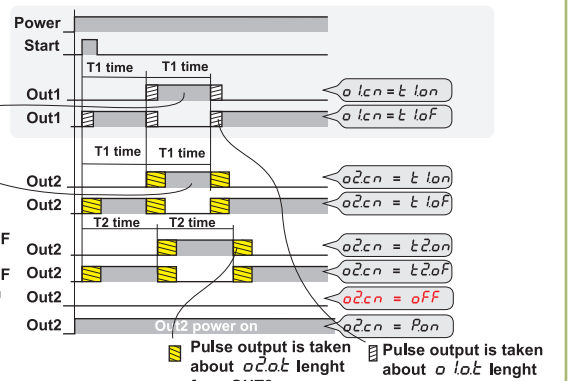
**MODE 7**  
RESET with START  
after TIMING with START

If  $a_{lat}$  or  $a_{2at}$  is selected Hold, Constant output is taken until START Input or RESET Input is set to ON from OUT1 or OUT2.

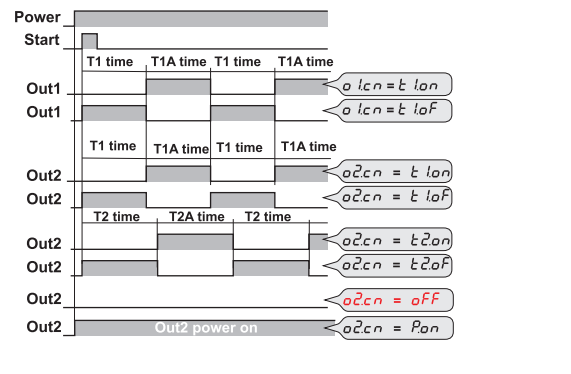


**MODE 8**  
SINGLE PERIOD TIMING  
with START ON

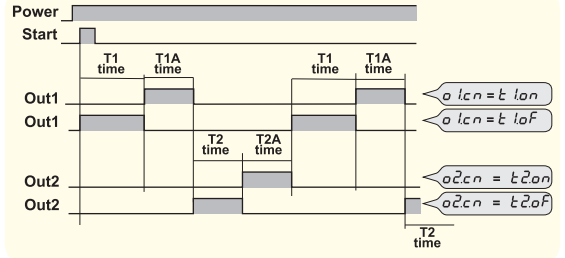
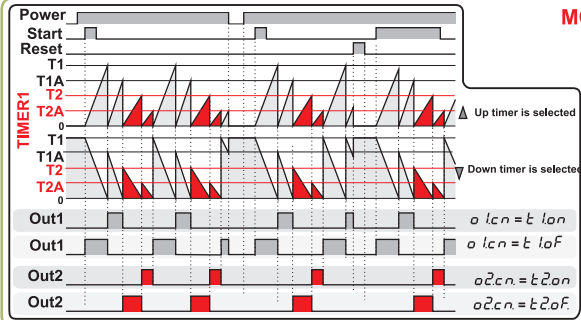
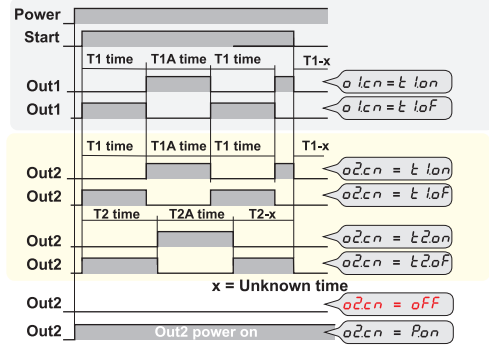
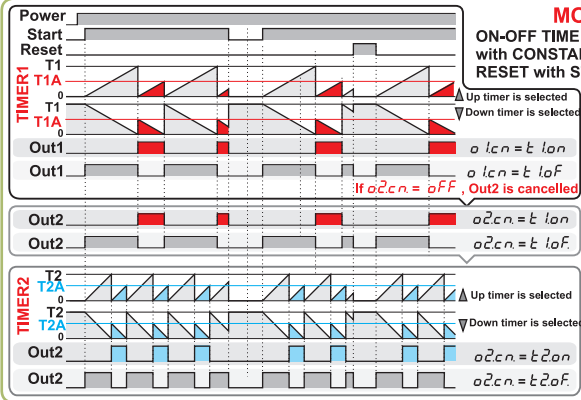
If  $a_{lat}$  or  $a_{2at}$  is selected Hold, OUT1 is set ON or OFF about T1 length, OUT2 is set ON or OFF about T2 length when START Input is set to ON.



