MULTISER 03-PC-96 02-PC-96 01-PC-96 01-96

MULTISER 03-PC-DIN 02-PC-DIN 01-PC-DIN 01-96

NETWORK ANALYSER

TÜV SÜD GOST-R CE **ISO 9001:2008**

www.kael.com.tr

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

PARAMETERS:	MULTISER-03-PC	MULTISER-02-PC	MULTISER-01-PC	MULTISER-01
Ct : current transformer ratio (1...5000)	■	■	■	■
Ut : voltage transformer ratio (1...4000)	■	■	■	■
Denn Set : Demand SET	■	■	■	
PIN: (Pasword)	■	■	■	
PULS oUt : Pulse out	■			
PULS In : Digital input	■			
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
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

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

	With RS485 MODBUS RTU	Standart Benefits	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	■	■	■	■	■	■	■	■	■	■		■

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 harmonic protection

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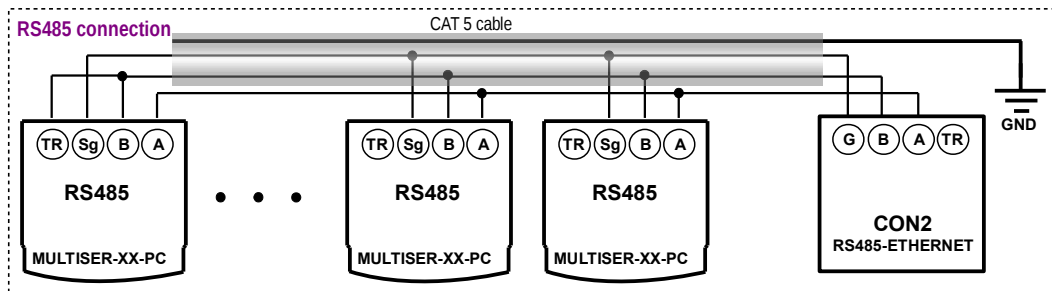- 3P&4W, 3P&3W, ARON Connectionı

