



trumeter
innovation by design

Catalogue 2012

POWER MANAGEMENT PRODUCTS

-  **Power Quality and Energy**
-  **Electrical Measurement**
-  **Power Factor Correction**
-  **Remote Monitoring**
-  **Protection & Control**

- 1937 Trumeter Company Started
- 1955 Opened Radcliffe Factory
- 1991 Acquire Trumeter Inc (USA)
- 1997 OEM Business starts
- 2004 Production starts in Malaysia
- 2007 Jaguar XF Console Production starts
- Jan 2010 Company reformed as Trumeter Technologies Ltd
New Investment, Strengthened Management Team
- July 2010 Company Moved to New HQ in North Manchester
- Sept 2010 Production Start up at modern newly constructed Penang facility
- Aug 2011 Acquisition of Redington Counters in USA
- Nov 2011 Entes Partnership signed
- Feb 2012 Relocate UK HQ to larger improved facility
- Mar 2021 Relocate USA HQ to larger improved facility

Mission & Values

TOTAL TEAM TRUMETER

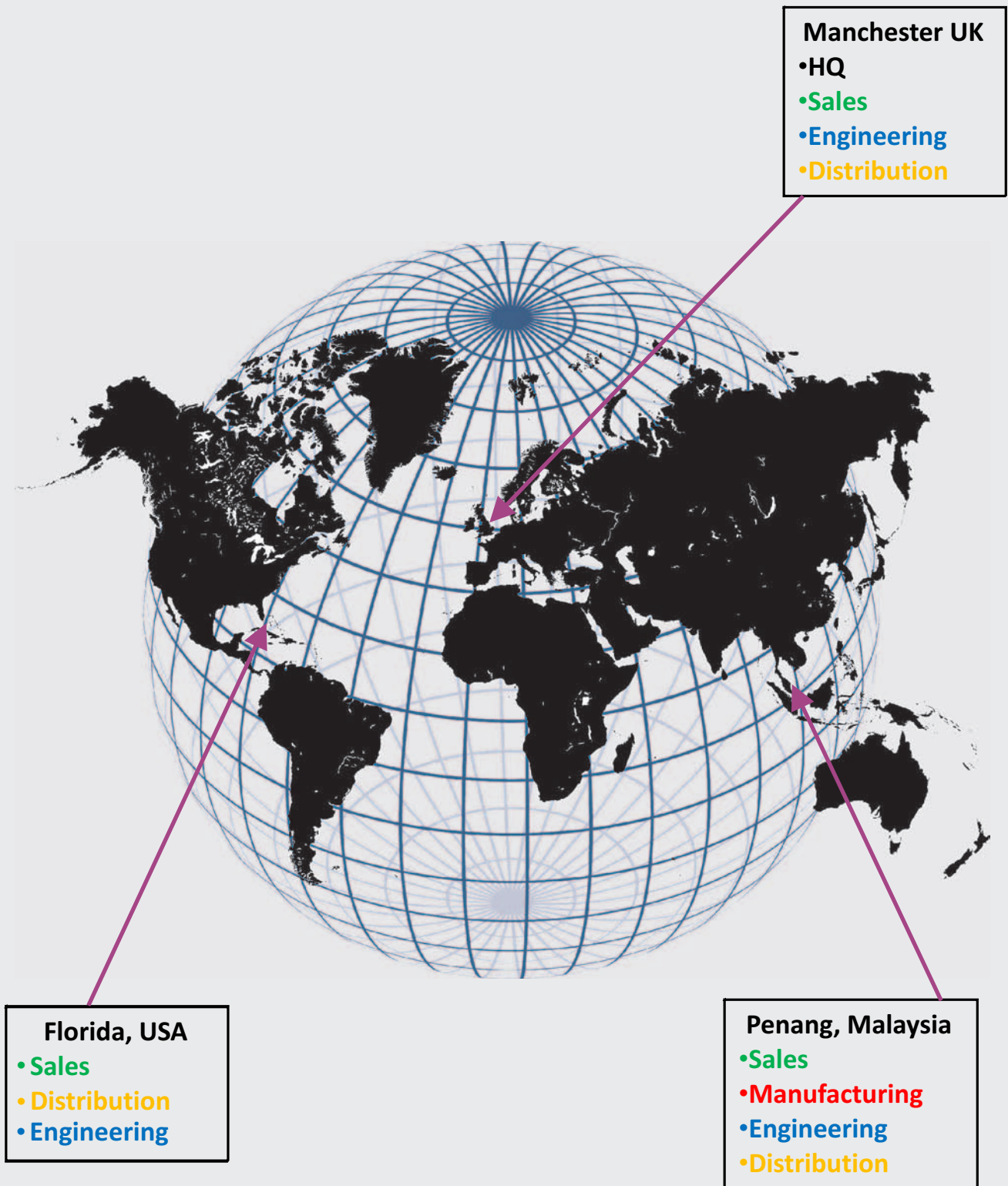
The Total Team Trumeter spirit is defined by one global team, driven by the best interest of our customers, investors and employees.

COMMITMENT TO EXCELLENCE

Through continuous improvement and working with integrity, and in true partnership with our customers and suppliers, we design and manufacture innovative products and services of world class quality, delivered on time.

SUSTAINABILITY

Our group will grow profitably and sustainably to ensure that we can continue to be the first choice supplier in our chosen markets for both core and special products.



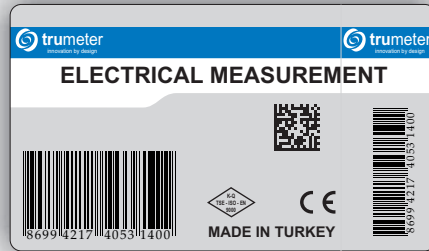
- ISO9002 accreditation since 1993
- ISO9001:2008 accreditation since May 2002
 - Successful audits July 2010, March 2011, October 2011
 - Manufacturing, Design & Engineering, Customer Fulfilment
- ISO TS16949 - In progress
- Strong Sub-contractor and Supplier evaluation & control process
- QPulse: Company-wide Distributed Quality Management System
- Regular OEM Factory Audits
 - Brita , Flextronics etc

As one of the world's leading manufacturers of measuring products, Trumeter Technologies Ltd rank second to none in designing, manufacturing and distributing products in three distinctive areas: Length Measurement, Distance Measurement and Electronic Counting, providing the best package of technological innovation, low cost manufacturing, reliability and support.

Trumeter Technologies' beginnings date back to 1937, when the company designed and manufactured a range of mechanical counting systems for measuring physical length in the textile industry. Today, our products for length measurement are used in an extensive number of industries including textile, carpet, wallpaper, timber, and cable measurement. For over half a century Trumeter Technologies Ltd have been designing and manufacturing world-class quality wheel-based distance measuring products for applications within surveying and road, construction, land, stadia, indoor and rail track engineering and maintenance.

Taking advantage of the impact of technology evolution in industrial processes, Trumeter Technologies design and manufacture a world-class Control and Measurement range of products, comprising electromechanical and electronic counting products for measuring, monitoring, and process controlling, including timers, rate meters, as well as totalising and multifunction counters.

These products are marketed through a global Distributor network, covering all major industrial markets as well as developing and emerging markets.



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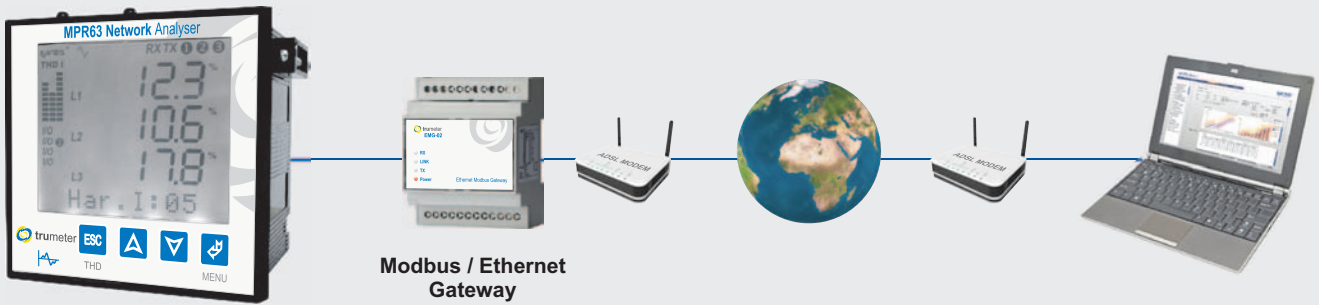


Power Quality and Energy

Network Analysers
MPR-6x Series
MPR-5x Series
EPM-0x Series
Power and Energy Meters
EPR-04 Series
ES Series

NETWORK ANALYSERS

MPR-50 / MPR-52S / MPR-60S / MPR-63



MPR-63



General

- **MPR-50:** Network Analyser.
- **MPR-52S-10:** Network Analyser with THD measurement, RS-485 (MODBUS) and Alarm Contact.
- **MPR-60S:** Network Analyser with THD measurement, RS-485 (MODBUS), Alarm Contact and 1MB Memory.
- **MPR-63:** Network Analyser with THD, up to 31th Harmonics measurement, RS-485 (MODBUS), Alarm Contact and 1MB Memory.
- IEC 61000-6-2, IEC 61000-6-4, IEC 61010-1

Modbus

Memory

Analogue Output

Max. Demand

Harmonics

Digital Input

Alarm Contact

Product Code

Product Code	% THD I, THD V	2-31th Harmonics	I Neutral Current	Alarm Contact	Digital Input	Energy Pulse Output	RS-485 Comm.	0(2)-10V	0(4)-20mA	Memory	Real Time Clock	LCD Display	Pcs / Carton
MPR-50													8
MPR-52S-10													8
MPR-60S													8
MPR-60S-10													8
MPR-60S-20													8
MPR-60S-21													8
MPR-60S-40													8
MPR-60S-41													8
MPR-63													8
MPR-63-10													8
MPR-63-20													8
MPR-63-21													8
MPR-63-40													8
MPR-63-41									1 pc				8
MPR-63-42									2 pcs				8

PC Interface Software (MPR-SW)

MPR-SW is a graphic based software, which enables remote monitoring via internet or intranet.

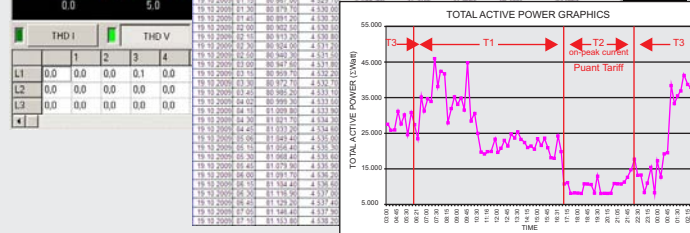
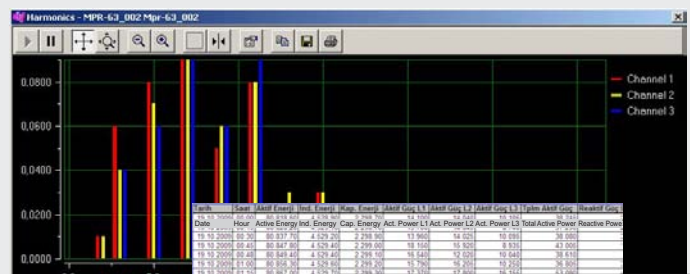
Please refer to page 46 for MPR-SW Software.



Front Panel View



Table View



Harmonics View (for MPR-63)

Phase - Neutral Voltages (V_{LN})	Neutral Current	Active Power (P)	Active Energy - Import (kWh)
Phase - Phase Voltages (V_{LL})	Total Current (ΣI)	Reactive Power (Q)	Active Energy - Export (kWh)
Average Phase - Neutral Voltage	Power Factor (P.F)	Apparent Power (S)	Reactive Energy - Capacitive (kVArh)
Average Phase - Phase Voltage	$\text{Cos}\phi$	Total Active Power (ΣP)	Reactive Energy - Inductive (kVArh)
Max. Demand	Frequency (Hz)	Total Reactive Power (ΣQ)	
Phase Currents (I)	Max / Min. Values	Total Apparent Power (ΣS)	

Measured Parameters (MPR-50)

+

Total Harmonic Distortion for Voltage (THD V %)	Total Harmonic Distortion for Current (THD I %)
---	---

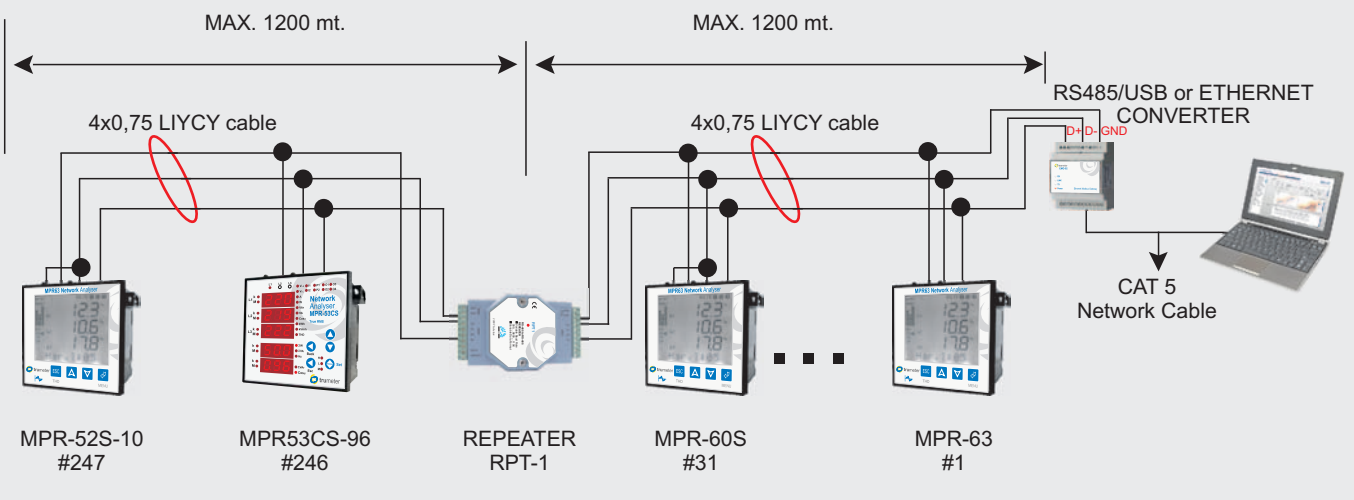
Measured Parameters (MPR-52S-10 / MPR-60S)

+

Individual Harmonics for Voltage - up to 31th	Individual Harmonics for Current - up to 31th
---	---

Measured Parameters (MPR-63)

247 DEVICES CAN BE CONNECTED SERIALLY BY USING REPEATERS.



* Trumeter recommends 4x0,75 LIYCYmm² cable for RS-485 communications

NETWORK ANALYSERS

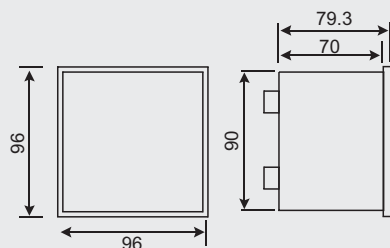
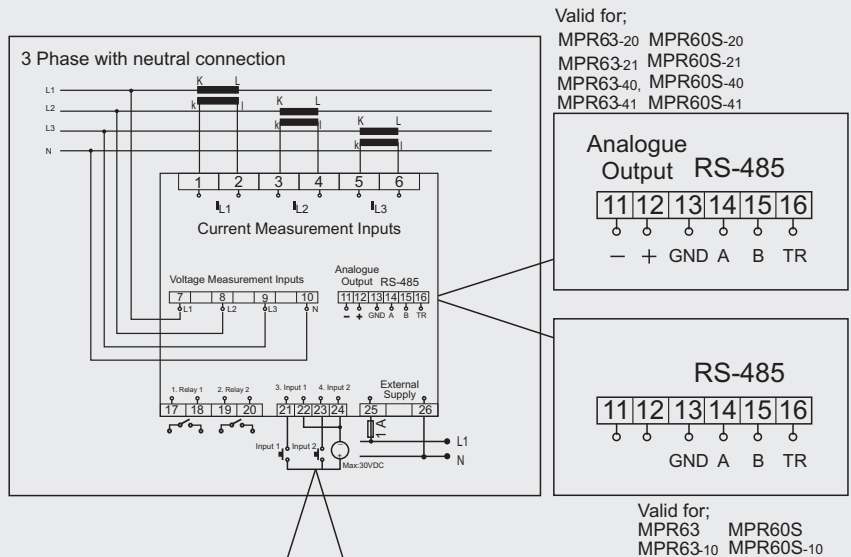
MPR-50 / MPR-52S / MPR-60S / MPR-63

MODEL	MPR-50	MPR-52S-10	MPR-60S	MPR-63
SPECIFICATIONS				
HOUSING				
Dimensions	96x96mm PR19			
Protection Class	IP40 Front Panel; IP54 Optional			
Weight	0,75 kg/device; One package contains 8 pcs.			
Display	Backlit 3,6" LCD			
MEASUREMENTS				
Voltage				
Measuring Range	1.0-300V AC (L-N); 2.0-500V AC (L-L)			
Measuring Range with Transformer	Transformer Ratio: 1.0-4000			
Accuracy	%0.5 ± 2 Digit			
Input Impedance	1.8MΩ			
Burden	<0.5 VA			
Overload Voltage	1.2 x Measurement Range			
Current				
Nominal Current	In : 5A			
Lowest Current	5 mA			
Measurement Range	5 mA - 5.5 A Accuracy: 0.5% ±2 digit			
Measurement Range with Transformer	mA 10000 A Transformer Ratio: 1-5000.0			
Burden	0,5 VA			
Overload Current	2xIn			
Discontinuous Overload Current	10xIn			
Power/Energy				
Active Power	0 - 4000 MW	Accuracy: %1 ± 2 Digit		
Reactive Power	0 - 4000 MVar	Accuracy: %2 ± 2 Digit		
Apparent Power	0 - 4000 MVA	Accuracy: %2 ± 2 Digit		
Power Factor	±1.00 Accuracy: ± 0,01			
Active Energy	0 99 999 999 kWh or MWh	Accuracy: 1% ±2 Digit		
Reactive Energy	0 99 999 999 kVarh or MVarh	Accuracy: 1% ±2 Digit		
Total Harmonic Distortion(THD)	THD V%, THD I%			
Harmonics				2-31 (V) Voltage and (I) Current
Demand/Demand Time	15 min.			
Frequency	45-65 Hz			
SUPPLY				
Operating Voltage	85 -265 V AC/DC			
Operating Frequency	50/60 Hz			
Power Consumption	<6 VA			
INPUT/OUTPUT/SETTINGS				
Digital Input	-	2	2 (MPR60S-10/20/40)	2 (MPR63-10/20/40/42)
Digital Output	-	-	2 (MPR60S-21/41)	2 (MPR63-21/41)
Analog Output	-	-	(0)4-20 mA (MPR60S-40/41; MPR63-40/41/42) (0)2-10 V DC (MPR60S-20/21; MPR63-20/21)	
Contact Output	-	2 NO contacts 5A ; 1250 VA cosφ=1.00		
Energy Pulse Output	-	Active Energy Output(1kWh/pulse - 50MWh/pulse) Reactive Energy Output(1kVarh/pulse - 50MVarh/pulse)		
Delay Time	-	Voltage Parameters 0-300 sec.; Current and Power Parameters 0-900 sec.; Frequency, PF, cos and		
PULSE OUTPUT				
Switching Current	-	Max. 50 mA		
Switching Voltage	-	5..24 V DC		
Pulse Duration	-	100 ...2500 msec.		
Maximum Voltage	-	Max. 30 V DC		
MEMORY				
Data Logging	-	Selectable 28 parameters with Time Stamp(1500 records)		
Capacity	-	1MB		
COMMUNICATION				
Interface/Protocol	-	RS 485 / MODBUS RTU		
Transfer Rate	-	1200 - 38400		
AMBIENT CONDITIONS				
Ambient Temperature	- 5 / +55°C			
Storage Temperature	- 25 / +70°C			
Overvoltage Category	III			
Pollution Degree	II			
Ambient Humidity	%90			
STANDARDS				
Security Standards	EN-61010-1			
EMC Standards	EN-61000-6-2, EN-61000-6-4			
Mechanical Endurance	EN 60529			
CONNECTIONS				
Installation	Terminal / Flush-mounting with rear terminals			
Connection Terminals	Socket Type Terminal with Screws			
Connection Types	3 Phase+Neutral(3P4W), 3 Phase(3P3W), 3 Phase(Aron)			