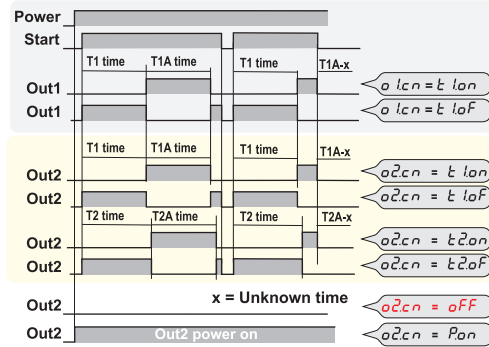
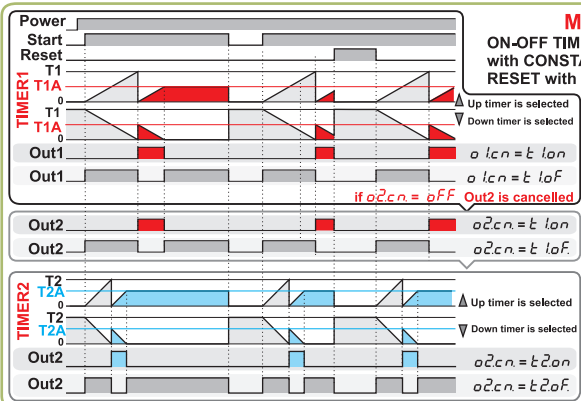
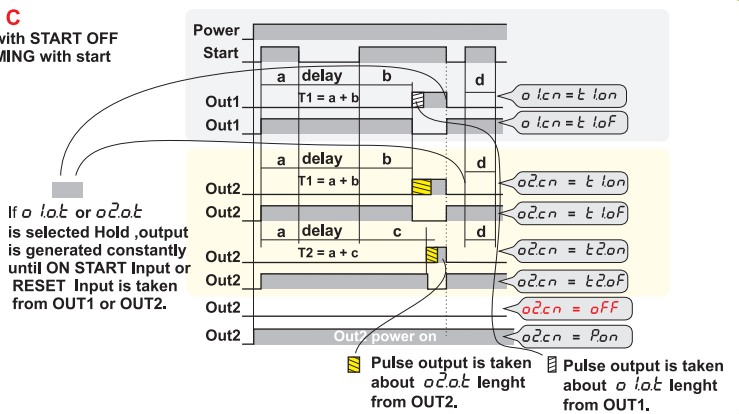
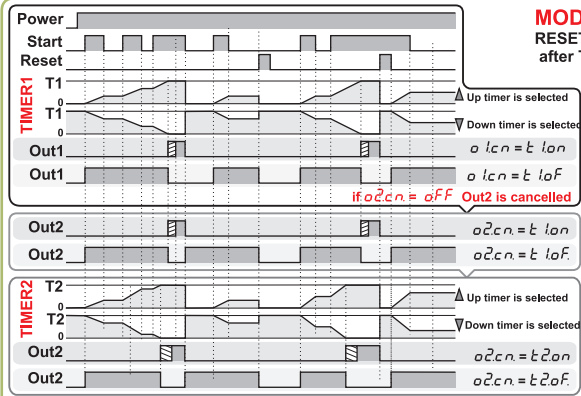
**MODE 9**  
ON-OFF TIME  
PERIODIC PROCESS  
with START PULSE



NOTE : All operations will be switched to standby if the Gate input is active.



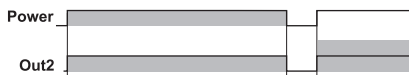
ATTENTION! In order to choose this mode,  $a\text{ }o\text{ }zcn$  parameter must be set to  $t\text{ }don$  or  $t\text{ }dof$ .