Measurements

- Voltage   (V1N, V2N, V3N , V12, V23, V13)
- Current   (I1, I2, I3, ΣI)
- Power Factor (PF1, PF2, PF3)
- **cosΦ** 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)
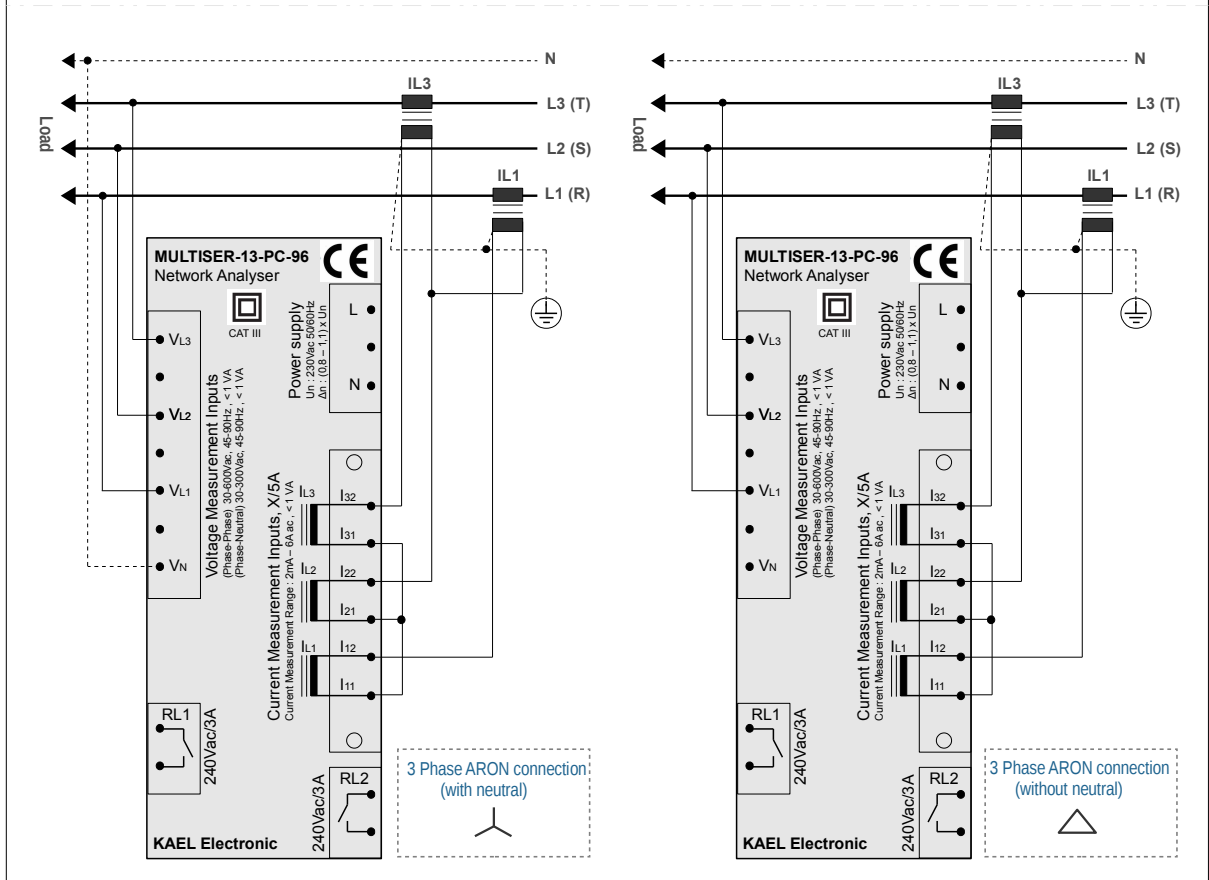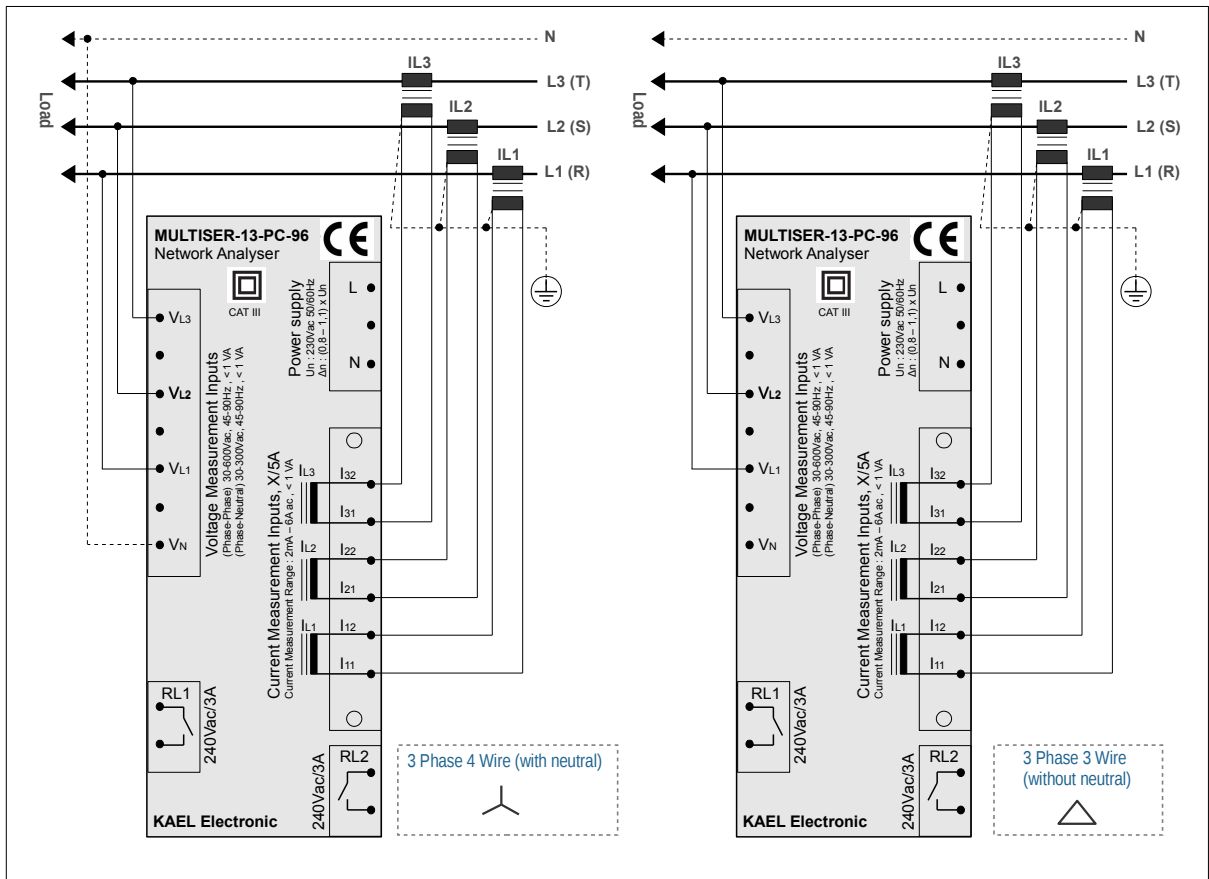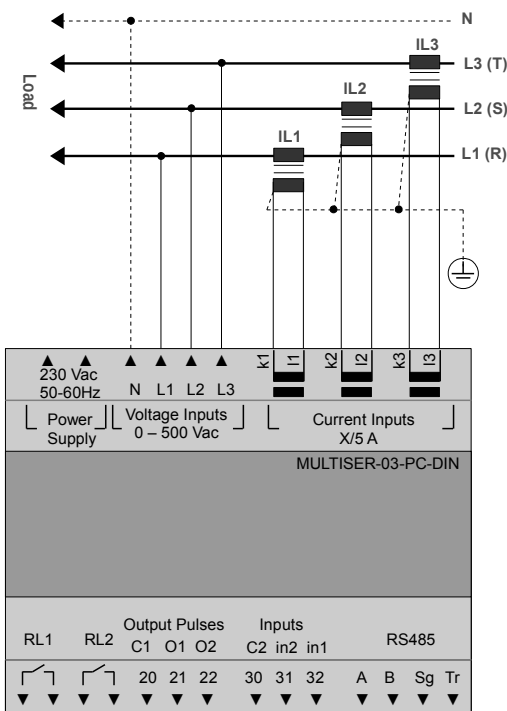- Peak and Demands

