3 PHASE POWER METER

Model:POWER-01-DIN

ENERGY 02-96
POWER 01-96

ENERGY 02-DIN
POWER 01-DIN

ENERGY and POWER

TÜV SÜD GOST-R CE ISO 9001:2008

PARAMETERS:	ENERGY-02	POWER-01
Ct : current transformer ratio (1...5000)	■	■
Ut : voltage transformer ratio (1...4000)	■	■
Denn Set : Demand SET	■	■
PIN: (Pasword)	■	■
PULS oUt : Pulse out	■	
bUS rtU : Settings of Modbus RTU	■	
CLr : clear	■	■
Coon tyPE : connection type	■	■
rES ALL PAr : reset all values	■	■

MODEL

	With RS485 MODBUS RTU: VL1,VL2,VL3; VL12,VL23,VL13; IL1,IL2,IL3,I-Neutral,Hz; P1,P2,P3,Q1,Q2,Q3,S1,S2,S3; CosΦ1,CosΦ2,CosΦ3; PFD1,PFD2,PFD3,ΣPF; ΣP,ΣQi,ΣQc,ΣQ,ΣS; imp-exp ΣkWh; imp-exp ΣkVARh(ind); imp-exp ΣkVARh(cap); ΣkVAh; 3 – 31. harmonics for currents; 3 – 31. harmonics for voltages	Power Factor PF1,PF2,PF3	W Active Power	VAR Reactive Power	VA Apparent Power	ΣkWh Active Energy	ΣkVArh, Reactive Energy	Peak	Min,Max demand	2 Pulse out for Energy	RS-485 MODBUS-RTU	3P&4W , 3P&3W , ARON connection	Current and Voltage Transformer Ratio	Password	LED display	96 x 96	DIN
ENERGY-02-96	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
ENERGY-02-DIN	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
POWER-01-96	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
POWER-01-DIN	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Introduction

The device was designed to measure, report and analyse the electrical magnitudes in the 3-phase electric network and both design and software were produced by KAEL engineers. The state-of-the-art technologies were inserted in this device and both menus which facilitate the use of the user and the required features were included.

WARNINGS

1- The device shall be engaged by competent and licensed persons in conformity with the instructions set forth in the operation manual. In case required, controls shall be carried out by such persons also.
2- Do not open the inside of the device or cause to be opened. There are no parts inside the device which the user or anyone else may intervene.
3- Use the device according to assembly instructions
4- Before making electrical connection to the terminals of the device, make sure there is no electric power on the cables and terminals. The switchboard shall not have electric power on.
5- The fuses used in the device are of 1A FF type.
6- Make sure to fix the device on the switchboard firmly without swings with the apparatus given with the device.
7- Do not touch the keys on the front panel of the device with any substance other than your finger.
8- Wipe the device only with dry cloths after making sure the electric energy of the device is cut-off. Water or chemicals used for cleaning may cause damage to the device.
9- Before activating (energizing) your device please make sure that the terminal connections are made according to the connection scheme and without causing any contact problems (loose connection or contact of multiple copper cables).
10. The above measurements and warnings are for your safety. Kael Elektronik Ltd Şti or the dealer may not be held liable for any inconveniences when those warnings are not observed.

Features

- Easy use with menu
- Improved dynamic software
- Ability to enter current and voltage transformer rates
- True RMS
- Voltage, current and harmonic protection
- Password protection
- 3P&4W, 3P&3W, ARON Connection

Measurements

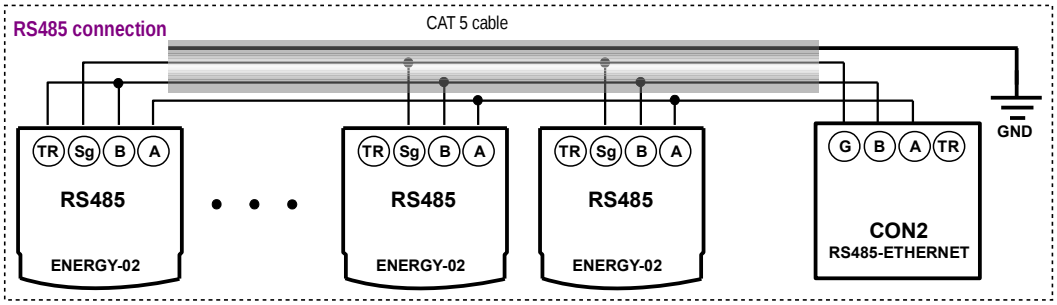
- Active Power (ΣP)
- Inductive Reactive Power ΣQ(ind)
- Capacitive Reactive Power ΣQ(cap)
- Apparent Power (ΣS)
- Active Energy (ΣkWh)
- Inductive Reactive Energy (ΣkVARh(ind))
- Capacitive Reactive Energy (ΣkVARh(cap))
- Peak and Demands

