MULTIMET 01-PC-96 01-96 02-R-96 02-96

MULTIMET 01-PC-DIN 01-DIN 02-R-DIN 02-DIN

MULTIMETERS

ISO 9001:2008

www.kael.com.tr

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

PARAMETERS:	MULTIMET-01	MULTIMET-01-PC-R	MULTIMET-02	MULTIMET-02-R
Ct : current transformer ratio (1...5000)	■	■	■	■
Ut : voltage transformer ratio (1...4000)	■	■	■	■
Denn Set : Demand SET	■	■	■	■
PIN: (Pasword)	■	■	■	
rELE oUt : Settings of Relay outputs		■		■
bUS rtU : Settings of Modbus RTU		■		
CLr : clear	■	■	■	■
Coon tyPE : connection type	■	■	■	■
rES ALL PAr : reset all values	■	■	■	■

MODEL

With RS485 MODBUS RTU	Voltages(phase-neutral) VL1N,VL2N,VL3N	Voltages(phase-phase) VL12,VL23,VL13	Currents I1,I2,I3	Frequency	Neutral Current	Power Factors PF1,PF2,PF3	Powers W,VAR,VA	Peak	Min,Max demand	Voltage, Current, Frequency protections	Phase Sequence Protection	2 Relay outputs	RS-485 MODBUS-RTU	3P&4W , 3P&3W , ARON connections	Voltage transformer ratio	Current transformer ratio	Password	LED display	96 x 96	DIN
MULTIMET-01-96	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
MULTIMET-01-DIN	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
MULTIMET-01-PC-96	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
MULTIMET-01-PC-DIN	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
MULTIMET-02-96	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	
MULTIMET-02-DIN	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■		■
MULTIMET-02-R-96	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	
MULTIMET-02-R-DIN	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■		■

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,,ΣS

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.

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 frequency protection
- Phase Sequence Protection
- Multiple alarms
- Password
- 3P&4W, 3P&3W, ARON Connectionı

Measurements

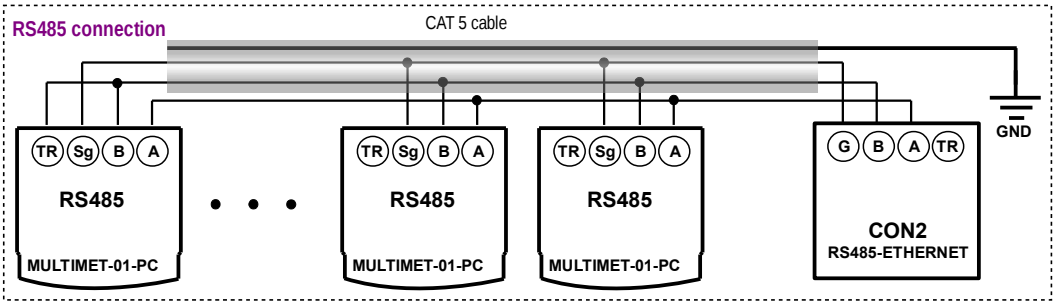
- Voltage (V1N, V2N, V3N , V12, V23, V13)
- Current (I1, I2, I3,)
- Power Factor (PF1, PF2, PF3)
- Frequency (Hz)
- Active Power (ΣP)
- Inductive Reactive Power Q(ind)
- Capacitive Reactive Power Q(cap)
- Apparent Power (ΣS)
- Neutral Current (I(N))
- Peak and Demands