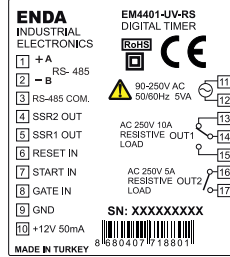
NOTE 1 : All operations will be switched to standby if the Gate input is active.

NOTE 2 : If  $a\text{ }o\text{ }zcn$  parameter is set to  $P\text{ }on$ , then Out2 output is activated and remains until power down.

In this selection, the Out2 output is only used to monitor whether the timer is energized. All other Out2 functions cannot be used.

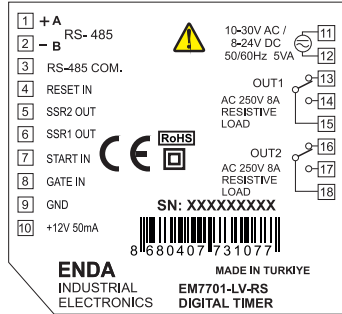


## CONNECTION DIAGRAM



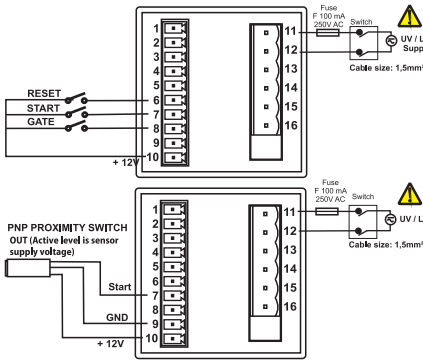
Equipment is protected throughout by DOUBLE INSULATION.

Holding screw 0.4-0.5Nm

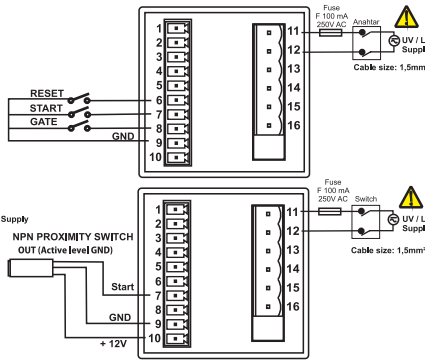


## SENSOR CONNECTION SAMPLES

### Typical connections for PNP sensor type

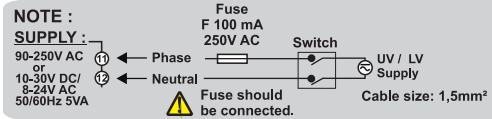


### Typical connections for NPN sensor type

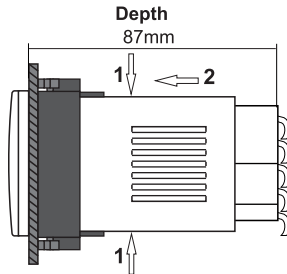
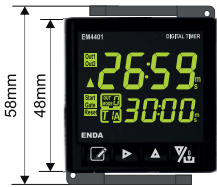


**!** Logic output of the device is not electrically isolated. Therefore, the logic output terminals should not be grounded when using grounded thermocouples.

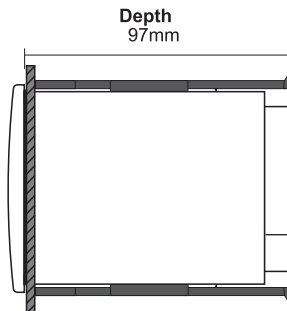
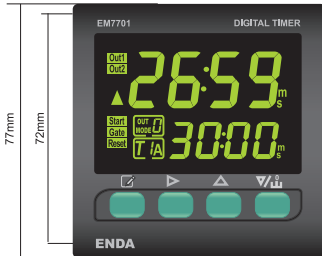
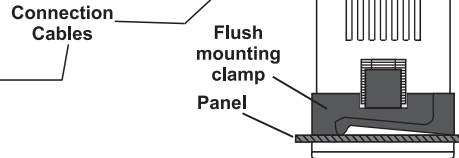
**Note :** 1) Mains supply cords shall meet the requirements of IEC60227 or IEC60245.  
2) In accordance with the safety regulations, the power supply switch shall bring the identification of the relevant instrument and it should be easily accessible by the operator.



