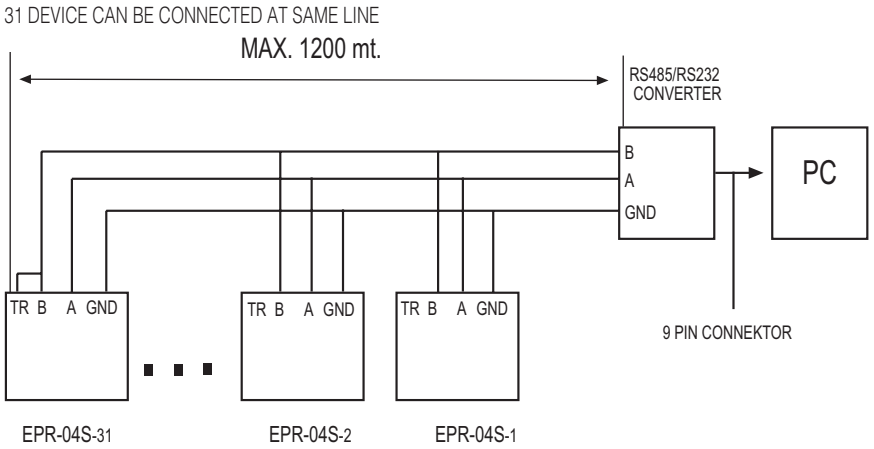
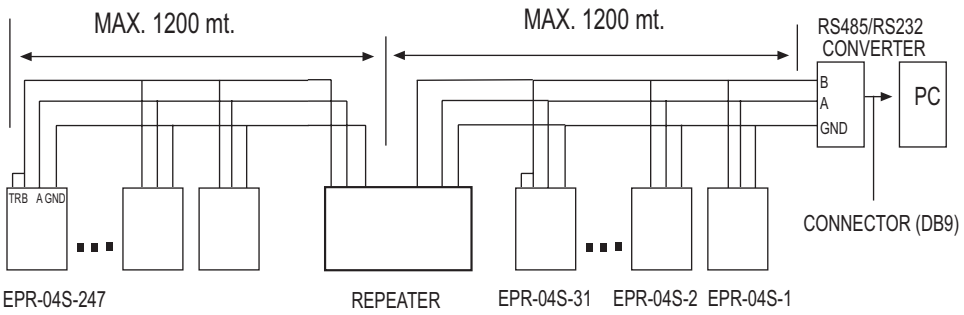
EPR-04S PC CONNECTION





DIGITAL POWERMETER
EPR-04S

EPR-04S DIGITAL POWERMETER

EPR-04S is a 3-phase digital powermeter and energymeter which measures:

-Active Power (W)
-Reactive Power (VAr)
-Apparent Power (VA)
-Active Energy (kWh)
-Reactive Energy (kVArh)
-Cosφ

These values are scrolled between by the set button (◈) First 3 displays show L1, L2 and L3 phase values and the 4th display show total value of each selected measured value (W, VAr,VA,kWh or kVArh).
EPR-04S also measures Maximum Demand, Demand, maximum and minimum values of power. EPR-04S has MODBUS serial interface.

When :

1. W led lights: Active Power
2. VAr led lights: Reactive Power
3. VA led lights: Apparent Power
4. kWh led lights:
   a-) A-I :Imported Active Energy
   b-) A-E : Exported Active Energy
5. KVArh led lights:
   a-) r-L :Reactive-Inducitive Energy
   b-) r-C :Reactive-Capacitive Energy
6. Cosφ led lights :Cosφ of the network is measured.

Operating Principle:

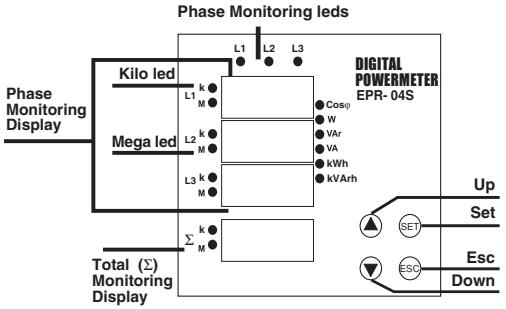
EPR-04S displays the energy and power values by multiplying voltage and current ratios by values read from input. So, the displayed values are the real values of system.

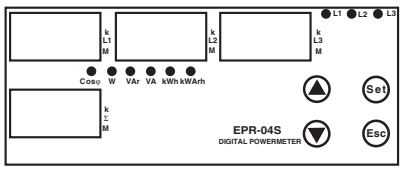
Energy Pulse Outputs
EPR-04S has 2 Energy Pulse Outputs; Pul1, Pul2.
Pul1 (Reactive Energy Pulse Output): A 400msec. pulse output is given, if measured energymeter value increases 1 KVArh. Pul1 is used for Reactive Inductive energy values.
Pul2 (Active Energy Pulse Output): A 400msec. pulse output is given, if measured energy meter value increases 1KWh. Pul2 is used for both (Active Import) and (Active Export) energy values. Min. pulse period is 1.6 sec.

