



Please read this document carefully before using this product. The guarantee will be invalidated if the device is damaged by not following instructions detailed in the manual. The company shall not be responsible for any damage or losses however caused, which may be experienced as a result of the installation or use of this product.

# ENDA EMTc2412 MILK TANK CONTROLLER

Thank you for choosing ENDA EMTc2412 Milk Tank Controller.



- ▶ 35x77mm Sized.
- ▶ On-Off Control.
- ▶ Two relay output can be selected for cooling and agitating.
- ▶ Single NTC prob input.
- ▶ Compressor protection parameters can be set.
- ▶ In case of probe failure, input status can be set to ON, OFF or periodic.
- ▶ Upper and lower setpoint limits can be adjusted.
- ▶ Agitation ON and OFF duration can be adjusted.
- ▶ Lower and upper alarm limit can be adjusted to depending on set value.
- ▶ °F or °C Temperature unit selection.
- ▶ External alarm function can be configured to digital inputs.
- ▶ Transfer device parameter settings with ENDA key - no power-up required. (Optional)
- ▶ RS485 ModBus protocol communication feature. (Optional).
- ▶ CE marked according to European Norms.

## Order Code

EMTc2412 -  -

1                      2

### 1 - Supply Voltage

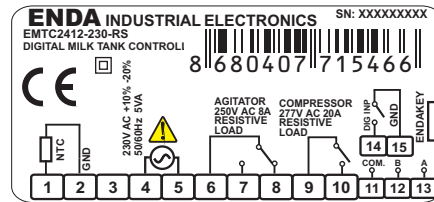
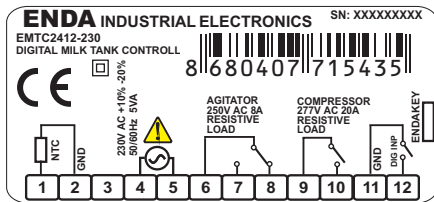
230.....230V AC  
24 .....24V AC/DC  
12 .....12V AC/DC  
SM.....9-30VDC/7-24VAC

### 2 - ModBus

RS.....ModBus (Specify at Order)  
Blank.....N/A



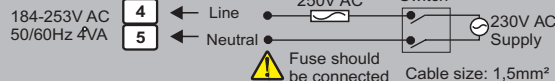
ENDA EMTc2412 is intended for installation in control panels. Make sure that the device is used only for intended purpose. The electrical connections must be carried out by a qualified staff and must be according to the relevant locally applicable regulations. During an installation, all of the cables that are connected to the device must be free of electrical power. Device must be protected against inadmissible humidity, vibrations, severe soiling and make sure that the operation temperature is not exceeded. The cables should not be close to the power cables or components.



Equipment is protected throughout by **DOUBLE INSULATION**

Holding screw 0.4-0.5Nm.

### NOTE: SUPPLY:



### 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.

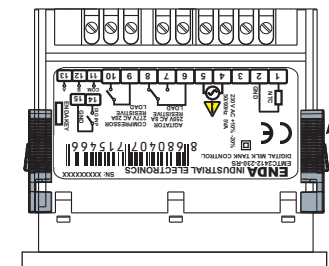
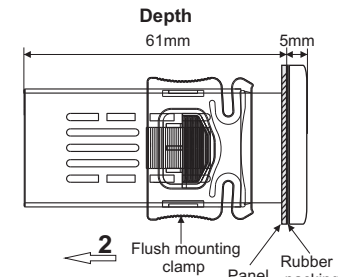
ENVIRONMENTAL CONDITIONS	
Ambient / Storage temp.	0 ... +50°C/-25 ... 70°C (without icing)
Relative humidity	Relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.
Protection class	According to EN60529; Front panel: IP65
Height	Max. 2000m
<b>⚠ Do not use the device in locations subject to corrosive and flammable gasses.</b>	
ELECTRICAL CHARACTERISTICS	
Supply voltage	230V AC +%10 -%20, 50/60Hz ; 12/24 V AC/DC ± %10 or SM 9-30VDC/7-24VAC
Power consumption	Max. 5VA
Connection	2.5mm <sup>2</sup> screw-terminal connections
Scale	-60.0 ... +150.0°C (-76.0 ... +302.0°F)
Sensitivity	0.1°C (Can be selected as 0.1°C or 1°C.)
Accuracy	±1°C
Time accuracy	±1%
Display	4 digits, 12.5mm, 7 segment LED
EMC	EN 61326-1: 2013
Safety requirements	EN 61010-1: 2010 (Pollution degree 2, overvoltage category II)
OUTPUTS	
Relay Output	For Compressor Relay : NO. 277V AC,20A (for resistive load), 2hp, 1.49kW 250V AC (for inductive load)
	For Agitating Relay : NO+NC 250V AC,8A (for resistive load), 1/2hp, 0.37kW 240V AC (for inductive load)
Life expectancy for Relay	For Compressor Relay : Without load 10.000.000 switching; 277V AC, 20A (resistive load) 100.000 switching.
	For Agitating Relay : Without load 30.000.000 switching; 250V AC, 8A (resistive load) 100.000 switching.
CONTROL	
Control type	Single set-point control
Control algorithm	On-Off control
Hysteresis	Adjustable between 1 ... 20.0°C.
HOUSING	
Housing type	Suitable for flush -panel mounting
Dimensions	W77xH35xD61mm
Weight	Approx. 190g (After packing)
Enclosure material	Self extinguishing plastics.
<b>⚠ While cleaning the device, solvents (thinner, gasoline, acid etc.) or corrosive materials must not be used.</b>	

