

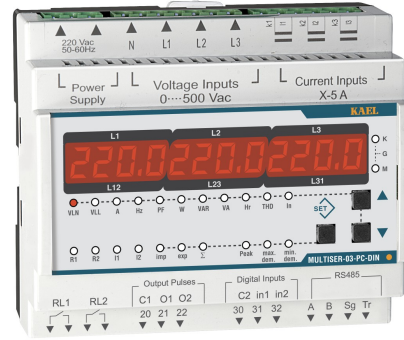
MULTISER

03-PC-96
02-PC-96
01-PC-96
01-96
11-96
11-PC-96

MULTISER

03-PC-DIN
02-PC-DIN
01-PC-DIN
01-DIN
11-DIN
11-PC-DIN

NETWORK ANALYSER



www.kael.com.tr

KAEL Mühendislik Elektronik Tic. ve San. Ltd.Şti.

	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,ΣQ,ΣQc,ΣQ,ΣS	imp-exp ΣkWh	imp-exp ΣkVARh(ind)	imp-exp ΣkVARh(cap)
	3 - 31. harmonics for currents	3 - 31. harmonics for voltages								
	Standart Benefits									
	- Voltage - Current - Power Factor - Frequency - Active Power - Reactive Power - Apparent Power - Active Energy - Reactive Energy - Neutral Current - THD-V and THD-I - Peaks and Demands - True RMS - Current and Voltage Transformer Ratio - Password 3P&4W , 3P&3W , ARON connection									
	- ALARMS (Over Voltage – Under Voltage and Voltage Unbalance) - ALARMS (Over Current – Under Current and Current Unbalance) - ALARMS (Phase sequence-Phase failure Over THD-V and Over THD-I) 2 Relay Outputs 2 Digital Inputs 2 Pulse Outputs for energies - RS-485 MODBUS-RTU - LED display 96 x 96 - DIN									
MULTISER-01-96										
MULTISER-01-PC-96										
MULTISER-02-PC-96										
MULTISER-03-PC-96										
MULTISER-01-DIN										
MULTISER-01-PC-DIN										
MULTISER-02-PC-DIN										
MULTISER-03-PC-DIN										
MULTISER-11-96										
MULTISER-11-PC-96										
MULTISER-11-DIN										
MULTISER-11-PC-DIN										

New

Table-1

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 KAELE 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.

All the information and warnings you need to know concerning the device were described in the user operation manual. Please read this manual carefully before engaging with the device. Please do not take any action before consulting with our company for any matters not clearly understood.

Tel: +90 232 877 14 84 (pbx) Fax: +90 232 877 14 49

Factory: Atatürk Mh. 78. Sok. No:10 Ulucak Köyü Kemalpaşa İzmir- TURKIYE

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
- Multiple alarms
- Password protection
- 3P&4W, 3P&3W, ARON Connection

Measurements

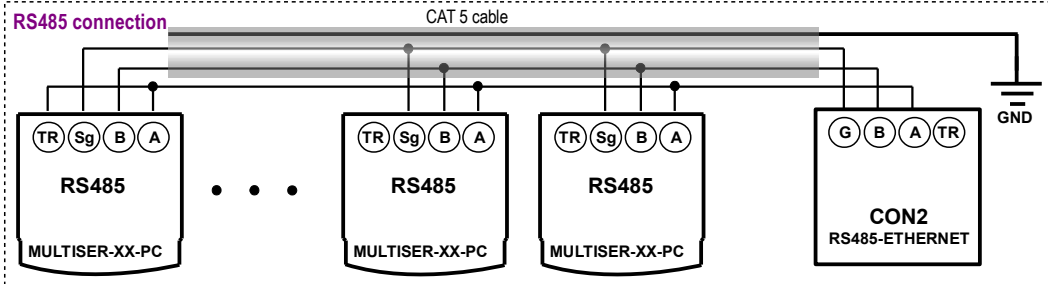
- Voltage (V1N, V2N, V3N, V12, V23, V13)
- Current (I1, I2, I3, ΣI)
- Power Factor (PF1, PF2, PF3)
- $\cos\Phi$ values (CosΦ1, CosΦ2, CosΦ3,)
- Frequency (Hz)
- Active Power (ΣP)
- Inductive Reactive Power [ΣQ(ind)]
- Capacitive Reactive Power [ΣQ(cap)]
- Apparent Power (ΣS)
- Active Energy (ΣkWh)
- Inductive Reactive Energy (ΣkVARh(ind))
- Capacitive Reactive Energy (ΣkVARh(cap))
- Neutral Current (I(N))
- Total harmonic distortion for current and voltage (THD-V ve THD-I)
- Peak and Demands