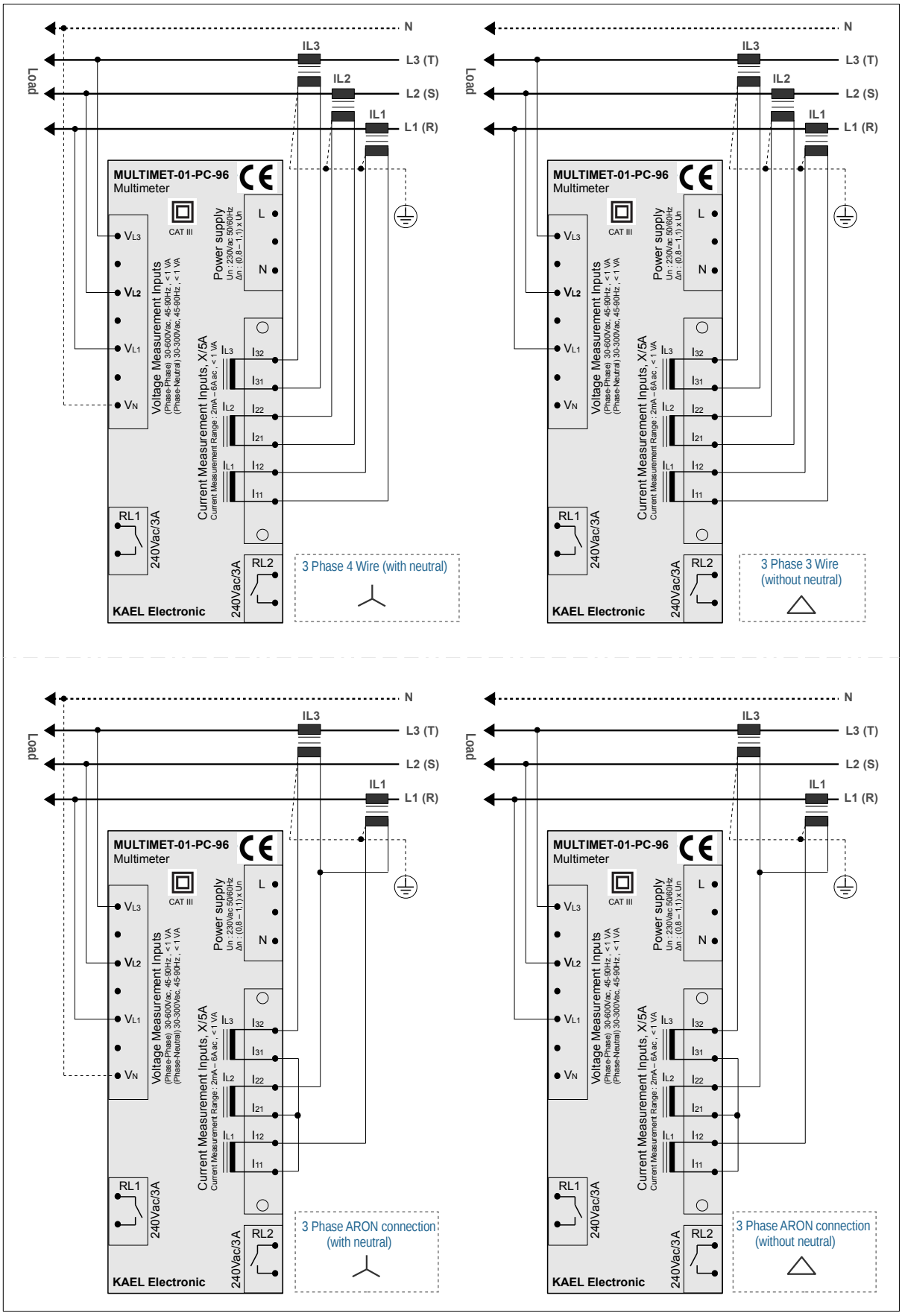
Outputs

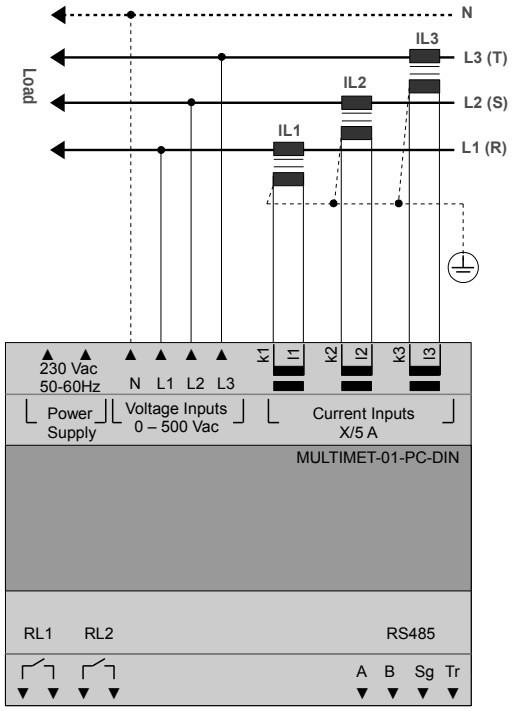
- Relay Output (2pcs)
- RS-485 MODBUS-RTU