## DIMENSIONS



### For removing mounting clamps:

- Push the flush-mounting clamp in direction 1 as shown in the figure below. Then, pull out the clamp in direction 2.



- Note:**
- 1) Panel thickness should be maximum 7mm.
  - 2) If there is no 60mm free space at the back side of the device, it would be difficult to remove it from the panel.



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- °F FAHRENHEIT LED : 1) During a parameter value is indicated or measured temperature value in °F unit, this LED is ON.  
2) During a parameter value set in the hidden menu and if the current parameter is also available in user menu, this LED is ON.
- M MANUAL OPERATION MODE LED : 1) If agitator operation type is dependent to compressor, this LED is ON.  
2) If agitator operation type is in automatic mode (flasher timing), this LED is OFF.
- AGITATOR LED : 1) If agitator output activated, this LED is ON.  
2) While waiting agitator delays, this LED blinks.
- COMPRESSOR LED : 1) If compressor output activated, this LED is ON.  
2) While waiting compressor delays, this LED blinks.
- SET In "Running Mode", indicates the set value.  
In "Programming Mode", indicates the selected parameter value.
- In "Programming Mode" allows to pass to the next parameter. While setting a parameter, increase the parameter value. If this key held down continuously, parameter value increases rapidly.
- In "Programming Mode" allows to pass to the previous parameter. While setting a parameter, increase the parameter value. If this key held down continuously, parameter value decreases rapidly.

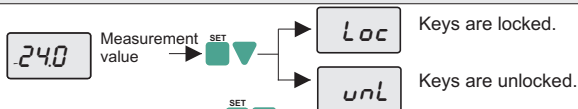
## FRONT PANEL COMMANDS

### 1. Viewing and Changing The Set Value



While in the running mode, if **SET** key is pressed set value is displayed for 3 seconds. While in this case, the set value is changed with **▲▼** keys.

### 2. Locking and Unlocking Keys

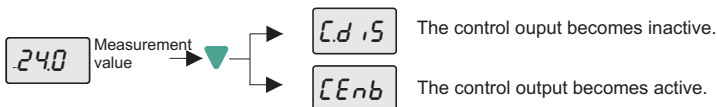


While in the operating mode, if **SET** **▼** keys are pressed together among 2 seconds the *Loc* message is displayed and the keys are locked. If the keys are locked **SET** **▼** keys are pressed for 2 seconds again *unL* message is displayed and key lock is opened and is returned to the normal way of working. While keys are locked, While keypad locked, if **SET** key is pressed, set value can be displayed but set value can not be changed. While keypad locked, if any key is pressed except **SET** key, *Loc* message appears on display.

### 3. Manuel Agitating Process

In "Running Mode", if **▲** key is pressed for 2 seconds, agitating process starts or stops. If *AGOn* parameter is 0, manuel agitating is disabled.