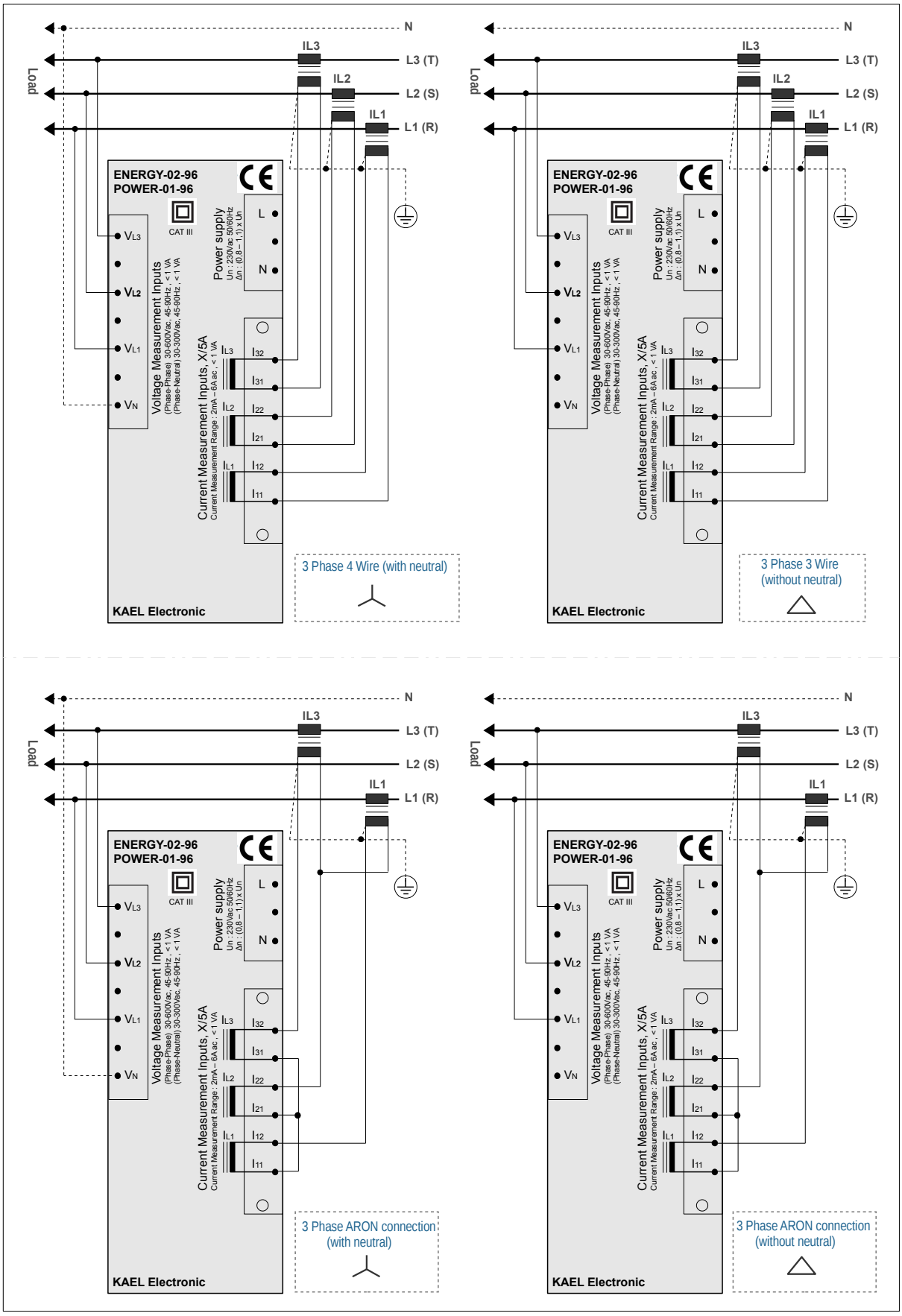
Outputs

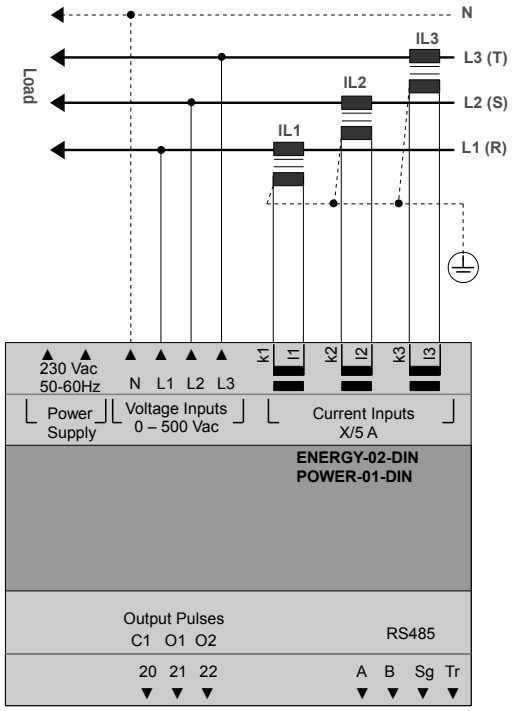
- Pulse Output (2pcs)
- RS-485 MODBUS-RTU