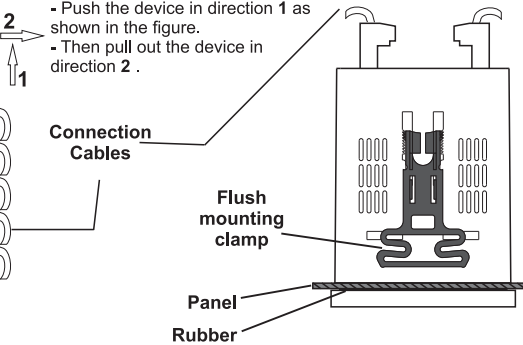
## DIMENSIONS



**To removing the mounting clamps ;**  
- Push the device in direction 1 as shown in the figure.  
- Then pull out the device in direction 2 .

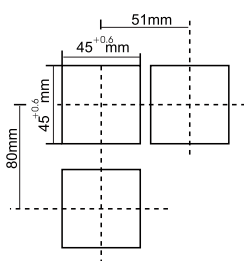


**To removing the mounting clamps ;**  
- Push the device in direction 1 as shown in the figure.  
- Then pull out the device in direction 2 .

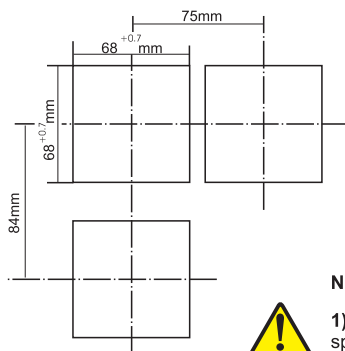


## PANEL CUT OUT

### EM4401



### EM7701



**Note :**

- 1) While performing panel mounting, additional space should be allocated for cables.
- 2) Panel thickness should be maximum 9mm.
- 3) If there is no 100mm free space at back side of the device, it would be difficult to remove it from the panel.