Making the Connections

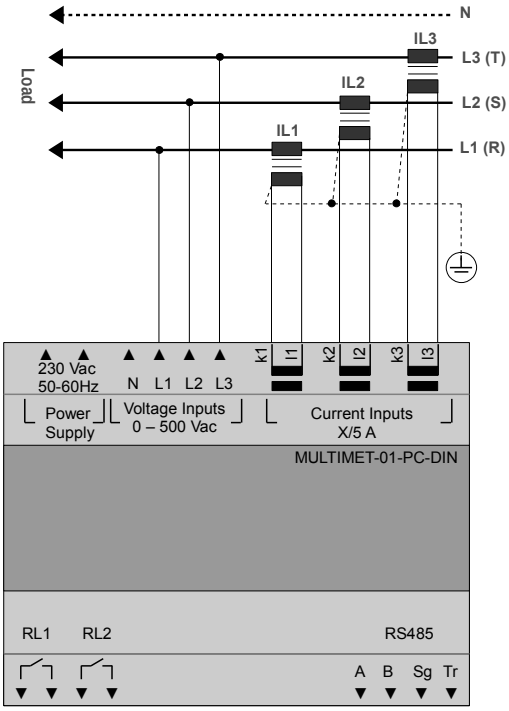
- The connections of the system must be made when it is out of power.
- The connections of the device shall be connected as shown in the connection scheme.
- The current and voltage connections shall be connected in a manner that they are placed on the same phase same current transformer and with the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



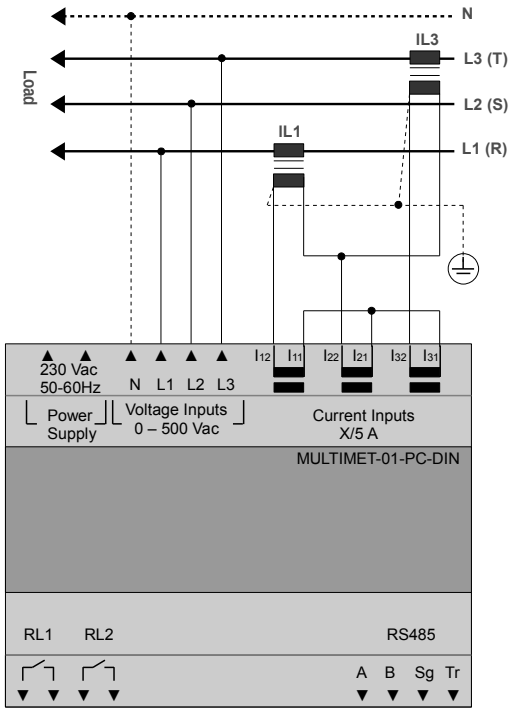

N
IL3
L3 (T)
IL2
L2 (S)
IL1
L1 (R)
Load
MULTIMET-01-PC-96
Multimeter
CAT III
Power supply
Un : 230Vac 50/60Hz
Δn : (0,8 – 1,1) x Un
L
N
Voltage Measurement Inputs
(Phase-Phase) 30-600Vac, 45-90Hz , < 1 VA
(Phase-Neutral) 30-300Vac, 45-90Hz , < 1 VA
VL3
VL2
VL1
VN
Current Measurement Inputs, X/5A
Current Measurement Range : 2mA – 6A ac , < 1 VA
IL3
I32
I31
IL2
I22
I21
IL1
I12
I11
RL1
240Vac/3A
RL2
240Vac/3A
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)



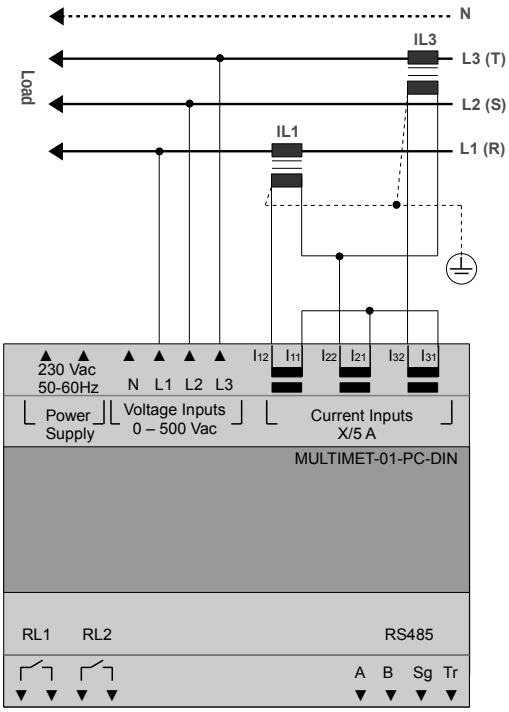
3 Phase 4 Wire (with neutral)