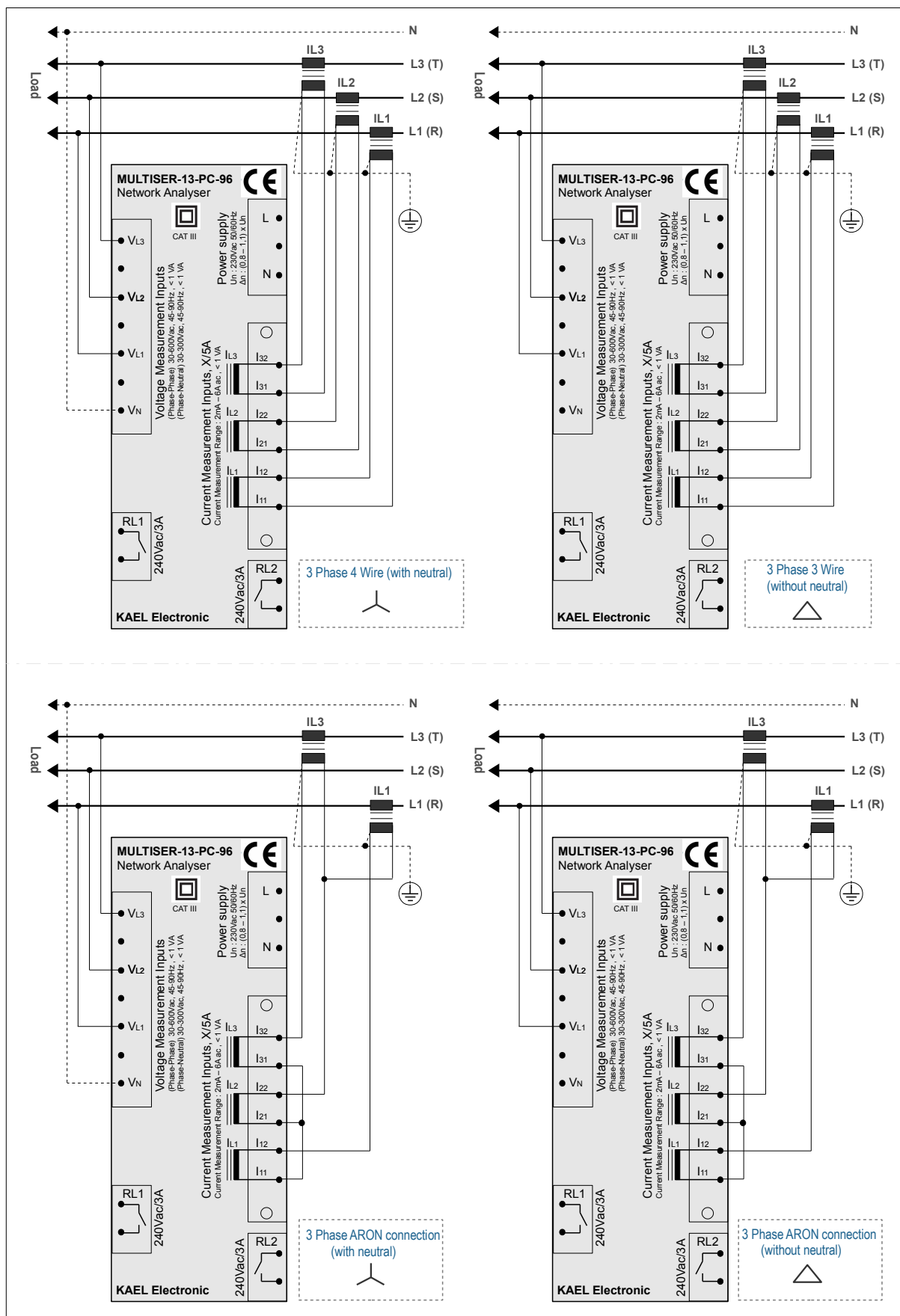
Inputs & Outputs

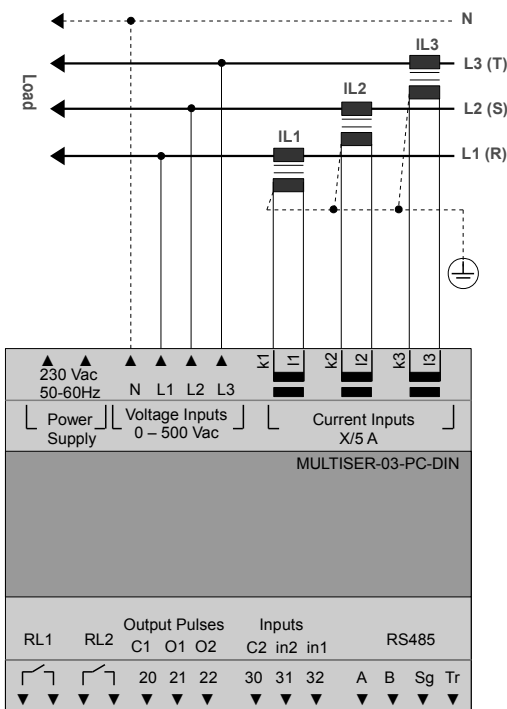
- Relay Output (2pcs)
- Pulse Output (2pcs)
- Digital Inputs (2pcs)
- RS-485 MODBUS-RTU