Demand and Maximum Demand
Demand is average of power for the demand time. Demand time can be changed between 1-60 minutes.
Maximum demand is the max. value of the average power values measured during demand time. If the new average value exceeds the maximum demand value, the new demand value is recorded as maximum demand.

Watching of Min.,Max. and Demand Values:

Min. and Max. values are defined for Active Power(W),reactive power(VAr) and apparent power(VA). Demand values are defined for total active power(W),total reactive power(VAr) and total apparent power(VA).
If measured instant value is smaller than min. value which was stored before, it is stored as new min. value. If measured instant value is greater than max. value which was stored before, it is stored as new max. value.
Demand value is the smallest value of the measured values in demand time. If the smallest value of the measured values (for example 15 minute) in demand time is greater than the demand value which was stored before, it is stored as new demand value.
If one of defined parameters is displayed when deman button is pressed , min.,max or demand values are displayed. When an undefined parameter is displayed if demand button is pressed, instant value is continued to display.
For example when power factor is displayed instant values are continued to display because min., max. and demand values are undefined.





64EPR4S0/10-05

FUNCTIONS OF BUTTONS

▲ When W led lights,it shows max.power values which are measured instantaneously and it shows total average demand values. Also it is used for moving upwards in the menu.

▼ When W led lights,it shows min.power values which are measured instantaneously and it shows total average demand demand values. Also it is used for moving downwards in the menu.

SET It is used for passing between parameters such as W, Var, VA, KWh, KVArh, cosφ. When it is pressed for 5 second, adjustment mode is entered. In the adjustment mode it is used for saving parameters and moving to the sub menu.

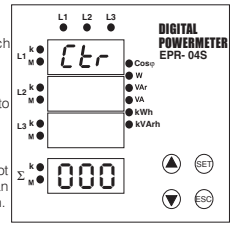
ESC In the adjustment mode, it is used for entering to the upper menu or it is used for quiting from the adjustment mode without saving the values.

Current Transformer Ratio Setup

Ctr In this menu, current transformer ratio is adjusted.

Note: If the current transformer is not used between the system and EPR-04S, current transformer ratio is entered as '1'.
Example: ; If a current transformer which has a ratio of 250/5A is used between the system and EPR-04S; Current transformer ratio is entered as
= 250/5
= 50 .

◈ Push SET button 5 seconds (Ctr menu is displayed)



◈ Push SET button (The number which is the last digit of second display blinks)

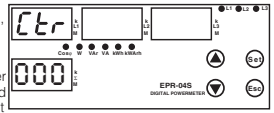
▲▼ By using UP-DOWN buttons enter to the fourth digit of desired value.

◈ Push SET button (First number of the third display blinks). If you did not enter the fourth digit correct, you can reentry by pressing the ESC button.

▲▼ By using UP-DOWN buttons, enter to the third digit of desired value.

◈ Push SET button (The number which is in the middle of the third display blinks. If you did not enter the third digit correct, you can reentry by pressing the ESC button.

▲▼ By using UP-DOWN buttons, enter to the second digit of desired value



◈ Push SET button (The number which is the last digit of third display blinks). If you did not enter the second digit correct, you can reentry by pressing the ESC button

▲▼ By using UP-DOWN buttons, enter to the last digit of desired value.

◈ Push set button,Ctr is displayed. (Data is entered but is not activated yet. For activating the new data please follow the below steps).

◀ Push ESC button one by one until (SAU SEt yES) appears at the display.

◈ Push SET button when (SAU SEt yES) appears at the display. (When SAU SEt yES appears at the display,If you push ESC button or choose "no" option instead of "yES" option, new data will be canceled and previous value will be activated.

Voltage Transformer Ratio Setup

Utr In this menu, voltage transformer ratio is adjusted.

Note: If the voltage transformer is not used between the system and EPR-04S, voltage transformer ratio is entered as '1'.
Example: ; If a voltage transformer which has a ratio of 34.5KV/100V is used between the system and EPR-04S; Voltage transformer ratio is entered as
= 34500/100
= 345

◈ Push SET button 5 seconds (Ctr menu is displayed)

▲▼ By using UP-DOWN buttons find the Utr menu.

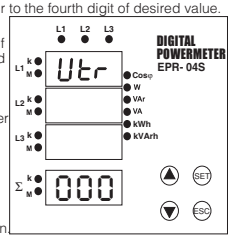
◈ Push SET button (The number which is the last digit of second display blinks)

By using UP-DOWN buttons enter to the fourth digit of desired value.

Push SET button (First number of the third display blinks). If you did not enter the fourth digit correct, you can reentry by pressing the ESC button.

By using UP-DOWN buttons, enter to the third digit of desired value.

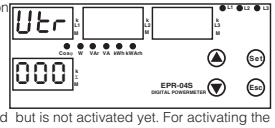
Push SET button (The number which is in the middle of the third display blinks. If you did not enter the third digit correct, you can reentry by pressing the ESC button.



