TPM-05 and TPM-05A
USER MANUAL

* Measures up to voltage harmonics 41st (L-N and L-L).
* Measures up to current harmonics 41st.
* Measures the neutral current. (Only on TPM-05A)
* Supports 3P4W connections.
* RS485 Modbus RTU.
* 71.5 x 61.5 Custom Design Glass LCD.
* It shows the active powers of each phase and total (P).
* It shows the reactive powers of each phase and total (Q).
* It shows the apparent powers of each phase and total (S).
* It shows power factor (PF) and Cosφ(FI) values of each phases.
* It shows the min., max. and ave. values of the phase-to-phase and Phase-neutral voltages (V)
* It shows the current values of each phase (I).
* It shows the import and export active energies of each phase and total (ΣkWh).
* It shows the inductive and capacitive reactive energies of each phase and total (ΣkVArh).
* It shows the apparent energies of each phase and total (ΣkVAh).
* 2 relay outputs (adjustable), 1 Digital Input
* Event logs (voltage rise/fall, power cut, current/PF/THDV and THDI limits)
* The date and time can be set.
* Real time clock.
* It shows demands.
* You can delete energies, demand, and event logs.
* The menu is password protected.

Tense Electric Electronics

MADE IN TÜRKİYE CE

1 - Connection Schemes:

Figure-1 - TPM-05 Connection Diagram

Figure-1: 3P4W connection type: 3 phase current and 3 phase voltage and neutral.

Figure-1A - TPM-05A Connection Diagram

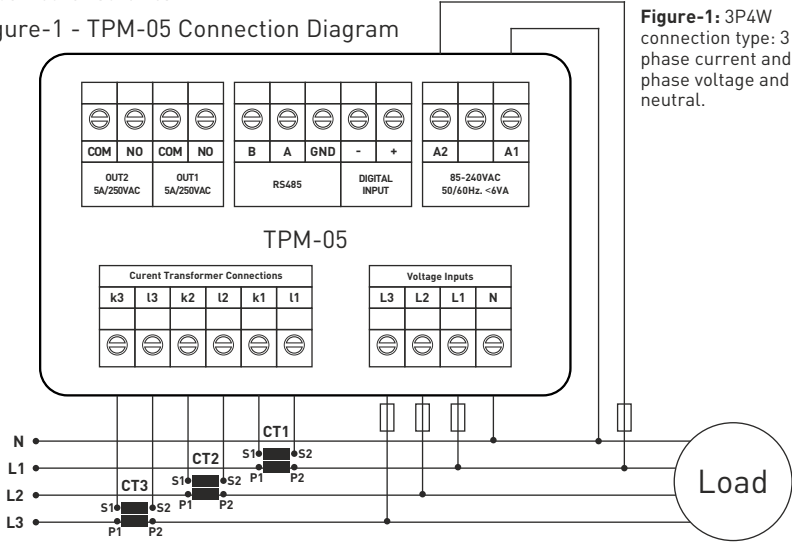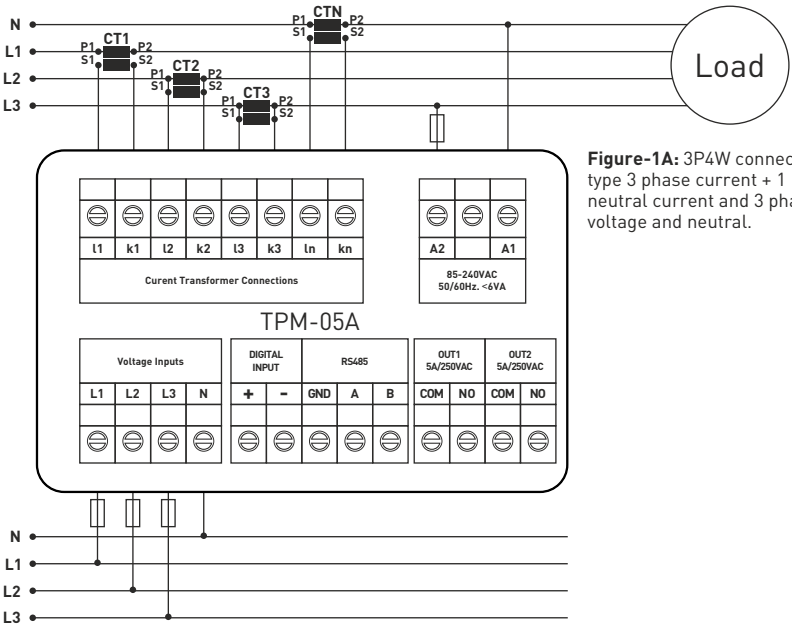**Figure-1A:** 3P4W connection type 3 phase current + 1 neutral current and 3 phase voltage and neutral.