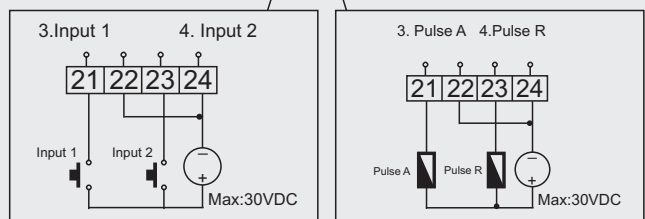
Connection Diagram

Dimensions

(PR19- 96x96mm)

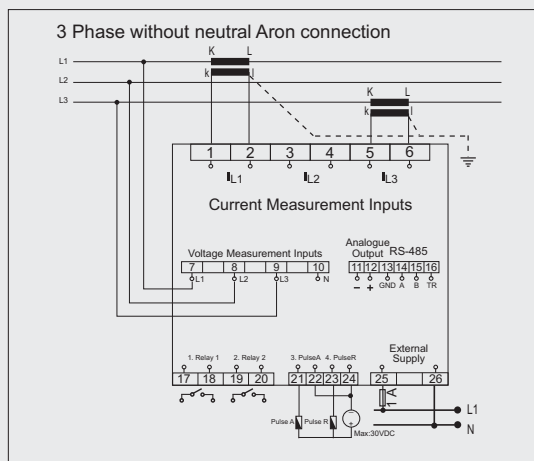
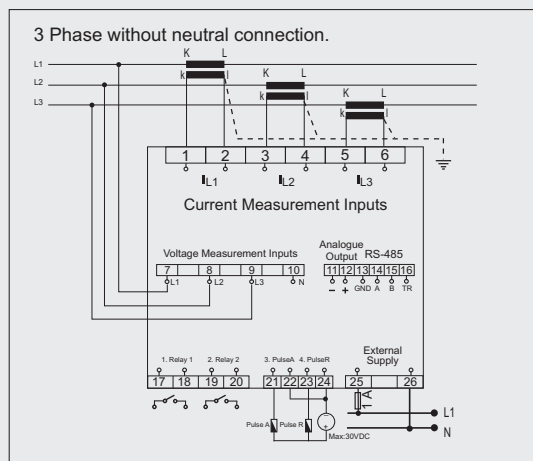


TYPE PR 19



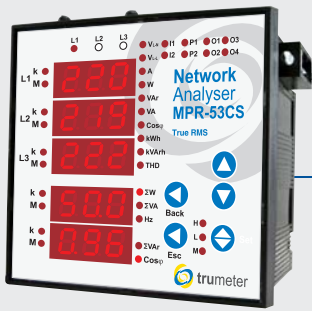
Valid for;
MPR63-10 MPR60S-10
MPR63-20 MPR60S-20
MPR63-40 MPR60S-40

Valid for;
MPR63 MPR60S
MPR63-21 MPR60S-21
MPR63-41 MPR60S-41



NETWORK ANALYSERS

MPR-53 / EPM-07 Series



MPR-53CS-96



Modbus / Ethernet Gateway



MPR-SW Software



General

MPR-53 / EPM-07 series measures many parameters of an electric network. More than 50 parameters are displayed.

- EPM-07: Network Analyser.
- EPM-07S: Network Analyser with RS-485 (MODBUS).
- MPR-53: Network Analyser with THD measurement.
- MPR-53S: Network Analyser with THD measurement and RS-485 (MODBUS).
- MPR-53CS: Network Analyser with THD measurement, RS-485, Pulse Counter, Digital Hour Counter, Alarm Contact
- IEC 61000-6-2, IEC 61000-6-4, IEC 61010-1

Modbus

Harmonics

Max. Demand

Pulse Output

Digital Input

Alarm Contact

Digital Hour Counter

Pulse Counter

Product Code

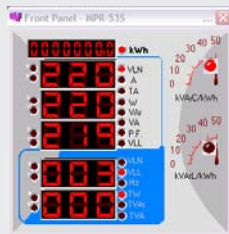
	% THD I	% THD V	Neutral Current	Digital Input	Energy Pulse Output	Dual Energy Meter	6 Different Energy Calculation Methods	.../5A	CT-25 (120A)	Alarm Contact	Digital Hour Counter	Pulse Counter	RS-485 Comm.	Pcs / Carton
EPM-07-96														12
EPM-07-DIN														12
EPM-07S-96														12
EPM-07S-DIN														12
MPR-53-96														12
MPR-53-DIN														12
MPR-53S-96														12
MPR-53CS-96														12
MPR-53S-DIN														12
MPR-53CS-DIN														12
MPR-53S-DIN-CT25									●					12
EPM-07S-DIN-CT25									●					12

● Min. Order Quantity is 200pcs / device

PC Interface Software (MPR-SW)

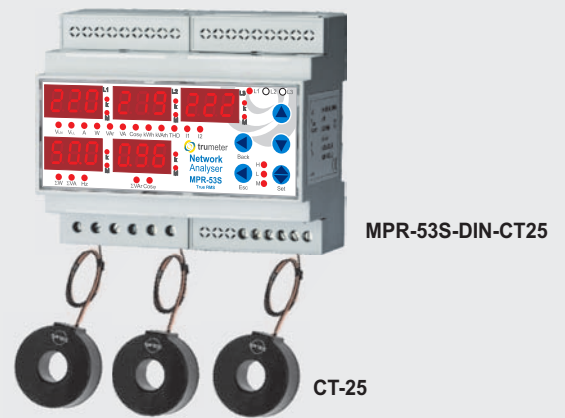
MPR-SW is a graphic based software, which enables remote monitoring via intranet or internet.

Please refer to page 46 for MPR-SW Software.



TABLO1

	L1	L2	L3	L1	L2	L3
THD	14.7	14.7	14.6	PH	0.02	0.02
I	20	20	20	Cos	0.01	0.01
V	20	20	20	Con	0.01	0.02



CT-25 is a Current Transformer, which is used together with MPR-53S-DIN-CT25 model. It is a unique solution, which replaces conventional type CTs up to 120A.

Phase - Neutral Voltages (V_{LN})	Total Current (ΣI)	Apparent Power (S)	Reactive Energy - Capacitive (kVArh)
Phase - Phase Voltages (V_{LL})	Power Factor (P.F)	Total Active Power (ΣP)	Reactive Energy - Inductive (kVArh)
Average Phase - Neutral Voltage	$\text{Cos}\phi$	Total Reactive Power (ΣQ)	Max. Demand
Average Phase - Phase Voltage	Frequency (Hz)	Total Apparent Power (ΣS)	Max / Min. Values
Phase Currents (I)	Active Power (P)	Active Energy - Import (kWh)	
Neutral Current	Reactive Power (Q)	Active Energy - Export (kWh)	

Measured Parameters (EPM-07 / 07S)

+

Total Harmonic Distortion for Voltage (THD V %)	Total Harmonic Distortion for Current (THD I %)
---	---

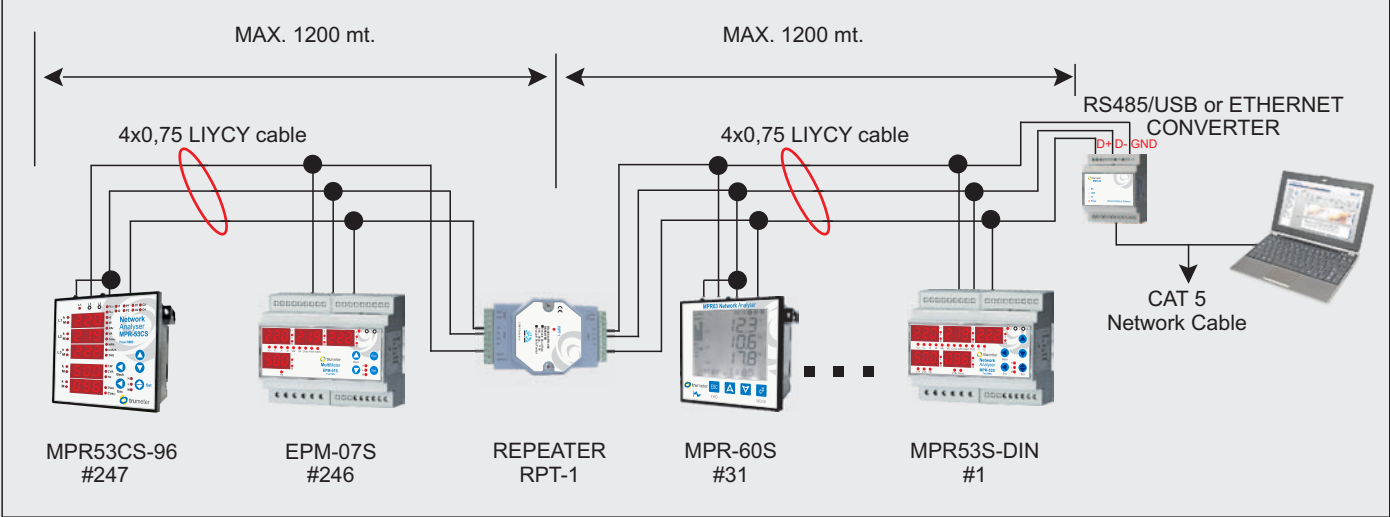
Measured Parameters (MPR-53 / MPR-53S)

+

Digital Hourmeters	Digital Pulse (Count)
--------------------	-----------------------

Measured Parameters (MPR-53CS)

247 DEVICES CAN BE CONNECTED SERIALLY BY USING REPEATERS.



* Trumeter recommends 4x0,75 LIYCYmm² cable for RS-485 communications

NETWORK ANALYSERS

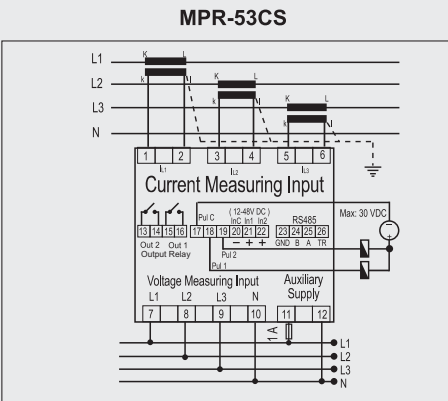
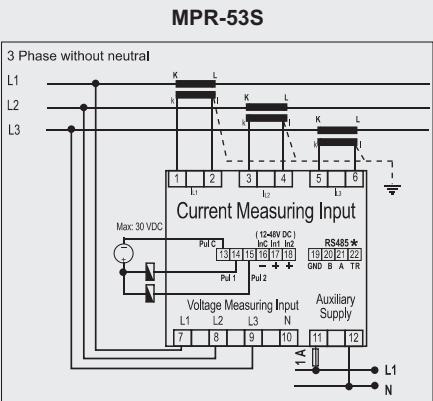
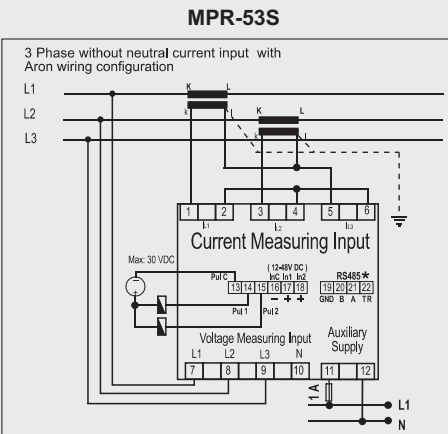
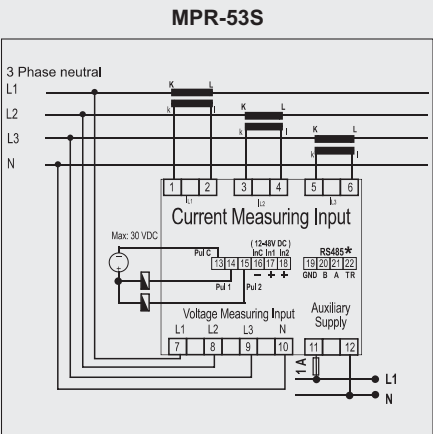
MPR-53 / EPM-07 Series

MODEL	EPM-07	EPM-07S	MPR-53	MPR-53S	MPR-53CS
SPECIFICATIONS					
HOUSING					
Dimensions	96x96mm PR19, DIN6 PK26				
Protection Class	IP40 Front Panel; IP54 Optional				
Weight	0,75 kg/device; One package contains 8 pcs.				
Display	Backlit 3,6" LCD				
MEASUREMENTS					
Voltage					
Measuring Range	10-300V AC (L-N),10-500VAC (L-L)				
Measuring Range with Transformer	10-300V(L-N) direkt,10-200kV Transformer Ratio: 1.0-4000				
Accuracy	%1±1 digit [(%10-%110)xTam skala]				
Input Impedence	1.8 MΩ				
Burden	<0.5 VA				
Overload Voltage	1.2 x Measurement Range				
Current					
Nominal Current	In:5,5A				
Lowest Current	50mA				
Measurement Range	50mA-5,5A Accuracy: %1±1 digit [(%10-%110)xTam skala]				
Measurement Range with Transformer	50mA-10.000A Transformer Ratio:1-2000 programlanabilir				
Burden	<1 VA				
Overload Current	1,2 In				
Power/Energy					
Active Power	0-215 MW Doğruluk: %1±1 digit [(%10-%110)xTam skala]				
Reactive Power	0-215 MVAr Doğruluk: %1±1 digit [(%10-%110)xTam skala]				
Apparent Power	0-215 MVA Doğruluk: %1±1 digit [(%10-%110)xTam skala]				
Power Factor	4 kuadrant				
Active Energy	0-99 999 999 999,9 kWh				
Reactive Energy	0-99 999 999 999,9 kVArh				
Demand/Demand Time	1-60 dakika				
Frequency	45-65 Hz				
SUPPLY					
Operating Voltage	110VAC/230VAC ±% 10 veya 45-265V AC/DC				
Operating Frequency	45-65 Hz				
Power Consumption	<4VA				
INPUT/OUTPUT/SETTINGS					
Digital Input	2 Inputs				
Digital Input Pulse Width	20msec.				
Digital Input Operating Voltage	12...48VAC/DC				
Digital Hourmeter	3 hourmeters for MPR-53CS, non-resettable total Hour meter, resettable run hour meter, resettable alarm hour meter.				
Delay Time	0-999,9 sec. for ON- and OFF-delay time(for MPR-53CS)				
Contact Output	2 NO Contacts 5A; 1250 VA(for MPR-53CS)				
Energy Pulse Output	NPN transistor				
Switching Current	Max. 50 mA				
Switching Voltage	5..24VDC Max. 30V DC				
Pulse Duration	100 msec. Pulse period, 80 msec. Pulse width				
COMMUNICATION					
Interface/Protocol	MODBUS RTU(RS-485)				
Parity	None, Odd, Even				
Address	1_247				
Transfer Rate	2400-38400 bps				
AMBIENT CONDITIONS					
Ambient Temperature	-5,+55°C				
Overvoltage Category	III				
Pollution Degree	II				
STANDARDS					
Security Standards	EN 61010-1				
EMC Standards	EN 61000-6-2, EN 61000-6-4				
Mechanical Endurance	EN 60529				
CONNECTIONS					
Installation	Flush-mounting with rear terminals(PR 19), Rail mount(PK 26)				
Connection Terminals	Socket Type Terminal with Screws				
Connection Types	3 Phase+Neutral(3P4W), 3 Phase(3P3W), 3 Phase(Aron)				

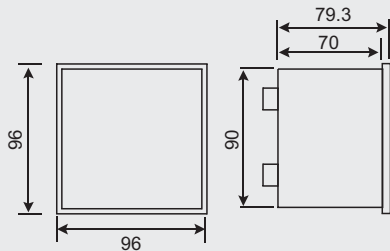
* 110 V AC, 60Hz Supplied devices are custom manufactured by order

Connection Diagram

(PR 19- 96x96mm)

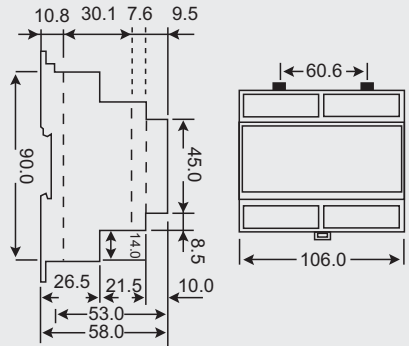
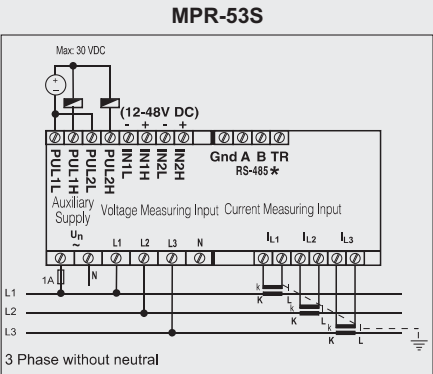
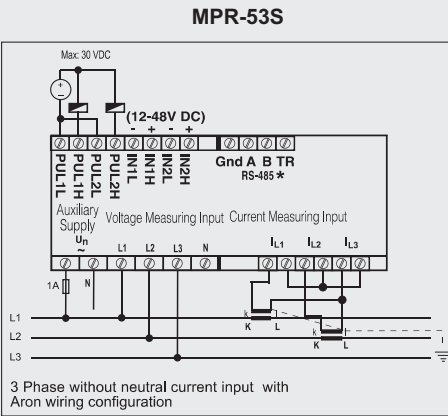
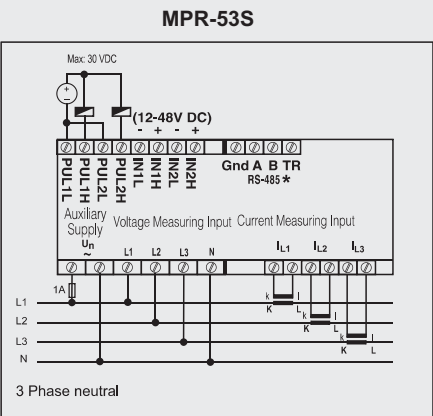