3 Phase 3 Wire (without neutral)



3 Phase ARON connection (with neutral)



3 Phase ARON connection (without neutral)

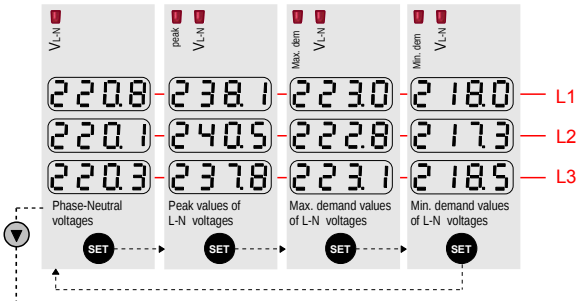
MEASUREMENTS

MULTIMET-01 ve MULTIMET-01-PC için (VL-N, VL-L, A, I-Neutral, Hz, CosΦ, W, VAr, VA)
MULTIMET-02 ve MULTIMET-02-R için (VL-N, VL-L, A, I-Neutral, Hz, CosΦ)

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.

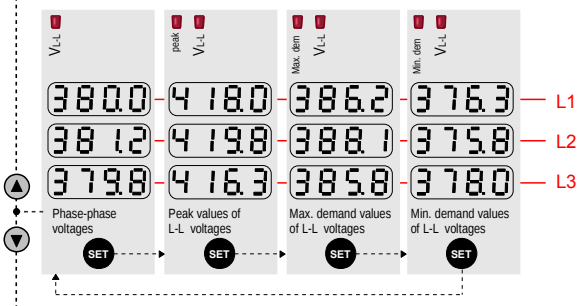
Voltages of phase to neutral (VL-N)

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.



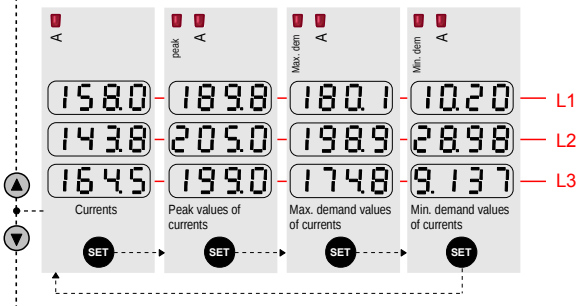
Voltages of phase to phase (VL-L)

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.



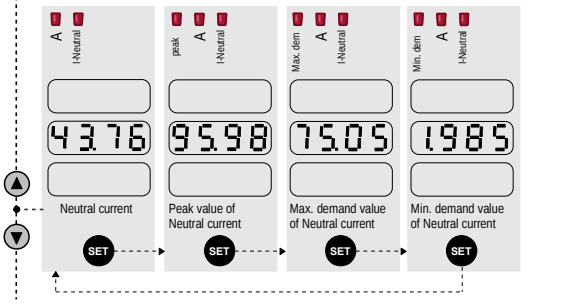
Currents (I1, I2, I3)

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.

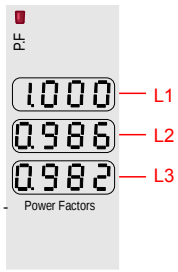


MEASUREMENTS

MEASUREMENTS

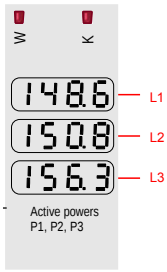
Frequency (Hz)

Power Factor (P.F)



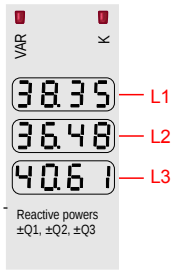
Active Power (P1, P2, P3)

Active powers for each phases can be found in this menu.



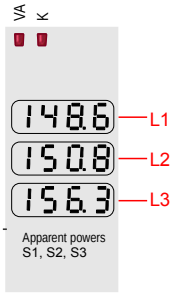
Reactive Power (±Q1, ±Q2, ±Q3)

Reactive powers for each phases can be found in this menu.