2 - Matters to be considered in current transformer selection and connection

- Note that the value of current transformer is higher than the maximum current drawn from the system.
- It is advisable that the class of the current transformer (it can be written class, klas, cl, kl)is 0.5 .
- To avoid the complexity when connecting the current transformer output terminal use different colour cables or give cable numbers.
- Please spread the cables which are connected to current transformer output terminal from remote high voltage lines.
- Please fix current transformers to bara, cable or rail to avoid rattling .

3 - Warnings:

- Please use the device properly according to our directions.
- Please protect LCD screen from sun light
- Please take 5cm space behind the device after the device installation
- Please fix the device front cover panel with the apparatus that comes with it
- Please not use device in the damp board
- Please add a key or circuit breaker to assembly
- Please keep key or circuit breaker close the device or in an easily accessible location by the operator
- There should be no electricity in the connection cables when assembling device
- There should be used shielded or twisted cord cable at the non-network-connected input and output lines. These cables should not be passed near the high power lines and the device.
- Assembling and electrical connections must be done by technical staff according to instruction manuel.
- The feed cables should be suitable for IEC 60227 or IEC 60245 requirements.

4 - Device Maintenance :

Turn off energy of the device and disconnect from connections. Clean the device body by using slightly moist or dry cloth. Do not use conductor or other chemical as a cleaning agent matter which is harmful to device. Make connections after the cleaning of device and give energy to device and make sure that device works properly.

5 - General:

TPM-05 and TPM-05A Energy analyzer measures load or voltage, current, cosφ, active power, reactive power , minimum and maximum values of the load and also measures demands. It records the events. This analyzer measures current harmonics and voltage harmonics up to 41. harmonics.

6 - First Operation of the Device:

Please read the warnings before powering the device. Make connections of the device according to the connection scheme. When the device is first powered up figure-4 displayed on the screen. Firstly enter the current transformer ratio from the settings menu and if the voltage transformer medium voltage is being measured), enter the voltage transformer ratios.

7- Introduction of Screen:
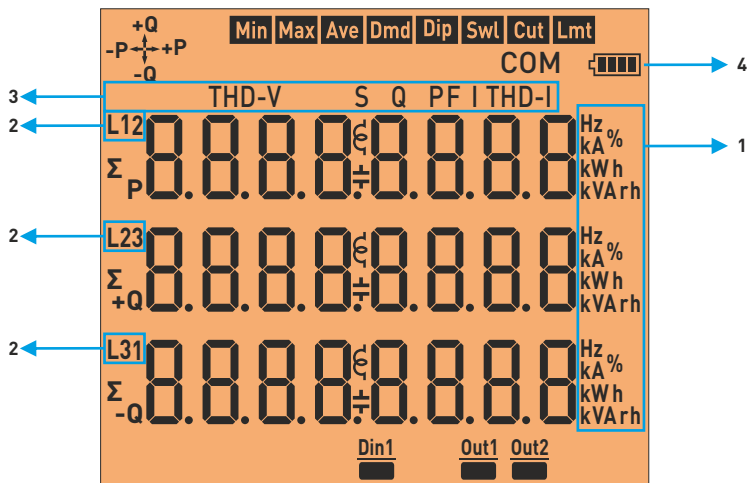
1 - Indicates the unit of the value.

2 - Indicates which phase the value belongs to .

3 - Indicates displayed values. V- voltage, I-current, F-frequency, S-apparent power, P- active power, PF- power factor, FI- cosine phi THD-I- total current harmonics, THD-V- total voltage harmonics, Q-reactive power.

4 - Indicates battery level of clock time.

→+P Specified that the indicated active energies are imported.

-P→ Specified that the indicated active energies are exported.

+Q Specified that the indicated reactive energies are inductive.

-Q Specified that the indicated reactive energies are capacitive.

ɕ Specified that the indicated reactive energies are inductive.

⊣⊢ Specified that the indicated reactive power are capacitive.

COM Indicates that communication is done.

Min Indicates that the values shown are minimum.

Max Indicates that the values shown are maximum.

Ave Indicates that the values shown are average.

Dmd Indicates that the values shown are demand.

Dip Indicates that the values shown are below 10%.

Swl Indicates that the values shown are over 10%.

Cut Indicates that the values shown are below 40%.

Lmt Indicates that the values shown are over (CTRx4) in current and over 20% in harmonics.

Din1 Din1: There is voltage(1)

Din1 Din1: There is no voltage(0)

Out1 Out1: Relay 1 is active (short circuit)

Out1 Out1: Relay 1 is de-active (open circuit)

Out2 Out2: Relay 2 is active (short circuit)

Out2 Out2: Relay 2 is de-active (open circuit)

Σ P Total active energy

Σ +Q Total inductive reactive energy

Σ -Q Total capacitive reactive energy

8- Introduction of Buttons:

ESC: Press this button while in menu to exit the menu without saving the values.
When this key is pressed while not in the menu, the screen always shows figure-4.