Dimensions



TYPE PR 19

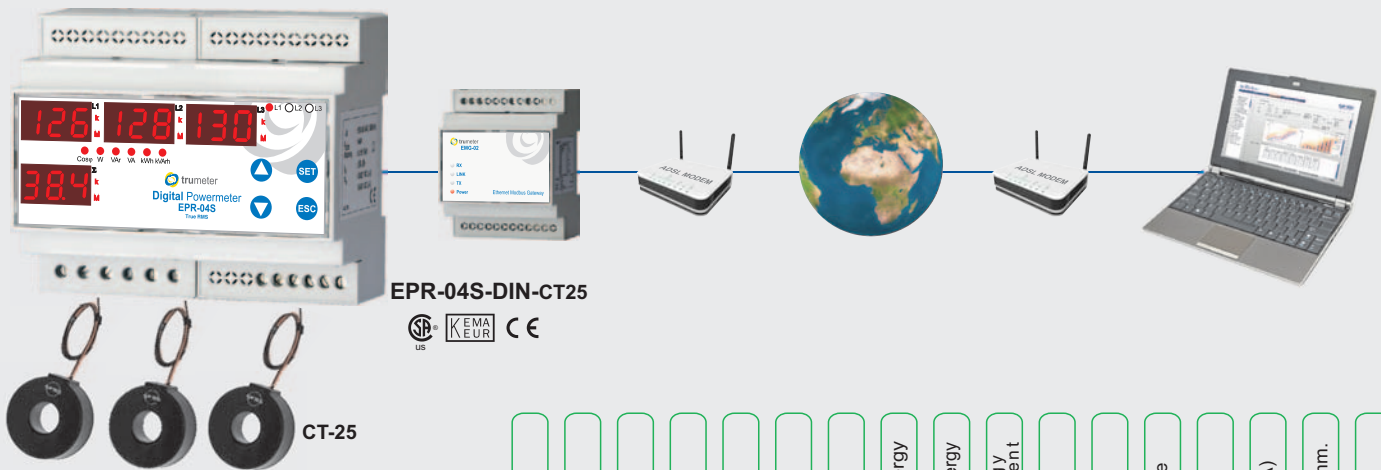
(PK 26 - DIN6)



TYPE DIN / PK 26

* RS-485 terminals are standart for EPM-07S and MPR-53S

EPR Series



Max.
120A

Product Code

Product Code	Cosp	W	VAr	VA	Σ W	Σ VAr	Σ VA	kWh A. Energy	kVArh R. Energy	Dual Energy Measurement	Demand	Digital Input	Energy Pulse	.../5A	CT-25 (120A)	RS-485 Comm.	Pcs / Carton
EPR-03-96																	12
EPR-04-96																	12
EPR-04-DIN																	12
EPR-04S-96																	12
EPR-04S-DIN																	12
EPR-04S-DIN-CT25																	12
ES-32L	Digital Energy Counter (32 A)																10
ES-80L	Digital Energy Counter (80 A)																10

● Optional - Min. Order Quantity is 200pcs/device.

CT-25 is a Current Transformer, which is used together with EPR-04S-DIN-CT25 model. It is a unique solution, which replaces conventional type CTs up to 120A.

MODEL	EPR-04,EPR-04S	
SPECIFICATIONS		
HOUSING		
Dimensions	96x96mm PR19,DIN6 PK26	
Protection Class	IP40 Front Panel; IP54 Optional	
Weight	0,5 kg/device; 12 pcs.	
Display	Red LED, Height: 10 mm	
MEASUREMENTS		
Voltage		
Measuring Range	10-300V AC (L-N), 10-500VAC (L-L)	
Measuring Range with Transformer	Transformer Ratio: 1.0-4000	
Accuracy	1% ±1 digit [(10%-110%)xFull Scale]	
Input Impedence	1.8 MΩ	
Burden	<0.5 VA	
Current		
Nominal Current	5,5A	
Lowest Current	50mA	
Measurement Range	5 mA - 5,5 A Accuracy: 0.5% ±2 digit	
Measurement Range with Transformer	5 mA 10000 A Transformer Ratio: 1-5000.0	
Burden	<1VA	
Overload Current	1.2 In	
Power/Energy		
Active Power	0-215MW	
Reactive Power	0-215MVar	
Apparent Power	0-215MVA	
Power Consumption	<4VA	
Active Energy	9 999 999,9 Mwh	
Reactive Energy	9 999 999,9 MVarh	
SUPPLY		
Operating Voltage	110VAC/230VAC ±% 10 or 45-265VAC/DC	
Operating Frequency	45-65Hz	
INPUT/OUTPUT		
Digital Input	2 Inputs	
Digital Input Pulse Width	20msec.	
Digital Input Operating Voltage	12..48V AC/DC	
Energy Pulse Output	NPN Transistor	
Switching Current	Max. 50 mA	
Switching Voltage	Max. 30VDC	
Pulse Duration	100 msec. Pulse period, 80 msec. Pulse width	
AMBIENT CONDITIONS		
Ambient Temperature	-5 / +55°C	
Overvoltage Category	III	
Pollution Degree	II	
Ambient Humidity	%90	
STANDARDS		
Security Standards	EN 61010-1	
EMC Standards	EN 61000-4-5, EN 61000-4-4 EN 61000-4-2, EN 61000-4-11	
Mechanical Endurance	EN 60529	
CONNECTIONS		
Installation	Flush-mounting with rear terminals(PR 19), Rail mount(PK 26)	
Connection Terminals	Socket Type Terminal with Screws	
Connection Types	3 Phase+Neutral(3P4W), 3 Phase(3P3W), 3 Phase(Aron)	

General

- **EPR-04: Digital Power and Energymeter**
EPR-04 measures active / reactive / apparent power and active / reactive energy for each phase and cosφ in 4 displays.
- **EPR-04S: Digital Powermeter with RS-485**
In addition to EPR-04 features, EPR-04S has RS-485 communication. Power, energy and cosφ values can be monitored via MPR-SW software.
- **Software**
MPR-SW : Software for monitoring and recording parameters for MPR and EPR Series.



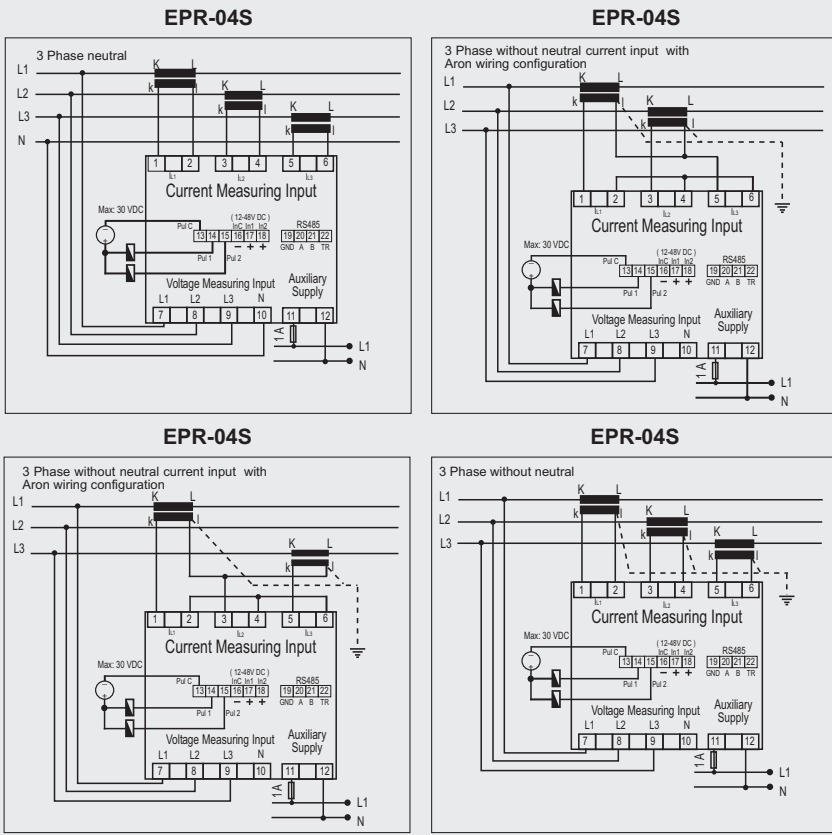
EPR-04S-96

Features

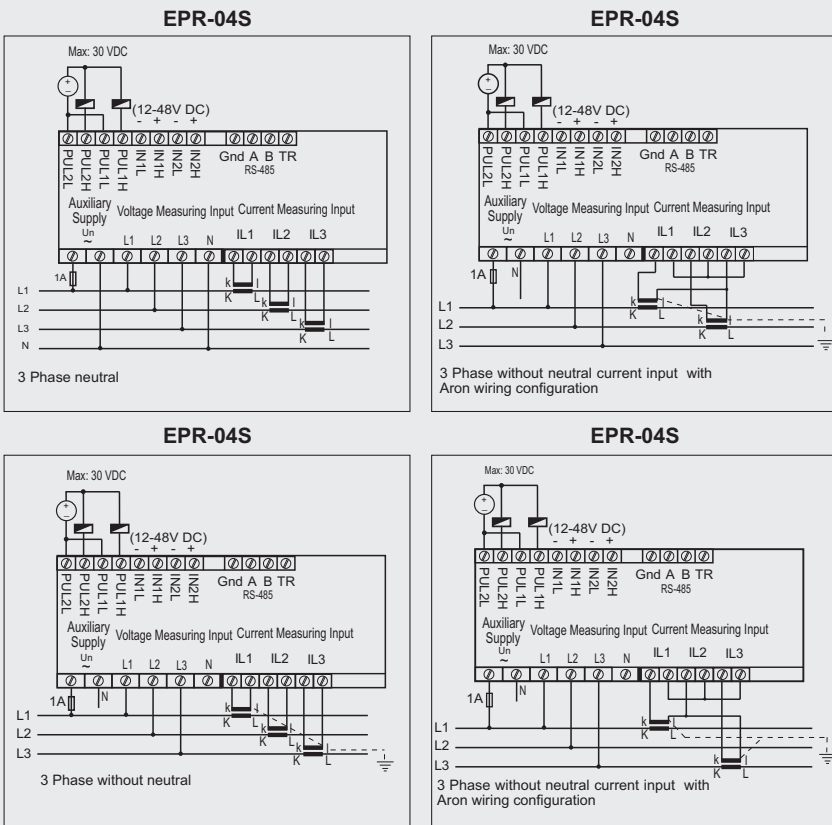
- Non-flammable enclosure
- Double Insulation (□)
- Measurement Category III
- Terminal Connection
- Flush mounting with rear terminals
- IP40 (front panel), IP00 (terminals)
- IEC 61010-1, IEC 61000-6-2, IEC 61000-6-4

Connection Diagram

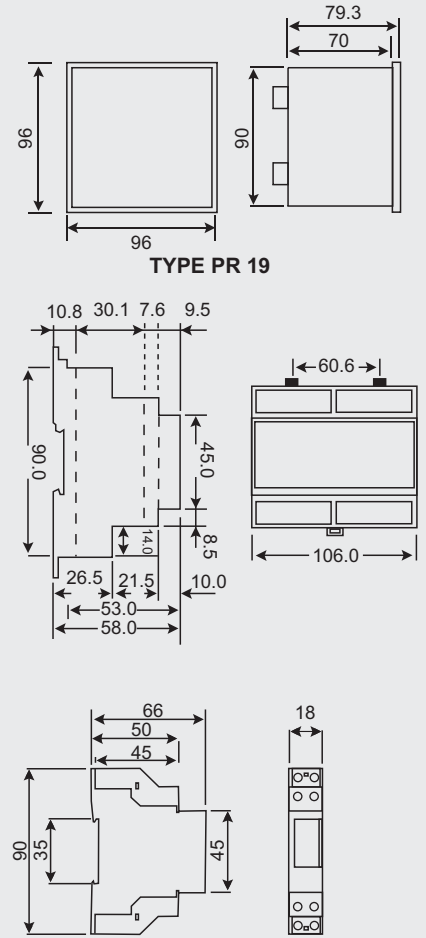
(PR19- 96x96mm)



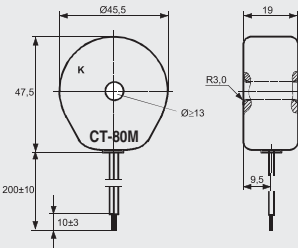
(PK26 - DIN6)



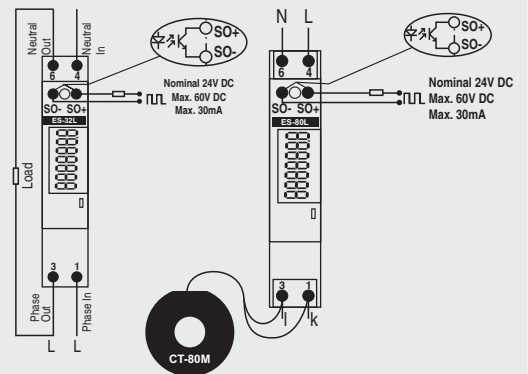
Dimensions



Note: Should not be used for billing purposes.

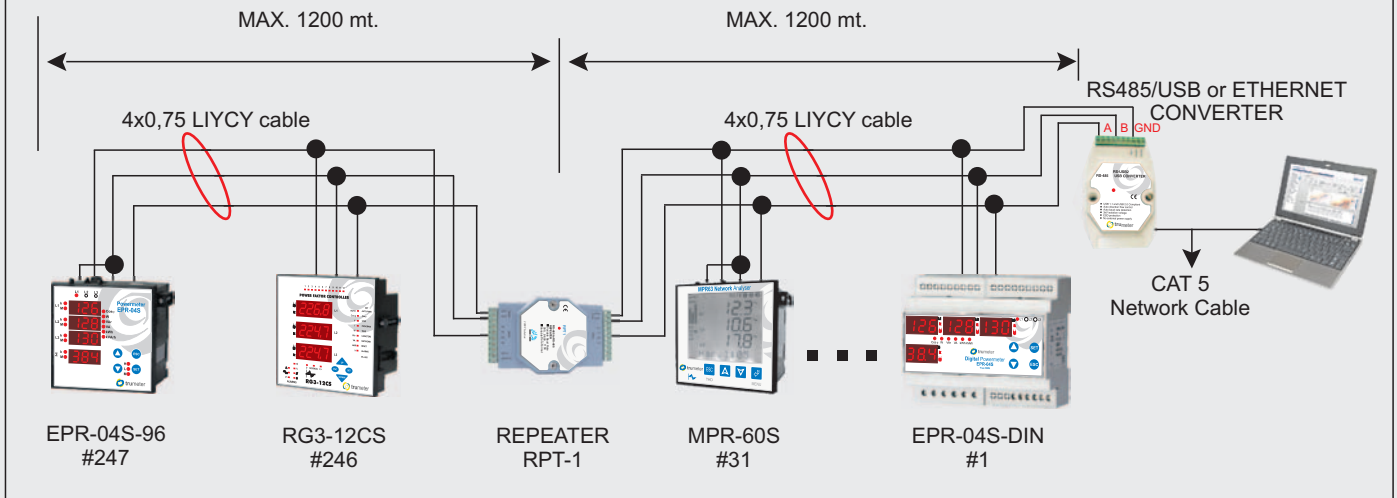


Connection Diagram

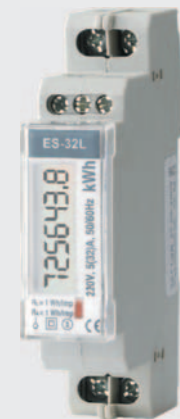


- The device has pulse outlets for remote reading and central data storage.
- By flashing, the LED on the front panel makes it possible to observe whether the measuring is active or not.
- The LCD display on the front panel makes easy and accurate power reading possible.

247 DEVICES CAN BE CONNECTED SERIALLY BY USING REPEATERS.



* ENTES recommends 4x0,75 LIYCYmm² cable for RS-485 communications



ES-32L

ES-32L / ES-80L : Watt-Hour Meter General

- ES Series measure the active watt hour (kWh) consumption directly and error free in single phase systems.
- The most important features of the device are its reliability, small size, light weight, modern design, and easy installation.