By using UP-DOWN buttons, enter to the second digit of desired value

Push SET button (The number which is the last digit of third display blinks). If you did not enter the second digit correct, you can reentry by pressing the ESC button.

By using UP-DOWN buttons, enter to the last digit of desired value.



Push set button,Utr is displayed. (Data is entered but is not activated yet. For activating the new data please follow the below steps.

Push ESC button one by one until (SAU SEt yES) appears at the display.

Push SET button when(SAU SEt yES) appears at the display. (When SAU SEt yES appears at the display,If you push ESC button or choose "no" option instead of "yES" option, new data will be canceled and previous value will be activated.

Demand Time Setup:

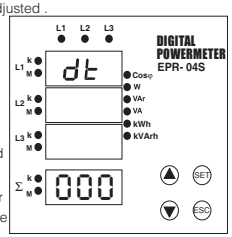
dt In this menu,demand time is adjusted .

Push SET button 5 seconds (Ctr menu is displayed)

By using UP-DOWN buttons find the dt menu.

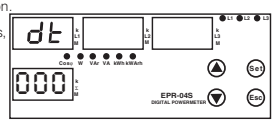
Push SET button (The number which is in the middle of the third display blinks.)

By using UP-DOWN buttons, enter to the second digit of desired value



Push SET button (The number which is the last digit of third display blinks). If you did not enter the second digit correct, you can reentry by pressing the ESC button.

By using UP-DOWN buttons, enter to the last digit of desired value.



Push set button,dt is displayed. (Data is entered but is not activated yet.
For activating the new data please follow the below steps).

Push ESC button one by one until (SAU SEt yES) appears at the display.

Push SET button when (SAU SEt yES) appears at the display. (When SAU SEt yES appears at the display,If you push ESC button or choose "no" option instead of "yES" option, you quit from adjustment menu without saving new settings and device continues to work with previous settings.

Monitoring and Erasing of minimum and maximum values:

CLr
dE
En

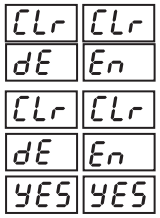
In this menu, values of min.,max. or energymeter's are erased. It saves the instantaneously measured min. and max. values of EPR-04S into its memory. Please kindly look at to the section of **FUNCTIONS OF BUTTONS** for min. and max. values.

Note: Informations which are saved to the memory are not affected from the electric interruptions.

In the CLr dE or En menu ; when you choose and quit from all menus, if you confirm the changes,min. and max. values of all parameters or values of energymeters are erased at the same time.**For erasing the values of min. and max. or energymeter**;In the measurement position,

Push SET button 5 seconds (Ctr menu is displayed)

By using the UP-DOWN buttons find the CLr dE or En menu.



Push SET button.(CLr dE no menu is displayed)

By using the UP-DOWN buttons ; If you want to delete the values choose yEs, if not choose no.

Push SET button. (CLr dE is displayed)

Push ESC button.

User password Setup:

Pin In this menu user password is defined and activated. You must define and activate a 4 digit user password for preventing device settings from the illegal usage. There are 2 sub menu under the Pın menu.

Changing of User Password:

Pin This menu is used for changing the user password .

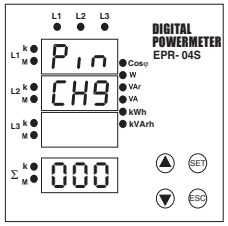
CHG ***Note:*** Factory default value for user password is **"1234"** For changing the user password;In the measurement mode,

Push SET button 5 seconds (Ctr menu is displayed)

Bu using UP-DOWN buttons find Pın menu.

Push SET button (Pın ACt menu is displayed.)

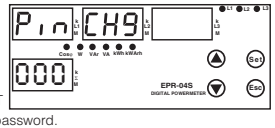
By using the UP-DOWN buttons find Pın CHg menu.



By using UP-DOWN-SET button enter the old password

By using UP-DOWN-SET button enter the new password

By using UP-DOWN-SET button reenter the new password.



Push SET button, Pın CHg is displayed. Data is entered but is not activated yet. For activating the new data please follow the below steps).

Push ESC button one by one until (SAU SEt yES) appears at the display.

Push SET button when (SAU SEt yES) appears at the display. (When SAU SEt yES appears at the display,If you push ESC button or choose "no" option instead of "yES" option, you quit from adjustment menu without saving new settings and device continues to work with previous settings.