Making the Connections

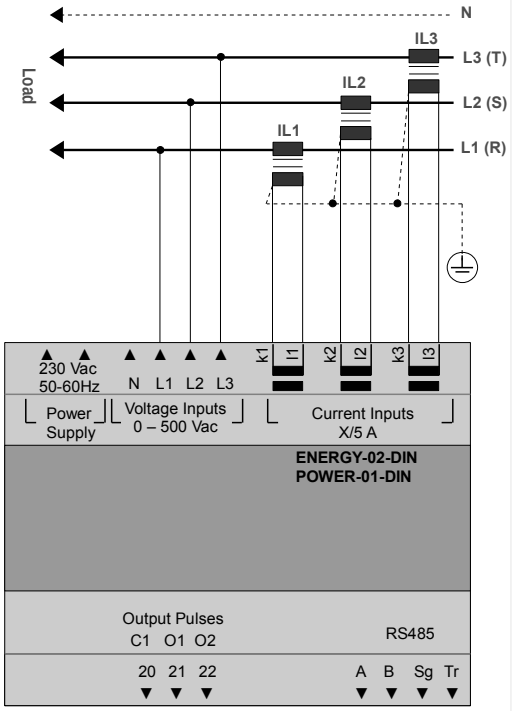
- The connections of the system must be made when it is out of power.
- The connections of the device shall be connected as shown in the connection scheme.
- The current and voltage connections shall be connected in a manner that they are placed on the same phase same current transformer and with the same direction. Connection scheme must be observed.
- The value of the current transformer chosen shall not be less than the real load value and X/5 amperes. Moreover, it is recommended to chose class 0,5.
- Fuses to be used shall be FF type. Fuses to be used shall be chosen according to given current values.
- RS485 connection shall be made.
- Do not supply power to the device before all the connections are checked by means of a measurement apparatus.
- The terminals for currents and voltage are suitable for cables with 2,5mm2 cross- section.
- Pulse outputs, Inputs and RS485 terminals are suitable to max. 1,5 mm2 cables
- CAT5 (category 5) cables are recommended for RS485 connection



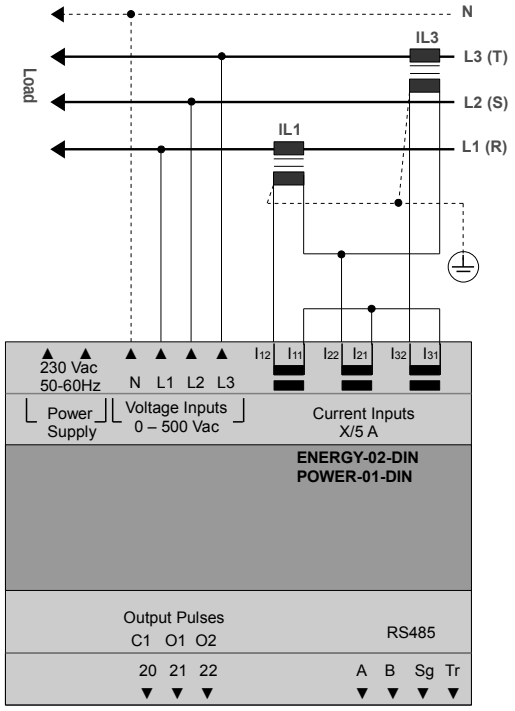

N
IL3
L3 (T)
IL2
L2 (S)
IL1
L1 (R)
Load
ENERGY-02-96
POWER-01-96
CAT III
Power supply
Un : 230Vac 50/60Hz
Δn : (0,8 – 1,1) x Un
L
N
Voltage Measurement Inputs
(Phase-Phase) 30-600Vac, 45-90Hz , < 1 VA
(Phase-Neutral) 30-300Vac, 45-90Hz , < 1 VA
VL3
VL2
VL1
VN
Current Measurement Inputs, X/5A
Current Measurement Range : 2mA – 6A ac , < 1 VA
IL3
I32
I31
IL2
I22
I21
IL1
I12
I11
KAEL Electronic
3 Phase 4 Wire (with neutral)
3 Phase 3 Wire
(without neutral)
3 Phase ARON connection
(with neutral)
3 Phase ARON connection
(without neutral)



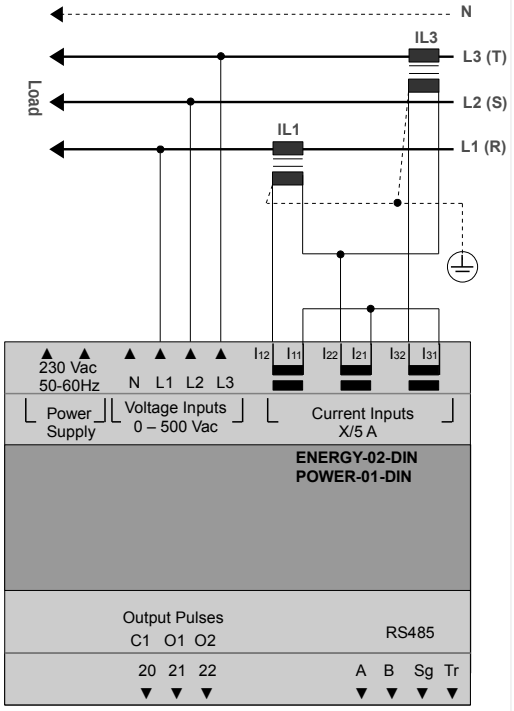
3 Phase 4 Wire (with neutral)



3 Phase 3 Wire (without neutral)



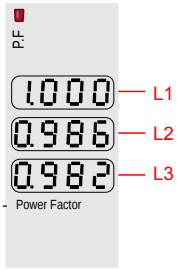
3 Phase ARON connection (with neutral)



3 Phase ARON connection (without neutral)

MEASUREMENTS

Power Factor (P.F)