**ENDA EM Series** 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.

# ENDA EM SERIES DIGITAL TIMER MODBUS ADRES MAP

## 1.1 Memory Map for Timer Holding Registers

Parameter Number	Holding Register addresses Decimal (Hex)	Data Type	Data Content	Read / Write Permission	Factory Defaults	
Timer1 Configuration Parameters	<b>H0</b>	0000d (0000h)	Word	Setpoint for T1 time ( <b>Adjustable between 0-9999d. Format : BCD = 0-9999d</b> ) E.g. : Adjusting for 259 seconds MSB = 02h, LSB = 59h	R W	10
	<b>H1</b>	0001d (0001h)	Word	Setpoint for T1A time ( <b>Format must be as in the H0 parameter</b> )	R W	15
	<b>H2</b>	0002d (0002h)	Word	Setpoint for T1 time base 0 = 99.99sec, 1 = 999.9sec, 2 = 9999sec, 3 = 99m59sec, 4 = 999.9min 5 = 9999min, 6 = 99h59min, 7 = 999.9hr, 8 = 9999hr.	R W	1
	<b>H3</b>	0003d (0003h)	Word	Setpoint for T1A time base. ( <b>Format must be as in the H2 parameter</b> ).	R W	0
	<b>H4</b>	0004d (0004h)	Word	Minimum setpoint value limit for T1 time. ( <b>Format must be as in the H0 parameter</b> )	R W	0
	<b>H5</b>	0005d (0005h)	Word	Maximum setpoint value limit for T1 time. ( <b>Format must be as in the H0 parameter</b> )	R W	9999
	<b>H6</b>	0006d (0006h)	Word	Minimum setpoint value limit for T1A time. ( <b>Format must be as in the H0 parameter</b> )	R W	0
Timer2 Configuration Parameters	<b>H7</b>	0007d (0007h)	Word	Maximum setpoint value limit for T1A time. ( <b>Format must be as in the H0 parameter</b> )	R W	9999
	<b>H8</b>	0008d (0008h)	Word	Setpoint for T2 time ( <b>Format must be as in the H0 parameter</b> )	R W	30
	<b>H9</b>	0009d (0009h)	Word	Setpoint for T2A time ( <b>Format must be as in the H0 parameter</b> )	R W	100
	<b>H10</b>	0010d (000Ah)	Word	Setpoint for T2 time base. ( <b>Format must be as in the H2 parameter</b> ).	R W	1
	<b>H11</b>	0011d (000Bh)	Word	Setpoint for T2A time base. ( <b>Format must be as in the H2 parameter</b> ).	R W	0
	<b>H12</b>	0012d (000Ch)	Word	Minimum setpoint value limit for T2 time. ( <b>Format must be as in the H0 parameter</b> )	R W	0
	<b>H13</b>	0013d (000Dh)	Word	Maximum setpoint value limit for T2 time. ( <b>Format must be as in the H0 parameter</b> )	R W	9999
Output Parameters	<b>H14</b>	0014d (000Eh)	Word	Minimum setpoint value limit for T2A time. ( <b>Format must be as in the H0 parameter</b> )	R W	0
	<b>H15</b>	0015d (000Fh)	Word	Maximum setpoint value limit for T2A time. ( <b>Format must be as in the H0 parameter</b> )	R W	9999
	<b>H16</b>	0016d (0010h)	Word	Output type parameter. Can be adjusted between 0 and 11. See graphic tables for output types	R W	0
	<b>H17</b>	0017d (0011h)	Word	OUT1 Configuration parameter. Can be adjusted between 0 and 2. See graphic tables for output types	R W	1
	<b>H18</b>	0018d (0012h)	Word	OUT2 Configuration parameter. Can be adjusted between 0 and 4. See graphic tables for output types	R W	0
	<b>H19</b>	0019d (0013h)	Word	OUT1 Contact output duration. Adjustable between 0.00 and 99.99 sec. ( 0 = Hold) <b>Format: BCD = 99h, MSB = 99h</b> E.g. : Adjusting for 12.50sec., MSB 12hr, LSB = 50hr	R W	0
	<b>H20</b>	0020d (0014h)	Word	OUT2 Contact output duration. Adjustable between 0.00 and 99.99 sec. ( 0 = Hold) <b>(Format must be as in the H19 parameter)</b>	R W	0
Device Configuration	<b>H21</b>	0021d (0015h)	Word	Minimum puls duration time parameters for RESET, START and GATE inputs. 0 = 1ms, 1 = 20ms, 2 = 50ms, 3 = 100ms	R W	1
	<b>H22</b>	0022d (0016h)	Word	Display luminous intensity setting parameter. Can be adjusted between 1 and 20.	R W	10
	<b>H23</b>	0023d (0017h)	Word	Display configuration parameter. Adjustable between 0 and 6. See TABLE 2 for selection.	R W	0
	<b>H24</b>	0024d (0018h)	Word	Device address values for Modbus. (Adjustable between 1 and 247)	R W	1
	<b>H25</b>	0025d (0019h)	Word	Communication speed for : 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
Security Parameters	<b>H26</b>	0026d (001Ah)	Word	T1 (Timer1) Menu, security access level parameter. Adjustable between 0 and 2. 0 = Menu invisible, 1 = Modification can be done, 2 = Menu parameters only visible.	R W	1
	<b>H27</b>	0027d (001Bh)	Word	T2 (Timer2) Menu, security access level parameter. Adjustable between 0 and 2. 0 = Menu invisible, 1 = Modification can be done, 2 = Menu parameters only visible.	R W	1
	<b>H28</b>	0028d (001Ch)	Word	Output configuration menu, security access level parameter. Adjustable between 0 and 2. 0 = Menu invisible, 1 = Modification can be done, 2 = Menu parameters only visible.	R W	1
	<b>H29</b>	0029d (001Dh)	Word	Device configuration menu, security access level parameter. Adjustable between 0 and 2. 0 = Menu invisible, 1 = Modification can be done, 2 = Menu parameters only visible.	R W	1
	<b>H30</b>	0030d (001Eh)	Word	Function control parameter. If 23040d (5A00h) value is entered, device is returned to factory settings.	R W	0