Activating the user password:

Pin
ACt

This menu is used for activating the user password. After the user password is activated for entering to the menus; while the instant values are observed,user password is required if the button is pushed for 5 sn. If the user password is entered wrong device does not latch

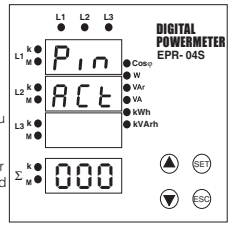
Note: Factory default value of user password is **"1234"**
For activating the user password; In the measurement mode,

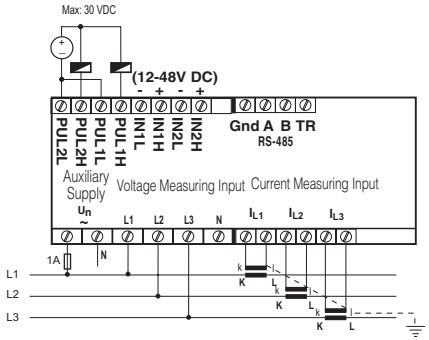
Push SET button 5 sn. (Ctr menu is displayed)

By using UP-DOWN buttons find Pın menu.

Push SET button (Pın ACt menu is displayed.)

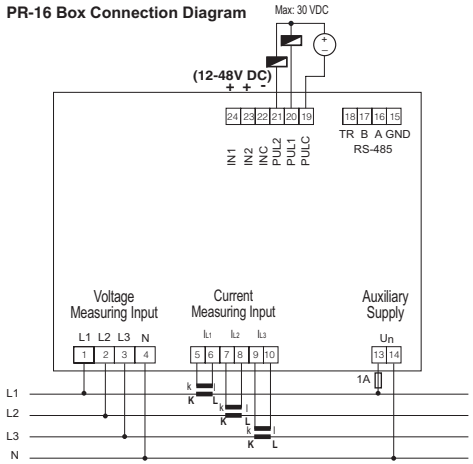
Push SET button (The number which is the last digit of second display blinks)