Apparent Power (S1,S2,S3)

Apparent powers for each phases can be found in this menu.



NOTE: MULTIMET-02-R and MULTIMET-02 do not measure powers.

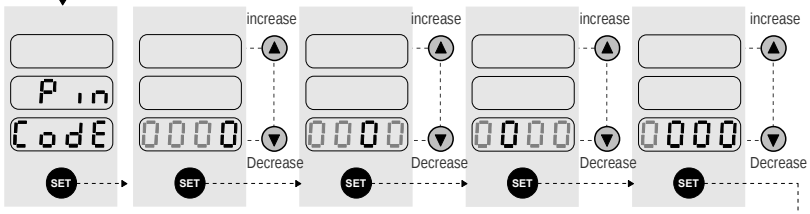
Parameters

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)

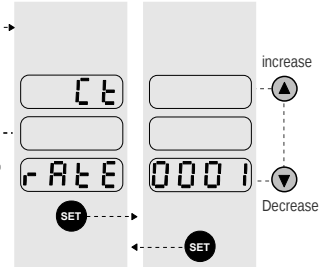
Factory setting for the password is "0000" '. To the desired number is reached by using the arrow keys for each a digit. Confirmed by pressing the SET key.



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

Current transformer ratio value is entered.

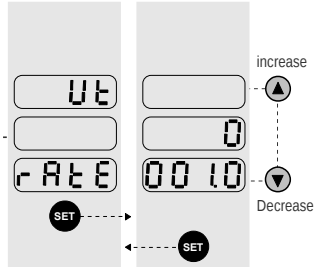
Example: For 500 / 5A is entered 100. (500/5A=100)



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

Voltage transformer ratio value is entered.

Example: For 34500 /100V is entered 345. (34500/100V=345)

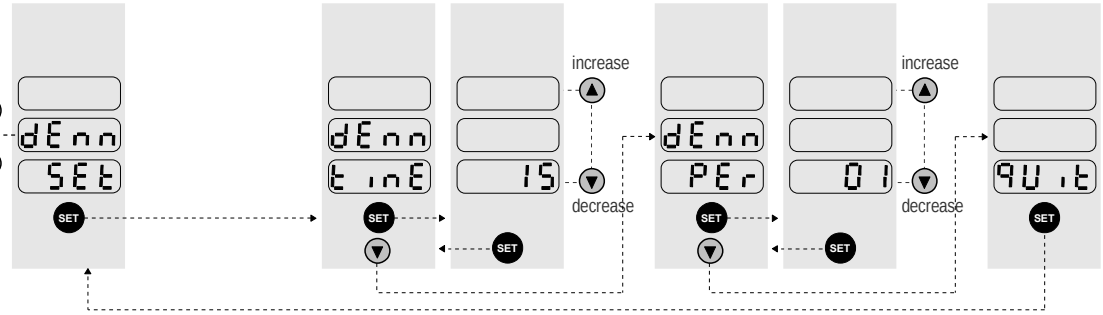


PARAMETERS

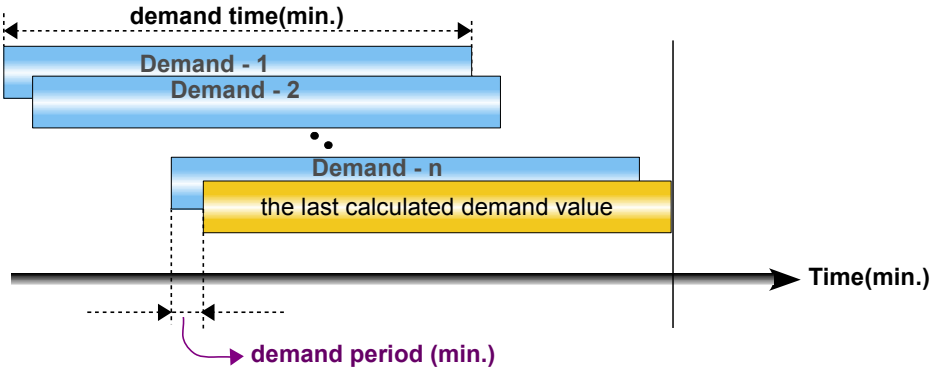
dEnn SEt : Demand SET
There are two parameters.
These are shown in the graph below.

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.