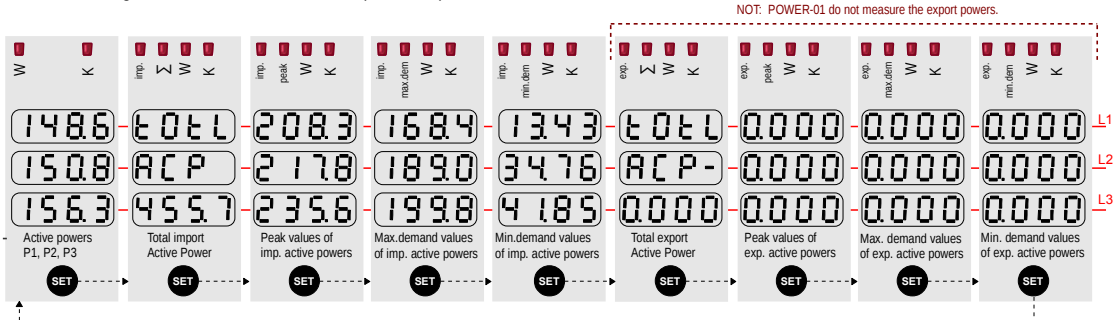
MEASUREMENTS:

For ENERGY-02 (P.F, W, VAr, VA, ΣW, ΣVAR, ΣVA, ΣWh, ΣVArh, ΣVAh)
For POWER-01 (P.F, W, VAr, VA, ΣW, ΣVAR, ΣVA)
The above parameters can be reached step by step using arrow keys. Related leds lights up and displays the corresponding parameter value which is displayed at the same time.

Active Power (P1, P2, P3, ∑P)

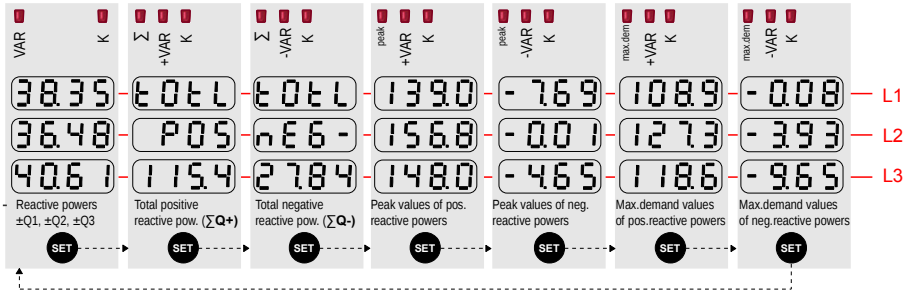
Active powers for each phases, total active power , their peak and demand values can be found in this menu. Demand and peak values are cleared in (cLr P) menu . Also setting of the demand time can be set in (dEnn SEt) menu.

NOT: POWER-01 do not measure the export powers.



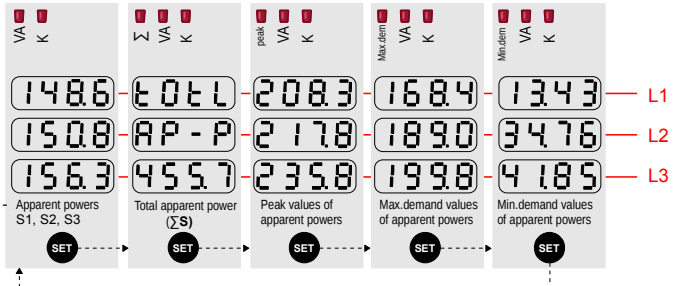
Reactive Power (+Q1, -Q1, +Q2, -Q2, +Q3, -Q3, ∑Q+, ∑Q-)

Reactive powers for each phases, total positive and negative reactive power , their peak and demand values can be found in this menu. Demand and peak values are cleared in (cLr q) menu . Also setting of the demand time can be set in (dEnn SEt) menu.



Apparent Power (S1,S2,S3, ∑S)

Apparent powers for each phases, total apparent power , their peak and demand values can be found in this menu. Demand and peak values are cleared in (cLr S) menu . Also setting of the demand time can be set in (dEnn SEt) menu.



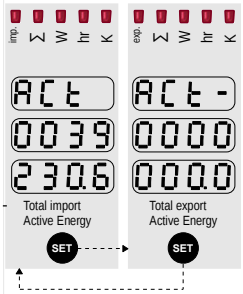
MEASUREMENTS

MEASUREMENTS

Active Energy (KWhr,MWhr,GWhr)

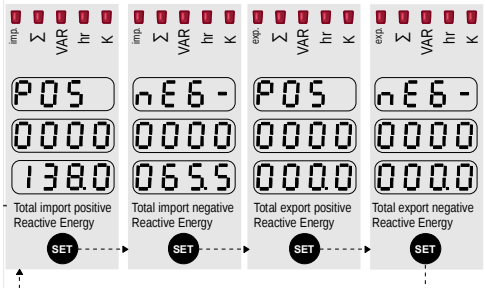
Total import and export active energy can be monitored.
Energies can be deleted in (CLR Energy) menu.

NOT: POWER-01 do not measure to the energies.



Reactive Energy (KVARhr,MVARhr,GVARhr)

Total import/export positive and negative energy can be monitored .
Energies can be deleted in (CLR Energy) menu.



Apparent Energy (KVAhr)

Apparent Energy can be deleted in
(CLR Energy) menu.

PARAMETERS

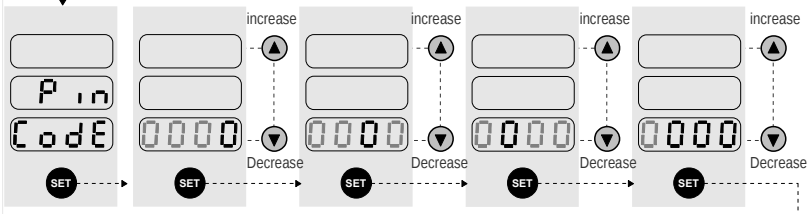
Parameters

If the password is active, SET button is pressed for 3 seconds, the parameter menu can be accessed only after entering 4-digit password. Temporary password is "0000". if password is not active, you can enter to the parameter menu without entering password. First parameter is current transformer ratio. After pressing the SET key, value is increased or decreased by using the arrow keys. By pressing the SET button, the new value will be saved.