### 4. Activating / Inactivating The Control Outputs

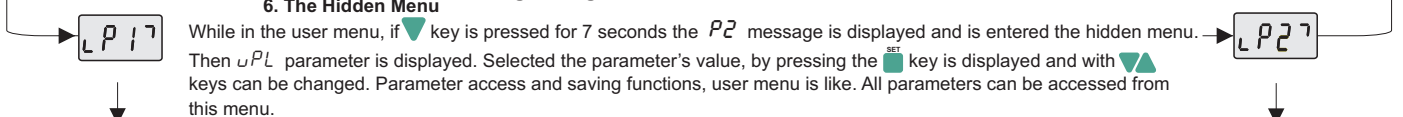


When in the running mode, if **▼** key is pressed for 2 seconds, *C.d.S* message is displayed and control outputs becomes to the inactive position, the device works as the indicator. When the control outputs are disabled; if **▼** key is pressed for 2 seconds *C.Enb* is disabled and the device continues to do control function.

### 5. Changing Parameter Values

**▲▲** Keys are pressed together for 2 seconds *P1* is displayed and the user menu is entered, afterwards first parameter's name is displayed in the user menu. While a parameter was selected, by pressing to **SET** key parameter's value is displayed, the displayed this parameter can be changed with **▲▼** keys. When the parameter name is shown, no action is done after 3 seconds or to the **SET** key is pressing again to return to the parameter's name. When the parameter name is shown, **▲▲** keys are pressed together immediately without waiting to get out of this process.

### 6. The Hidden Menu



While in the user menu, if **▼** key is pressed for 7 seconds the *P2* message is displayed and is entered the hidden menu. Then *uPL* parameter is displayed. Selected the parameter's value, by pressing the **SET** key is displayed and with **▲▼** keys can be changed. Parameter access and saving functions, user menu is like. All parameters can be accessed from this menu.

### 7. Transferring the parameters between menus

If **SET** **▼** keys are pressed together for 2 seconds, parameter is transferred to the user menu. In this way, up to 8 parameters can be transferred to the user menu. In user menu, if **SET** **▼** keys are pressed together along the 2 seconds the parameter is removed from the user menu. When a parameter is displayed in the user menu "F" LED lights up in the hidden menu. If the user menu have not any parameter, *nP* message is displayed.

## ERROR MESSAGES

<b>PFR</b>	Thermostat probe is broken.	<b>P5C</b>	Thermostat probe short circuited.
<b>---</b>	Temperature value is higher than the scale.	<b>---</b>	Temperature value is lower than the scale.

## ALARM SITUATION

- WW**  
**24.0**  
**AA** 1) If an alarm condition occurs, measurement parameter value flashes on indicator.
- WW**  
**EA**  
**AA** 2) External alarm is activated. Outputs are not affected by this condition.
- WW**  
**SA**  
**AA** 3) External alarm is activated. Output relays are OFF.

## FACTORY SETTINGS

**▼** Key is held down while the device is powered up the *d.PAR* message will see and restore the factory parameters.

## RUNNING MODES

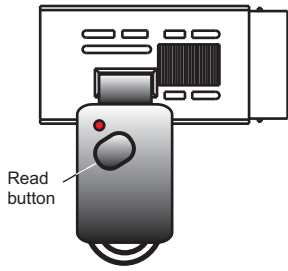
### MANUEL RUNNING MODE :

If environment temperature is above the  $SEt$  (setpoint) and  $AGtP$  parameter is selected as  $nRn$ , compressor and agitating relays become activated. When the environment temperature drops below the set value, the compressor relay is deactivated. After the compressor deactivated, agitator relay remains active until  $AGon$  time. After this time, agitator period deactivated until  $AGoF$  time. After this time agitator becomes active again.

### AUTOMATIC RUNNING MODE :

If  $AGtP$  parameter is set to  $oLo$ , agitator relay runs independently from the compressor relay until  $AGon$  and /or deactivated until  $AGoF$  period.

## ENDAKEY PARAMETER TRANSFER



### TRANSFERRING THE PARAMETERS FROM ENDAKEY TO DEVICE

While in "Running Mode", if  $\blacktriangledown$  key on device or "Read" button on "ENDAKEY" is pressed, " $dL$ " message appears on display and parameters are read and transferred to the device. If the parameter transfer is successful, the " $rEF$ " message appears and the device begins to work with the loaded parameter values. If the parameters are wrong, incorrect or "ENDAKEY" is faulty, " $Err$ " message appears. Parameters will not be changed on device.

### TRANSFERRING THE PARAMETERS FROM DEVICE TO ENDAKEY

While in "Running Mode", if  $\blacktriangle$  key is pressed on device, " $uL$ " message appears on display and parameters are read and transferred to the device. If process succes, " $Suc$ " message appears. In case of failure, "Err" message appears. Parameters will not be changed on device.