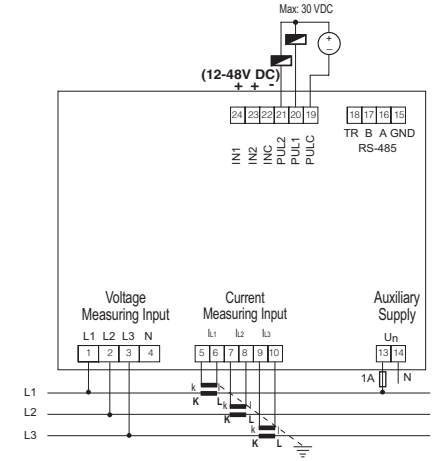


3 Phase without neutral

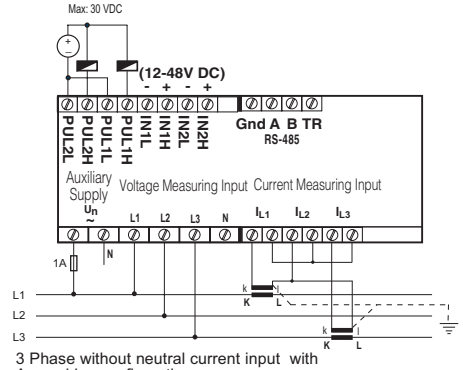
PR-16 Box Connection Diagram



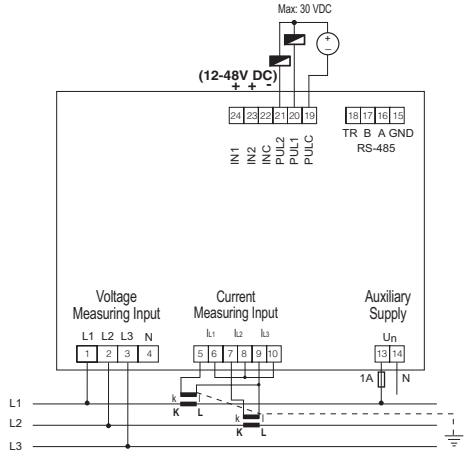
3 Phase neutral



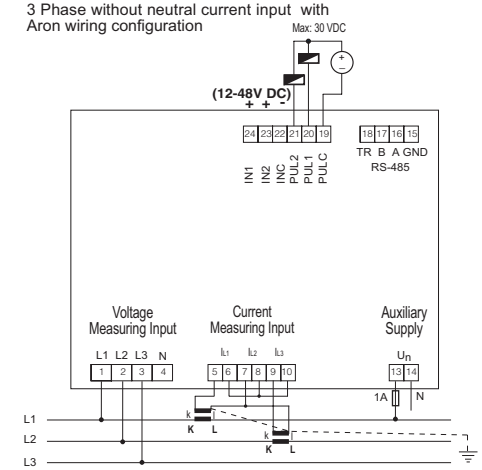
3 Phase without neutral



3 Phase without neutral current input with Aron wiring configuration

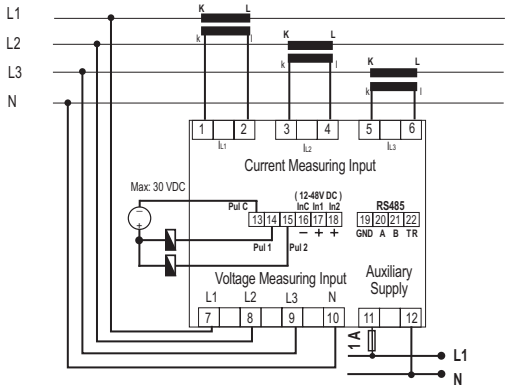


3 Phase without neutral current input with Aron wiring configuration

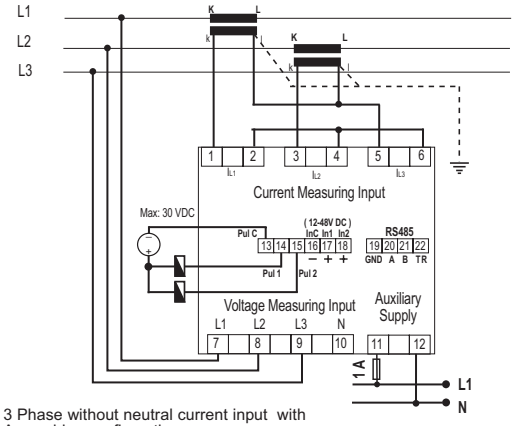


3 Phase without neutral current input with Aron wiring configuration

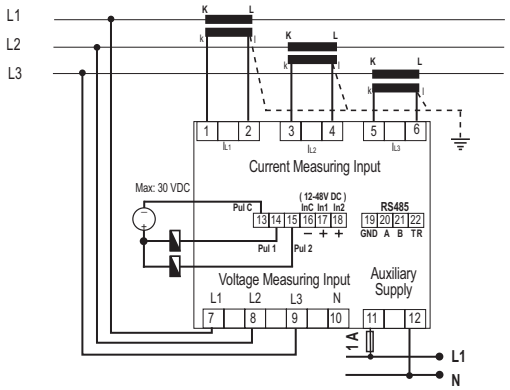
PR 19 Box Connection Diagram



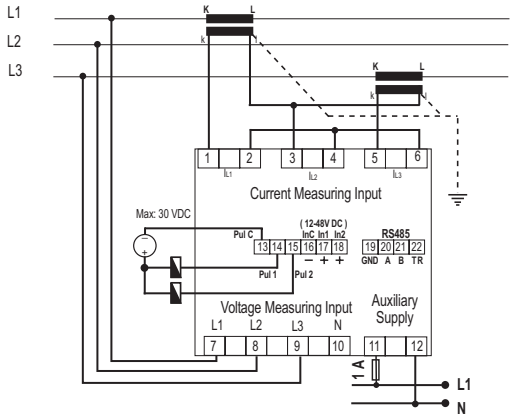
3 Phase neutral



3 Phase without neutral current input with Aron wiring configuration

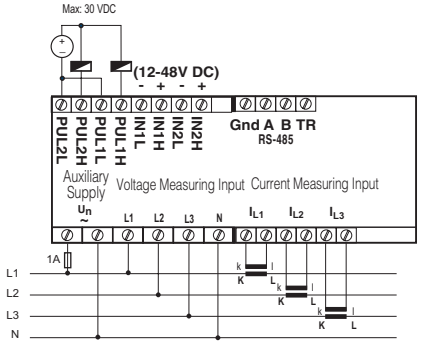


3 Phase without neutral

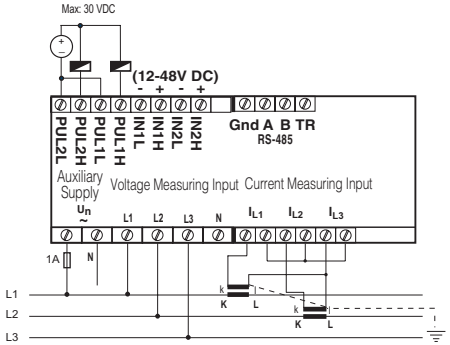


3 Phase without neutral current input with Aron wiring configuration

PK 26 Box Connection Diagram



3 Phase neutral



3 Phase without neutral current input with Aron wiring configuration

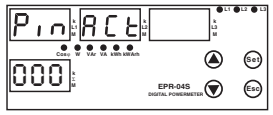
DIGITAL POWERMETER
EPR-04S

By using UP-DOWN buttons enter to the fourth digit of desired value.

Push SET button (First number of the third display blinks). If you did not enter the fourth digit correct, you can reentry by pressing the ESC button

By using UP-DOWN buttons, enter to the third digit of desired value.

Push SET button (The number which is in the middle of the third display blinks. If you did not enter the third digit correct, you can reentry by pressing the ESC button)

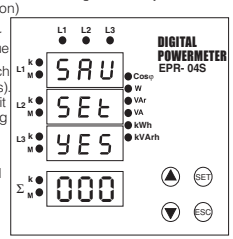


By using UP-DOWN buttons, enter to the second digit of desired value

Push SET button (The number which is the last digit of third display blinks). If you did not enter the second digit correct, you can reentry by pressing the ESC button)

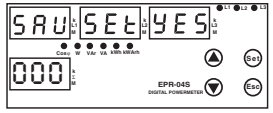
By using UP-DOWN buttons, enter to the last digit of desired value.