Making the Connections

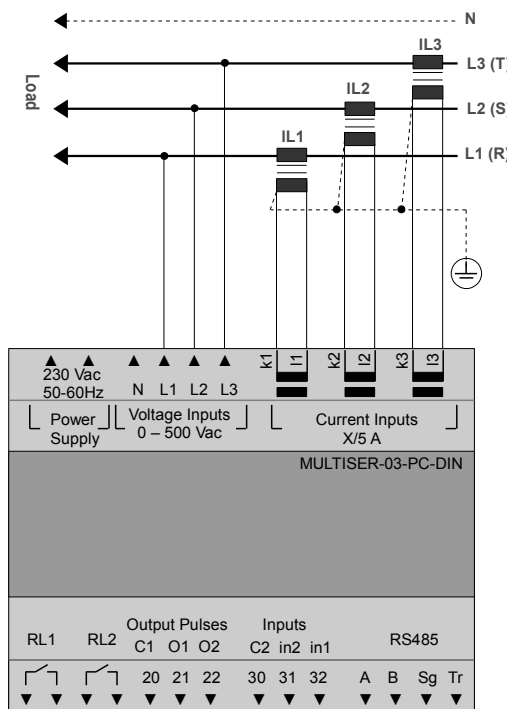
- The connections of the system must be made when it is out of power.
- The connections of the device shall be connected as shown in the connection scheme.
- The current and voltage connections shall be connected in a manner that they are placed on the same phase same current transformer and with the 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



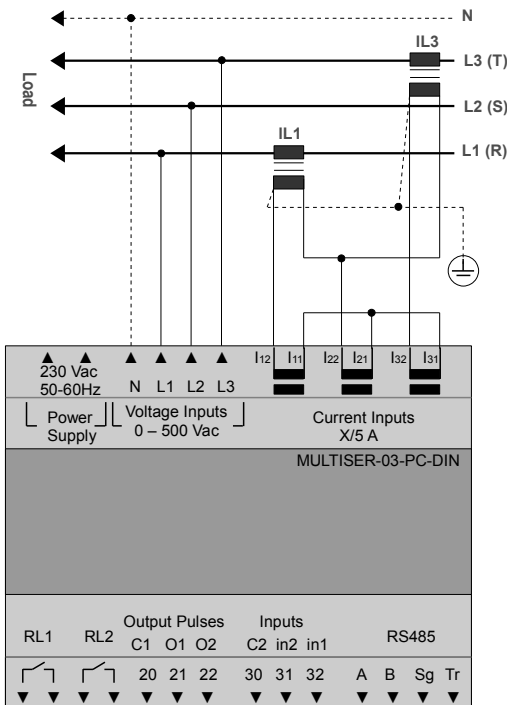




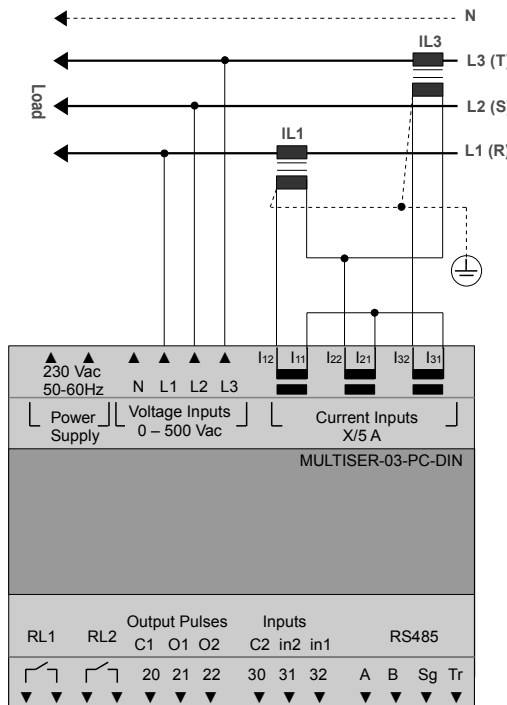
3 Phase 4 Wire (with neutral)



3 Phase 3 Wire (without neutral)



3 Phase ARON connection (with neutral)



3 Phase ARON connection (without neutral)

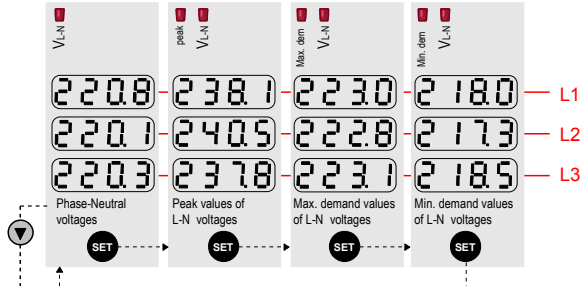
MEASUREMENTS

(VL-N, VL-L, I, I-Neutral, Hz, THD-V, THD-I, CosΦ, W, VAr, VA, ΣW, ΣVAR, ΣVA, ΣWh, ΣVArh, ΣVAh)

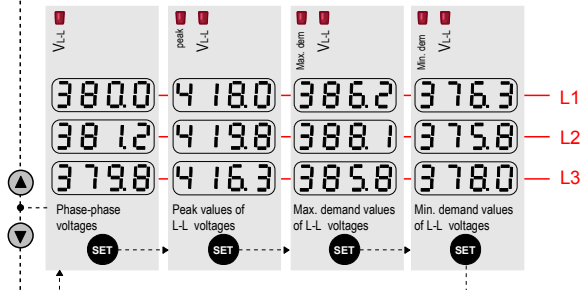
The above parameters can be reached step by step using arrow keys. Related leds lights up and displays the corresponding parameter value which is displayed at the same time.