SET: This button enters menu/parameter. It records the changes of parameters and remove from parameter.

DOWN: This button enables to fast progress between the values that are measured out of menu.

RIGHT: This button allows to progress by displaying the measured values outside the menu together with the details. It allows navigation between parameters when pressed in menu.
In the parameter, it allows to transition between steps and parameters.
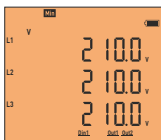
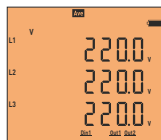## 9 - Progress On Screen Information:

| Figure-4 | Figure-5 | Figure-6 | Figure-7 | Figure-8 |

Figure-4: It shows phase-neutral voltage. When you press right button, the figure-5 comes to screen.

Figure-5: It shows minimum(Min) voltage values of phase-neutral voltage. When you press right button, the figure-6 comes to screen.

Figure-6: It shows maximum(Max) voltage values of phase-neutral voltage. When you press right button, the figure-7 comes to screen.

Figure-7: It shows average(Ave) voltage values of phase-neutral voltage. When you press right button, the figure-7 comes to screen.

Figure-8: It shows the date and time, in which phase-neutral voltage goes under 90% (<Vtr x 230 x 0.9) of the nominal voltage values (lowest). When you press the right button, values belong to L2 and L3 phases comes to screen respectively. When you press right button, the figure-9 comes screen.
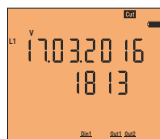
Figure-9: It shows the date and time, in which phase-neutral voltage goes above 110% (<Vtr x 230 x 1.1) of the nominal voltage values (swl). When you press the right button, values belong to L2 and L3 phases comes to screen respectively. When you press right button, the figure-10 comes to screen.

| Figure-9 | Figure-10 |

Figure-10: It shows the recorded date and time, in which phase-neutral voltage goes under 40% (<Vtr x 230 x 0.4) of the nominal voltage values (cut), and a blackout occurs. When you press the right button, values belong to L2 and L3 phases comes to screen respectively. When you press right button, the figure-11 comes to screen.
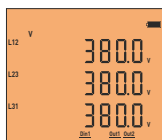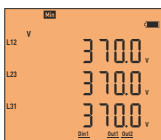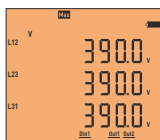

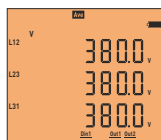
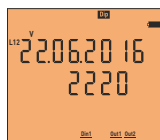| Figure-11 | Figure-12 | Figure-13 | Figure-14 | Figure-15 |

Figure-11: It shows the phase-phase voltage values. When you press right button, the figure-12 comes to screen.

Figure-12: It shows the minimum(Min) values of the phase-phase voltage. When you press right button, the figure-13 comes to screen.

Figure-13: It shows the maximum(Max) values of the phase-phase voltage. When you press right button, the figure-14 comes to screen.

Figure-14: It shows the average(Ave) values of the phase-phase voltage. When you press right button, the figure-15 comes to screen.

Figure-15: It shows the date and time, in which phase-phase voltage goes under 90% (<Vtr x 230 x 0.9) of the nominal voltage values (lowest). When you press the right button, values belong to L23 and L31 phases comes to screen respectively. When you press right button, the figure-16 comes to screen.

Figure-16: It shows the date and time, in which phase-phase voltage goes above 110% (<Vtr x 230 x 1.1) of the nominal voltage values (swl). When you press the right button, values belong to L23 and L31 phases appear on the screen respectively. When you press right button, the figure-17 comes to screen.

| Figure-16 | Figure-17 |

Figure-17: It shows the recorded date and time, in which phase-phase voltage goes under 40% (as a default) (<Vtr x 230 x 0.4) of the nominal voltage values (cut), and a blackout occurs. When you press the right button, values belong to L23 and L31 phases comes to screen respectively. When you press right button, the figure-18 comes to screen
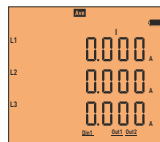
Figure-18   Figure-18A   Figure-19   Figure-20   Figure-21

Figure-18: It shows current values of each phase. When you press the right key, figure-18a comes to the screen.

Figure-18A: The real neutral current passing through the neutral current transformer is shown in the 1st line, the software vector sum of all phase currents in the 2nd line, and the scalar sum of all phase currents in the 3rd line. (Only for TPM-05A.) When you press the right button, figure-19 appears on the screen.

Figure-19: It shows the minimum (Min) current values of each phase. When you press the right button, figure-20 comes to the screen.

Figure-20: It shows the maximum (Max) current values of each phase. When you press the right button, Figure-21 comes to the screen.

Figure-21: It shows the average (Ave) current values of each phase. When you press the right button, Figure-22 comes to the screen.

Figure-22   Figure-23   Figure-24

Figure-22: It shows current demand (Dmd) values for each phase. When you press the right button, Figure-23 comes to the screen.