## 1.2 Memory Map for Control Coils

Parameter Number	Coil Addresses Decimal (Hex)	Data Type	Data Content	Read / Write Permission	Factory Defaults
<b>C0</b>	0000d (0000h)	Bit	Timer counting direction (0 = Count UP ,1 = Count DOWN)	R W	0
<b>C1</b>	0001d (0001h)	Bit	Data storage in case of power failure (Permanent memory parameters) 0 = Storing data enabled (Possible), 1 = Storing data disabled (Not Possible).	R W	0
<b>C2</b>	0002d (0002h)	Bit	Sensor type selection. (0 = NPN ,1 = PNP)	R W	0
<b>C3</b>	0003d (0003h)	Bit	Panel RESET activation. ( 0 = Reset key inactive, 1 = Reset key is active )	R W	0
<b>C4</b>	0004d (0004h)	Bit	Reserve	R W	0
<b>C5-C15</b>	0005d (0005h) ..... 0015d (000Fh)	Bit	Reserve	R W	X



# ENDA EM SERIES DIGITAL TIMER MODBUS ADDRESS MAP

## 1.3 Memory Map for Input Registerlers

Parameter Number	Holding Register addresses Decimal (Hex)	Data Type	Data Content	Read / Write Permission
I0	0000d (0000h)	Word	Timer1 time value ( <b>Must be read according to BCD format</b> )	R
I1	0001d (0001h)	Word	Timer2 time value ( <b>Format is as in the I0 parameter</b> )	R
I2	0002d (0002h)	Word	Out1 puls time value ( <b>Must be read according to BCD format. Sensitivity 0.00sn</b> )	R
I3	0003d (0003h)	Word	Out2 puls time value ( <b>Format is as in the I2 parameter</b> )	R

## 1.4 Memory Map for Output Status Indicator Bits

Parameter Number	Discrete input addresses	Data Type	Data Content	Read / Write Permission
D0	(0000)h	Bit	OUT1 Output status (0 = OFF ,1 = ON)	R
D1	(0001)h	Bit	OUT2 Output status (0 = OFF , 1 = ON )	R
D2	(0002)h	Bit	Panel reset key status ( 0 = Reset key inactive, 1 = Reset key is active )	R
D3	(0003)h	Bit	Reserve	R
D4	(0004)h	Bit	Reset input status ( 0 = Reset input inactive, 1 = Reset input is active )	R
D5	(0005)h	Bit	Gate input status ( 0 = Gate input inactive, 1 = Gate input is active )	R
D6	(0006)h	Bit	Start input status ( 0 = Start input inactive, 1 = Start input is active )	R
D7-D15	0007d (0007h) ..... 0015d (000Fh)	Bit	Reserve	R

## 1.5 Memory Map for Software Revision Input Registers

Software Revision	0920d (0398h)	14 Word	Software name and update date is in ASCII format and 14 word. Example : EM4401-01 25 March 2016. 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 <b>ME44010- 1           52M a r   210.6</b>	R
<b>NOTE :</b> To view each word correctly by changing the byte sequences should be displayed as ASCII TEXT				

## 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 Sample ;  
Structure of command message  
(Byte Format)

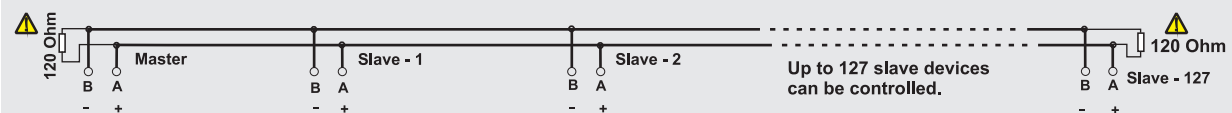
Device Address	(0A)h
Function Code	(01)h
Beginning address of coils.	MSB (04)h
	LSB (A1)h
Number of coils (N)	MSB (00)h
	LSB (01)h
CRC DATA	LSB (AC)h
	MSB (63)h

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.

### \* MODBUS CONNECTION DIAGRAM



Termination should be accomplished by attaching 120 Ohm resistors to the start and at the end of the communication line.

\* Applies to devices with Modbus function.