Voltages of phase to neutral (VL-N)

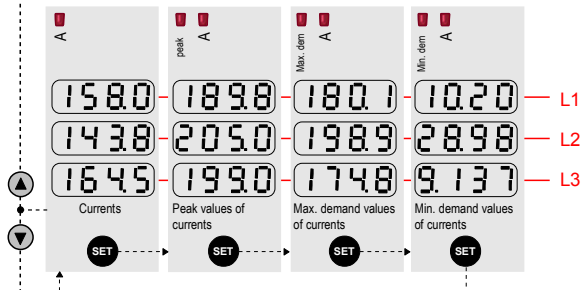
Phase-to-neutral voltages , their peak and demand values can be found in this menu. Demand and peak values are cleared in (cLr UL-n) menu . Also setting of the demand time can be set in (dEnn SEt) menu.

**Voltages of phase to phase (VL-L)**

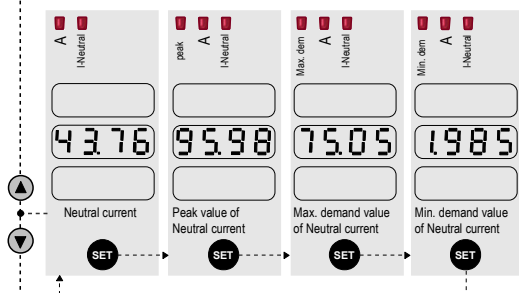
Phase-to-phase voltages , their peak and demand values can be found in this menu. Demand and peak values are cleared in (cLr UL-L) menu . Also setting of the demand time can be set in (dEnn SEt) menu.

**Currents (I1, I2, I3)**

Phase currents , their peak and demand values can be found in this menu. Demand and peak values are cleared in (cLr A) menu . Also setting of the demand time can be set in (dEnn SEt) menu.

**Neutral Current (I-Neutral)**

Neutral current , its peak and demand values can be found in this menu. Demand and peak values are cleared in (cLr A) menu . Also setting of the demand time can be set in (dEnn SEt) menu.



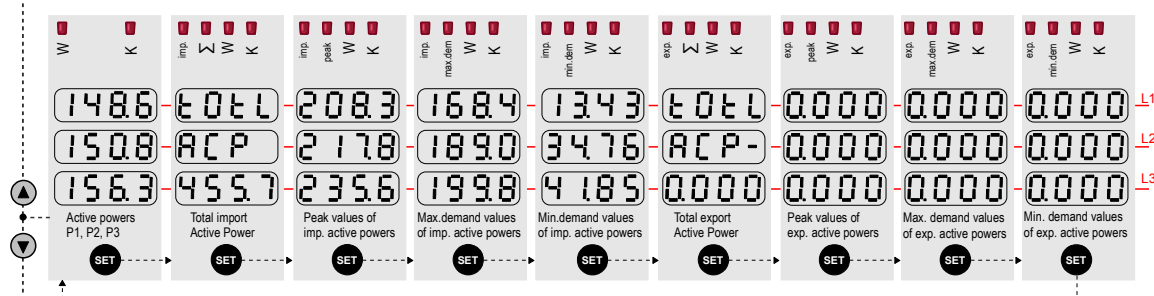
Frequency (Hz)



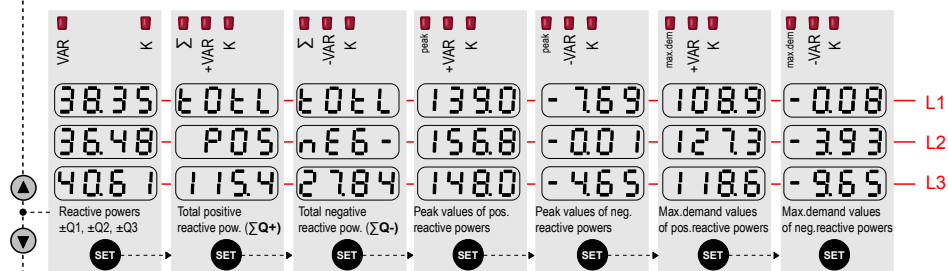
Power Factor (P.F)

Active Power (P1, P2, P3, ΣP)

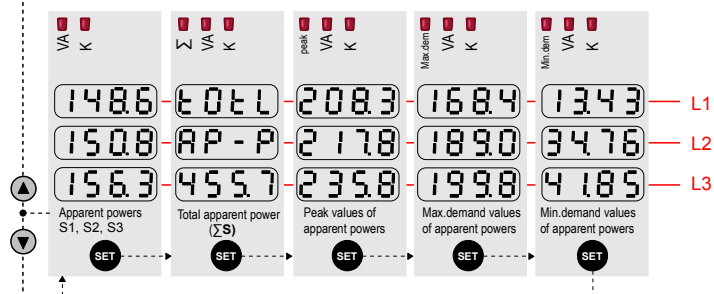
Active powers for each phases, total active power , their peak and demand values are in this menu. Demand and peak values are cleared in (cLr P) menu . Also setting of the demand time can be set in (dEnn SEt) menu.