Figure-23: It shows the time and date of demands which belongs to each phase. When you press the right button, values which belongs to the L2 and L3 comes to screen respectively. When you press the right button, Figure-24 comes to the screen.

Figure-24: It shows the time and date which current limit (>Ctr x 4) of each phase is exceeded. When you press the right button, values which belongs to the L2 and L3 comes to screen respectively. When you press the right key, Figure-25A comes to the screen.
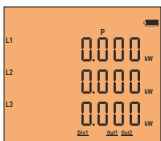

Figure-25A   Figure-25   Figure-26   Figure-27   Figure-28

Figure-25A: It shows the total powers. In order from top to bottom; active power (P), reactive power (Q) and apparent power (S).When you press the right button, figure-25 comes to the screen.

Figure-25: It shows the active power (P) values for each zone. When you press the right button, figure-26 comes to the screen.

Figure-26: It shows the maximum active power (P) values for each phase. When you press the right button, figure-27 comes to the screen.

Figure-27: It shows average(Ave) active power(P) value of each phase. When you press the right button, Figure-28 comes to the screen.

Figure-28: It shows the active power (P) demand (Dmd) values for each phase. When you press the right button, Figure-29 comes to the screen.

Figure-29

Figure-29: It shows the time and date of active power(P) demands of each phase. When you press the right button, values which belongs to the L2 and L3 comes to screen respectively. When you press the right button, Figure-30 comes to the screen.
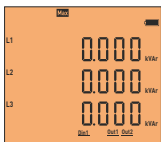
Figure-30 Figure-31 Figure-32 Figure-33 Figure-34

Figure-30: It shows the reactive power value(Q) which belongs to each phase. When the right button is pressed; Figure-31 comes to the screen.

Figure-31: It shows the maximum reactive power value(Max)which belongs to each phase. When the right button is pressed; Figure-32 comes to the screen.

Figure-32: It shows average(Ave) reactive power(Q) which belongs to each phase. When the right button is pressed; Figure-33 comes to the screen.

Figure-33: It shows the demand(Dmd) of reactive power(Q) which belongs to each phase. When the right button is pressed; Figure-34 comes to the screen.

Figure-34: It shows the dates and time values of the reactive power(Q)'s demand. When the right button is pressed values of L2 and L3 phases comes to the screen subsequently. When the right button is pressed; Figure-35 comes to the screen.
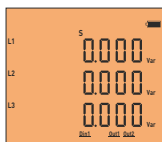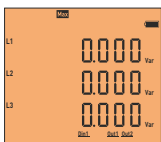

Figure-35 Figure-36 Figure-37 Figure-38 Figure-39

Figure-35: It shows apparent power (S)which belongs to each phase. When the right button is pressed; Figure-36 comes to the screen.

Figure-36: It shows maximum(Max) apparent power(S) value which belongs to each phase. When the right button is pressed; Figure-37 comes to the screen.

Figure-37: shows average(Ave) apparent power(S) which belongs to each phase. When the right button is pressed; Figure-38 comes to the screen.

Figure-38: It shows the demand(Dmd) of apparent power(S) which belongs to each phase. When the right button is pressed; Figure-39 comes to the screen.

Figure-39: It shows the dates and time values of the apparent power(S)'s demand. When the right button is pressed; Figure-40 comes to the screen.
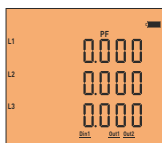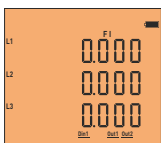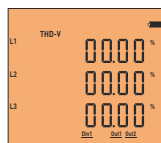

Figure-40 Figure-40A Figure-41 Figure-42 Figure-43

Figure-40: It shows the power factor value(PF) Which belong to each phase. When the right button is pressed; Figure-40A comes to the screen.

Figure-40A: It shows the cosine phi value(PI) Which belong to each phase. When the right button is pressed; Figure-41 comes to the screen.

Figure-41: It shows time and dates of each phase when the power factor limit (<0.80) of each phase is lowered(Lmt). When the right button is pressed values of L2 and L3 phases comes to the screen subsequently. When the right button is pressed; Figure-42 comes to the screen.

Figure-42: It shows the frequency value of each phase. When the right button is pressed; Figure-43 comes to the screen.

Figure-43: It shows total harmonic distortion value(THD-V) which belongs to voltage of the phase. When the right button is pressed; Figure-44 comes to the screen.
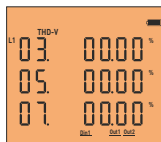
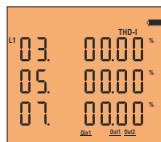| Figure-44 | Figure-45 | Figure-46 | Figure-47 | Figure-48 |

Figure-44: It shows total harmonic distortion value(THD-I)which belongs to current of the phase. When the right button is pressed; Figure-45 comes to the screen.