ES-80L

MODELS	ES-32L	ES-80L
Technical Features	Digital Energy Counters	
Accuracy	Class 1	
Operating Voltage	230 VAC, 50 / 60 Hz.	
Tolerance	-20 % / +15 %	
Operating Current	0,02~32 A	0,08~80 A
Nominal Current	In = 5 A, IMax. = 32 A	In = 40 A, IMax. = 80 A
Min. Rated Current	20 mA	
Frequency Range	50-60 Hz ±%10	
Display	6+1 digit = 999999,9 kWh	
Pulse Output	1000 Imp./kWh	
Pulse Time	Ti=20 ms.	
Installation	Rail Mount (DIN EN50022)	
Power Consumption	< 2 VA	
Operating Temperature	(-20 °C) - (+65 °C)	
Weight	75 gr. (except package weight)	140 gr. (except package weight)
EMC		
Surge Voltage Test	4 kV 1.2 / 50 μs. (IEC 1000-4-5)	
Burst Test	4 kV (IEC 1000-4-4)	



Electrical Measurement

Multimeters

EPM-06 Series

EPM-04 Series

EVM-05 Series

Ammeters

EPM Series

EPM-4x Series

EPM-R4x Series

Voltmeters

EVM Series

EVM-3x Series

EVM-R3x Series

Cos-φ Meter

ECR-3

Frequency Meter

EFC-3

Transducers

TA

TV

EPM-04 / EPM-06 / EVM-05 Series



EPM-04h General

- 3-Phase
- Measured Parameters : V, A, Hz
- Max. / Min. and Demand Values
- Run Hour and Total Run Hour (non-resettable)
- Programmable CT and VT Ratios
- Password Protection

Resettable Hourmeter



Continuous Hourmeter



Product Code

	3 ~ Voltage	3 ~ Current	Cosφ	Hz (Frequency)	I neutral	Demand	Max. Values	Min. Values	Alarm Contact	Under / Over Voltage Protection	Under / Over Current Protection	Under / Over Frequency Protection	RS-485 Comm.	.../5A	CT-25 (120A)	Run Hour (Resettable)	Total Hour (Nonresettable)	Flush Mount	Rail Mount	Pcs / Carton
EPM-04-96	•	•		•	•	•	•	•							○					12
EPM-04h-96	•	•		•	•	•	•	•							○	•	•			12
EPM-04h-96-CT25	•	•		•	•	•	•	•							○	•	•			12
EPM-04-DIN	•	•		•	•	•	•	•							○				•	12
EPM-04C-96	•	•		•	•	•	•	•	•	•	•	•			○				•	12
EPM-04C-DIN	•	•		•	•	•	•	•	•	•	•	•			○				•	12
EPM-04CS-96	•	•		•	•	•	•	•	•	•	•	•	•		○				•	12
EPM-04CS-DIN	•	•		•	•	•	•	•	•	•	•	•	•		○				•	12
EPM-06-96	•	•	•	•	•	•	•	•							○				•	12
EPM-06-DIN	•	•		•	•	•	•	•							○				•	12
EPM-06C-96	•	•		•	•	•	•	•	•	•	•	•			○				•	12
EPM-06C-DIN	•	•		•	•	•	•	•	•	•	•	•			○				•	12
EPM-06CS-96	•	•		•	•	•	•	•	•	•	•	•	•		○				•	12
EPM-06CS-DIN	•	•		•	•	•	•	•	•	•	•	•	•		○				•	12
EVM-05C-96				•			•	•							○				•	12
EVM-05C-DIN				•			•	•							○				•	12

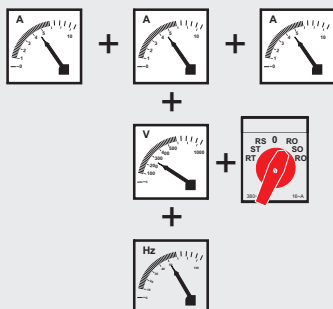
○ Min. Order Quantity is 200pcs/device. (either ... / 5A or CT-25 connection)

Max. Demand

Alarm Contact



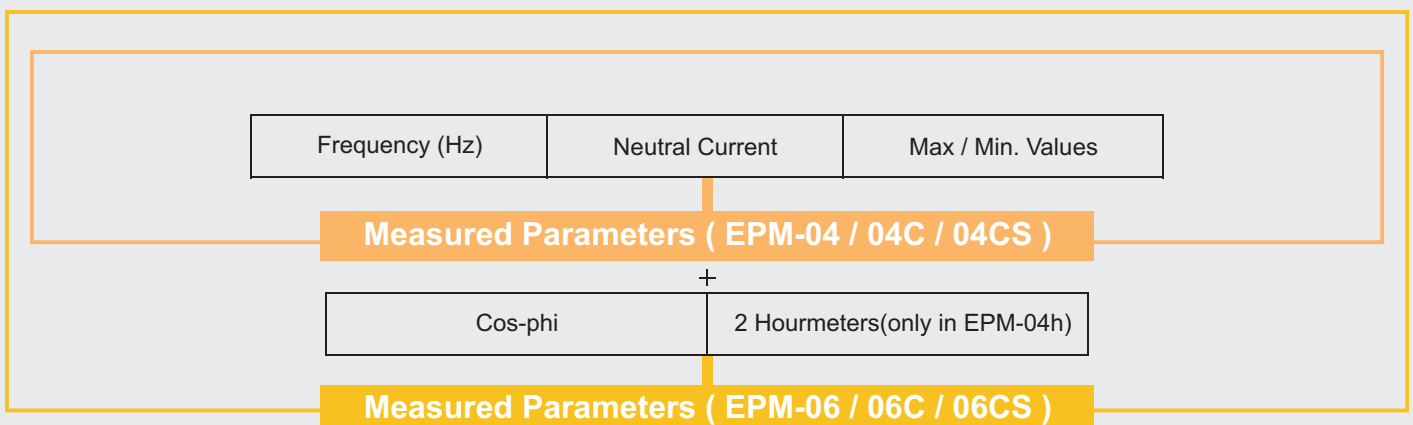
Modbus



EPM-06C-96

EPM-04 / EPM-06 / EVM-05 Series

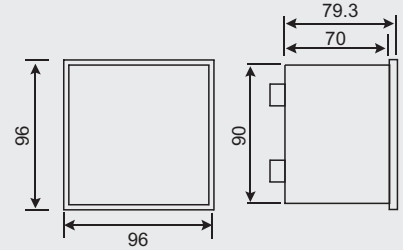
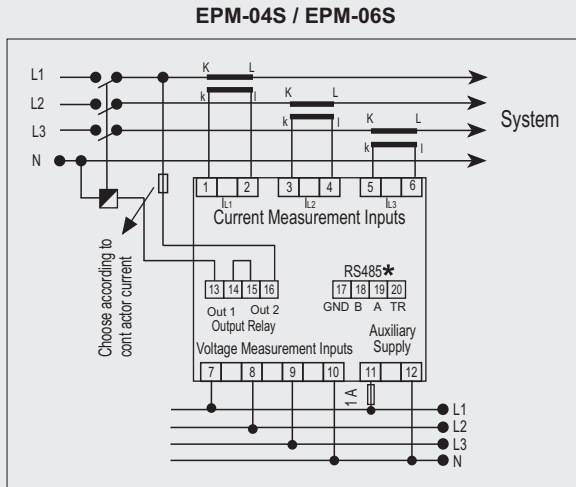
MODEL	EPM-04	EPM-04h	EPM-04C	EPM-04CS	EPM-06	EPM-06C	EPM-06CS	EVM-05C	
SPECIFICATIONS									
HOUSING									
Dimensions	96x96mm PR19,DIN6 PK26								
Protection Class	IP40 Front Panel; IP54 Optional								
Weight	0,56kg/device; One package contains 12 pcs. (PR19) / 0,52kg/device; One package contains 12 pcs. (PK26)							0,45kg/device; One package contains 12 pcs.	
Display	Red LED, Height: 10mm(PR19)/9,2mm(PK26)								
MEASUREMENTS									
Voltage									
Measuring Range	10-300V AC (L-N),10-500VAC (L-L)								
Measuring Range with Transformer	Transformer Ratio: 1.0-4000								
Accuracy	%1±1 digit								
Input Impedence	1.8 MΩ								
Current									
Nominal Current	5.5 A								
Measurement Range	5 mA - 5,5 A Accuracy: %1 ±1digit								
Measurement Range with Transformer	50mA-10kA								
Burden	<0.5 VA								
Overload Current	1.2 In								
Demand/Demand Time	Programmable between 1-60 Minutes								
Frequency	45-65 Hz								
SUPPLY									
Operating Voltage	110VAC/230VAC, ±%10 veya 45-265VAC/DC								
Operating Frequency	45-65Hz								
Power Consumption	<4 VA								
INPUT/OUTPUT/SETTINGS									
Delay Time	0-999,9 sec. for ON- and OFF-delay time								
Contact Output	-	5A 1250VA	-	5A 1250VA					
AMBIENT CONDITIONS									
Ambient Temperature	-5C/+50°C								
Overvoltage Category	III								
Pollution Degree	II								
Ambient Humidity	%90								
STANDARDS									
Security Standards	EN 61010-1								
EMC Standards	EN 61000-6-2, EN 61000-6-4								
Mechanical Endurance	EN 60529								
CONNECTIONS									
Installation	Flush-mounting with rear terminals(PR 19), Rail mount(PK 26)								
Connection Terminals	Socket Type Terminal with Screws(PR19), Terminal with screws(PK26)								
Connection Types	3 Phase+Neutral(3P4W), 3 Phase(3P3W)								



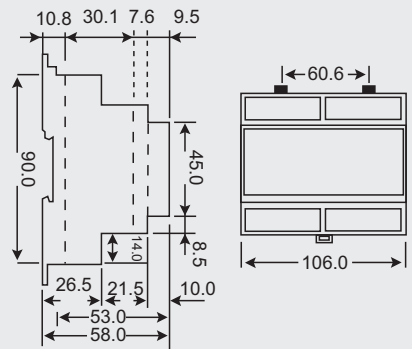
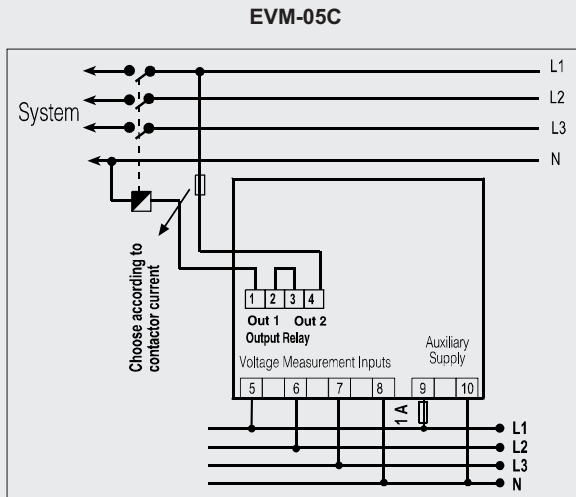
Connection Diagram

(PR19- 96x96mm)

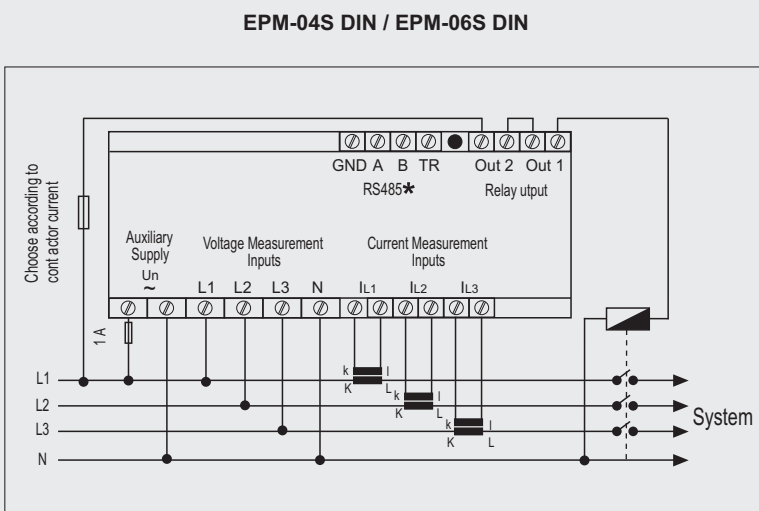
Dimensions



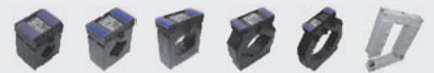
TYPE PR 19



TYPE DIN / PK 26



for Current Transformers;
See page 43
section Power Factor Correction





EPM-34



EPM-4P-96 (SLIM)



Current Transformer

or



Max. 210 A Current Transformer



EPM-R4D



Product Code

Product Code	Description	3 ~ Current	1 ~ Current	CT-25 (210A)	Dual Demand*	.../1A	.../5A	Demand	Output Contact	Flush Mount	Rail Mount	Fixed Cur. Terminal	24-250V AC/DC	pcs / carton
EPM-4A-72	Direct Ammeter with CT-25 (120A) (CT-25 included)													16
EPM-4A-96	Direct Ammeter with CT-25 (120A) (CT-25 included)													12
EPM-4C-48	Ammeter (with Output Contact) (CT-25 not included)													20
EPM-4C-72	Ammeter (with Output Contact) (CT-25 not included)													16
EPM-4C-96	Ammeter (with Output Contact) (CT-25 not included)													12
EPM-4C-OG-96	Ammeter with Output Contact (for MV applications)													12
EPM-4D-48	Ammeter													20
EPM-4D-72	Ammeter													16
EPM-4D-96	Ammeter													12
EPM-4P-96	Ammeter (CT-25 not included)													12
EPM-R4C	Ammeter with Output Contact (Rail Mount)													16
EPM-R4D	Ammeter (Rail Mount)													16
EPM-14-96	Ammeter													12
EPM-34-96	Ammeter													12

Current TRANSFORMER (For ENTES panelmeters)

CT-25 Primary : 210A / Secondary : 50mA, Inner Diameter : 17.8 mm, Outer Diameter: 47 mm 72

- True RMS Measurement.
- Non-flammable enclosure.
- Terminal Connection.
- Programmable Current Transformer Ratio (5...10.000/5A).
- Double Insulation (), Measurement Category III.
- Flush mounting with rear terminals.
- Ambient Operating Temperature: -5°C,+50°C.
- IEC 61000-6-2, IEC 61000-6-4, IEC 61010-1.

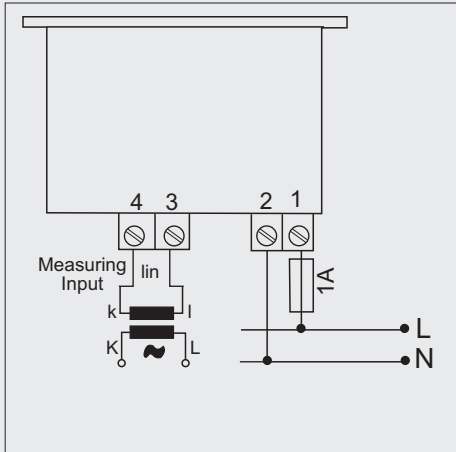
MODELS	Panel-Mounted				Rail-Mounted		
	EPM-4D	EPM-4C	EPM-4P	EPM-34	EPM-4A	EPM-R4D	EPM-R4C
SPECIFICATIONS							
Electrical Parameters							
Operating Voltage (U _n)	110** / 230 V AC ±10%, 50/60 Hz			24-250V AC/DC	110** / 230 V AC ±10%, 50/60 Hz		
Network Type	Single-phase / 2 wires			3-p/4-wire(Star)	Single-phase / 2 wires		
Accuracy	1% ±1 digit			0,5% ± 1 digit	1% ±1 digit		
Current Transformer Ratio	5...10000 / 5 A			1...1000	5...10000 / 5 A		
Measurement Input	0,05 - 5,5 A (with terminals); 2 - 210 A (with CT-25)			0,005-5,5A~ (for X/5A)	0,05 - 5,5 A; 2 - 210 A	50 mA - 5,5 A	
Measurement Ranges	0,05 - 10 000 A (with X5 CT); 2 - 210 A (with CT-25)			5mA...5000A(.../5A)	0,05 - 10 000 A; 2 - 210 A	50 mA - 10 000 A	
Power Consumption	< 4 VA						
Burden	< 1 VA						
Output Contact	-		1 NO, 5 A 1250 VA	-	1 NO, 5 A 1250 VA		
Pick-up Contact	1 NO, 5 A 1250 VA			-	-		
Instant Tripping	-	0,5 x spL*** 1,5 x spH****		-	1,5xSet Point	-	1,5xSet Point
Hysteresis	-	0-0,5 x Full scale		-	4%xSet Point	-	4%xSet Point
Delay Time	-	0 - 999,9 sec.		-	-	-	0 - 999,9 sec.
Demand Time (Average)	1- 60 min.			1- 60min./1- 60sec.	1- 60 min.		
Display	Red LED, 14 mm Height			Red LED, 12 mm	Red LED, 14 mm Height	Red LED, 10 mm Height	
Mechanical Parameters							
Dimensions	72x72 mm (PR18) Slim 96x96 mm (PR19)	72x72 mm (PR18) Slim 96x96 mm (PR19)	Slim 96x96 mm (PR19)	96x96 mm (PR19)	72x72 mm (PR18) 96x96 mm (PR19)	DIN III Type Rail Mount (PK20)	
Weight / each	0,35 kg (PR25), 0,3 kg (PR18), 0,35 kg (PR19)			0,35 kg (PR19)	0,35 kg, 0,3 kg, 0,35 kg		0,3 kg
Quantity in 1 package	16 pcs (PR18), 12 pcs (PR19)			12 pcs (PR19)	16 pcs, 12 pcs		16 pcs

* Dual Demand: 1st Demand is in terms of minutes; 2nd Demand is in terms of seconds

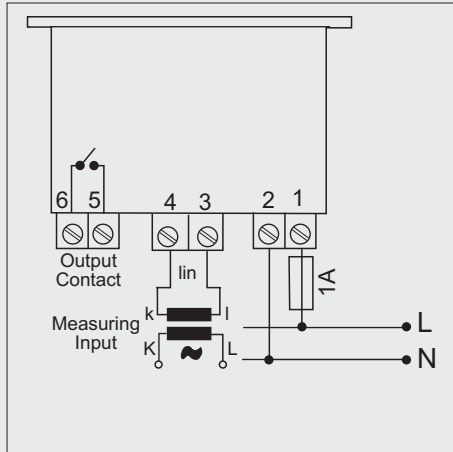
** 110 V AC, 60Hz Supplied devices are custom manufactured by order