SET Press for 3 seconds

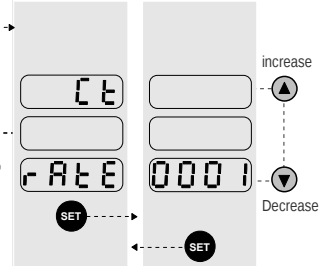
PIN (Password)

Factory setting for the password is "0000" '. To the desired number is reached by using the arrow keys for each a digit. Confirmed by pressing the SET key.



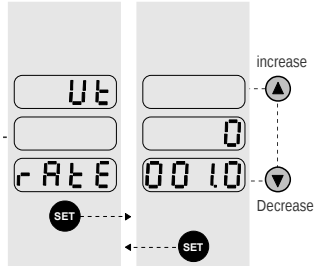
Ct :Current Transformer Ratio (1.....5000)

Current transformer ratio value is entered.
Example: For 500 / 5A is entered 100. (500/5A=100)



Ut :Voltage Transformer Ratio (1.....4000)

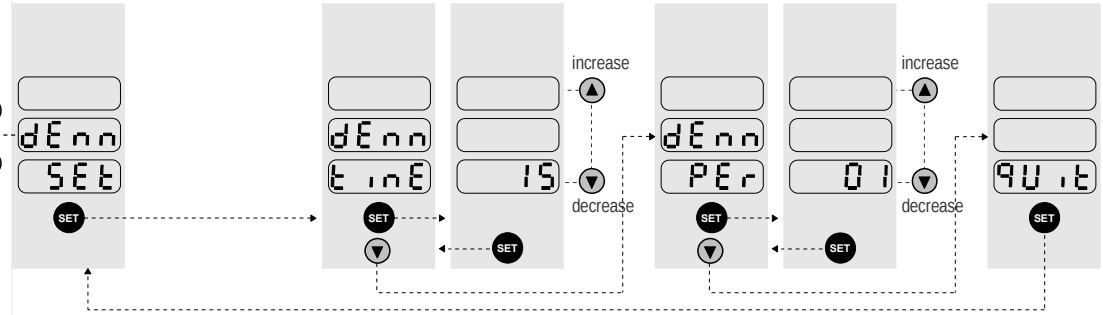
Voltage transformer ratio value is entered.
Example: For 34500 /100V is entered 345. (34500/100V=345)



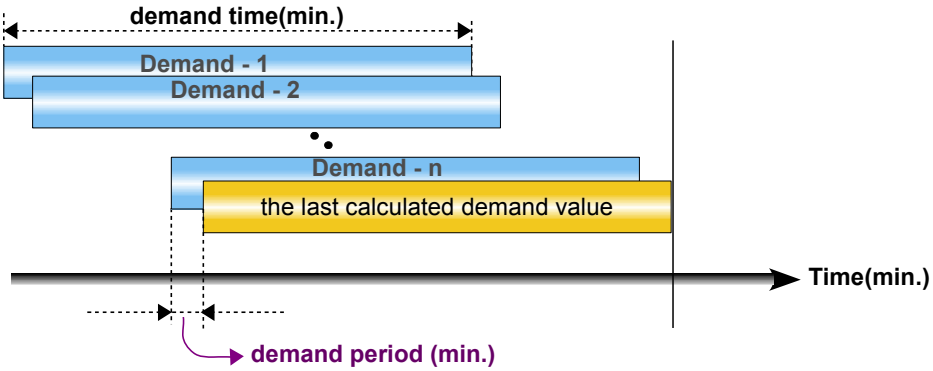
dEnn SEt : Demand SET
There are two parameters.
These are shown in the graph below.

dEnn tınE :Demand Time
(demand period +1) ..... (60 minutes)
Refers to the computation time.

dEnn PEr :Demand Period (1minute) ....(demand time - 1)
Refers to the time between two calculations.



Example: if , demand time= 15 minutes and demand period= 3 minutes ; Every 3 minutes, demand value is re-calculated for the last 15 minutes.