Inputs & Outputs

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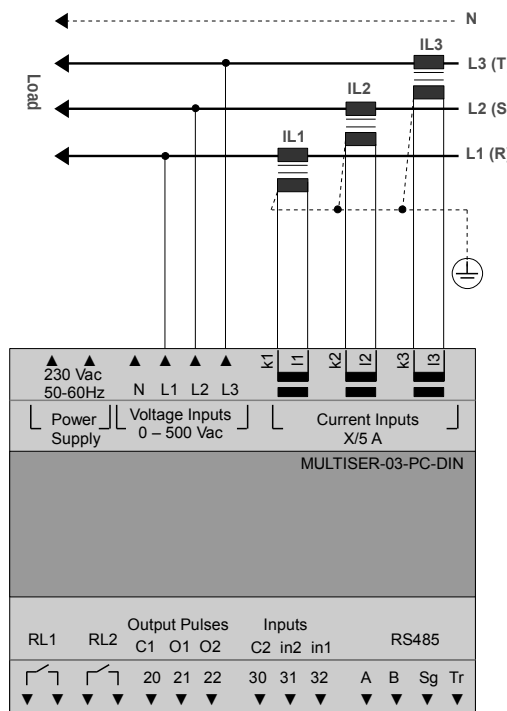- RS-485 MODBUS-RTU

⚠ 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
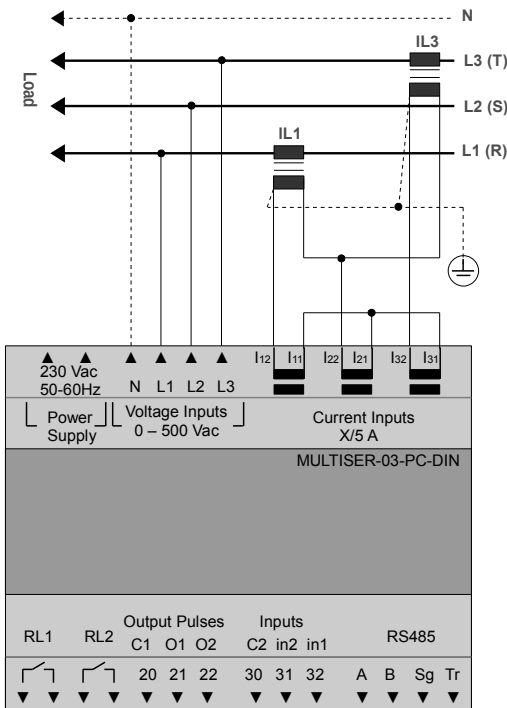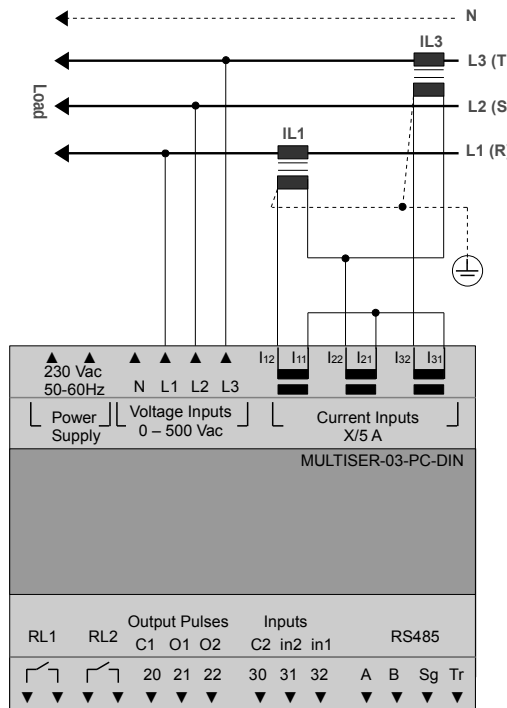- CAT5 (category 5) cables are recommended for RS485 connection

Top-left diagram:

N
L3 (T)
L2 (S)
L1 (R)

Load

IL3
IL2
IL1

MULTISER-13-PC-96
Network Analyser

CAT III

Power supply
Un : 230Vac 50/60Hz
Δn : (0,8–1,1) x Un

L
N

V_{L3}
V_{L2}
V_{L1}
V_{N}

Voltage Measurement Inputs
(Phase-Phase) 30-600Vac, 45-90Hz, < 1 VA
(Phase-Neutral) 30-300Vac, 45-90Hz, < 1 VA

Current Measurement Inputs, X/5A
Current Measurement Range : 2mA – 6A ac, < 1 VA

I_{L3} I_{32} I_{31}
I_{L2} I_{22} I_{21}
I_{L1} I_{12} I_{11}

RL1
240Vac/3A

RL2
240Vac/3A

KAEL Electronic

3 Phase 4 Wire (with neutral)

Top-right diagram:

N
L3 (T)
L2 (S)
L1 (R)

Load

IL3
IL2
IL1

MULTISER-13-PC-96
Network Analyser

CAT III

Power supply
Un : 230Vac 50/60Hz
Δn : (0,8–1,1) x Un

L
N

V_{L3}
V_{L2}
V_{L1}
V_{N}

Voltage Measurement Inputs
(Phase-Phase) 30-600Vac, 45-90Hz, < 1 VA
(Phase-Neutral) 30-300Vac, 45-90Hz, < 1 VA

Current Measurement Inputs, X/5A
Current Measurement Range : 2mA – 6A ac, < 1 VA

I_{32} I_{31}
I_{22} I_{21}
I_{12} I_{11}

RL1
240Vac/3A

RL2
240Vac/3A

KAEL Electronic

3 Phase 3 Wire
(without neutral)

Bottom-left diagram:

N
L3 (T)
L2 (S)
L1 (R)