Connection Diagram

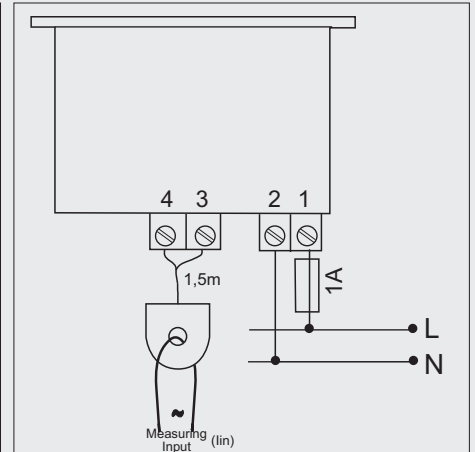
EPM-4D



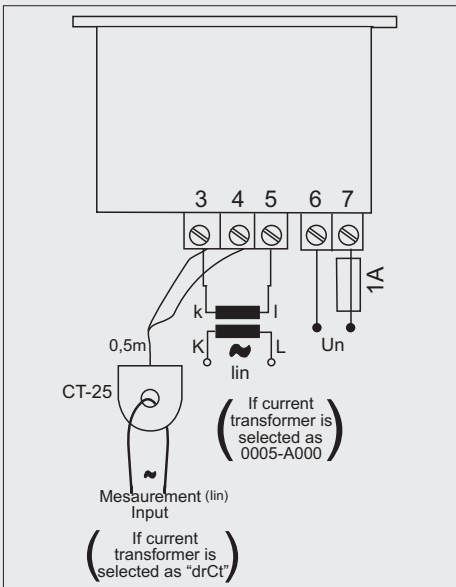
EPM-4C



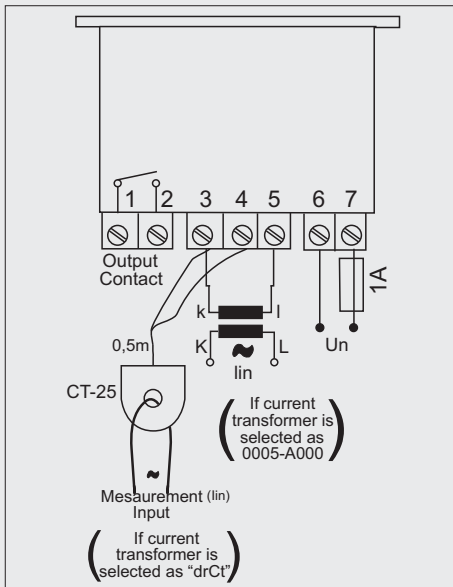
EPM-4A



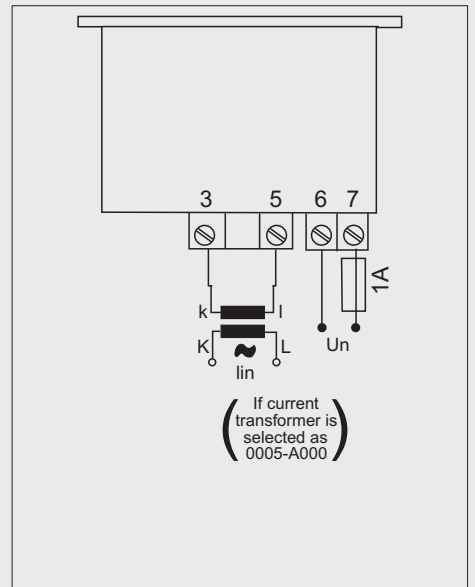
EPM-4A



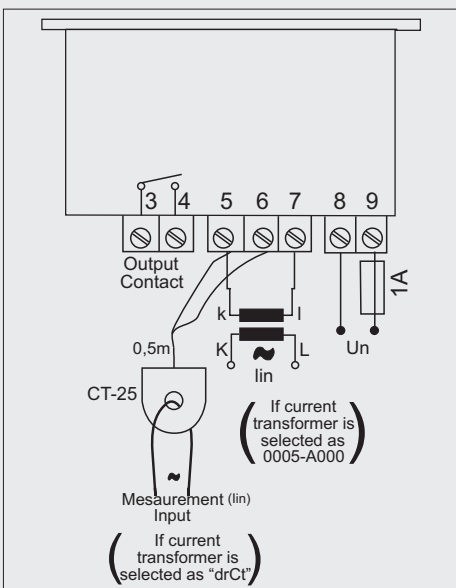
EPM-4C



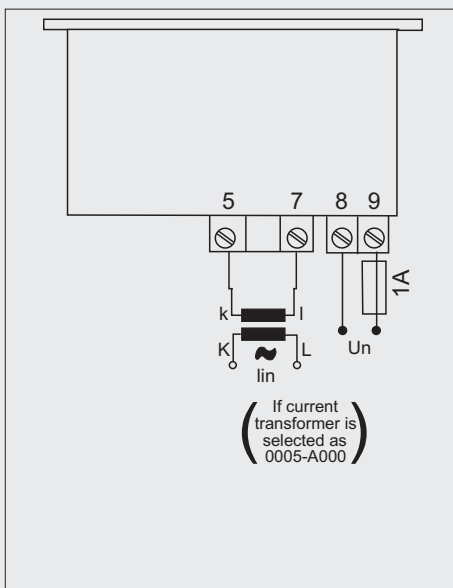
EPM-4D



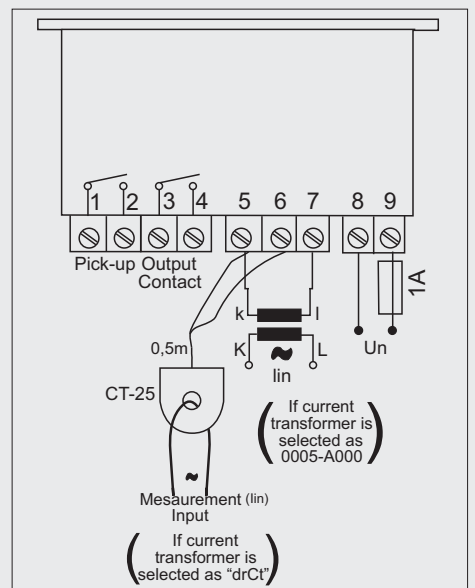
EPM-4C



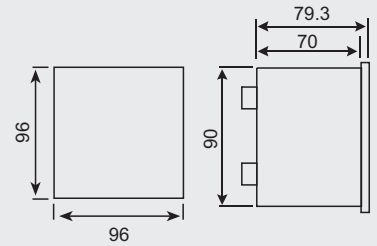
EPM-4D



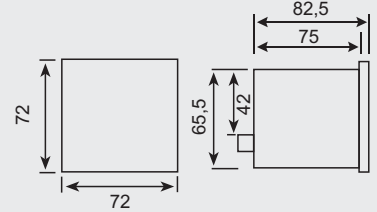
EPM-4P



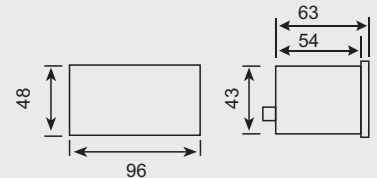
Dimensions



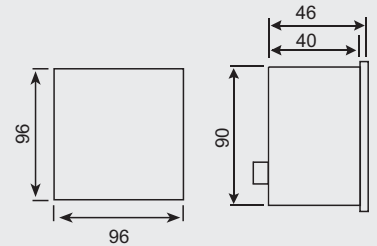
TYPE PR 19 (96x96)



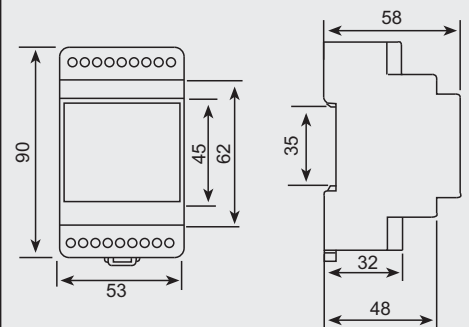
TYPE PR 18 (72x72)



TYPE PR 20 (48x96)

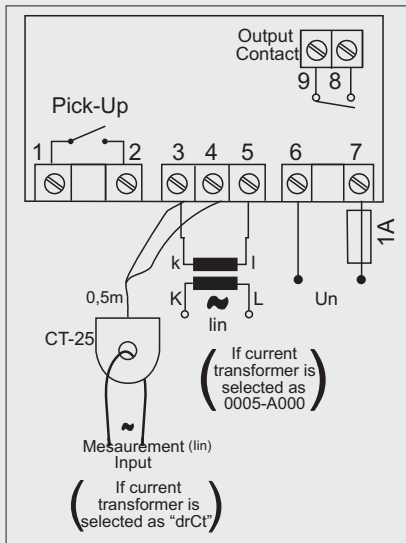


TYPE PR 25 (slim 96)

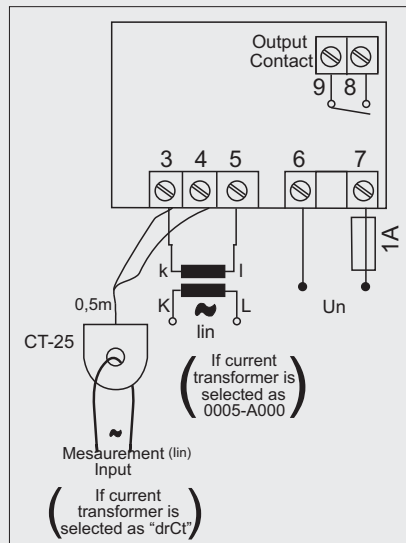


TYPE PK 20

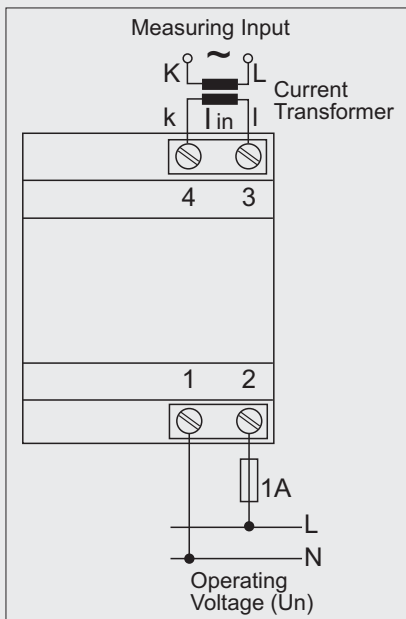
EPM-4P



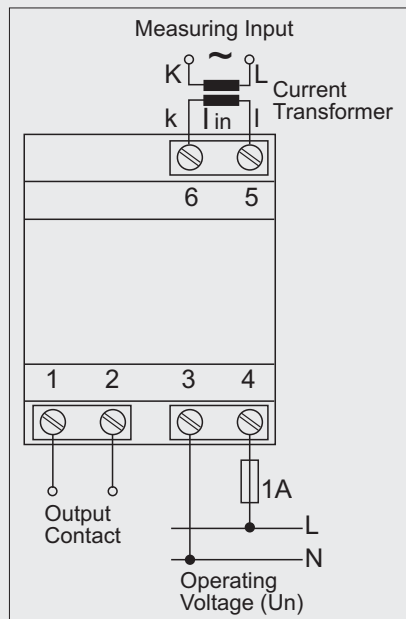
EPM-4C



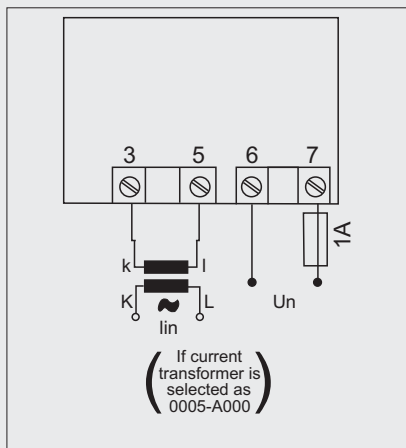
EPM-R4D



EPM-R4C



EPM-4D



VOLTMETERS

EVM / EVM-R Series



EVM-35



EVM-3C-96



EVM-3S-48



EVM-R3C



Product Code

Product Code	Description	3-phase / Selectable	3 ~ Voltage	1 ~ Voltage	Max. Value	Min. Value	Output Contact	24-250V AC/DC	Flush Mount	Rail Mount	Pcs / Carton
EVM-3-48	Voltmeter				●	●					20
EVM-3-72	Voltmeter				●	●					16
EVM-3-96	Voltmeter				●	●					12
EVM-3C-48	Voltmeter (with Output Contact)				●	●	●				20
EVM-3C-72	Voltmeter (with Output Contact)				●	●	●				16
EVM-3C-96	Voltmeter (with Output Contact)				●	●	●				12
EVM-3S-48	3-phase Selectable Voltmeter	●									20
EVM-3S-72	3-phase Selectable Voltmeter	●									16
EVM-3S-96	3-phase Selectable Voltmeter	●									12
EVM-R3	Voltmeter (Rail Mount)				●	●				●	16
EVM-R3C	Voltmeter with Output Contact (Rail Mount)				●	●	●			●	16
EVM-R3S	3-phase Selectable Voltmeter (Rail Mount)	●								●	16
EVM-15-96	1-phase Voltmeter		●					●	●		12
EVM-35-96	3-phase Voltmeter		●					●	●		12

- 24-240V AC/DC
- Range 1-40 kV
- Class 0,5
- IP54

- True RMS Measurement
- Non-flammable enclosure
- Double Insulation (□),
- Measurement Category III

- Terminal Connection
- Flush mounting with rear terminals

- Ambient Operating Temperature : -5°C, +50°C
- IEC 61000-6-2,
- IEC 61000-6-4,
- IEC 61010-1

MODELS

Panel-Mount

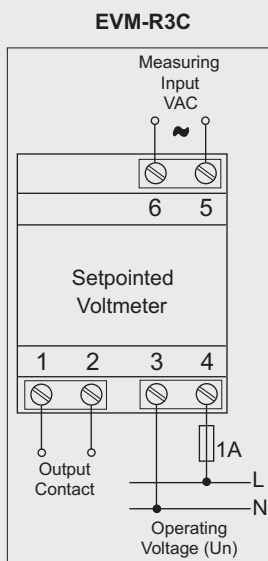
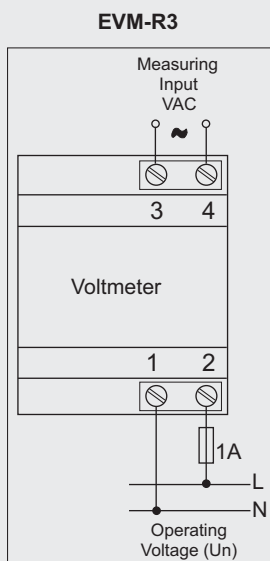
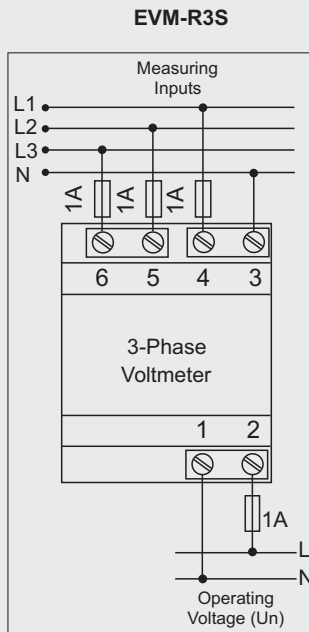
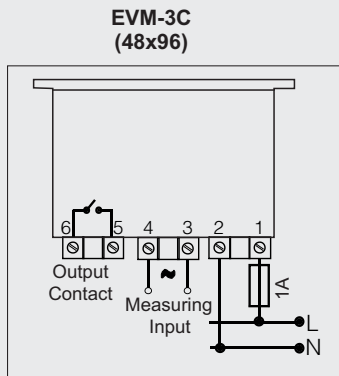
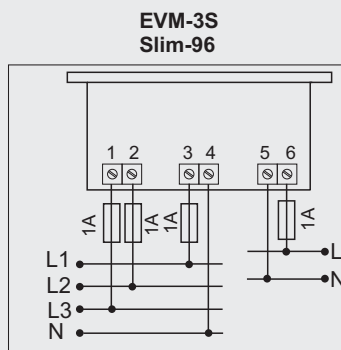
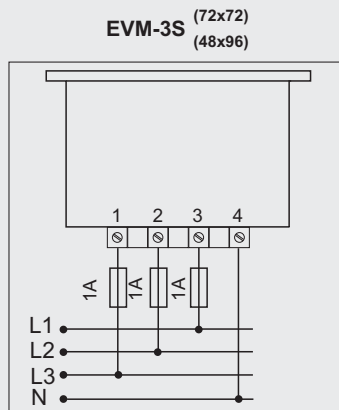
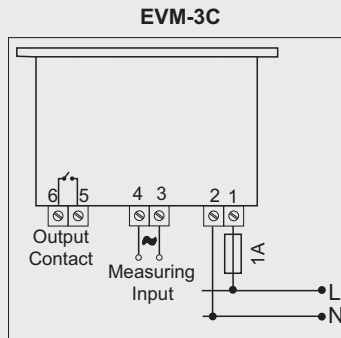
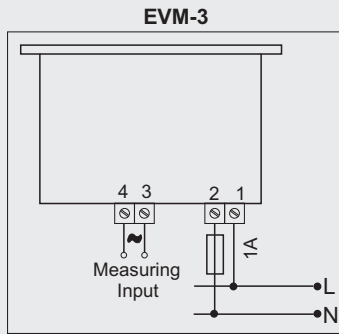
Rail-Mount

SPECIFICATIONS	Panel-Mount				Rail-Mount		
	EVM-3	EVM-3C	EVM-3S	EVM-35	EVM-R3	EVM-R3C	EVM-R3S
Electrical Parameters							
Operating Voltage (U _n)	110 V AC* / 230 V AC ±10% , 50/60 Hz			24-250V AC/DC	110 V AC* / 230 V AC ±10% , 50/60 Hz		
Network Type	Single-phase/ 2-wire		3-phase / 4-wire (Star)		Single-phase/ 2-wire		3-phase / 4-wire (Star)
Accuracy	1% ±1 digit		0,5% ± 1 digit		1% ±1 digit		
Measurement Ranges	10 - 600 V AC		10-300V AC (L-N) 10-500V AC (L-L)	1V-400 kV	10 - 600 V AC		10-300 V AC (L-N) 10-500 V AC (L-L)
Power Consumption	< 4 VA						
Burden	< 1 VA						
Output Contact	-	1 NO, 5 A 1250 VA		-	1 NO, 5 A 1250 VA		-
Instantaneous tripping	-	1,5 x setpoint		-	1,5 x setpoint		-
Hysteresis	-	4% x setpoint		-	4% x setpoint		-
Delay Time	-	0 - 99,9 sec		-	0 - 99,9 sec		-
Mechanical Parameters							
Dimensions	48x96 mm (PR 20), 72x72 mm (PR 18), 96x96 mm (PR 19)			96x96 mm (PR 19)	DIN III Type-Rail Mount (PK20)		
Weight / each	0,3kg (PR20), 0,35kg (PR18), 0,4kg (PR19)			0,4kg (PR19)	0,25 kg		
Quantity in 1 package	20pcs (PR20), 16pcs (PR18), 12pcs (PR19)			12pcs (PR19)	16 pcs		

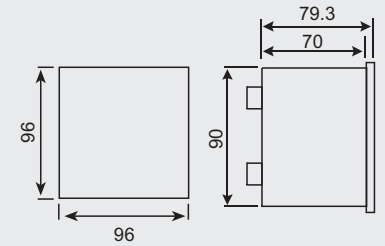
* 110 V AC, 60Hz Supplied devices are custom manufactured by order

Connection Diagram

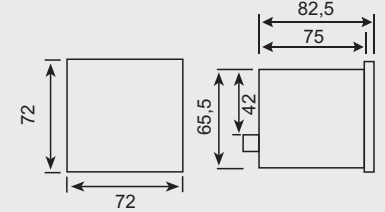
(PR19- 96x96mm)



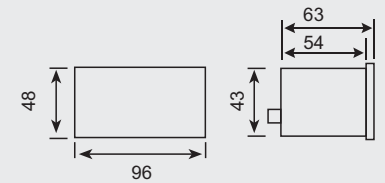
Dimensions



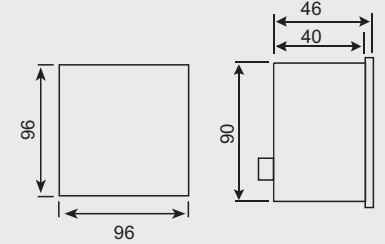
TYPE PR 19 (96x96)



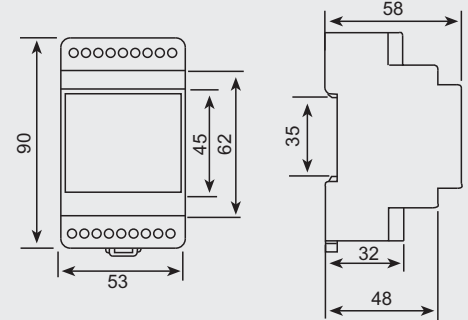
TYPE PR 18 (72x72)



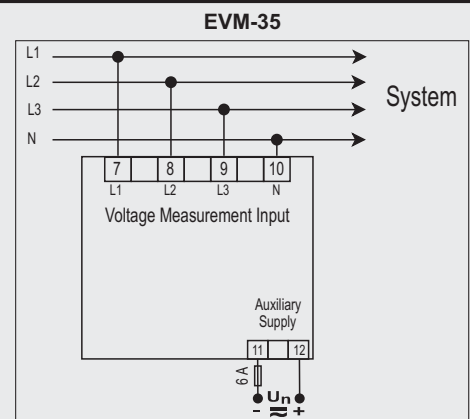
TYPE PR 20 (48x96)



TYPE PR 25 (slim 96)



TYPE PK 20



Connection diagrams are given for reference. Please always check the latest user manual given with product or download from www.entes.com.fr.