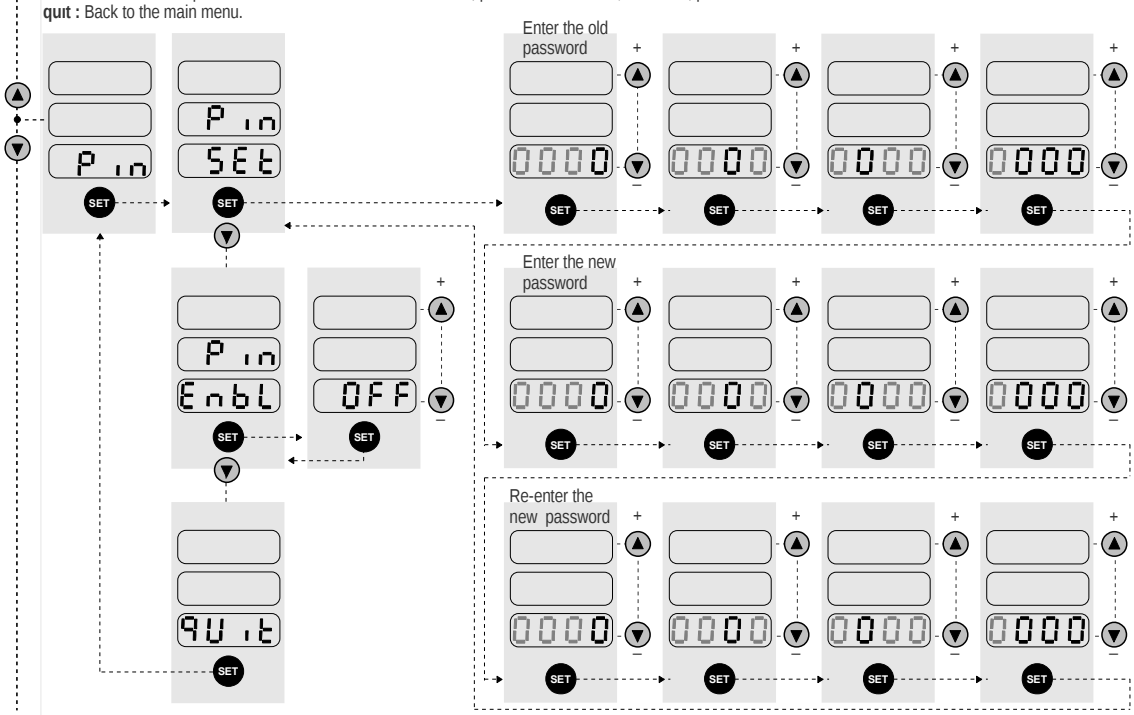


PIN (Password) : In this section, the password can be changed. Also password can be enabled or disabled.

Pın SEt : Default value for the password is "0000". First of all, the old password (PIN OLD) must be entered correctly. If the old password is correct, the user can enter the new password (**Pın nEU**). You must enter the new password again (**Pın rEP**). If both passwords are the same, "NEU Pin Suite" message appears on the screen and a new password will be stored.

Pın EnbL : Password protection is enabled or disabled. **Pın On** ; password is enabled, **Pın OFF** ; password is disabled.

quıt : Back to the main menu.

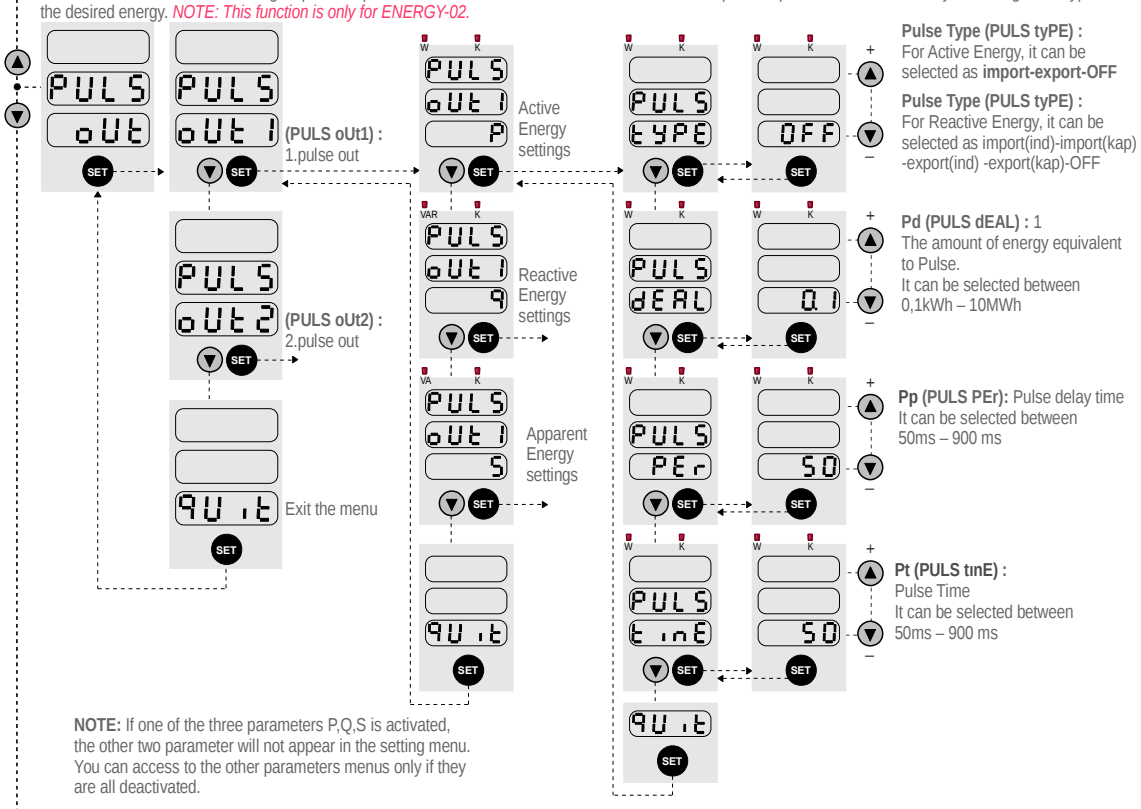


PARAMETERS

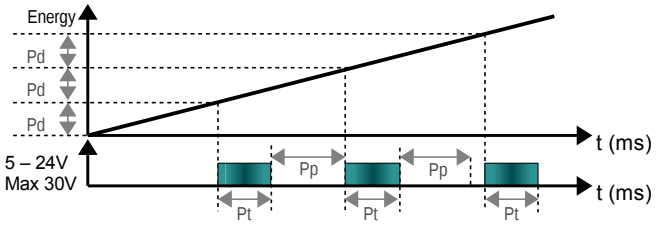
PARAMETERS

PARAMETERS

PULS oUt : The device has two digital pulse output. Menus and functions are the same for the two outputs.Outputs can be set differently according to the type of the desired energy. *NOTE: This function is only for ENERGY-02.*