Load

IL3
IL1

MULTISER-13-PC-96
Network Analyser

CAT III

Power supply
Un : 230Vac 50/60Hz
Δn : (0,8–1,1) x Un

L
N

V_{L3}
V_{L2}
V_{L1}
V_{N}

Voltage Measurement Inputs
(Phase-Phase) 30-600Vac, 45-90Hz, < 1 VA
(Phase-Neutral) 30-300Vac, 45-90Hz, < 1 VA

Current Measurement Inputs, X/5A
Current Measurement Range : 2mA – 6A ac, < 1 VA

I_{L3} I_{32} I_{31}
I_{L2} I_{22} I_{21}
I_{L1} I_{12} I_{11}

RL1
240Vac/3A

RL2
240Vac/3A

KAEL Electronic

3 Phase ARON connection
(with neutral)

Bottom-right diagram:

N
L3 (T)
L2 (S)
L1 (R)

Load

IL3
IL1

MULTISER-13-PC-96
Network Analyser

CAT III

Power supply
Un : 230Vac 50/60Hz
Δn : (0,8–1,1) x Un

L
N

V_{L3}
V_{L2}
V_{L1}
V_{N}

Voltage Measurement Inputs
(Phase-Phase) 30-600Vac, 45-90Hz, < 1 VA
(Phase-Neutral) 30-300Vac, 45-90Hz, < 1 VA

Current Measurement Inputs, X/5A
Current Measurement Range : 2mA – 6A ac, < 1 VA

I_{L3} I_{32} I_{31}
I_{L2} I_{22} I_{21}
I_{L1} I_{12} I_{11}

RL1
240Vac/3A

RL2
240Vac/3A

KAEL Electronic

3 Phase ARON connection
(without neutral)

3 Phase 4 Wire (with neutral)

N

IL3 — L3 (T)

IL2 — L2 (S)

IL1 — L1 (R)

Load

230 Vac 50-60Hz	N	L1	L2	L3	k1	I1	k2	I2	k3	I3

Power Supply | Voltage Inputs 0 – 500 Vac | Current Inputs X/5 A

MULTISER-03-PC-DIN

RL1 | RL2 | Output Pulses C1 O1 O2 | Inputs C2 in2 in1 | RS485

20 21 22 | 30 31 32 | A B Sg Tr

3 Phase 4 Wire (with neutral) ⅄

3 Phase 3 Wire (without neutral)

N

IL3 — L3 (T)

IL2 — L2 (S)

IL1 — L1 (R)

Load

230 Vac 50-60Hz	N	L1	L2	L3	k1	I1	k2	I2	k3	I3

Power Supply | Voltage Inputs 0 – 500 Vac | Current Inputs X/5 A

MULTISER-03-PC-DIN

RL1 | RL2 | Output Pulses C1 O1 O2 | Inputs C2 in2 in1 | RS485

20 21 22 | 30 31 32 | A B Sg Tr

3 Phase 3 Wire (without neutral) △

3 Phase ARON connection (with neutral)

N

IL3 — L3 (T)

— L2 (S)

IL1 — L1 (R)

Load

230 Vac 50-60Hz	N	L1	L2	L3	I12	I11	I22	I21	I32	I31

Power Supply | Voltage Inputs 0 – 500 Vac | Current Inputs X/5 A

MULTISER-03-PC-DIN

RL1 | RL2 | Output Pulses C1 O1 O2 | Inputs C2 in2 in1 | RS485

20 21 22 | 30 31 32 | A B Sg Tr

3 Phase ARON connection (with neutral) ⅄

3 Phase ARON connection (without neutral)

N

IL3 — L3 (T)

— L2 (S)

IL1 — L1 (R)

Load

230 Vac 50-60Hz	N	L1	L2	L3	I12	I11	I22	I21	I32	I31

Power Supply | Voltage Inputs 0 – 500 Vac | Current Inputs X/5 A

MULTISER-03-PC-DIN

RL1 | RL2 | Output Pulses C1 O1 O2 | Inputs C2 in2 in1 | RS485

20 21 22 | 30 31 32 | A B Sg Tr

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.
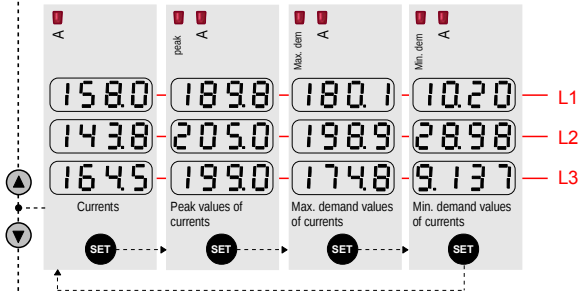
Voltages of phase to neutral (VL-N)

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.

VL-N	peak VL-N	Max. dem VL-N	Min. dem VL-N	
220.8	238.1	223.0	218.0	L1
220.1	240.5	222.8	217.3	L2
220.3	237.8	223.1	218.5	L3
Phase-Neutral voltages	Peak values of L-N voltages	Max. demand values of L-N voltages	Min. demand values of L-N voltages	
SET	SET	SET	SET	
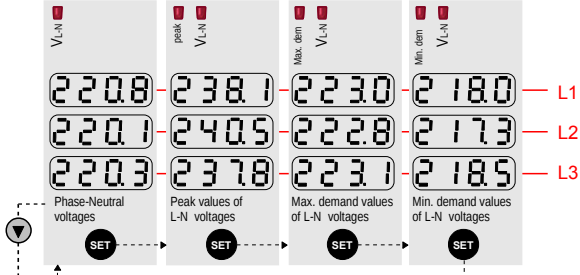
Voltages of phase to phase (VL-L)

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.