Reactive Power (+Q1, -Q1, +Q2, -Q2, +Q3, -Q3, $\Sigma Q+$, $\Sigma Q-$)

Reactive powers for each phases, total positive and negative reactive power , their peak and demand values are 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.

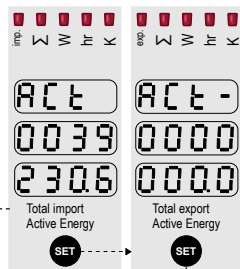
Apparent Power (S1,S2,S3, ΣS)

Apparent powers for each phases, total apparent power , their peak and demand values are 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.

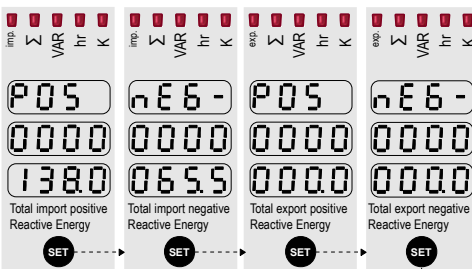


Active Energy (KWhr,MWhr,GWhr)

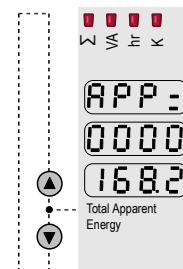
Total import and export active energy can be monitored. Energies can be deleted in (CLR Energy) menu.

**Reactive Energy (KVARhr,MVARhr,GVARhr)**

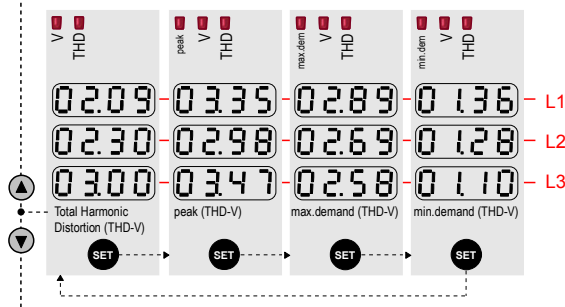
Total import/export positive and negative energy can be monitored. Energies can be deleted in (CLR Energy) menu.

**Apparent Energy (KVAhr)**

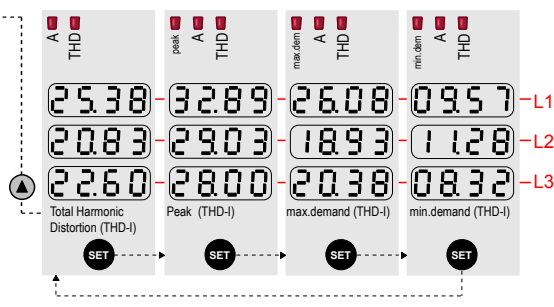
App. Energy can be deleted in (CLR Energy) menu.

**Total Harmonic Distortion for Voltages (THD-V %)**

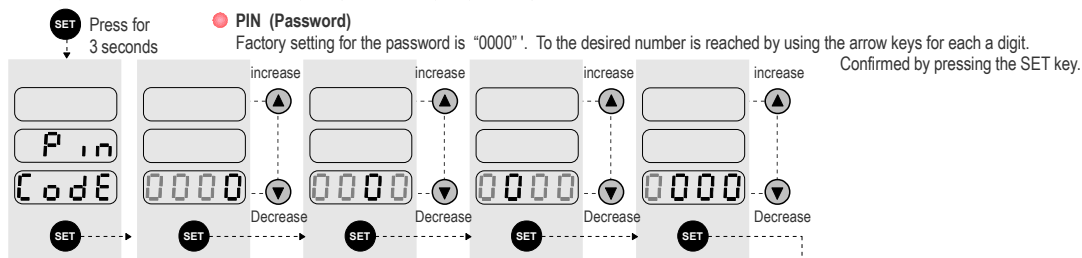
Total Harmonic Distortion for Voltages, their peak and demand values can be monitored in this menu. Demand and peak values can be deleted in (CLR thdU) menu. Also setting of the demand time can be set in (dEnn SET) menu.