**NOTE 1 :** No power-up required for transferring the parameter by using "ENDAKEY". For long battery life, "ENDAKEY" must be disconnected from device after the transferring process.

**NOTE 2 :** Please specify at order "ENDAKEY" if required.

## DEVICE PARAMETERS

### CONTROL PARAMETERS

		MIN.	MAX.	UNIT	DEF. SET
$SEt$	Setpoint value.	-60.0	150.0	°C	2.0
$uPL$	Upper limit for setpoint value.	-60.0	$uPL$	°C	150.0
$LoL$	Lower limit for setpoint value.	$LoL$	150.0	°C	-60.0
$HYS$	Cooling hysteresis.	0.1	20.0	°C	2.0
$oFF$	Cooling offset value.	-20.0	20.0	°C	0

### CONFIGURATION PARAMETERS

$Un$ $it$	Temperature unit (Devices with part code suffix 'F' have deg F as the default 'Unit').	°C	°F		°C
$dPnt$	Decimal point ( $no$ = decimal point isn't shown $22^{\circ}C$ , $YES$ =decimal point is shown $22.3^{\circ}C$ .)	$no$	$YES$		$no$
$d.inP$	Digital input types. $nd$ : Digital input unused. $ER$ : External alarm. $ER$ message flashes in the display. Output unchanged. $SR$ : Important external alarm. $SR$ message flashes in the display. Relay output is turned off. $HC$ : Control type. $CLYP$ parameter is changed. (If $HE = Lo$ , If $Lo = HE$ ) $dF$ : Defrost operation is started.	$nd$	$dF$		$nd$
$dd$	Digital input delay. The period of the digital inputs to be active.	0:00	99:00		0:00
$dPo$	Digital input polarity. $CL$ = While a digital input contact is closed, it is activated. $oP$ = While a digital input is opened, it is activated.	$CL$	$oP$		$CL$

### COMPRESSOR PROTECTION PARAMETERS

$CPon$	Delay time for the compressor after power is on.	0:00	99:00	min:sec	1:00
$CFoS$	Required delay time for the compressor to restart following stop.	0:00	99:00	min:sec	1:00
$CPPr$	ON time period for the compressor output in case of probe failure.	0:00	99:00	min:sec	0:00
$CPPF$	OFF time period for the compressor output in case of probe failure.	0:00	99:00	min:sec	1:00

### AGITATOR CONTROL PARAMETERS

$AGtP$	Agitator run type selection. $nRn$ : Agitator runs dependent to compressor. $oLo$ : Runs independently from compressor, runs according to $AGon$ and $AGoF$	$conP$	$tinP$		$conP$
$AGon$	Agitator uptime duration. (If $AGon$ is selected as 0, automatic and manual agitating is disabled).	0:00	99:00	min:sec	3:00
$AGoF$	Time intervals between two successive agitators.	0:00	99:00	hr:min	00:15
$AGPr$	Agitating process by power-up. $no$ : Agitating process will not started by power-up. $YES$ : Agitating process will start by power-up.	$no$	$YES$		$no$
$AGPo$	Agitating process delay time after power-up.	0:00	99:00	min:sec	1:00

### ALARM CONTROL PARAMETERS

$RuPL$	Limit for upper alarm level. When $RelYP$ is changed, $RuPL$ should be readjusted.	$RLoL$	150.0	°C	150
$RLoL$	Limit for lower alarm level. When $RelYP$ is changed, $RLoL$ should be readjusted.	-60.0	$RuPL$	°C	-60
$RHYS$	Hysteresis alarm	0.1	20.0	°C	2
$RelYP$	Alarm configuration. ( $RbS$ = Independent alarm. Alarm values are $RLoL$ and $RuPL$ .) ( $rEF$ = Relative alarm. Alarm values are $SEt - RLoL$ and $SEt + RuPL$ .) NOTE: Upper and Lower alarm level variables are determined according to the " $RelYP$ " parameter. If $RelYP = RbS$ , $RLoL$ and $RuPL$ . If $RelYP = rEF$ , $LoL = SEt - RLoL$ and $RuPL$ .	$RbS$	$rEF$		$RbS$
$RdFL$	Time delay to display alarm message after alarm is on.	0:00	99:00	min:sec	0:00
$RdPo$	Time delay to display alarm message after power is on.	0:00	99:00	hr:min	0:10