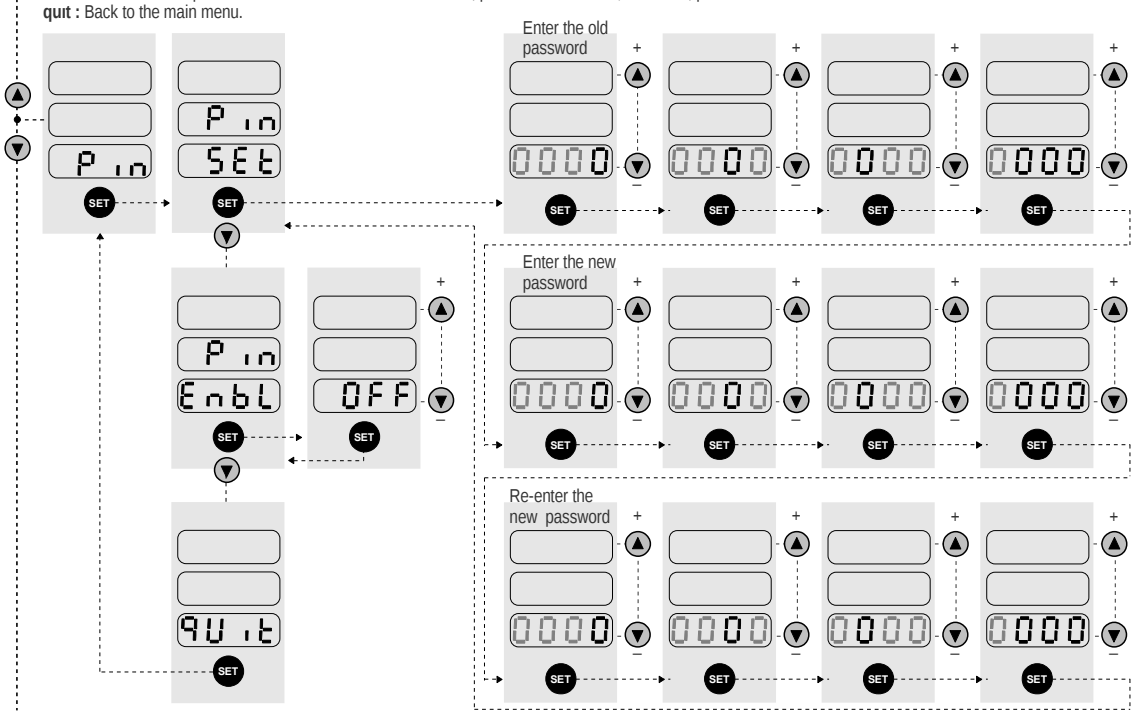


PIN (Password) : In this section, the password can be changed. Also password can be enabled or disabled.

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.