**Total Harmonic Distortion for Currents (THD-I %)**

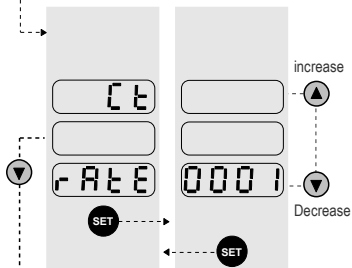
Total Harmonic Distortion for currents, their peak and demand values can be monitored in this menu. Demand and peak values can be deleted in (CLR thd I) menu. Also setting of the demand time can be set in (dEnn SET) menu.

**Parameters**

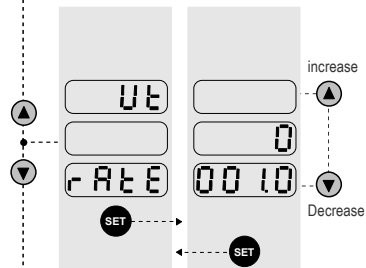
If the password is active, SET button is pressed for 3 seconds, the parameter menu can be accessed only after entering 4-digit password. Temporary password is "0000". If password is not active, you can enter to the parameter menu without entering password. First parameter is current transformer ratio. 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.



- **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)



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: Choose a device from table 1 for this characteristic.*

Pulse Type (PULS tyPE) :
For Active Energy, it can be selected as **import-export-OFF**
For Reactive Energy, it can be selected as **import(ind)-import(kap)-export(ind)-export(kap)-OFF**

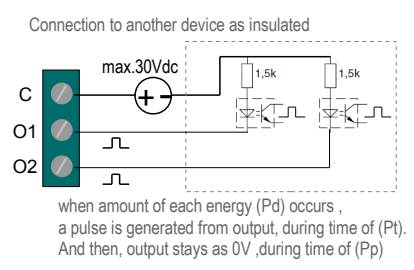
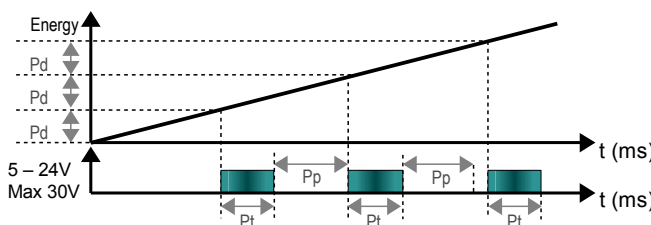
Pd (PULS dEAL) : 1
The amount of energy equivalent to Pulse.
It can be selected between 0,1kWh – 10MWh

Pp (PULS PER) : Pulse delay time
It can be selected between 50ms – 900 ms

Pt (PULS tInE) :
Pulse Time
It can be selected between 50ms – 900 ms

usage with relay

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.

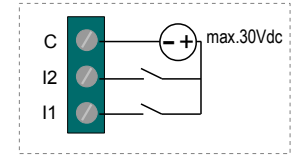


● **PULS In** : The device has two digital inputs. Menus and functions are the same for the two outputs.

NOTE: Choose a device from table 1 for this characteristic.

For example, it can understand position of the circuit breaker.

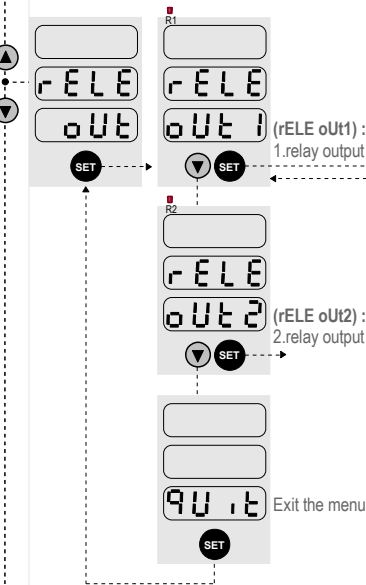
- There is an input at i1.
- There is not an input at i1.



PARAMETERS

PARAMETERS

● rELE oUT : The device has two digital inputs. Menus and functions are the same for the two outputs.



NOTE: Choose a device from table 1 for this characteristic.

Relay contact position
no : Normally open
nc : Normally closed

Permission to Access
on : enabled
oFF : disabled

NOTE: If remote Access Permission (ten) is made, can not be accessed to the other parameters. The pre-set parameters are disabled. In this case, the relay can be accessed only via remote access (if device has RS485 port).