Push SET button, Pın ACt oF is displayed (Data is entered but is not activated yet. For activating the new data please follow the below steps)



Push ESC button one by one until (SAU SEt yES) appears at the display..

Push SET button whenl (SAU SEt yES) appears at the display. (When SAU SEt yES appears at the display,If you push ESC button or choose “no” option instead of “yES” option, new data will be canceled and previous value will be activated.



Serial Communication

EPR-04S has MODBUS RTU communication protocol which is optical isolated. All measured parameters can be transfer to the computer.Transformer ratios and parameters of communication can be set. Saved demand and energy values can erase

Adjustment of Parameters
Adjustment of Device ADDRESS

Push SET button 5 sec.

By using UP-DOWN buttons find Adr bulun

Push SET button again.

By using UP-DOWN buttons adjust the desired value. ESC

Push SET button for saving the new value. Adr

Push ESC button one by one until (SAU SEt yES) appears 001

Push SET button when (SAU SEt yES) appears at the display. (When SAU SEt yES appears at the display,If you push ESC button or choose “no” option instead of “yES” option, you quit from adjustment menu without saving new settings and device continues to work with previous settings. 002

Adjustment of Baud Rate

Baud Rate can be chosen as a value of 1200,2400,4800,9600,19200, 38400 bps

Push SET button 5 sec. ESC

By using UP-DOWN buttons find bRU

Push SET button again. bRU

9

By using UP-DOWN buttons adjust the desired value.

Push SET button for saving the new value. 600

Push ESC button one by one until (SAU SEt yES) appears

Push SET button when (SAU SEt yES) appears at the display. (When SAU SEt yES appears at the display,If you push ESC button or choose “no” option instead of “yES” option, you quit from adjustment menu without saving new settings and device continues to work with previous settings.

Adjustment of Parity:
Parity can be adjust as NO, ODD or EVEN.

Push SET button 5 sec. ESC

By using UP-DOWN buttons find PAr bulunuz PAr

Push SET button again. odd

By using UP-DOWN buttons adjust the desired value.

Push SET button for saving the new value. no

Push ESC button one by one until (SAU SEt yES) appears

Push SET button when (SAU SEt yES) appears at the display. (When SAU SEt yES appears at the display,If you push ESC button or choose “no” option instead of “yES” option, you quit from adjustment menu without saving new settings and device continues to work with previous settings.

IMPORTANT NOTE: In order communicate with ENTES software Baudrate has to be 38400 bps and parity has to be “no”

MODBUS RTU PROTOCOL

Standart MODBUS RTU message is shown below.

T	ADDRESS 8 BIT	FUNCTION 8 BIT	DATA NX8BIT	CRCH	CRCL	T

The T times corresponds to a time in which data must not be exchanged on the communication bus to allow the connected devices to recognize the end of one message and the beginning of another. This time must be at least 3.5 characters at the selected baud rate. Adress range (1-247) is address of the connected device. The data field contains data sent to the slave by master or data sent to master by slave.

CRC is a error check method by using MODBUS RTU protocol and consists of 2 bytes.

Available Modbus Function:

03H	READ HOLD REGISTERS
06H	PRESET SINGLE REGISTER
10H	PRESET MULTIPLE REGISTERS

Read Hold (03) function is used for reading measured values and transformers ratio. Registers can be read are between 0-68. For example to read phase1 voltage;

01 03 00 00 00 01 84 0A

01 Device adres
03 Function
00 MSB adres
00 LSB adres
00 Register number MSB
01 Register number LSB
84 CRC MSB
0A CRC LSB
Preset Single Register (06) function is used to set transformer ratio or for clearing one of min.,max., Demand values.

Current transformers ratio can be set 5-10000, voltage transformer ratio can be set 1-2000 min.,Max. and Demand values can be only clear. If sent value is outside of this range device responds with an error message.
Setting CT to 100;

01 06 00 37 00 64 D8 35

01 Device Address
06 Function
00 MSB adres
37 LSB adres
00 Data MSB
64 Data LSB
D8 CRC MSB
35 CRC LSB
Preset Multiple Register(10H) is used to set more then one register at same time.
Setting CT to 100,Ut to 20;

01 10 00 37 00 02 00 64 00 C8 84 8F
01 Device Address
10 Function
00 MSB adres
37 LSB adres
00 Register number MSB
02 Register number LSB
04 Byte count
00 Data MSB
64 Data LSB
00 Data MSB
C8 Data LSB
84 CRC MSB
8F CRC LSB