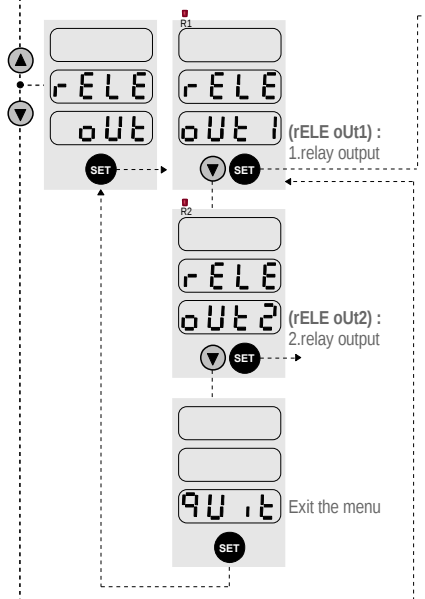
PARAMETERS

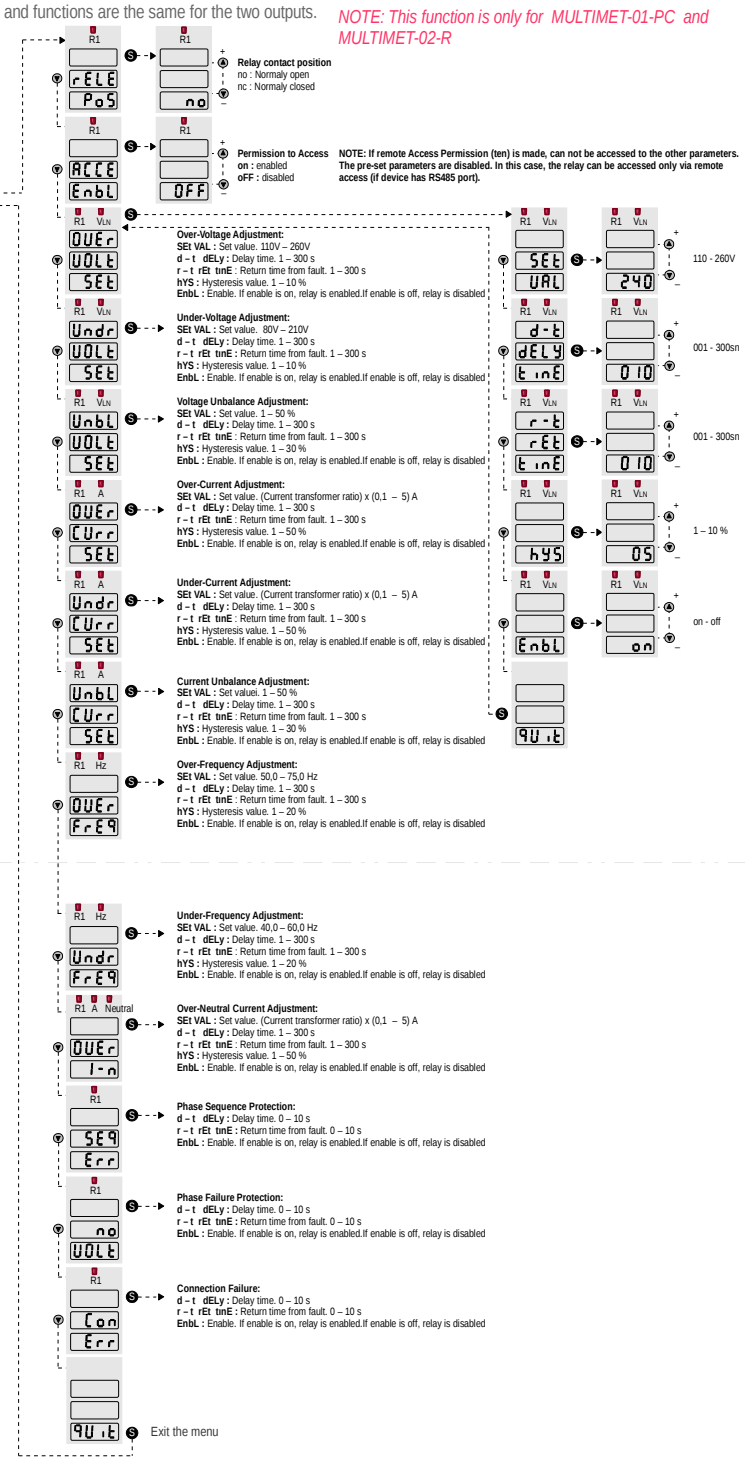
PARAMETERS

PARAMETERS

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

NOTE: This function is only for MULTIMET-01-PC and MULTIMET-02-R

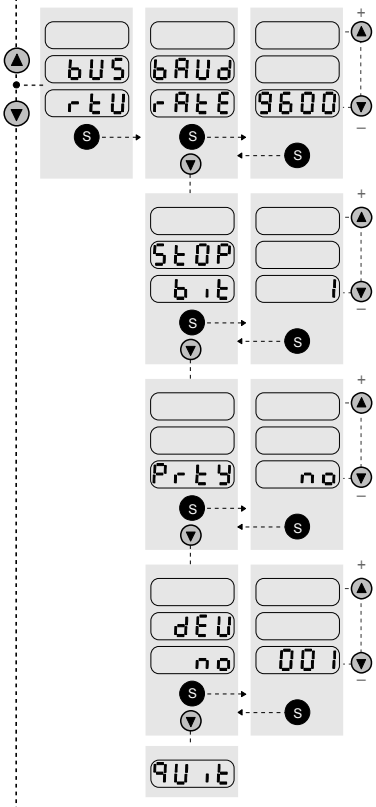




PARAMETERS

PARAMETERS

bUS rtU : Modbus rtu adjustments.