Figure-45: It shows the date and time of each phase exceeding (>%8) THD-V limit. When you press the right button, the values of the L2 and L3 phases are displayed on the screen respectively. When the right button is pressed; Figure-46 comes to the screen.

Figure-46: It shows the date and time of each phase exceeding (>%8) THD-I limit. When you press the right button, the values of the L2 and L3 phases are displayed on the screen respectively. When the right button is pressed; Figure-47 comes to the screen.

Figure-47: It shows the voltage harmonics values of up to 41st harmonics are displayed on each screen, with 3 values per screen. . When you press the right button, the values of the L2 and L3 phases are displayed on the screen respectively. When the right button is pressed; Figure-48 comes to the screen.

Figure-48: It shows the current harmonics values of up to 41st harmonics are displayed on each screen, with 3 values per screen. When you press the right button, the values of the L2 and L3 phases are displayed on the screen respectively. When the right button is pressed; Figure-49 comes to the screen.
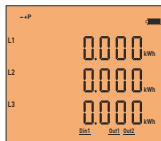

| Figure-49 | Figure-49A | Figure-50 | Figure-51 | Figure-52 |

Figure-49: It shows the import active, inductive reactive and capacitive reactive energy values which belongs to total of the phase. When the right button is pressed; Figure-49A comes to the screen.

Figure-49A: It shows the apparent energy values which belongs to total of the phase. When the right button is pressed; Figure-50 comes to the screen.

Figure-50: It shows the value of import active energy which belongs to each phase. When the right button is pressed; Figure-51 comes to the screen.

Figure-51: It shows the value of export active energy which belongs to each phase. When the right button is pressed; Figure-52 comes to the screen.

Figure-52: It shows the value of inductive reactive energy which belongs to each phase. When the right button is pressed; Figure-53 comes to the screen.

| Figure-53 | Figure-53A | Figure-54 | Figure-55 | Figure-56 |

Figure-53: It shows the value of capacitive reactive energy which belongs to each phase. When the right button is pressed; Figure-54 comes to the screen.
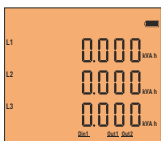
Figure-53A: It shows the value of apparent energy which belongs to each phase. When the right button is pressed; Figure-54 comes to the screen.

Figure-54: It shows the voltage irregularities of the phases with each other. When the right button is pressed; Figure-55 comes to the screen.

Figure-55: It shows the current irregularities of the phases with each other. When the right button is pressed; Figure-56 comes to the screen.

Figure-56: It shows the date and time. When the right button is pressed; Figure-57 comes to the screen.
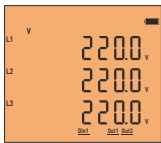
10 - Fast Forwarding of Screen Information:

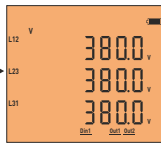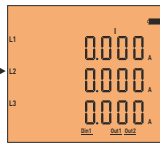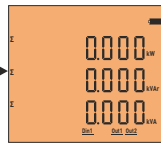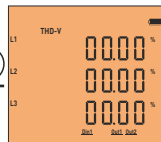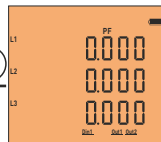When the device is energized, Figure-4 comes to the screen.
When you press the down button, Figure-11 comes to the screen.
When you press the down button, Figure-18 comes to the screen.
When you press the down button, Figure-25A comes to the screen.
When you press the down button, Figure-25 comes to the screen.
When you press the down button, Figure-30 comes to the screen.
When you press the down button, Figure-35 comes to the screen.
When you press the down button, Figure-40 comes to the screen.
When you press the down button, Figure-42 comes to the screen.
When you press the down button, Figure-43 comes to the screen.
When you press the down button, Figure-49 comes to the screen.
When you press the down button, Figure-54 comes to the screen.
When you press the down button, Figure-56 comes to the screen.
When you press the down button, Figure-57 comes to the screen.
When you press the down button, Figure-4 comes to the screen.

Figure-4: It shows the voltage values between phase-neutral.
Figure-11: It shows phase-to-phase voltage values.
Figure-18: It shows current values.
Figure-25: It shows Active power (P) values.
Figure-25A: It shows the total power (P, Q, S) values.
Figure-30: It shows Reactive power (Q) values.
Figure-35: It shows Apparent power (S) values.
Figure-40: It shows Power factor (PF) values.
Figure-42: It shows the frequency values.
Figure-43: It shows Total voltage harmonic values.
Figure-49: It shows Total energy (active and reactive) values.
Figure-54: It shows Percentage of voltage imbalance.
Figure-56: It shows the date and time.
Figure-57: It is used to enter the menu.