VL-L	peak VL-L	Max. dem VL-L	Min. dem VL-L	
380.0	418.0	386.2	376.3	L1
381.2	419.8	388.1	375.8	L2
379.8	416.3	385.8	378.0	L3
Phase-phase voltages	Peak values of L-L voltages	Max. demand values of L-L voltages	Min. demand values of L-L voltages	
SET	SET	SET	SET	
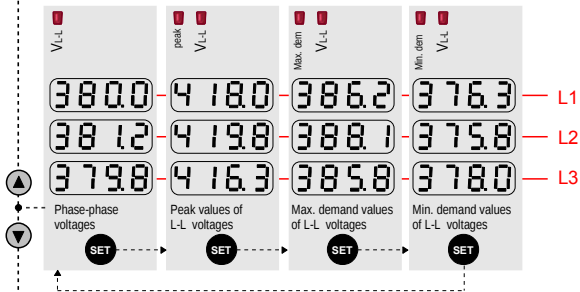
Currents (I1, I2, I3)

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.

A	peak A	Max. dem A	Min. dem A	
158.0	189.8	180.1	10.20	L1
143.8	205.0	198.9	28.98	L2
164.5	199.0	174.8	9.137	L3
Currents	Peak values of currents	Max. demand values of currents	Min. demand values of currents	
SET	SET	SET	SET	

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.

A I-Neutral	peak A I-Neutral	Max. dem A I-Neutral	Min. dem A I-Neutral
43.76	95.98	75.05	1.985
Neutral current	Peak value of Neutral current	Max. demand value of Neutral current	Min. demand value of Neutral current
SET	SET	SET	SET
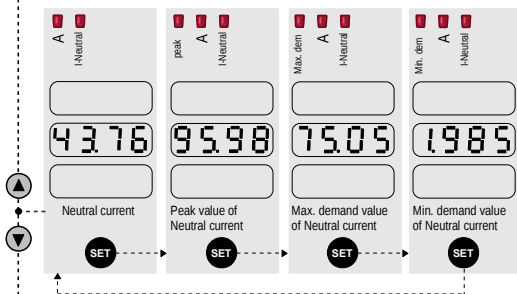
Frequency (Hz)

Hz

50.01

Frequency

Power Factor (P.F)

P.F.

1.000 — L1
0.986 — L2
0.982 — L3

Power Factors

Active Power (P1, P2, P3, ∑P)

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.

W K	imp. ∑ W K	imp. peak W K	imp. max.dem W K	imp. min.dem W K	exp. ∑ W K	exp. peak W K	exp. max.dem W K	exp. min.dem W K
148.6	tOtL	208.3	168.4	13.43	tOtL	0.000	0.000	0.000	L1
150.8	ACP	217.8	189.0	34.76	ACP-	0.000	0.000	0.000	L2
156.3	455.7	235.6	199.8	41.85	0.000	0.000	0.000	0.000	L3

Active powers P1, P2, P3 | Total import Active Power | Peak values of imp. active powers | Max.demand values of imp. active powers | Min.demand values of imp. active powers | Total export Active Power | Peak values of exp. active powers | Max. demand values of exp. active powers | Min. demand values of exp. active powers

SET → SET → SET → SET → SET → SET → SET → SET → SET

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 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.

VAR K	∑ +VAR K	∑ -VAR K	peak +VAR K	peak -VAR K	max.dem +VAR K	max.dem -VAR K
38.35	tOtL	tOtL	139.0	- 7.69	108.9	- 0.08	L1
36.48	POS	nE6 -	156.8	- 0.01	127.3	- 3.93	L2
40.61	115.4	27.84	148.0	- 4.65	118.6	- 9.65	L3

Reactive powers ±Q1, ±Q2, ±Q3 | Total positive reactive pow. (∑Q+) | Total negative reactive pow. (∑Q-) | Peak values of pos. reactive powers | Peak values of neg. reactive powers | Max.demand values of pos.reactive powers | Max.demand values of neg.reactive powers

SET → SET → SET → SET → SET → SET → SET

Apparent Power (S1,S2,S3, ∑S)

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.

VA K	∑ VA K	peak VA K	Max.dem VA K	min.dem VA K
148.6	tOtL	208.3	168.4	13.43	L1
150.8	AP - P	217.8	189.0	34.76	L2
156.3	455.7	235.8	199.8	41.85	L3

Apparent powers S1, S2, S3 | Total apparent power (∑S) | Peak values of apparent powers | Max.demand values of apparent powers | Min.demand values of apparent powers

SET → SET → SET → SET → SET

Active Energy (KWhr,MWhr,GWhr)
Total import and export active energy can be monitored. Energies can be deleted in (CLR Energy) menu.

ACt
0039
230.6
Total import Active Energy

ACt -
0000
000.0
Total export Active Energy

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

POS
0000
138.0
Total import positive Reactive Energy

nE6 -
0000
065.5
Total import negative Reactive Energy

POS
0000
000.0
Total export positive Reactive Energy

nE6 -
0000
000.0
Total export negative Reactive Energy

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

APP :
0000
168.2
Total Apparent Energy

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.

	peak THD-V	max.dem THD-V	min.dem THD-V	
02.09	03.35	02.89	01.36	L1
02.30	02.98	02.69	01.28	L2
03.00	03.47	02.58	01.10	L3

Total Harmonic Distortion (THD-V) / peak (THD-V) / max.demand (THD-V) / min.demand (THD-V)

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.

	peak THD-I	max.dem THD-I	min.dem THD-I	
25.38	32.89	26.08	09.57	L1
20.83	29.03	18.93	11.28	L2
22.60	28.00	20.38	08.32	L3

Total Harmonic Distortion (THD-I) / Peak (THD-I) / max.demand (THD-I) / min.demand (THD-I)

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.