NOTE: This function is only for MULTIMET-01-PC

Baud rate: 2400,4800,9600,19200,28800,38400,57600,115200
Stop Bits : (0.5) , (1) , (1.5) , (2)
Parity : no , even , odd
Cihaz No : 001 255

MODBUS – RTU

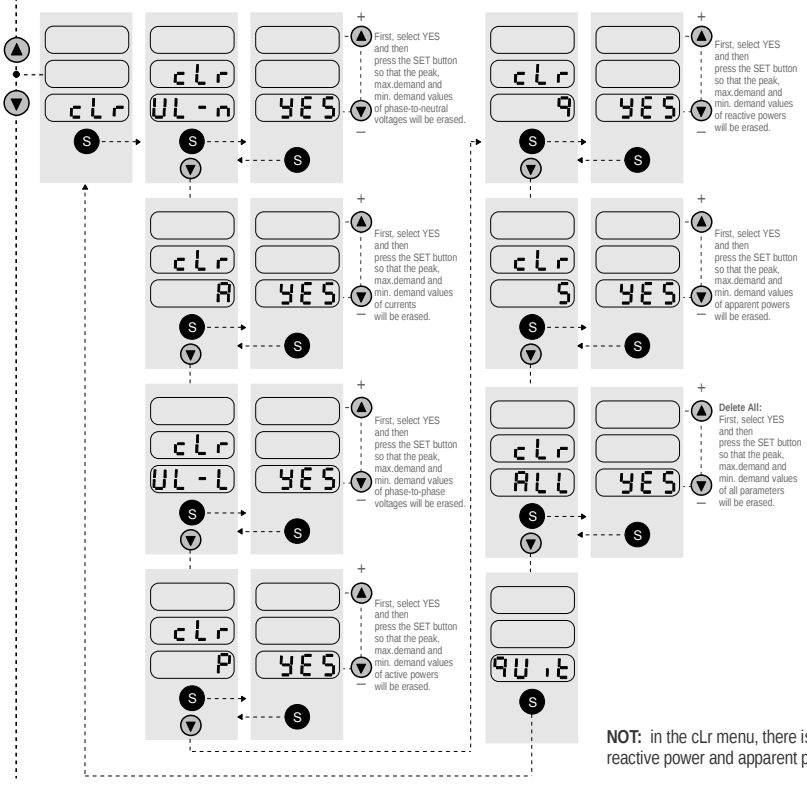
ADRESS 8 BIT	FUNCTION 8 BIT	DATA 8 BIT	CRCL 8 BIT	CRCH 8 BIT	T Delay time for 3,5 character

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.



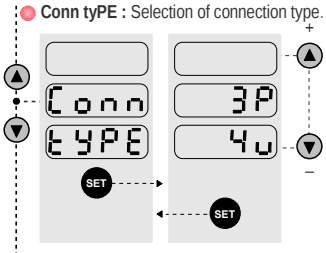
PARAMETERS

NOT: in the cLr menu, there is no delete section for active power, reactive power and apparent power in for MULTIMET-02-R and MULTIMET-02.

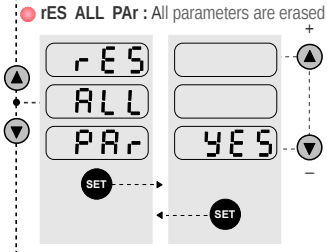
PARAMETERS

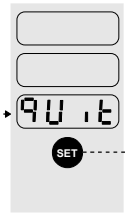
Conn tyPE : Selection of connection type.

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





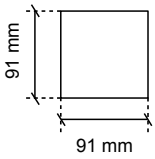
Back to the measurement display

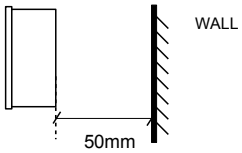
Installation Instructions

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)

accuracy

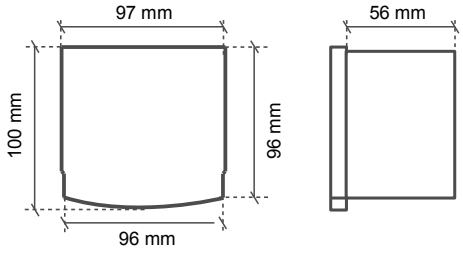
Voltage	: 0,5 class
Current	: 0,5 class
Active Power	: 1 class
Reactive Power	: 2 class
Apparent Power	: 1 class

Relay Outputs (2 pcs) : 2 NO and max.3A/240 Vac

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. Relay output

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
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

2. Relay output

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
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.

Formulas

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