Over-Voltage Adjustment:
SET VAL : Set value. 110V ~ 260V
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 10 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Under-Voltage Adjustment:
SET VAL : Set value. 80V ~ 210V
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 10 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Voltage Unbalance Adjustment:
SET VAL : Set value. 1 ~ 50 %
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 30 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Over-Current Adjustment:
SET VAL : Set value. (Current transformer ratio) x (0.1 ~ 5) A
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 50 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Under-Current Adjustment:
SET VAL : Set value. (Current transformer ratio) x (0.1 ~ 5) A
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 50 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Current Unbalance Adjustment:
SET VAL : Set value. 1 ~ 50 %
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 30 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Over-Frequency Adjustment:
SET VAL : Set value. 50.0 ~ 75.0 Hz
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 20 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Under-Frequency Adjustment:
SET VAL : Set value. 40.0 ~ 60.0 Hz
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 20 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Over THD-V Adjustment:
SET VAL : Set value. 1 ~ 99 %
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 50 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Over THD-I Adjustment:
SET VAL : Set value. 1 ~ 99 %
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 50 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Over HD-V Adjustment:
SET VAL : Set value. 1 ~ 99 %
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 50 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Over HD-I Adjustment:
SET VAL : Set value. 1 ~ 99 %
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 50 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Over-Neutral Current Adjustment:
SET VAL : Set value. (Current transformer ratio) x (0.1 ~ 5) A
d - t dELy : Delay time. 1 ~ 300 s
r - t rEt tNE : Return time from fault. 1 ~ 300 s
hYS : Hysteresis value. 1 ~ 50 %
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Phase Sequence Protection:
d - t dELy : Delay time. 0 ~ 10 s
r - t rEt tNE : Return time from fault. 0 ~ 10 s
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Phase Failure Protection:
d - t dELy : Delay time. 0 ~ 10 s
r - t rEt tNE : Return time from fault. 0 ~ 10 s
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

Connection Failure:
d - t dELy : Delay time. 0 ~ 10 s
r - t rEt tNE : Return time from fault. 0 ~ 10 s
EnbL : Enable. If enable is on, relay is enabled. If enable is off, relay is disabled

PARAMETERS

Exit the menu

● **bUS rTU** : Modbus rtu adjustments.

▲ ▼

bUS
rtU

S

▲ ▼

bAUD
rATE

S

▲ ▼

9600

▲ ▼

STOP
bit

S

▲ ▼

1

▲ ▼

Prty

S

▲ ▼

no

▲ ▼

dEU

S

▲ ▼

no

▲ ▼

001

▲ ▼

9U.t

NOTE: Choose a device from table 1 for this characteristic.

Baud rate: 2400,4800,9600,19200,28800,38400,57600,115200

Stop Bits : (0.5) , (1) , (1.5) , (2)

Parity : no , even , odd

Cihaz No : 001255

MODBUS – RTU

ADRESS	FUNCTION	DATA	CRCL	CRCH	T
8 BIT	8 BIT	8 BIT	8 BIT	8 BIT	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.

▲ ▼

cLr

S

▲ ▼

UL-n

S

▲ ▼

YES

First, select YES and then press the SET button so that the peak, max demand and min. demand values of phase-to-neutral voltages will be erased.

▲ ▼

cLr

S

▲ ▼

A

S

▲ ▼

YES

First, select YES and then press the SET button so that the peak, max demand and min. demand values of currents will be erased.

▲ ▼

cLr

S

▲ ▼

UL-L

S

▲ ▼

YES

First, select YES and then press the SET button so that the peak, max demand and min. demand values of phase-to-phase voltages will be erased.

▲ ▼

cLr

S

▲ ▼

P

S

▲ ▼

YES

First, select YES and then press the SET button so that the peak, max demand and min. demand values of active powers will be erased.

▲ ▼

cLr

S

▲ ▼

9

S

▲ ▼

YES

First, select YES and then press the SET button so that the peak, max demand and min. demand values of reactive powers will be erased.

▲ ▼

cLr

S

▲ ▼

S

S

▲ ▼

YES

First, select YES and then press the SET button so that the peak, max demand and min. demand values of apparent powers will be erased.

▲ ▼

cLr

S

▲ ▼

thdU

S

▲ ▼

YES

First, select YES and then press the SET button so that the peak, max demand and min. demand values of THD-U will be erased.

▲ ▼

cLr

S

▲ ▼

thdI

S

▲ ▼

YES

First, select YES and then press the SET button so that the peak, max demand and min. demand values of THD-I will be erased.

▲ ▼

cLr

S

▲ ▼

Er6Y

S

▲ ▼

YES

Delete to energies: First, select YES and then press the SET button so that all energies will be erased.

▲ ▼

cLr

S

▲ ▼

ALL

S

▲ ▼

YES

Delete All: First, select YES and then press the SET button so that the peak, max demand and min. demand values of all parameters will be erased.

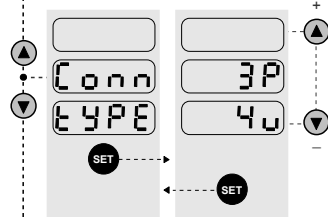
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9U.t

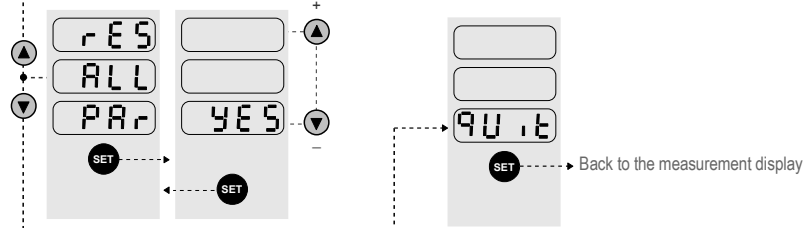
S

● **Conn type** : Selection of connection type.