Pin CodE — increase/Decrease **0000** — increase/Decrease **0000** — increase/Decrease **0000** — increase/Decrease **0000**

● **Ct :Current Transformer Ratio** (1........5000)
Current transformer ratio value is entered.
Example: For 500 / 5A is entered 100. (500/5A=100)

Ct rAtE — increase/Decrease **0001**

● **Ut :Voltage Transformer Ratio** (1........4000)
Voltage transformer ratio value is entered.
Example: For 34500 /100V is entered 345. (34500/100V=345)

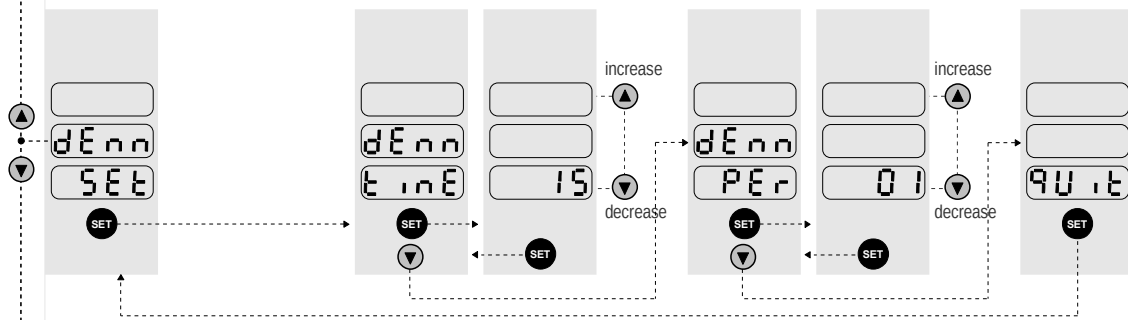**Ut rAtE** — increase/Decrease **0 0010**

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.

PARAMETERS

increase
decrease

increase
decrease

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

demand time(min.)

Demand - 1
Demand - 2

Demand - n
the last calculated demand value

**Time(min.)**

demand period (min.)
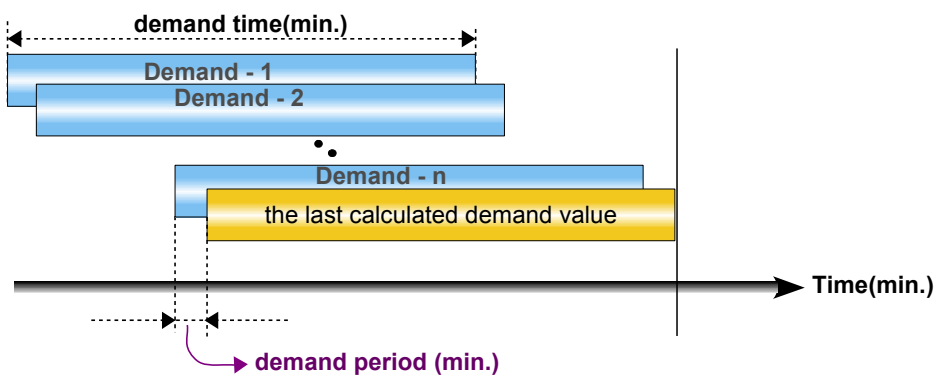
PIN (Password) : In this section, the password can be changed. Also password can be enabled or disabled.
Pın SEt : Default value for the password is "0000". First of all, the old password (PIN OLD) must be entered correctly. If the old password is correct, the user can enter the new password (**Pın nEU**). 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.