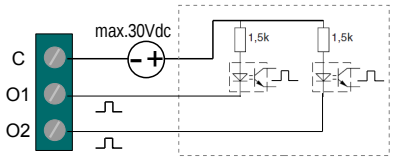


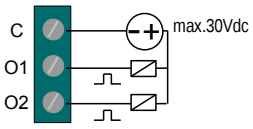
NOTE: If one of the three parameters P,Q,S is activated, the other two parameter will not appear in the setting menu. You can access to the other parameters menus only if they are all deactivated.



when amount of each energy (Pd) occurs , a pulse is generated from output, during time of (Pt). And then, output stays as 0V ,during time of (Pp)

Connection to another device as insulated





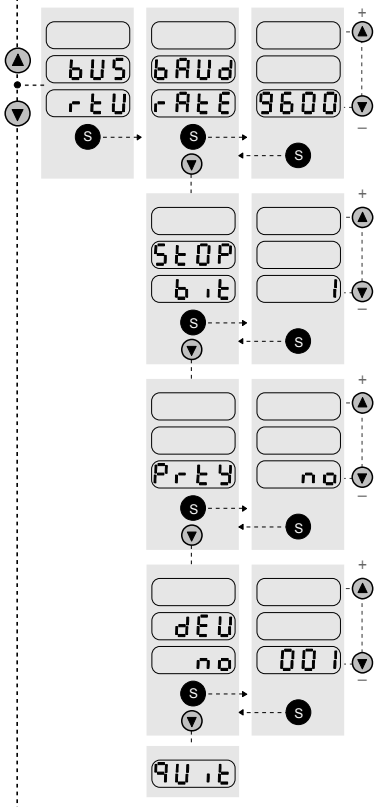
usage with relay

PARAMETERS

PARAMETERS

bUS rtU : Modbus rtu adjustments.

NOTE: This function is only for ENERGY-02.



Parity : no , even , odd
Cihaz No : 001 255

MODBUS – RTU

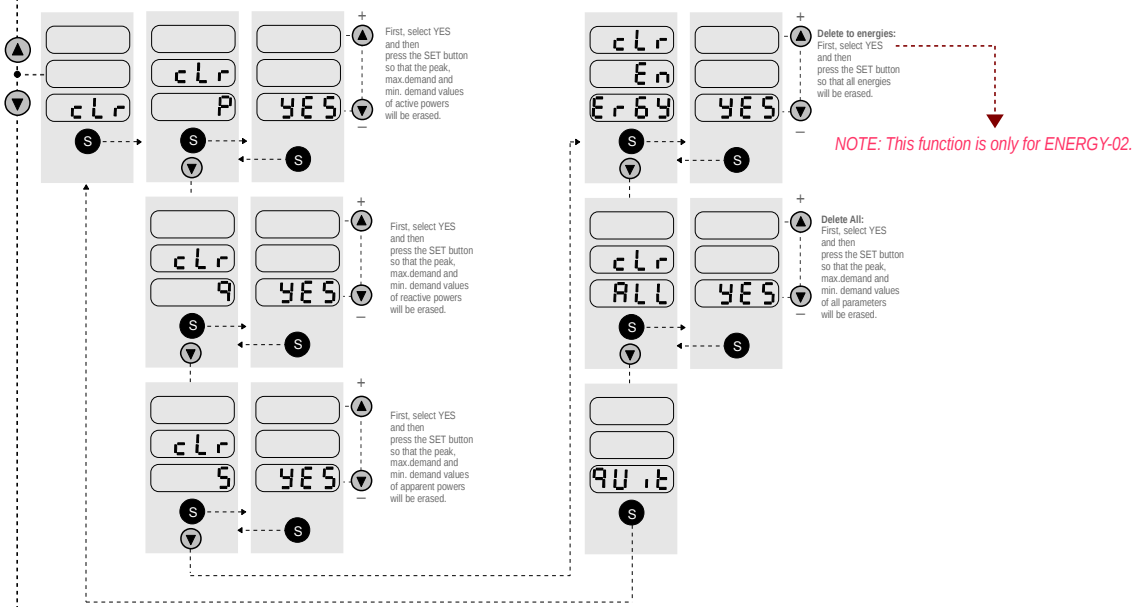
ADRESS 8 BIT	FUNCTION 8 BIT	DATA 8 BIT	CRCL 8 BIT	CRCH 8 BIT	T Delay time for 3,5 character

The maximum length of this package is 12 Byte.

MODBUS – RTU Functions

03H	READING SINGLE REGISTER
06H	WRITING SINGLE REGISTER
10H	WRITING MULTIPLE REGISTER

cLr : Demands, peak values, and accumulated energies can be erased in this section.The parameters which indicated by the LEDs at the top of the device, will be erased.



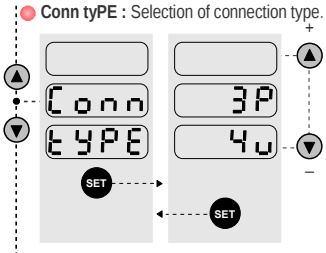
NOTE: This function is only for ENERGY-02.