11 - Menu Structure:

Figure-57 / Figure-58

Figure-68 / Figure-59 / Figure-60

Figure-67 / Figure-61

Figure-66 / Figure-62

Figure-65 / Figure-64 / Figure-63

When you press the set button while the figure-57 is on screen, figure-58 password inquiry is displayed on the screen. If a password has been created, enter the password and press the set button.

If password is not created, when you press set button while value is "0000", you can enter menu and Figure-59 comes to the screen.

By pressing the right button in the menu, you can scroll through the parameters. Press the set button to set the parameters. Press the Esc button to exit the menu.
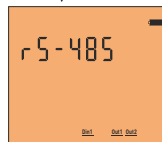
Figure-59: It is used to enter the current transformer ratio.
Figure-60: It is used to enter the voltage transformer ratio.
Figure-61: It is used to make communication settings.
Figure-62: It is used to delete Energy, Demand and Event records.
Figure-63: It is used to set the password.
Figure-64: It is used to determine the connection type.
Figure-65: It is used to set the date.
Figure-66: It is used to set the time.
Figure-67: It is used to assign Relay 1.
Figure-68: It is used to assign Relay 2.

11.1 - Setting the Current Transformer Ratio:
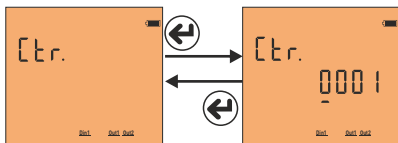
To change the current transformer ratio, press the set button while the figure-58 is on the screen. Figure-69 comes to the screen. Press right button to move between digits. Press the down key to change the value of the digit. You can change the digit value which is the underline. When you press the set button after entering the ratio, the current transformer ratio is recorded and the screen shows figure-59. You can scroll through the parameters in the menu by pressing the right button or you can exit the menu by pressing the Esc button.

Figure-59   Figure-69

Example: 100 / 5A current transformer ratio (multiplier value) is 20. The CTR value needs to be set to 0020.

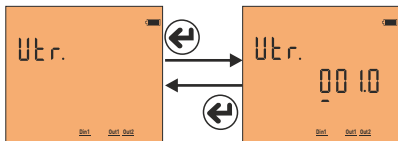## 11.2 - Changing Voltage Transformer Ratio:

To change the voltage transformer ratio, press the set button while the figure-60 is on the screen. Figure-70 comes to the screen. Press right button to move between digits. Press the down key to change the value of the digit. You can change the digit value which is the underline. When you press the set button after entering the ratio, the voltage transformer ratio is recorded and the screen shows figure-60. You can scroll through the parameters in the menu by pressing the right button or you can exit the menu by pressing the Esc button.

Figure-60   Figure-70

Example: Medium voltage (M.V.) = Enter the ratio of the voltage transformer that converts 34.500V to 110V. The ratio (multiplier) is calculated as 34,500 / 110 = 313,6 voltage transformer ratio. The VTR value must be set to 313.6.

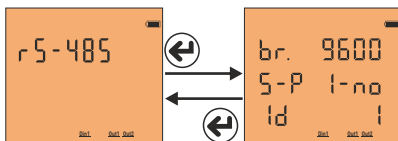## 11.3 - RS485 Remote Communication Settings

To change the RS-485 remote communication settings, press the set button while figure-61 is on the screen. Figure-71 comes to the screen. Four parameters can be set here. Baudrate, Stopbit, Parity and Modbus ID Press the right button to move the point (.) to the parameter you want to set.

Figure-61   Figure-71

Then change the parameter value by pressing the down key. When you press the Set button, the changes that you made are saved and Figure-61 comes to the screen. You can scroll through the parameters in the menu by pressing the right button or you can exit the menu by pressing the Esc button.

Modbus ID (MBID) value; when more than one communication devices connect to a modem, Serial number or ModBus address must be different. In such cases, enter a different value from other devices.

Baudrate(br): 1200 - 115200 bps, **ModBus ID(Id):** 1 - 247 **Stop bits:** 1-2, **Party** : none, even, odd.
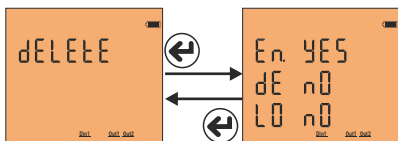
11.4 - Deleting Energy, Demand and Event Records:

To delete the records, press the set button while the screen is shown. Figure-71 comes to the screen. You can delete 3 records here. Energy (En), Demand (dE) and Event logs (LE). Press the right button to move the point (.) to the record which you want to delete. Then press the down button to change the value to "yes". The record value which you do not want to delete must remain in "no".