Enter the old password

Enter the new password

Re-enter the new password
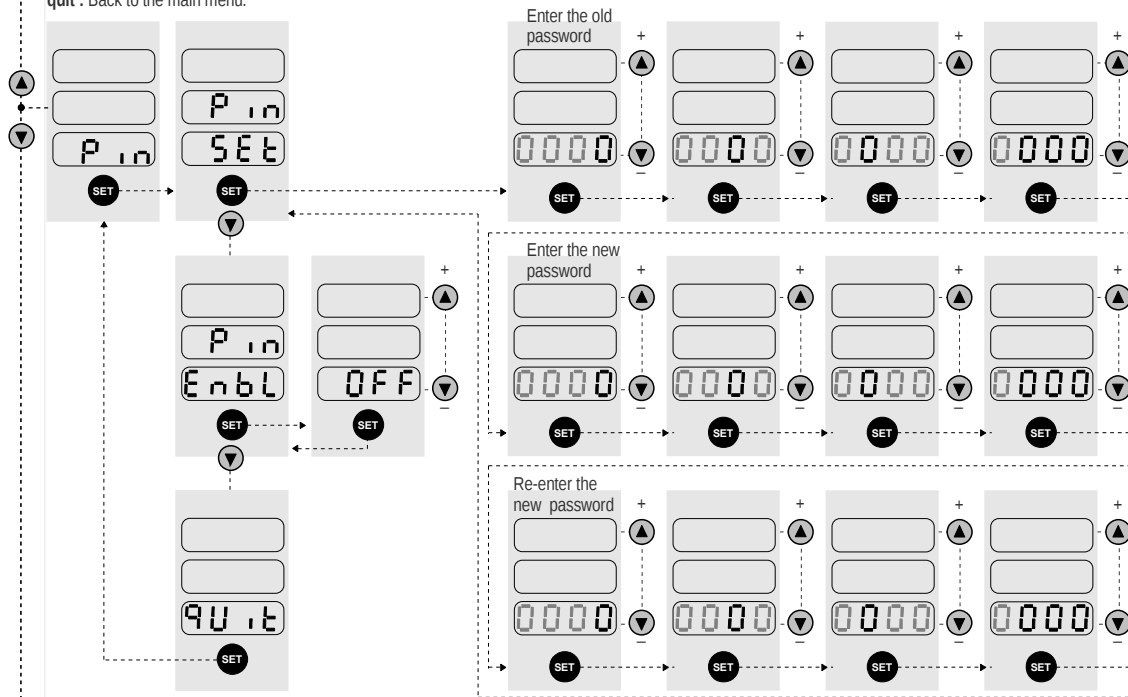
PARAMETERS

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 MULTISER-03-PC.*
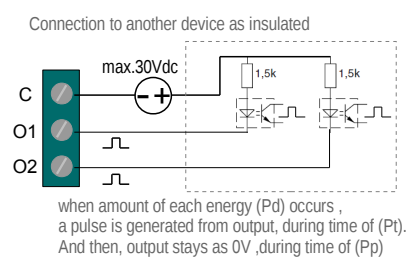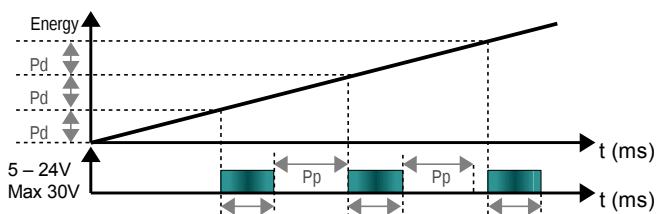
PULS oUt	PULS oUt1	PULS oUt1 P	PULS tYPE	OFF

(PULS oUt1) : 1.pulse out

Active Energy settings

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

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

PULS oUt2	PULS oUt1 q	PULS dEAL	0.1

(PULS oUt2) : 2.pulse out

Reactive Energy settings

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

qUit	PULS oUt1 S	PULS PEr	50

Exit the menu

Apparent Energy settings

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

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.

qUit	PULS tinE	50

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

qUit

C   max.30Vdc
O1
O2

usage with relay

Energy

Pd
Pd
Pd

t (ms)

5 – 24V
Max 30V

Pp   Pp

t (ms)

Pt   Pt   Pt

Connection to another device as insulated

max.30Vdc   1,5k   1,5k
C
O1
O2

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)

PULS In : The device has two digital inputs. Menus and functions are the same for the two outputs.
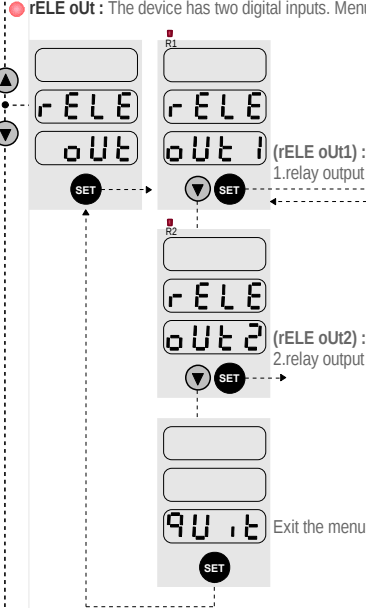
PULS In	PULS In1	OFF

NOTE: This function is only for MULTISER-03-PC.

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

■ There is an input at i1.

▪ There is not an input at i1.

PULS In2	OFF

C   max.30Vdc
I2
I1

qUit

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

NOTE: This function is only for MULTISER-03-PC and MULTISER-02-PC

rELE oUt

rELE oUt 1 — (rELE oUt1) : 1.relay output

SET

rELE oUt 2 (R2) — (rELE oUt2) : 2.relay output

SET

9Ut — Exit the menu

SET

---

rELE PoS (R1) → **no** (R1)
Relay contact position
no : Normally open
nc : Normally closed

ACCE EnbL (R1) → **OFF** (R1)
Permission to Access
on : enabled
oFF : disabled
NOTE: If remote Access Permission (on) 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 VOLt SEt (R1 VLN)
Over-Voltage Adjustment:
SEt VAL : Set value. 110V – 260V
d – t dELy : Delay time. 1 – 300 s
r – t rEt tınE : 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

Undr VOLt SEt (R1 VLN)
Under-Voltage Adjustment:
SEt VAL : Set value. 80V – 210V
d – t dELy : Delay time. 1 – 300 s
r – t rEt tınE : 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

UnbL VOLt SEt (R1 VLN)
Voltage Unbalance Adjustment:
SEt VAL : Set value. 1 – 50 %
d – t dELy : Delay time. 1 – 300 s
r – t rEt tınE : 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 CUrr SEt (R1 A)
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 tınE : 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

Undr CUrr SEt (R1 A)
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 tınE : 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

UnbL CUrr SEt (R1 A)
Current Unbalance Adjustment:
SEt VAL : Set valuei. 1 – 50 %
d – t dELy : Delay time. 1 – 300 s
r – t rEt tınE : 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 FrE9 (R1 Hz)
Over-Frequency Adjustment:
SEt VAL : Set value. 50,0 – 75,0 Hz
d – t dELy : Delay time. 1 – 300 s
r – t rEt tınE : 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