ADDRESS	DESCRIPTION	SIZE (BYTE)	ADDRESS	DESCRIPTION	SIZE (BYTE)
00H	R-ACTIVE POWER	2	1DH	S-REACTIVE POWER MAX	2
01H	S-ACTIVE POWER	2	1EH	S-REACTIVE POWER MIN	2
02H	T-ACTIVE POWER	2	1FH	T-REACTIVE POWER MAX	2
03H	TOTAL ACTIVE POWER	2	20H	T-REACTIVE POWER MIN	2
04H	R-REACTIVE POWER	2	21H	R-APPARENT POWER MAX	2
05H	S-REACTIVE POWER	2	22H	R-APPARENT POWER MIN	2
06H	T-REACTIVE POWER	2	23H	S-APPARENT POWER MAX	2
07H	TOTAL REACTIVE POWER	2	24H	S-APPARENT POWER MIN	2
08H	R-APPARENT POWER	2	25H	T-APPARENT POWER MAX	2
09H	S-APPARENT POWER	2	26H	T-APPARENT POWER MIN	2
0AH	T-APPARENT POWER	2	27H	ACTIVE ENERGY kWh.-1	2
0BH	TOTAL APPARENT POWER	2	28H	ACTIVE ENERGY kWh.-2	2
0CH	R-COS	2	29H	ACTIVE ENERGY kWh.-3	2
0DH	S-COS	2	2AH	ACTIVE ENERGY kWh.-4	2
0EH	T-COS	2	2BH	ACTIVE ENERGY kWh.(EXPORT) -1	2
0FH	WATT DEMAND	2	2CH	ACTIVE ENERGY kWh.(EXPORT) -2	2
10H	V Ar DEMAND	2	2DH	ACTIVE ENERGY kWh.(EXPORT) -3	2
11H	VA DEMAND	2	2EH	ACTIVE ENERGY kWh.(EXPORT) -4	2
12H	WATT DEMAND MAX	2	2FH	REACTIVE ENERGY kVArhL-1	2
13H	V Ar DEMAND MAX	2	30H	REACTIVE ENERGY kVArhL-2	2
14H	VA DEMAND MAX	2	31H	REACTIVE ENERGY kVArhL-3	2
15H	R-ACTIVE POWER MAX	2	32H	REACTIVE ENERGY kVArhL-4	2
16H	R-ACTIVE POWER MIN	2	33H	REACTIVE ENERGY kVArhC-1	2
17H	S-ACTIVE POWER MAX	2	34H	REACTIVE ENERGY kVArhC-2	2
18H	S-ACTIVE POWER MIN	2	35H	REACTIVE ENERGY kVArhC-3	2
19H	T-ACTIVE POWER MAX	2	36H	REACTIVE ENERGY kVArhC-4	2
1AH	T-ACTIVE POWER MIN	2	37H	VOLTAGE TRANS. RATIO	2
1BH	R-REACTIVE POWER MAX	2	38H	CURRENT TRANS. RATIO	2
1CH	R-REACTIVE POWER MIN	2	39H	DEMAND TIME (SEC.)	2

The Parameters are sent in 16bit Hexadecimal format. For Example, 230V voltage will be sent as 00E6H. Cosφ values shall be divided to 100. 0.98 Cosφ will be sent as 0062H. While Cosφ is a negative value the MSB bit will be sent as 1. Energy values are sent in 8 bytes (in decimal). 1234567891234,567kWh = 12 34 56 78 91 23 45 67 / 1000
Specifications for data cable ;
- 24 AWG or thicker
- Less than 100 ohm/ km
- Nominal characteristic impedance at 100 kHz of 100 ohms
- Less than 60 pF/m mutual capacitance (between two wires in a pair)
- Less than 120 pF/m mutual pair capacitance (the capacitance between one wire and all others connected to earth).
- Twisted Pair

ERROR CODES

Slave device (EPR-04S) sends error message when receive any missing query. Error codes are given below.

01 Invalid Function: If any message except given above is used, then 01 error messages will be sent.

02 Invalid Register: EPR-04S uses registers between 0 and 57. If any message is been sent out of this range, then 02 error message will be sent.

03 Invalid data: If any different value is been set for dedicated Transformer values and nonzero for demand value, then error message 03 will be sent.

MPR-SW-1 / SW-2: EPR-04S serial Interface Software

MPR-SW-1 / SW-2 Software is designed for use with EPR-04S device and analyze its measurement values. MPR-SW -1 / SW-2 is able to view realtime measurements and parameters on a PC screen. The software records all parameters and values into a database for future graphical analysis. The Graphical Analysis is designed flexible for view past records in hour,day and month periods. Inductive/Reactive and Capacitive/Reactive values can be viewed on the main window. Energy reports can also be viewed between specific dates.

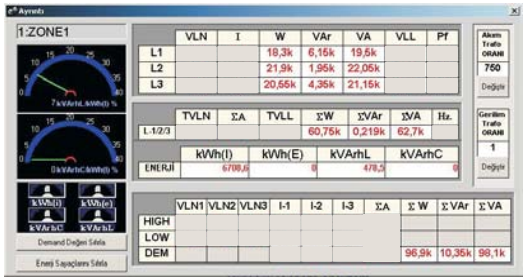
You may change setup parameters using the MPR-SW-1 / SW-2 Software: Set Transformer ratios, Reset Energy and Demand values and change the device address up to 247.
MPR-SW-2 can communicate with multiple (max. 247) EPR-04S devices.