Figure-62   Figure-72

When you press the Set button, only records with the value "yes" will be deleted and the Figure-62 comes to the screen. You can scroll through the parameters in the menu by pressing the right button or you can exit the menu by pressing the Esc button. **-11-**
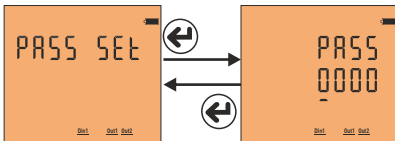
11.5 - Enter Password Value:

Figure-63

Figure-73

In order to change password; press Set button while Figure-63 is on the screen. The Figure-73 comes to the screen. In order to pass through steps; press the right button. In order to change the value of the step press the down button. You can change the step value with underline. If you press the set button after entering the password, the password is saved and the screen comes in figure-63. Pressing the right button; you can pass through the parameters in the menu or pressing Esc button you can quit the menu.
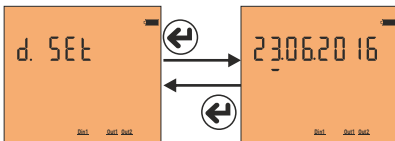
11.6 - Setting the Date:

Figure-64

Figure-74

In order to change the date, press the Set button while the Figure-64 is on the screen. The screen comes in figure-74. Underline is on the step which ındicate the day. In order to change the day press the down button. Then if you press the right button ; underline comes down of the month step. Press the down button in order to change the month. Then if you press the right button; the underline comes down of the year step. Press the down button in order to change the year. After the date is updated, when you press the set button; it is recorded and Figure-64 comes to the screen. Pressing the right button; you can pass through the parameters in the menu or pressing Esc button; you can quit the menu. Date display is organized as day / month / year.
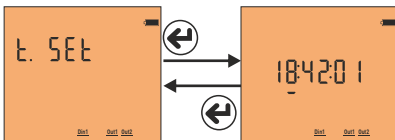
11.7 - Setting the Time:

Figure-65

Figure-75

In order to change the time; press the Set button while the figure-65 is on the screen. The Figure-75 comes to the screen; the underline is on the step which shows the clock. Press the down button in order to change the clock. Then if you press the right button, the underline comes down the step of second. Press down button to change the second. After the clock, minute and second is updated, it is recorded when you press the set button and figure-65 comes to the screen. Pressing the right button; you can pass through the parameters in the menu or pressing Esc button; you can quit the menu. Time display is organized as 24 hours.

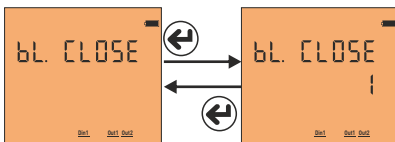## 11.8 - Setting the Backlight Duration:

Figure-66

Figure-76

In order to adjust the backlight duration (after the set time, the screen light turns off until any button is pressed to save power); press set button while Figure-66 is on the screen. The Figure-76 comes to the screen. Press the right button to increase the value. If you press the set button after adjusting the backlight duration (min.), the value is saved and the screen comes in figure-66. Pressing the right button; you can pass through the parameters in the menu or pressing Esc button; you can quit the menu.

11.9 - Task Assignment to Relay 1 and Relay 2:

Şekil-67   Şekil-77
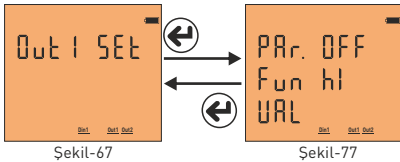
To assign the task to relay 1, press the set button, when figure-77 is on the screen. There are 3 settings; these are Parameter (PAr), Function (Valued) and Value (VAL). Press the right button to move the point (.) to the parameter. Press the down button to bring up the desired parameter. Then press the right button to move the point (.) to the function. Press the down button to set the function to low or high set. Press the right button to move the point (.) value. Press the down button to enter the desired value. Then when you press the set button, the task will be assigned to relay 1 and Figure-67 comes to screen. You can scroll through the parameters in the menu by pressing the right button or you can exit the menu by pressing the Esc button.

Parameters (PAr): Voltage (**ULn**), current (**ILn**), total current (**ILt**), total harmonic distortion belong to Voltage (**thdV**), total harmonic distortion belong to Current (**thdI**), power factor (**PF**), voltage Unbalance (**U Un**), current Unbalance (**I Un**), energy limit (**EnLI**) digital input (**dI n**) and off (**OFF**).

Function (Fun): Functions to be applied for parameters: if greater than value (**hI**) and smaller than value (**LO**).

Value(Val): The value to be set for the parameters.

Note1: The hysteresis value is fixed at 5%.

Note2: The task assignment of relay 2 is assigned in the same way as relay 1. While in menu for relay 2 assignment, The enterance should be done from the figure-68.