---

SEt VAL (R1 VLN) → **240** (R1 VLN) — 110 - 260V

dELy tınE (R1 VLN) → **010** (R1 VLN) — 001 - 300s

rEt tınE (R1 VLN) → **010** (R1 VLN) — 001 - 300s

hYS (R1 VLN) → **05** (R1 VLN) — 1 – 10 %

EnbL (R1 VLN) → **on** (R1 VLN) — on - off

9Ut

Undr FrE9 (R1 Hz)
Under-Frequency Adjustment:
SEt VAL : Set value. 40,0 – 60,0 Hz
d – t rEt tınE : 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 thdU (R1 V THD)
Over THD-V Adjustment:
SEt VAL : Set value. 1 – 99 %
d – t dELy : Delay time. 1 – 300 s
r – t rEt tınE : 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 (R1 A THD)
Over THD-I Adjustment:
SEt VAL : Set value. 1 – 99 %
d – t dELy : Delay time. 1 – 300 s
r – t rEt tınE : 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 hdU (R1 V)
Over HD-V Adjustment:
SEt VAL : Set value. 1 – 99 %
d – t dELy : Delay time. 1 – 300 s
r – t rEt tınE : 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 (R1 A)
Over HD-I Adjustment:
SEt VAL : Set value. 1 – 99 %
d – t dELy : Delay time. 1 – 300 s
r – t rEt tınE : 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 I - n (R1 A Neutral)
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 tınE : 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

SE9 Err (R1)
Phase Sequence Protection:
d – t dELy : Delay time. 0 – 10 s
r – t rEt tınE : Return time from fault. 0 – 10 s
EnbL : Enable. If enable is on, relay is enabled.If enable is off, relay is disabled

no VOLt (R1)
Phase Failure Protection:
d – t dELy : Delay time. 0 – 10 s
r – t rEt tınE : Return time from fault. 0 – 10 s
EnbL : Enable. If enable is on, relay is enabled.If enable is off, relay is disabled

Con Err (R1)
Connection Failure:
d – t dELy : Delay time. 0 – 10 s
r – t rEt tınE : Return time from fault. 0 – 10 s
EnbL : Enable. If enable is on, relay is enabled.If enable is off, relay is disabled

9Ut — Exit the menu

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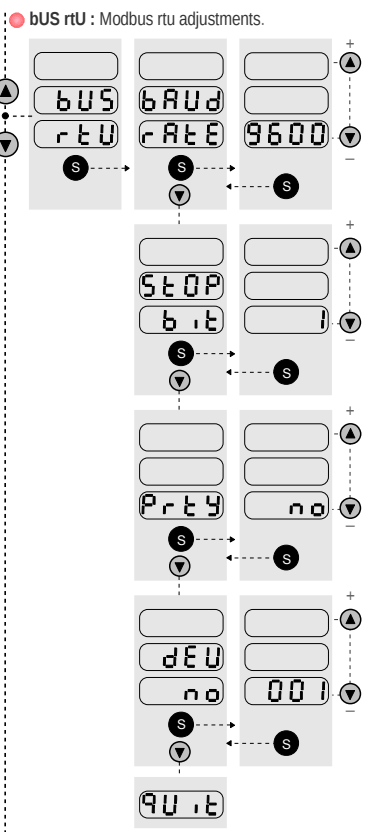
Baud rate: 2400,4800,9600,19200,28800,38400,57600,115200
Stop Bits : (0.5) , (1) , (1.5) , (2)
Parity : no , even , odd
Cihaz No : 001 255

bUS rtU	bAUd rAtE	9600	+ −
StOP bit		1	+ −
PrtY		no	+ −
dEU no		001	+ −
9Uit			

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 → cLr UL-n → 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 A → 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 UL-L → 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 P → 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 9 → 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 → 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 thdU → 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 thdI → 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 En ErbY → YES
Delete to energies: First, select YES and then press the SET button so that all energies will be erased.

cLr ALL → 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.

9Uit

Conn tyPE : Selection of connection type.

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

```
Conn        3P
tYPE        4u
```

SET

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

```
rES
ALL
PAr         YES         9uit
```

SET   SET   SET ----> 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

91 mm

91 mm

WALL

50mm

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

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	: 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

97 mm

56 mm

100 mm

96 mm

96 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	
Demand Interval	: 3 min	

1.Pulse output

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

2.Pulse output

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.Digital Input	: Alarm Input

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

1. Relay output

Phase Failure	: Relay OFF
Connection Failure	: Relay OFF
Contact Position	: N.O Normally Open
Remote Access Permit	: off

2. Relay output

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.

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

Formulas

RMS Voltage $\quad V_{RMS} = \sqrt{\dfrac{1}{N} \sum\limits_{i=0}^{N} V_i^2}$

RMS Current $\quad I_{RMS} = \sqrt{\dfrac{1}{N} \sum\limits_{i=0}^{N} I_i^2}$

Active Power $\quad P = \dfrac{1}{N} \sum\limits_{i=0}^{N} P_i$

Reactive Power $\quad Q = \dfrac{1}{N} \sum\limits_{i=0}^{N} Q_i$

Apparent Power $\quad S = \sqrt{P^2 + Q^2}$

Power Factor $\quad PF = \dfrac{P}{S}$

$$V_{THD}\ \% = \frac{\sqrt{\sum\limits_{i=2}^{N} V_i^2}}{V_1} \times 100$$

$$I_{THD}\ \% = \frac{\sqrt{\sum\limits_{i=2}^{N} I_i^2}}{I_1} \times 100$$