# MODBUS PROTOCOL ADDRESS MAP

## 1.1 HOLDING REGISTERS

Holding Register Addresses		Data Type	Data Content	Parameter Name	Read/Write Permission
Decimal	Hex				
0000d	0x0000	word	Set value.	<i>SEt</i>	Read / Write
0001d	0x0001	word	Set point upper limit.	<i>uPL</i>	Read / Write
0002d	0x0002	word	Upper level alarm.	<i>RuPL</i>	Read / Write
0003d	0x0003	word	Set point lower limit.	<i>LoL</i>	Read / Write
0004d	0x0004	word	Lower level alarm.	<i>RLoL</i>	Read / Write
0005d	0x0005	word	Cooling offset value.	<i>oFF</i>	Read / Write
0006d	0x0006	word	Cooling hysteresis.	<i>HYs</i>	Read / Write
0007d	0x0007	word	Alarm hysteresis.	<i>RHYs</i>	Read / Write
0008d	0x0008	word	Dijital input types. 0= <i>nd</i> ;1= <i>ER</i> ; 2= <i>sR</i> ; 3= <i>HL</i> ; 4= <i>dF</i>	<i>d.inP</i>	Read / Write
0009d	0x0009	word	Dijital input delay time.	<i>ddi</i>	Read / Write
0010d	0x000A	word	Delay time for the compressor after power-up.	<i>CPon</i>	Read / Write
0011d	0x000B	word	Required delay time for the compressor to restart following stop.	<i>CFos</i>	Read / Write
0012d	0x000C	word	ON time period for the compressor output in case of probe failure.	<i>CPPn</i>	Read / Write
0013d	0x000D	word	OFF time period for the compressor output in case of probe failure.	<i>CPPF</i>	Read / Write
0014d	0x000E	word	Agitator uptime duration. ( If <i>RLon</i> is selected as 0, automatic and manual agitating is disabled ).	<i>RLon</i>	Read / Write
0015d	0x000F	word	Time intervals between two successive agitators.	<i>RLoF</i>	Read / Write
0016d	0x0010	word	Agitating process delay time after power-up.	<i>RLPo</i>	Read / Write
0017d	0x0011	word	Time delay to display alarm message after alarm is ON.	<i>RdFL</i>	Read / Write
0018d	0x0012	word	Time delay to display alarm message after power is ON.	<i>RdPo</i>	Read / Write
0019d	0x0013	word	Device address for RS485 network connection.Adjustable between 1-247.	<i>RdRs</i>	Read / Write
0020d	0x0014	word	Baudrate (0=Off; 1=1200, 2=2400, 3=4800, 4=9600, 5=19200)	<i>bRud</i>	Read / Write

## 1.2 INPUT REGISTERS

Holding Register Addresses		Data Type	Data Content	Parameter Name	Read/Write Permission
Decimal	Hex				
0000d	0x0000	word	Measured temperature value (°C / °F)	--	Read

\* Input Register parameter value of the temperature reading, is defined as a signed integer. This value is associated with a portion. (So, "23,5°C" value of temperature "235" will be read in.)

## 1.3 DISCRETE INPUTS

Holding Register Addresses		Data Type	Data Content	Parameter Name	Read/Write Permission
Decimal	Hex				
0000d	0x00	Bit	Compressor output status (0=OFF; 1=ON)	--	Read
0001d	0x01	Bit	Agitator output status (0=OFF; 1=ON)	--	Read

## 1.4 COILS

Coil Addresses		Data Type	Data Content	Parameter Name	Read/Write Permission
Decimal	Hex				
00d	0x00	Bit	Temperature unit. OFF= <i>oC</i> ON= <i>oF</i>	<i>Unit</i>	Read / Write
01d	0x01	Bit	Decimal point . OFF= <i>no</i> ON= <i>yEs</i>	<i>dPnt</i>	Read / Write
02d	0x02	Bit	Digital input polarity. OFF= <i>cL</i> ON= <i>oP</i>	<i>dPo</i>	Read / Write
03d	0x03	Bit	Agitator run type selection. OFF= <i>nRn</i> ON= <i>oLo</i>	<i>RLtP</i>	Read / Write
04d	0x04	Bit	Agitating process by power-up. OFF= <i>no</i> ON= <i>yEs</i>	<i>RLPo</i>	Read / Write
05d	0x05	Bit	Alarm configuration. OFF= <i>Rbs</i> ON= <i>rEF</i>	<i>RLtYP</i>	Read / Write