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



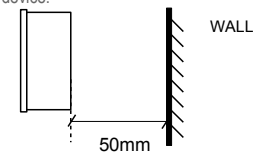
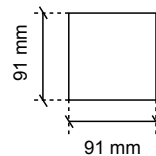
● **rES ALL PAR** : All parameters are erased and factory settings are restored



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 (GWh,GVARh,GVAh)
accuracy	
Voltage	: 0,5 class
Current	: 0,5 class
Active Power	: 1 class
Reactive Power	: 2 class
Apparent Power	: 1 class
Relay Outputs (2 pcs)	: 2 NO and max.3A/240 Vac
Pulse Outputs (2 pcs)	
Operating Voltage	: 5 – 24Vdc max. 30Vdc
Operating Current	: max 50 mA
Min. Switching Time	: 100 ms

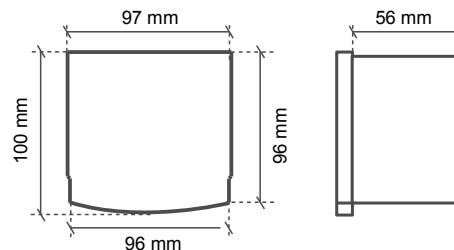
Digital Inputs (2 pcs)

Operating Voltage : 5 – 24Vdc max. 30Vdc

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 : 1255

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

MODBUS RTU	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
	Port Settings (Baud Rate)	: 9600
	Port Settings (Stop Bits)	: 1
	Port Settings (Parity)	: No
	Port Settings (Device No)	: 1
	Demand Time	: 15 minutes
1. Pulse output	Demand Interval	: 3 min
	Pulse Type for 1.Pulse Output	: OFF
	Pulse Value for 1. Pulse Output (Pd)	: 1 KWh
	Pulse Duration for 1.Pulse Output (Pt)	: 100 ms
	Pulse OFF Time for 1.Pulse output (Pp)	: 200 ms
	Pulse Type for 2.Pulse Output	: OFF
	Pulse Value for 2. Pulse Output (Pd)	: 1 KVARh
	Pulse Duration for 2.Pulse Output (Pt)	: 100 ms
	Pulse OFF Time for 2.Pulse output (Pp)	: 200 ms
	1.Digital Input	: Alarm Input
2. Pulse output	2.Digital Input	: Alarm Input
	Contact Position	: N.O Normally Open
	Remote Access Permit	: off
	Over Voltage	: 255V Relay OFF
	Under Voltage	: 185V Relay OFF
	Voltage Unbalance	: 10% Relay OFF
	Over Current	: 5A Relay OFF
	Under Current	: 1A Relay OFF
	Current Unbalance	: 50% Relay OFF
	Over Frequency	: 53Hz Relay OFF
1. Relay output	Under Frequency	: 48Hz Relay OFF
	Over THD-V	: 6% Relay OFF
	Over THD-I	: 15% Relay OFF
	Over HD-V	: 6% Relay OFF
	Over HD-I	: 15% Relay OFF
	Over Neutral Current	: 3A Relay OFF
	Phase Sequence Failure	: Relay OFF
	Phase Failure	: Relay OFF
	Connection Failure	: Relay OFF
	Connection Failure	: Relay OFF

1. Relay output	Phase Failure	: Relay OFF
	Connection Failure	: Relay OFF
	Contact Position	: N.O Normally Open
	Remote Access Permit	: off
	Over Voltage	: 255V Relay OFF
	Under Voltage	: 185V Relay OFF
	Voltage Unbalance	: 10% Relay OFF
	Over Current	: 5A Relay OFF
	Under Current	: 1A Relay OFF
	Current Unbalance	: 50% Relay OFF
2. Relay output	Over Frequency	: 53Hz Relay OFF
	Under Frequency	: 48Hz Relay OFF
	Over THD-V	: 6% Relay OFF
	Over THD-I	: 15% Relay OFF
	Over HD-V	: 6% Relay OFF
	Over HD-I	: 15% Relay OFF
	Over Neutral Current	: 3A Relay OFF
	Phase Sequence Failure	: Relay OFF
	Phase Failure	: Relay OFF
	Connection Failure	: Relay OFF

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

RMS Voltage	$V_{RMS} = \sqrt{\frac{1}{N} \sum_{i=0}^N V_i^2}$	$V_{THD} \% = \frac{\sqrt{\sum_{i=2}^N V_i^2}}{V_1} \times 100$
RMS Current	$I_{RMS} = \sqrt{\frac{1}{N} \sum_{i=0}^N I_i^2}$	
Active Power	$P = \frac{1}{N} \sum_{i=0}^N P_i$	$I_{THD} \% = \frac{\sqrt{\sum_{i=2}^N I_i^2}}{I_1} \times 100$
Reactive Power	$Q = \frac{1}{N} \sum_{i=0}^N Q_i$	
Apparent Power	$S = \sqrt{P^2 + Q^2}$	
Power Factor	$PF = \frac{P}{S}$	