MPR-SW Software Setup

Insert the Setup CD into the CD-ROM drive.
Browse the CD by double clicking "My Computer" and "CD-Rom" icons. Run "Setup.EXE by double clicking its icon or use the "START" menu button and choose "Run".
Write "d:\setup.exe" into the text box opened below.The setup program will install the software to your computer.

Run The MPR-SW Program :

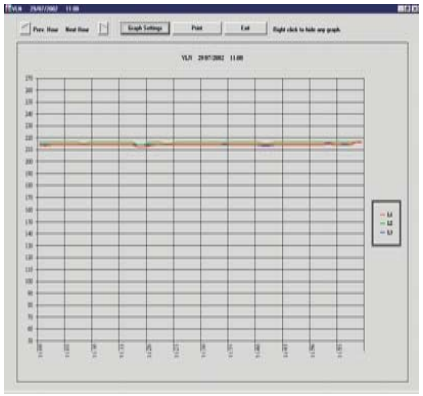
The setup software will install the MPR-SW-1/SW-2 Software under START -> ENTES -> Mpr-SW.exe directories. You may browse and run it



Clicking the "START" button on the main window, starts the real time analysis of EPR-04S device values. "SETTINGS" button is for setting up communication parameters (Adress, Parity, Baud Rate) between the PC and EPR-04S device. Both side parameters should be the same for correct data transmission. There are "CLEAR ENERGY" and "CLEAR DEMAND" buttons for resetting those values. Transformer ratio is able to setup with the "TRANS.RATIOS" button on the main menu.

Graphic Button and Statistics :

The Graphic menu, shows records and values for past 1 year period on a graphical interface. Users are able to choose the statistics period, hourly,daily and monthly from the window shown below.



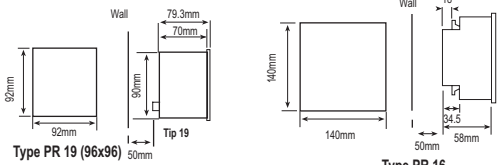
IMPORTANT NOTICE:

Please use the software's own EXIT buttons while quitting the menu or the Main Window.

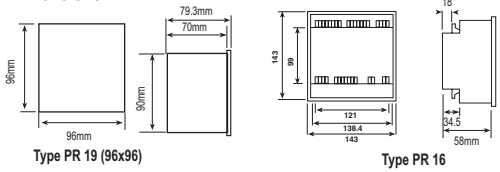
TECHNICAL DATA

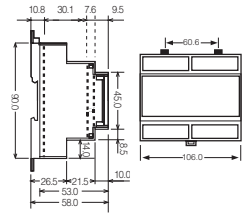
Operating Voltage (Un) the device	: Please look at the back labels on
Operating frequency (f)	: 50/60 Hz
Auxiliary supply Power Consumption	: < 4 VA
Measuring Input Power Consumption	: < 1VA
V_{In}	: 10-300VAC 50/60Hz. (L-N)
	: 10-500VAC 50/60Hz. (L-L)
I_{In}	: 0.05 - 5.5 A~
Measuring Range	: 0-900 M (W,VAr,VA)
Measuring Category	: CAT III
Class	: 1±1digit [(%10-%110) xFull Scale]
Voltage Transformer Ratio	: 1 ... 2000
Current Transformer Ratio	: 1 ... 2000
Demand Time	: 1-60 min. (programmable)
Serial Interface	: MODBUS RTU (RS 485)
	: Optically Isolated, programmable
	: Baud Rate 1200-38400 bps
	: Address 1-247
	: No , odd ,even Parity
Pulse Output	: NPN Transistor
Switch Period	: Min. 1,6 Sec. (400 msec pulse width)
Operation Current	: Max. 50 mA
Operation Voltage	: 5.....24 V DC, max. 30 VDC
Input	: 12...48 V DC
Ambient Temprature	: -5°C; +50°C
Display	: Red LED Display
Dimensions	: PR-19
Equipment Protection Class	: Double Insulation-Class II (⧈)
Box Protection Class	: IP 40
Box Material	: Non-flammable
Installation	: Panel Mounted (PR-16, PR-19) Rail Mounted (PK-26)
Wire Thickness(for terminal block)	: 2.5 mm^2
Weight	: 0.45 kg (PR-19, PK-26) 0.8 kg (PR-16)
Installation Category	: Class III

The area Measurements on The Control Panel



Dimensions





PRECAUTIONS FOR INSTALLATION AND SAFE USE

Failure to follow those instructions will result in death or serious injury.
- Disconnect all power before working on equipment..
- When the device is connected to the network, do not remove the front panel.
- Do not try to clean the device with solvent or the like.Only clean with dry cloth.
- Verify correct terminal connections when wiring.
- Electrical equipment should be serviced only by your component seller.
- No responsibility is assured by manufacturer or any of its subsidiaries for any consequences arising out of the use of this material.
- Only for rack panel mounting.