ECR-3-96

- Non-flammable enclosure
- Double Insulation (□)
- Measurement Category III
- Terminal Connection
- Flush mounting with rear terminals
- IP40 (front panel)
- IEC 61000-6-2
IEC 61000-6-4
IEC 61010-1



EFC-3-72



General

ECR-3

Digital cosφ-meter, measures cosφ of the power, drawn from the network, indicating whether the load is inductive or capacitive.

EFC-3

Digital frequencymeter, measures the frequency of the network.

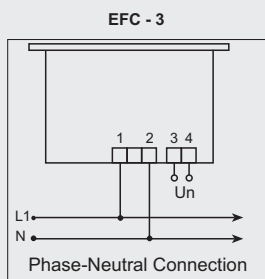
pcs / carton

Product Code

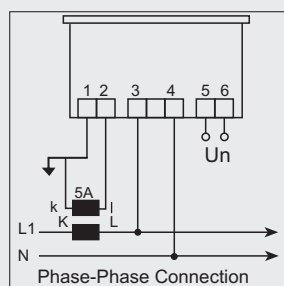
ECR-3-72	CosφMeter (0,1 Cap. - 0,1 ind.)	16
ECR-3-96		12
EFC-3-72	Frequencymeter (20-400 Hz.)	16
EFC-3-96		12

MODELS	Frequencymeter	Cosφmeter
SPECIFICATIONS	EFC-3	ECR-3
Electrical Parameters		
Operating Voltage (Un)	230 V AC* ±10%; 50/60 Hz	
Accuracy	1% ±1 digit	2° ±1 digit
Current Transformer Ratio	-	... / 5A
Measurement Ranges	20 - 400 Hz	0,00 - 0,99 (Ind. - Cap.)
Operating Voltage	30 - 300 V	50 - 300 V
Operating Current	-	100 mA - 5,5 A
Operating Frequency	50/60 Hz	
Display	Red LED ; 14,2 mm Height	
Mechanical Parameters		
Ambient Operating Temperature	-5°C, +50°C	
Dimensions	72x72 mm (PR18), 96x96 mm (PR19), 48x96 mm (PR20)	
Weight / each	0,3 kg (PR18), 0,4 kg (PR19), 0,3 kg (PR20)	
Quantity in 1 package	16 pcs (PR18), 12 pcs (PR19), 20 pcs (PR20)	

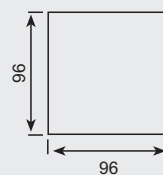
Connection Diagram (PR19- 96x96mm)



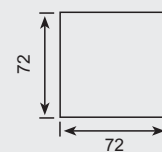
ECR - 3



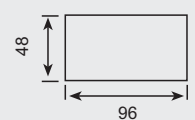
Dimensions



TYPE PR 19 (96x96)

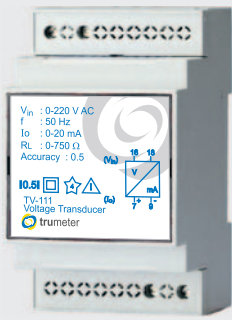


TYPE PR 18 (72x72)



TYPE PR 20 (48x96)

Connection diagrams are given for reference. Please always check the latest user manual given with product or download from www.entec.com.tr.



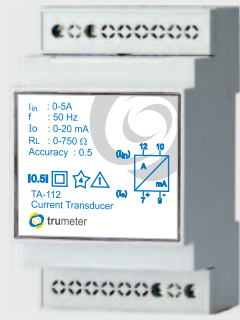
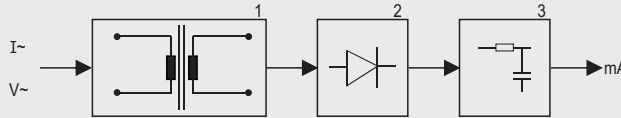
TV-111 Voltage Transducer

General

Transducers convert electrical signal to the analog signal. They are used in control and automation systems.

TA-111/TA-112 current transducers and TV-111 voltage transducer are self-powered. Supply voltage is not applied. Output current is 0-20 mA.

The transformer, which is used in the input circuits of TA-111 / TA-112 and TV-111 provides galvanic isolation between the input and output signals.



TA-112 Current Transducer



pcs / carton

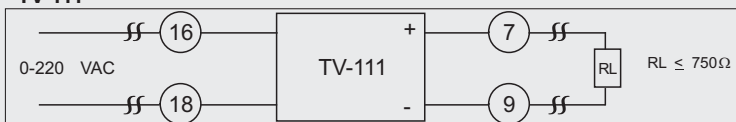
Product Code

TA-111	Input : 0-1AAC, Output : 0-20mA DC	16
TA-112	Input : 0-5AAC, Output : 0-20mA DC	16
TV-111	Input : 0-220V AC, Output : 0-20mA DC	16

MODELS	TA-111	TA-112	TV-111
SPECIFICATIONS			
Electrical Features			
Measurement Input	0 - 1 A AC	0 - 5 A AC	0 - 220 V AC
Frequency	50 Hz		
Power Consumption	3 VA		4 VA
Over Load Capacity	1,5xI _n (continuous) 20xI _n (1sec.) I _n = 1 A AC	1,5xI _n (continuous) 20xI _n (1sec.) I _n = 5 A AC	1,2xU _n (continuous) 2xU _n (1sec.) U _n = 220 V AC
Output Signal	0-20 mA DC		
Linear Output Range	(0,05...1,1) x I _n		(0,2...1,1) x U _n
Load(RL)	0 - 750 Ω		
Transmission Error	% 0,5 (Full Scale)		
Response Time	< 300 msec.		
Mechanical Features			
Equipment Protection	Double Insulation (□)		
Operating Temperature	-5°C, +50°C		
Humidity	≤ % 75		
Degree of Protection	IP 40 (front panel)		
Connection	Rail-mounted		
Dimensions	DIN III Type - Rail mount (PK20*)		
Weight	0,4 kg		0,35 kg
Quantity in 1 Package	16 pcs		

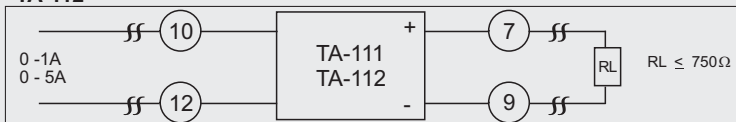
Connection Diagram

TV-111

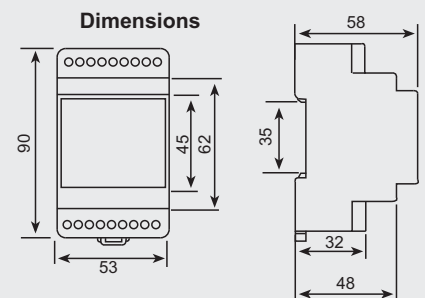


TA-111

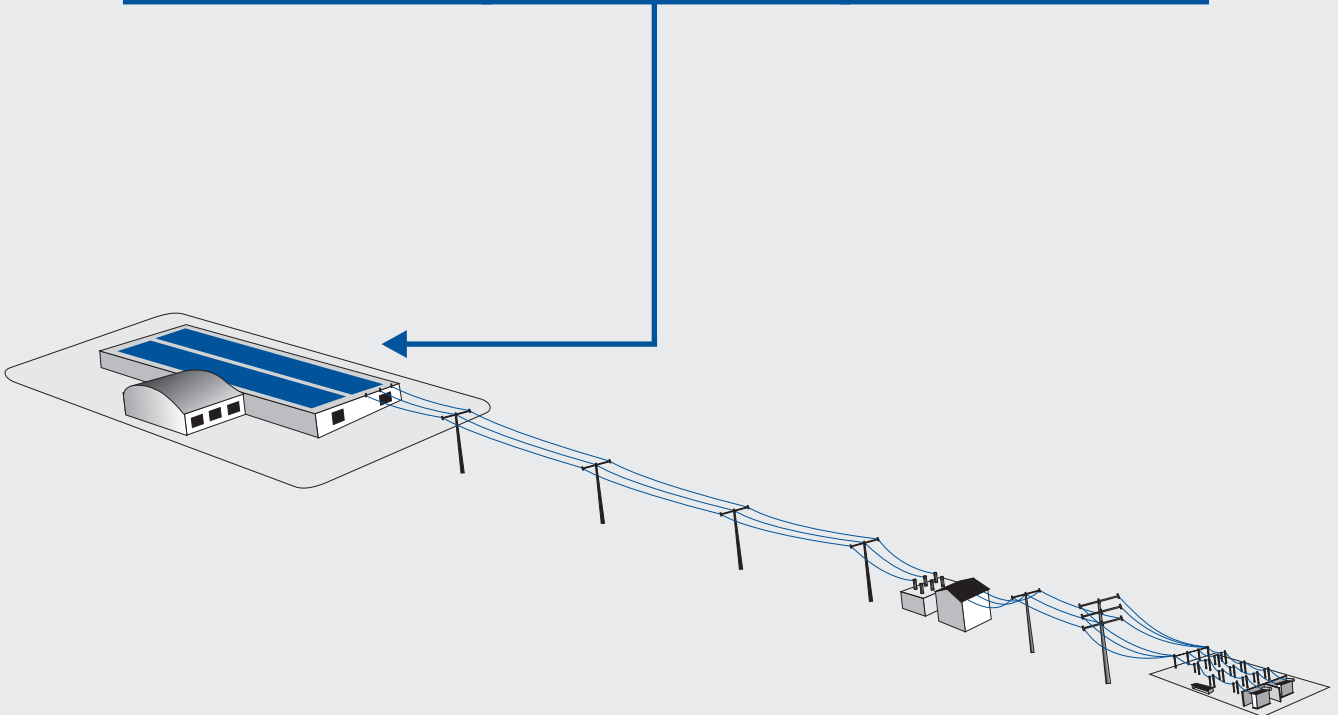
TA-112



Connection diagrams are given for reference. Please always check the latest user manual given with product or download from www.entes.com.tr.



TYPE PK 20



Power Factor Correction



Power Factor Controllers

RG-C Series

RG-B Series

RG-T Series

L.V. Capacitors

ENT. C100 Series

ENT. C50 Series

ENT. C25 Series

ENT. C10 Series

ENT. CF Series

Shunt Reactors

ENT.ERS Series

Harmonic Filters

ENT.ERH Series

Capacitor Duty Contactors

ENT-KT Series

Current Transformers

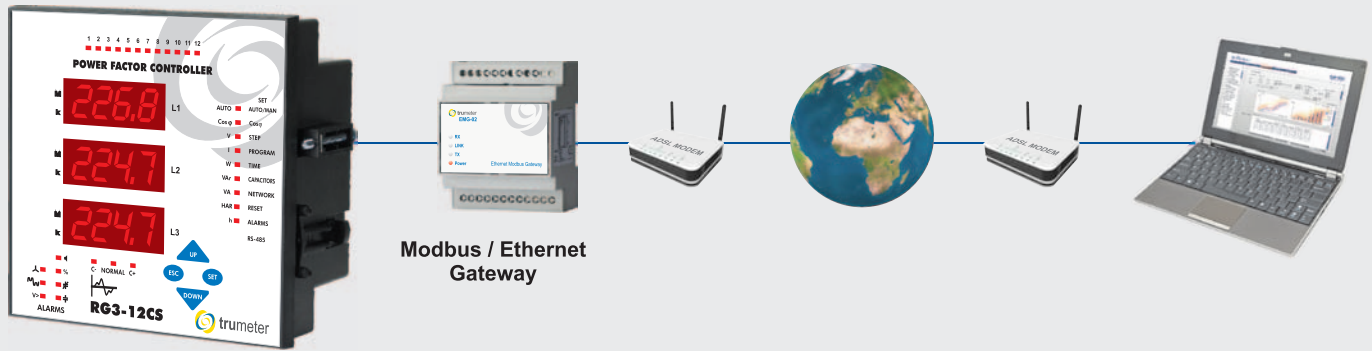
ENS Series

Discharge Units

DU-3

POWER FACTOR CONTROLLERS

RG Series



CE

Modbus Harmonics no >>>°C

Smart Switching	1 CT Measurement	3 CTs Measurement	Single-phase Capacitor Use	3-phase Capacitor Use	THD Protection	Dual Target cos-phi	Auto Setup	Password Protection	RS-485 Communication	Internal Temperature Control	External Temperature Control	Pcs / Carton
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Product Code

RG-6T	6 Steps											4
RG-8T	8 Steps											4
RG-12T	12 Steps											4
RG-8B-96	8 Steps											12
RG-8BS-96	8 Steps											12
RG3-12C	12 Steps											4
RG3-12CS	12 Steps											4

Discharge Unit

DU-3

Required for L.V. Power Capacitors up to 50 kVAr, 400V AC – 415V AC

20

Discharge Unit

○ Optional

● IEC 61000-6-2, IEC 61000-6-4, IEC 61010-1

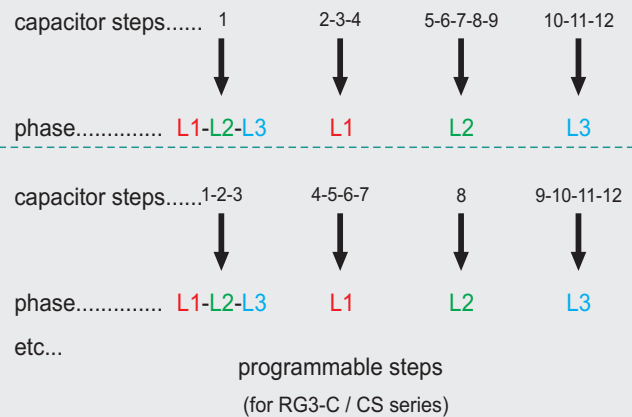
Major features of RG-B (single phase) and RG3-C (3-phase) series :



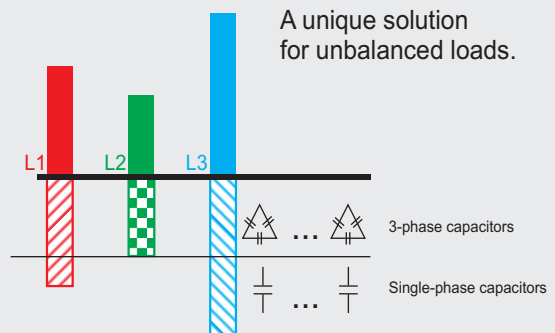
Overheat protection

no >>>°C

(for RG-B / BS and RG3-C / CS series)

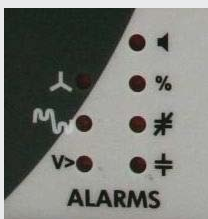


Compensation of each phase individually



(for RG3-C / CS series)

alarms



- Harmonic
- Temperature
- Improper Capacitor
- Wrong Connection
- Insufficient compensation
- Over Voltage
- Over compensation

(for RG-B / BS and RG3-C / CS series)

Phase - Neutral Voltages (V_{LN})	Phase Current (I)	Active Power (P)	Apparent Power (S)
Phase - Phase Voltages (V_{LL})	Cos ϕ	Reactive Power (Q)	

Measured Parameters (RG-T series)

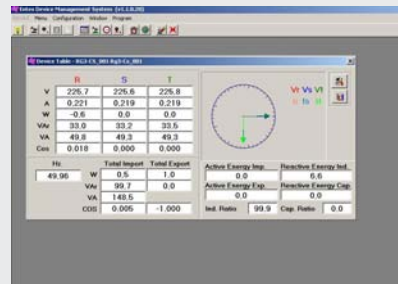
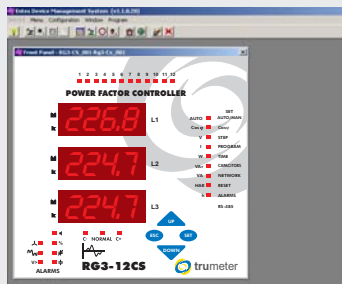
Individual Harmonics for Voltage - up to 19th	Total Harmonic Distortion for Voltage (THD V %)
Individual Harmonics for Current - up to 19th	Total Harmonic Distortion for Current (THD I %)

Measured Parameters (RG-B / RG-BS series)

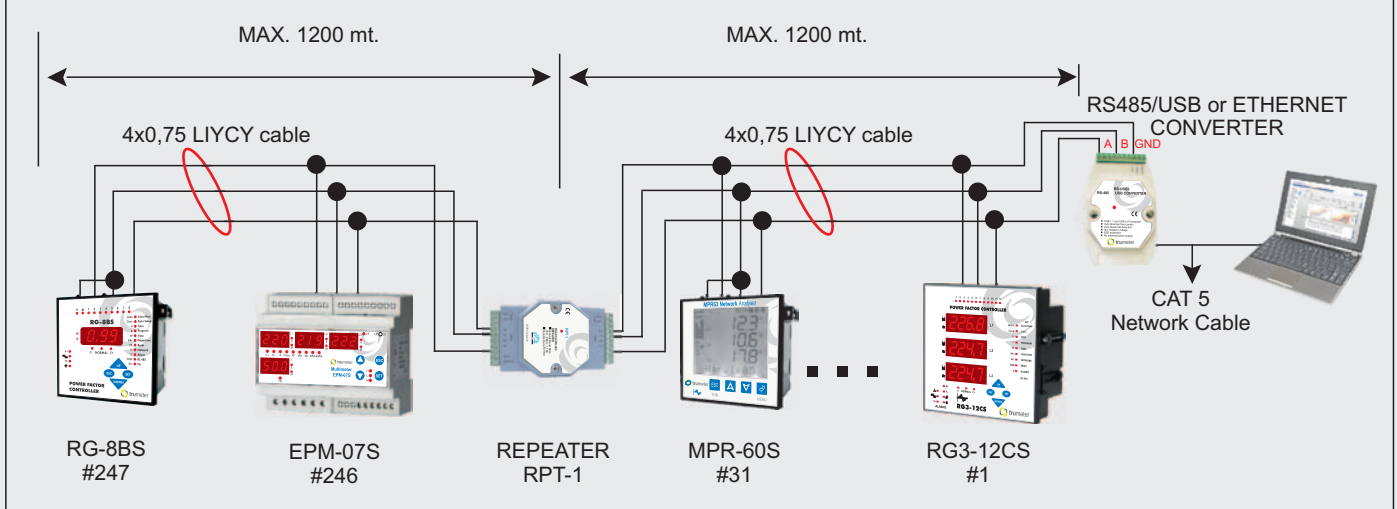
3-Phase Currents (I)	Total Current (ΣI)	Total Active Power (ΣP)	Total Apparent Power (ΣS)	Total Reactive Power (ΣQ)
Active Energy - Import (kWh)	Active Energy - Export (kWh)	Reactive - Capacitive (kVArh L)	Reactive - Inductive (kVArh C)	