Note3: To use the digital input parameter, 9V-24DC energy should be applied from the enterance of input to the device. In these parameters if the relay is wanted to be activated HI function; or if it is wanted to be activated while the energy is not available LO function should be chosen. The change of the voltage at the data input should be minimum at one second (1Hz)

Example: When the voltage rises above 250V, switch on relay 1. Parameters **(PAr)=ULn**, function **(fun)=hl** and value **(VAL)=250V** should be set. After the relay 1 is set like that; if one of the voltage values rises above 250V; relay 1 activated (The contact leads become short-circuited) When the all values of voltage are below %5 of 250V; the relay is deactivated (contact leads become open circuit)

12 - Menu Values Table:

Parameter Number	Parameter	Unit	Factory Value	Minimum Value	Maximum Value
Ctr	Current Transformer Ratio	-	1	1	5000
Vtr	Voltage Transformer Ratio	-	1.0	0.1	999.9
br	Baudrate	bps	9600	1200	115200
-	Stop bits	-	1	1	2
-	Data bits	-	8	-	-
-	Parity	-	none	none, even, odd	
Id	ModBus ID	-	1	1	247
En	Deleting Total Energy	-	No	Yes	No
dE	Deleting Demand Values	-	No	Yes	No
LO	Deleting Event Records	-	No	Yes	No
PASS	Password	-	0	0	9999
bL. CLOSE	Backlight Duration	min.	1	0ff	60
D. Set	Date	-	-	01.01.2000	31.12.2099
T. Set	Hour	-	-	00:00:00	23:59:59
Par	Parametre	-	OFF	OFF, Uln, Iln, Ilt, thdU, thdI, PF, U Un, I Un, EnLI, dI n	
Fun	Function	-	High	High	Low
UAL	Uln (voltage)	Volt	vtr x 10	vtr x 10	vtr x 500
	Iln (Current)	Amper	(ctrx10)/100	(ctrx10)/100	(ctrx500)/100
	Ilt (Total Current)	Amper	(ctrx3x10)/100	(ctrx3x10)/100	(ctrx3x500)/100
	thdU (Total Voltage Har.)	%	1	1	50
	thdI (Total Current Har.)	%	1	1	50
	PF (Power Factor)	%	0.50	0.50	0.99
	U Un (Voltage imbalance)	%	1	1	50
	I Un (Current Imbalance)	%	1	1	50
	EnLI (Energy Limit)	kWh	0.1	0.1	500.0
	dIn (Digital Input)	-	-	-	-
Dip	Low Voltage	%	<Vtr x 230 x 0,90 ve <Vtr x 400 x 0,90		
Swl	High voltage	%	>Vtr x 230 x 1,10 ve >Vtr x 400 x 1,10		
Cut	No Voltage	%	<Vtr x 230 x 0,40 ve <Vtr x 400 x 0,40		
Lmt I	Current Limit	%	>Ctr x 4		
Lmt Thd-V	Thd-V Limit	%	>1.08		
Lmt Thd-I	Thd-I Limit	%	>1.08		
Lmt PF	Power Factor Limit	%	<0.80		
dI n	Data Input Frequency	Hz.	>1Hz.		

13- Dimensions:
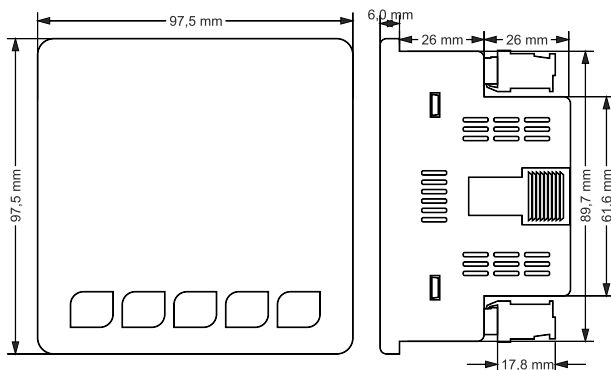
14 - Technical Specifications:

Operating Voltage	85V - 240V AC
Operating Frequency	50 / 60 Hz
Operating Power	<10VA
Operating Temperature	-20ºC.....55ºC
Input Voltage	3V - 330V AC
Voltage Measuring Range	3V - 570kV
Input Current	3mA - 5,5A
Current Measuring Range	3mA - 25.000A
Voltage, Current Accuracy	%±0,2
Active Accuracy	%±0,5
Reactive Accuracy	%±1
Supported Connection	3P4W
Current Transformer Ratio	1....5000
Voltage Transformer Ratio	1.0....999.9
Harmonic Voltage	3 - 41
Harmonic Current	3 - 41
Real Time Clock	>5 year
Communication	RS485 MODBUS RTU
Display	71.5x61.5mm Glass LCD
Contact Output	2A / 250V AC (Resistive Load)
Dijital Input	9V - 24V DC
Weight	<300Gr.
Protection Class	IP54(Front Panel), IP20(Body)
Panel Hole Measurements	91mm x 91mm
Connection Type	Plug-in Terminal Connection
Cable Diameter	1.5mm²
Assembly	Assembly to panel front cover
Working Altitude	<2000meter

15 - Contents:

16 - Contact Informations:

Energy and
Compensation
Tracking System
www.tenseenerji.com