PARAMETERS

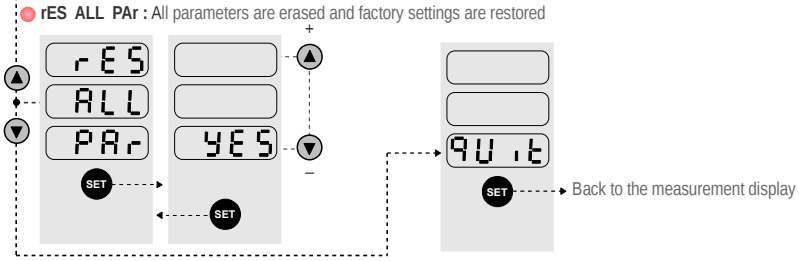
PARAMETERS

Conn tyPE : Selection of connection type.

3P 4u : 3 phase , 4 wire (star)
3P 3u : 3 phase , 3 wire (wye), without neutral



rES ALL PAr : All parameters are erased and factory settings are restored

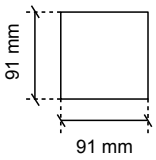


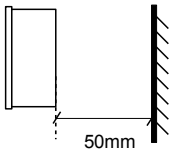
Installation Instructions

1- A space with a dimension of 92mm * 92mm shall be emptied on the panel where the device will be mounted.
2- Before assembly of the device, remove panel fixing apparatuses.
3- Place the device from front into the window opened in the panel as flush.
4- -Fix the device on to the panel by using fixing apparatuses from back part.

Make the assembly in a manner to assure 50 cms space between the device and the wall to enable good ventilation of the device.

PANEL SPACING DIMENSIONS





Technical Specifications

Operating Voltage (Un)	: (Phase-Neutral) 230Vac
Operating Range	: (0,8-1,1) x Un
Operating Frequency	: 50/60 Hz
Supply Power Consumption	: < 6VA
Power Consumption of Measurement Inputs:	: < 1VA
Vin	: 1 – 300 Vac (L-N) : 2 – 600 Vac (L-L)
Iin	: (as the secondary current of the current transformer) 0,01 - 6 Amp AC
Measurement Class	: CAT III
Voltage Transformer Ratio:	: 1 4000
Current Transformer Ratio	: 1 ..... 5000 (25000/5A)
Connection Type	: 3P&4W , 3P&3W , ARON
Demand Time	: 1 – 600 min
Display range	: 1,0V - 400,0 kV : 0,001A ..... 25000 A : 0 – 999,9 M (W,VAR,VA) : 0 – 999,9 k (W,VAR,VA) : 0 – 999.999.999,999 (GWh,GVARh,GVAh)

accuracy

Active Power	: 1 class
Reactive Power	: 2 class
Apparent Power	: 1 class

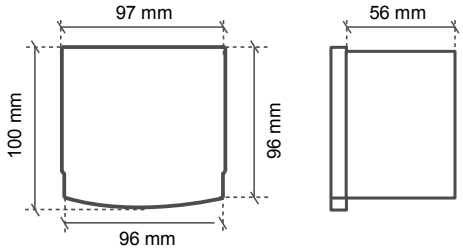
Pulse Outputs (2 pcs)

Operating Voltage	: 5 – 24Vdc max. 30Vdc
Operating Current	: max 50 mA
Min. Switching Time	: 100 ms

RS485

Baud rate	: 2400,4800,9600,19200,28800,38400,57600,115200
Stop Bits	: (0.5) , (1) , (1.5) , (2)
Parity	: no , even , odd
Device No	: 1 255

Device Protection Class	: IP 20
Terminal protection class	: IP 00
Ambient temperature	: - 5 °C .... + 50 °C
Installation Type	: to panel cover from front
Dimensions	: 96x96x56 mm



NOTE: Operating Voltage (Un): ask price and delivery time for 85-256Vac/dc

Factory Settings

	Current Transformer(Primary) Value	: 5 / 5 A
	Voltage Transformer Ratio	: 1
	Password	: if not changed by user (0000) NOTE 1
	Password use	: Off (disabled)
	Connection Type	: 3P&4W
MODBUS RTU	Port Settings (Baud Rate)	: 9600
MODBUS RTU	Port Settings (Stop Bits)	: 1
MODBUS RTU	Port Settings (Parity)	: No
MODBUS RTU	Port Settings (Device No)	: 1
	Demand Time	: 15 minutes
	Demand Interval	: 3 min
1. Pulse ouputt	Pulse Type for 1.Pulse Output	: OFF
1. Pulse ouputt	Pulse Value for 1. Pulse Output (Pd)	: 1 KWh
1. Pulse ouputt	Pulse Duration for 1.Pulse Output (Pt)	: 100 ms
1. Pulse ouputt	Pulse OFF Time for 1.Pulse output (Pp)	: 200 ms
2. Pulse output	Pulse Type for 2.Pulse Output	: OFF
2. Pulse output	Pulse Value for 2. Pulse Output (Pd)	: 1 KVARh
2. Pulse output	Pulse Duration for 2.Pulse Output (Pt)	: 100 ms
2. Pulse output	Pulse OFF Time for 2.Pulse output (Pp)	: 200 ms

Note 1 : The password is primarily defined as 0000. However the password will not change even in the event that factory values are restored after having amended the password. The latest password entered by the user is valid.

Note 2 : When factory settings are restored, energies are set to zero.

Formulas

Active Power	$P = \frac{1}{N} \sum_{i=0}^{N} P_i$
Reactive Power	$Q = \frac{1}{N} \sum_{i=0}^{N} Q_i$
Apparent Power	$S = \sqrt{P^2 + Q^2}$
Power Factor	$PF = \frac{P}{S}$