Measured Parameters (RG3-C / RG-CS series)

Remote Monitoring & Controlling of Power Factor Controllers is done with MPR-SW software :




247 DEVICES CAN BE CONNECTED SERIALLY BY USING REPEATERS.



* ENTES recommends 4x0,75 LIYCYmm² cable for RS-485 communications

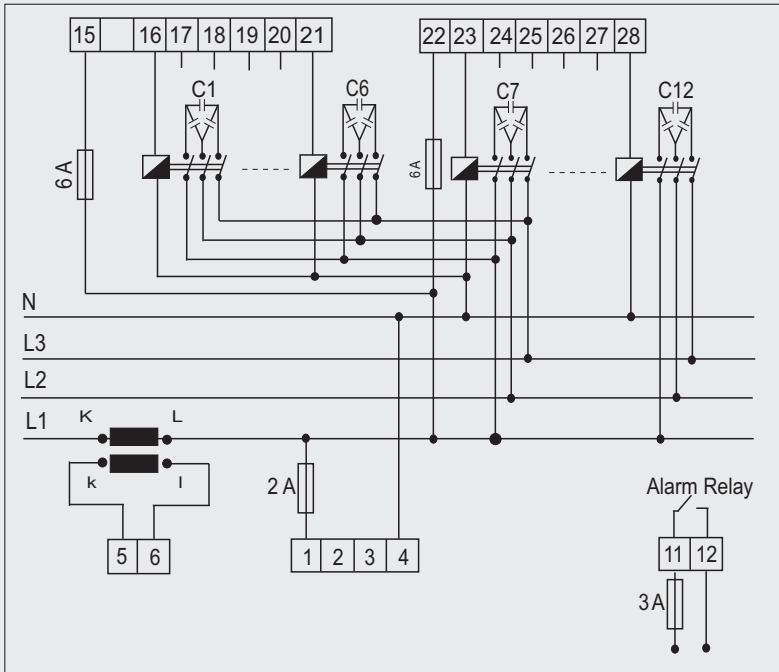
POWER FACTOR CONTROLLERS

RG Series

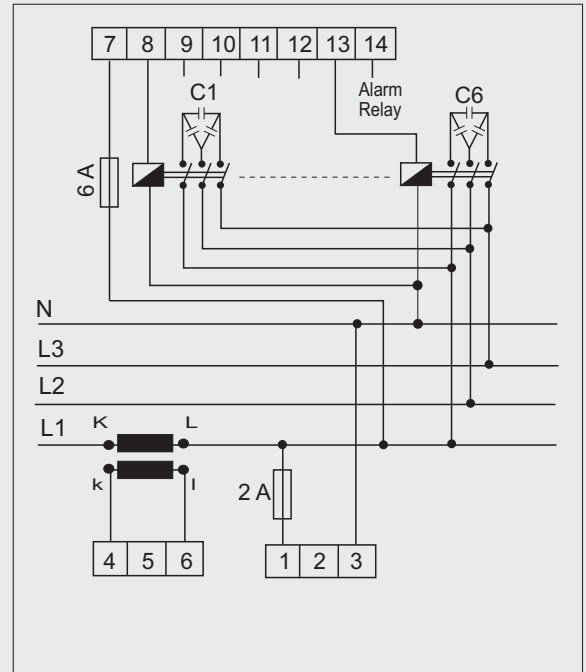
MODELS	RG-T	RG-B	RG-BS	RG3-C	RG3-CS
SPECIFICATIONS					
Electrical Parameters					
Operating Voltage (U_n)	110 V AC* / 230 V AC $\pm 10\%$; 50 / 60 Hz				
Operating Current	100 mA - 5,5 A				
Capacitor Steps	6, 8, 12	8		12	
Network Type	Single-phase 1 CT			3-phase 3 CTs (3 phase / 4 wires)	
Accuracy	1% ± 1 digit (V, I, $\cos\phi$) ; 2% ± 1 digit (W, VAr, VA)				
Current Transformer Ratio	5...10000 / 5A				
Power Consumption	< 2 VA (Current Circuit) < 3 VA - 10 VA (Voltage Circuit)				
$\cos\phi$ Setting	0,8 < $\cos\phi$ < 1 (inductive)	0,8 < $\cos\phi$ < 1 (inductive / capacitive)			
Dual Target $\cos\phi$ (for mains and generator)	-			●	
C/k Setting	0,02 - 1,00			-	
Automatic Energy Correction	-	●			
Automatic Disconnection of Damaged Capacitor Steps	-	●			
Time Delay Between Steps	2-1.800 sec. (for switch on / off separately)	1-1.800 sec. (for switch on / off separately)			
Discharge Time (Reconnection Time)	2-1.800 sec.	1-1.800 sec.			
Over Voltage Setting	-	240 - 275 V AC			
Output Contact	-	5 A, 1250 VA			
Display	Red LED, 14 mm Height (144x144 mm) / 10 mm Height (96x96 mm)				
Harmonic Measurement	-	Up to 19th harmonic for current and voltage separately			
Programmable THD-I and THD-V Alarm	-	●			
Programmable Discharge Time	-	●			
Programmable Over Voltage Alarm	-	●			
Automatic Power Calculation	-	●			
Programmable Energy Ratio Alarm (Inductive/Active) / (Capative/Active)	-	●			
Energy Measurement	-				●
Compensation of Each Phase	-				●
Displaying Parameters for Each Phase	-				●
Password Protection for Setup	-	●			
RS-485 Communication	-	●	-	-	●
Alarm Contact Output (Over Voltage, Harmonic)	-	●			
Temperature Control & Fan Contact Output	-	● (Internal Sensor)		○ (External Sensor with thermocouple)	
Mechanical Parameters					
Equipment Protection	Double Insulation (), Measurement Category III				
Ambient Operating Temperature	-5°C, +55°C				
Ambient Humidity	95%				
Degree of Protection	IP40 (front panel) - IP54 (Optional)				
Connection / Installation	Terminal / Flush-mounting with rear terminals				
Dimensions	144x144mm (PR16); 96x96mm (PR19)-only for 8 steps RG-8B/BS				
Packing Weight	0,9 kg (PR16) ; 0,6 kg (PR19) - only for 8 steps RG-8B/BS				
Quantity in 1 package	4 pcs (PR16) ; 12 pcs (PR19) - only for 8 steps RG-8B/BS				

Connection Diagram

RG-T

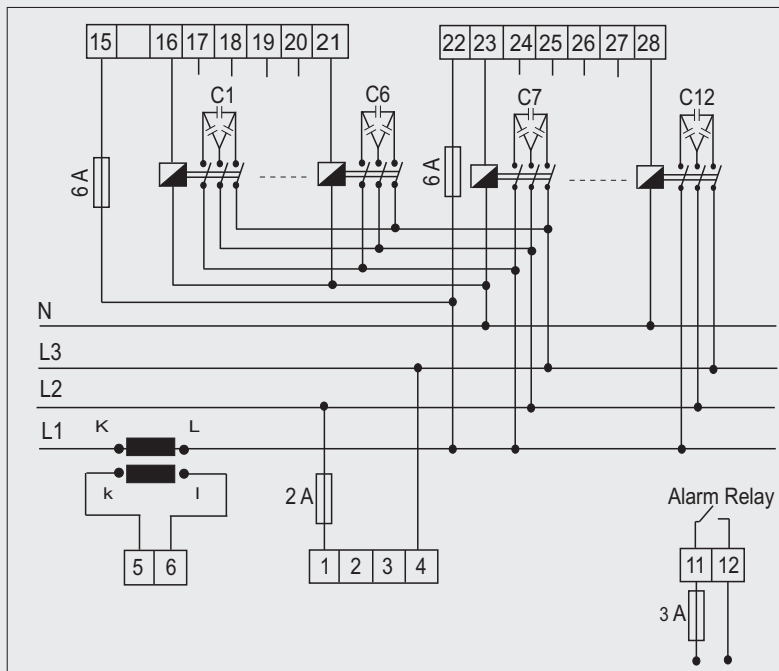


Phase-Neutral Connection

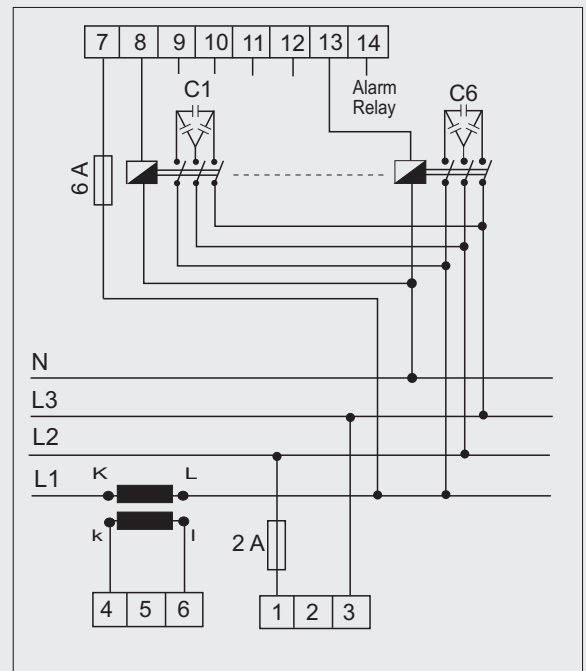


Phase-Neutral Connection**

RG-T



Phase-Phase Connection

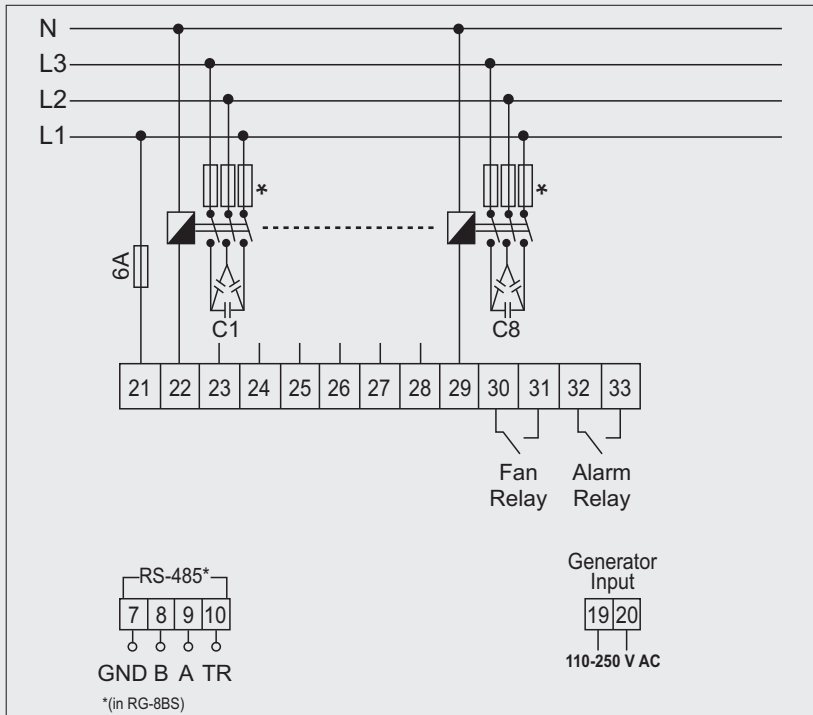


Phase-Phase Connection**

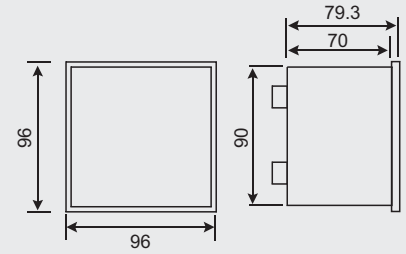
Connection diagrams are given for reference. Please always check the latest user manual given with product or download from www.entes.com.tr.

Connection Diagram

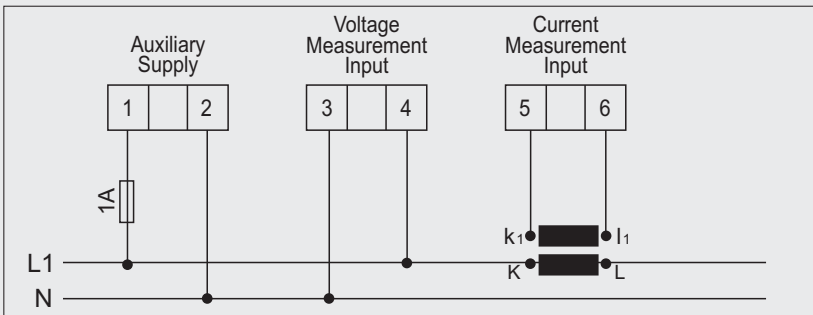
RG8-BS



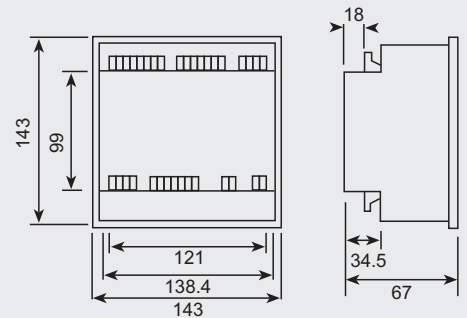
Dimensions



TYPE PR 19

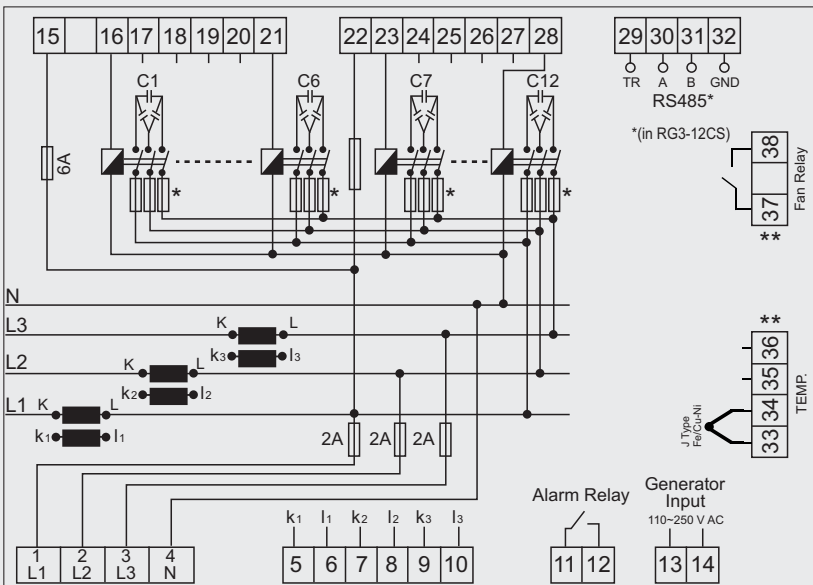


* Current value of 3-Fuses, which are connected to protect the capacitors, is chosen according to the nominal current value of capacitors.



TYPE PR 16

RG3-12CS



** Optional

Connection diagrams are given for reference. Please always check the latest user manual given with product or download from www.entec.com.tr.

THREE-PHASE POWER CAPACITORS

C10*	POWER (kVAr)	DIMENSION DxH (mm.)	PCS PER BOX	WEIGHT PER PACKAGE (Kg.)
ENT.C10-Voltage-1,5	1,5	55x165	21	9
ENT.C10-Voltage-2,5	2,5	55x165	21	9
ENT.C10-Voltage-5	5	65x200	14	9
ENT.C10-Voltage-7,5	7,5	75x215	12	9
ENT.C10-Voltage-10	10	75x255	12	9

C25*	POWER (kVAr)	DIMENSION DxH (mm.)	PCS PER BOX	WEIGHT PER PACKAGE (Kg.)
ENT.C25-Voltage-20	20	100x260	6	10
ENT.C25-Voltage-25	25	100x300	6	10
ENT.C25-Voltage-30	30	100x370	6	10

C50*	POWER (kVAr)	DIMENSION DxH (mm.)	PCS PER BOX	WEIGHT PER PACKAGE (Kg.)
ENT.C50-Voltage-10	10	75x200	6	10
ENT.C50-Voltage-12,5	12,5	75x200	6	10
ENT.C50-Voltage-15	15	85x200	6	10
ENT.C50-Voltage-20	20	90x200	6	10

C100*	POWER (kVAr)	DIMENSION DxH (mm.)	PCS PER BOX	WEIGHT PER PACKAGE (Kg.)
ENT.C100-P-Voltage-25	25	85x265	4	7
ENT.C100-P-Voltage-30	30	85x340	4	9
ENT.C100-Dg-Voltage-50	50	172x210	1	5



- Long Life Expectancy
130.000 hours (C50 model)
- Self Healing
- Smaller Dimensions
- Lower Dielectric Losses

SINGLE PHASE POWER CAPACITORS

CF*	POWER (kVAr)		DIMENSION DxH (mm.)	PCS PER BOX	WEIGHT PER PACKAGE (Kg.)
	400V AC	230V AC			
ENT.CF-Voltage-1,67	1,67	0,55	50x122	25	9
ENT.CF-Voltage-2,5	2,5	0,83	55x132	25	9
ENT.CF-Voltage-4,17	4,17	1,38	60x137	25	9

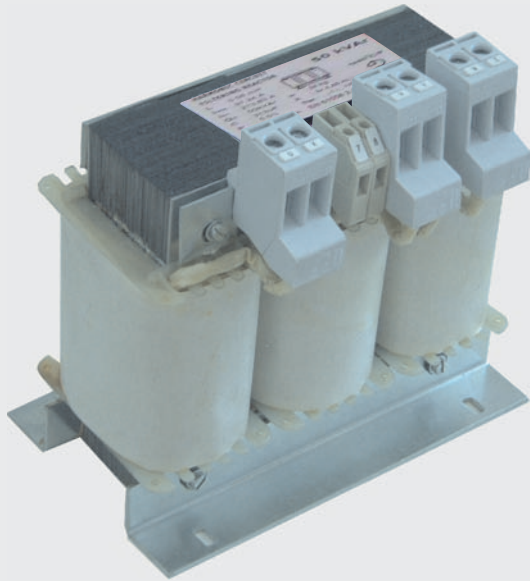
* OPERATING VOLTAGE	C10	C25	C50	C100	CF
	230V AC	400V AC	400V AC	400V AC	230V AC
	400V AC	415V AC	415V AC	415V AC	400V AC
	415V AC	450V AC	450V AC	440V AC	415V AC
	450V AC	525V AC	525V AC	460V AC	450V AC
		690V AC	690V AC		500V AC
					550V AC

MODELS	C10	C25	C50	C100	CF
Life Expectancy (hours)	80.000	80.000	130.000	>150.000 dry >130.000 oil	30.000
Rated Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz	50/60Hz
Capacitance Tolerance	-%5+%10	-%5+%10	-%5+%10	±%5	-%5+%10
Dielectric Loss	≤0,3 W/kVar	≤0,3 W/kVar	≤0,2 W/kVar	≤0,4 W/kVar	≤0,4 W/kVar
Altitude	≤2000 m	≤2000 m	≤2000 m	≤2000 m	≤2000 m
Test Voltage (Between Terminals)	2,15 x Un, AC 2 sec.	2,15 x Un, AC 2 sec.	2,15 x Un, AC 2 sec.	2,15 x Un, AC 2 sec.	2,15 x Un, AC 2 sec.
Test Voltage (Between Terminals and Case)	3 kV, AC 10 sec. (Un≤660 V)	3 kV, AC 10 sec. (Un≤660 V)	3 kV, AC 10 sec. (Un≤660 V)	4,6 kV, AC 2 sec.	3 kV, AC 10 sec.
Rated Temperature	-25+55°C	-25+55°C	-25+55°C	-25+55°C	-25+55°C
Max. Overvoltage	1,1xUn	1,1xUn	1,1xUn	1,1xUn	1,1xUn
Max. Overload In	2 x In	2 x In	4 x In	1,5 x In	2 x In
Protection Class	IP30	IP20	IP20	IP00	IP00
Discharge Resistance	Internal (75V after 3 min.)	Internal (50V after 1 min.)	Internal (50V after 1 min.)	External	—
Standards	IEC 60831-1/2	IEC 60831-1/2	IEC 60831-1/2	IEC 60831-1/2	IEC 60831-1/2

Discharge coil must be used in automatic compensation in case switch-on time is under 1 minute.

* Different operating voltages are available upon request.

* Trumeter recommends capacitors with 450V AC in networks with Harmonics.



General

Trumeter shunt reactors are high quality reactors designed to be used in inductive load systems. These reactors are compatible with european standards and are CE marked.

APPLICATION AREAS:

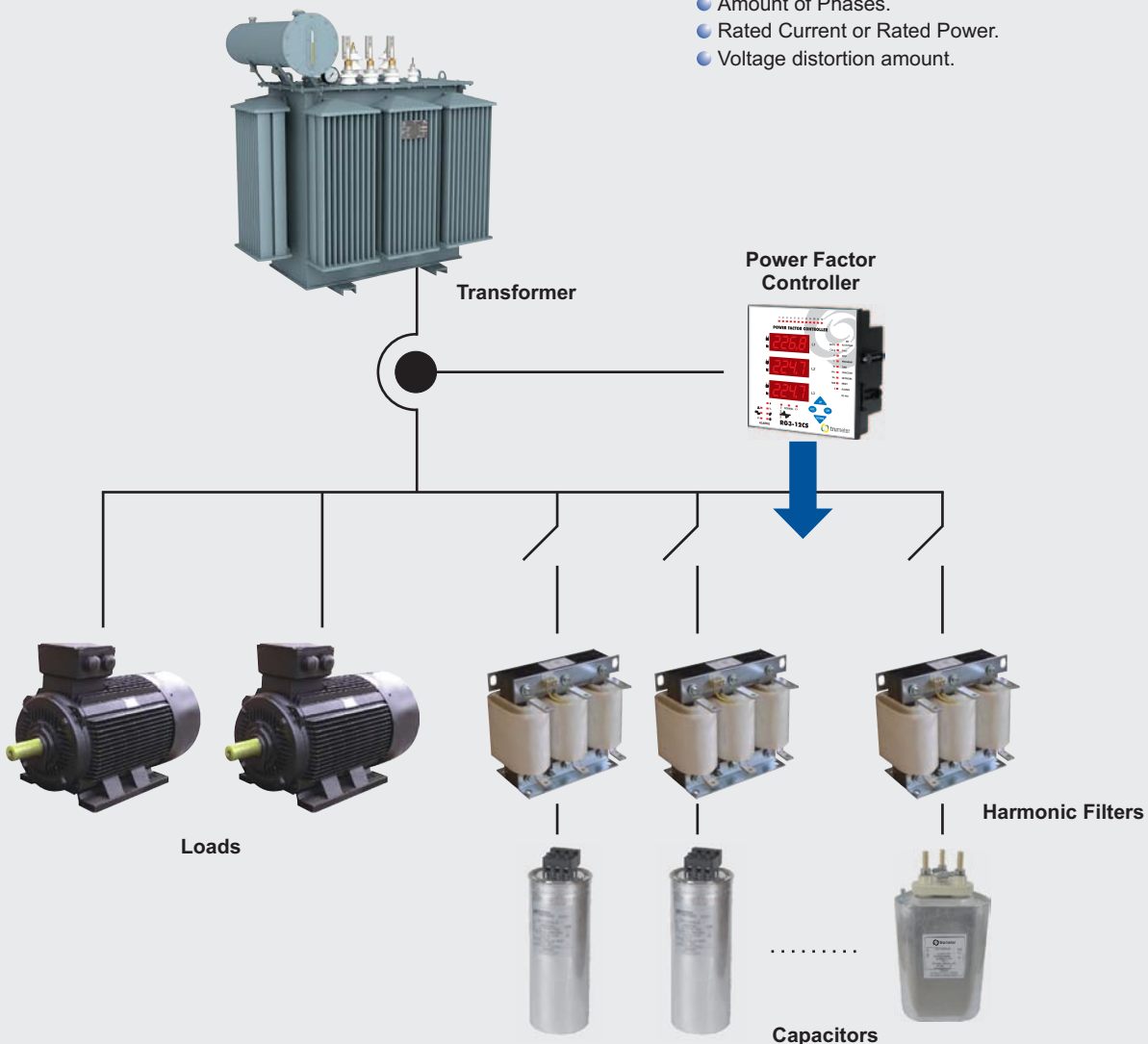
- Telecommunication stations in urban areas like radio, GSM and TV transmitters.
- Places with large area like campuses and farmlands.
- Inductive load test systems.

TECHNICAL SPECIFICATIONS

- Single or three phase, high permeable iron core, air gapped design.
- High quality copper or aluminium windings.
- Design according to customer specs.
- Thermal Switch for overload protection at each leg.
- Terminal block, bar or cable connection depending on current value.
- Vacuum impregnated varnish to ensure silent and moisture-immune operation.
- CE sign and compatibility with EN 61558 2-20.
- Manufactured under ISO 9000 quality management.

VALUES TO BE SPECIFIED FOR CUSTOM SHUNT REACTORS

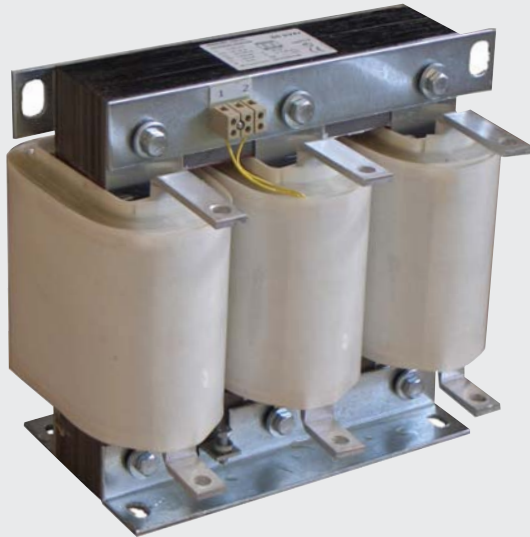
- Line Voltage.
- Amount of Phases.
- Rated Current or Rated Power.
- Voltage distortion amount.



DETUNED FILTER REACTORS

Detuned Filter Reactors, are used in series with capacitor banks in power factor correction units. By using these types of detuned reactors it is possible to avoid following negative effects on system.

- Overcurrent during switching on the capacitor banks.
- Overload of capacitor banks because of the harmonic resonance.
- Short lifetime on capacitors.
- Overheating of the utility transmission cables.
- Overheating of the distribution transformer.
- Unintended triggering of the protective devices.
- Distortion of utility voltage waveform and problems on voltage sensitive devices.
- Interferences on data transmission systems.
- Unexplainable faults in electronic boards.



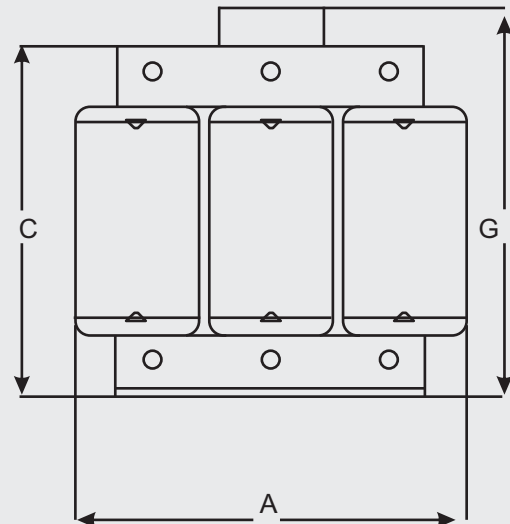
General

Trumeter Detuned filter reactors are high quality reactors designed to be used in detuned power factor correction units. These reactors are compatible with european standards and are CE marked.

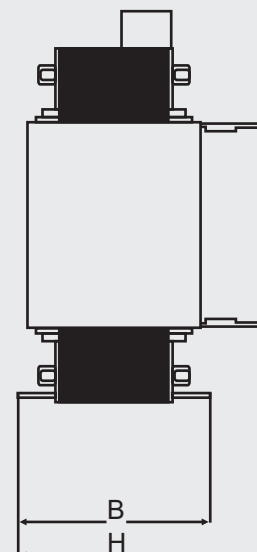
TECHNICAL SPECIFICATIONS:

- Single or three phase, high permeable iron core, air gapped design
- High quality copper or aluminium windings
- Available at any resonance frequency
- Linearity according to resonance frequency
- Harmonic loads according to EN 61000-2-2
 - U1= %106 x UN
 - U3= %0.5 x UN
 - U5= %5 x UN
 - U7= %5 x UN
- Thermal Switch for overload protection
- Terminal block, bar or cable connection depending on current value
- Vacuum impregnated varnish to ensure silent and moisture-immune operation
- CE sign and compatibility with EN 61558 2-20
- Manufactured under ISO 9000 quality management

DETUNED FILTER REACTOR SIZES



Size	A	B	C	G	H
1	150	67	125	195	-
2	150	82	125	195	-
3	180	92	150	220	-
4	180	102	150	220	-
5	225	100	190	-	200
6	225	124	190	-	224
7	240	130	200	-	230
8	265	126	220	-	226
9	265	140	220	-	240
10	265	152	220	-	252
11	300	132	250	-	232
12	300	140	250	-	240
13	360	163	300	-	263
14	420	168	350	-	288



- Specified capacitor values are used during the reactor design. Severe problems may occur when using another capacitor in conjunction with these reactors. Custom reactor designs are possible.
- Dimension values may change depending on design.

DETUNED FILTER REACTOR SELECTION TABLE

400V 50Hz Utility Voltage, 210Hz Resonance Frequency (p=5,67%)

Type	kVAr	L (mH)	I _{rms} (A)	I _{th} (A)	I _{lin} (A)	C* (uF)	Size	Weight (kg)
ENT.ERH-5,67-400-6,25	6,25	4,90	10,97	12,06	24,87	39,30	2	6
ENT.ERH-5,67-400-7,5	7,5	4,08	13,16	14,48	29,85	47,16	3	7
ENT.ERH-5,67-400-10	10	3,06	17,55	19,30	39,79	65,50	3	8
ENT.ERH-5,67-400-12,5	12,5	2,45	21,93	24,13	49,74	78,60	4	9
ENT.ERH-5,67-400-15	15	2,04	26,32	28,95	59,69	91,69	5	12,5
ENT.ERH-5,67-400-20	20	1,53	35,09	38,60	79,59	130,99	6	15
ENT.ERH-5,67-400-25	25	1,22	43,87	48,26	99,49	157,19	7	17,5
ENT.ERH-5,67-400-30	30	1,02	52,64	57,91	119,38	183,39	7	18
ENT.ERH-5,67-400-40	40	0,77	70,19	77,21	159,18	261,98	9	19
ENT.ERH-5,67-400-50	50	0,61	87,74	96,51	198,97	314,38	12	32
ENT.ERH-5,67-400-60	60	0,51	105,28	115,81	238,77	392,98	13	43
ENT.ERH-5,67-400-80	80	0,38	140,38	154,42	318,36	523,97	13	47
ENT.ERH-5,67-400-100	100	0,31	175,47	193,02	397,95	628,76	14	50

400V 50Hz Utility Voltage, 189Hz Resonance Frequency (p=7%)

Type	kVAr	L (mH)	I _{rms} (A)	I _{th} (A)	I _{lin} (A)	C* (uF)	Size	Weight (kg)
ENT.ERH-7-400-6,25	6,25	6,13	10,04	11,05	20,97	39,30	3	6
ENT.ERH-7-400-7,5	7,5	5,11	12,05	13,26	25,16	47,16	3	7
ENT.ERH-7-400-10	10	3,83	16,07	17,67	33,55	65,50	4	8
ENT.ERH-7-400-12,5	12,5	3,07	20,08	22,09	41,94	78,60	4	9
ENT.ERH-7-400-15	15	2,56	24,10	26,51	50,33	91,69	4	10
ENT.ERH-7-400-20	20	1,92	32,13	35,35	67,11	130,99	5	13
ENT.ERH-7-400-25	25	1,53	40,17	44,18	83,88	157,19	7	17,5
ENT.ERH-7-400-30	30	1,28	48,20	53,02	100,66	183,39	7	19
ENT.ERH-7-400-40	40	0,96	64,27	70,69	134,21	261,98	9	20
ENT.ERH-7-400-50	50	0,77	80,33	88,37	167,76	314,38	10	21
ENT.ERH-7-400-60	60	0,64	96,40	106,04	201,32	392,98	12	32
ENT.ERH-7-400-80	80	0,48	128,53	141,39	268,42	523,97	13	38
ENT.ERH-7-400-100	100	0,38	160,67	176,73	335,53	628,76	13	43

400V 50Hz Utility Voltage, 134Hz Resonance Frequency (p=14%)

Type	kVAr	L (mH)	I _{rms} (A)	I _{th} (A)	I _{lin} (A)	C* (uF)	Size	Weight (kg)
ENT.ERH-14-400-6,25	6,25	13,27	9,62	10,58	17,54	38,50	3	9
ENT.ERH-14-400-7,5	7,5	11,05	11,54	12,69	21,05	42,35	4	10
ENT.ERH-14-400-10	10	8,29	15,38	16,92	28,07	57,74	5	13
ENT.ERH-14-400-12,5	12,5	6,63	19,23	21,15	35,08	76,99	5	17,5
ENT.ERH-14-400-15	15	5,53	23,08	25,38	42,10	86,61	5	19
ENT.ERH-14-400-20	20	4,15	30,77	33,85	56,13	115,49	6	19,5
ENT.ERH-14-400-25	25	3,32	38,46	42,31	70,17	144,36	7	20
ENT.ERH-14-400-30	30	2,76	46,15	50,77	84,20	173,23	8	22
ENT.ERH-14-400-40	40	2,07	61,54	67,69	112,27	230,97	10	27
ENT.ERH-14-400-50	50	1,66	76,92	84,62	140,33	288,72	11	32
ENT.ERH-14-400-60	60	1,38	92,31	101,54	168,40	346,46	12	43
ENT.ERH-14-400-80	80	1,04	123,08	135,38	224,54	461,95	13	51
ENT.ERH-14-400-100	100	0,83	153,85	169,23	280,67	577,43	14	62

400V 60Hz Utility Voltage, 252Hz Resonance Frequency (p=5,67%)

Type	kVAr	L (mH)	I _{rms} (A)	I _{th} (A)	I _{lin} (A)	C* (uF)	Size	Weight (kg)
ENT.ERH-5,67-400-6,25	6,25	4,08	10,97	12,06	24,87	32,75	2	6
ENT.ERH-5,67-400-7,5	7,5	3,40	13,16	14,48	29,85	39,30	3	7
ENT.ERH-5,67-400-10	10	2,55	17,55	19,30	39,79	52,40	3	8
ENT.ERH-5,67-400-12,5	12,5	2,04	21,93	24,13	49,74	65,50	4	9
ENT.ERH-5,67-400-15	15	1,70	26,32	28,95	59,69	78,60	5	12,5
ENT.ERH-5,67-400-20	20	1,28	35,09	38,60	79,59	104,79	6	15
ENT.ERH-5,67-400-25	25	1,02	43,87	48,26	99,49	130,99	7	17,5
ENT.ERH-5,67-400-30	30	0,85	52,64	57,91	119,38	157,19	7	18
ENT.ERH-5,67-400-40	40	0,64	70,19	77,21	159,18	209,59	9	19
ENT.ERH-5,67-400-50	50	0,51	87,74	96,51	198,97	261,98	12	32
ENT.ERH-5,67-400-60	60	0,43	105,28	115,81	238,77	314,38	13	43
ENT.ERH-5,67-400-80	80	0,32	140,38	154,42	318,36	419,17	13	47
ENT.ERH-5,67-400-100	100	0,26	175,47	193,02	397,95	523,97	14	50

400V 60Hz Utility Voltage, 226Hz Resonance Frequency (p=7%)

Type	kVAr	L (mH)	I _{rms} (A)	I _{th} (A)	I _{lin} (A)	C* (uF)	Size	Weight (kg)
ENT.ERH-7-400-6,25	6,25	5,11	10,04	11,05	20,97	32,75	3	6
ENT.ERH-7-400-7,5	7,5	4,26	12,05	13,26	25,16	39,30	3	7
ENT.ERH-7-400-10	10	3,19	16,07	17,67	33,55	52,40	4	8
ENT.ERH-7-400-12,5	12,5	2,56	20,08	22,09	41,94	65,50	4	9
ENT.ERH-7-400-15	15	2,13	24,10	26,51	50,33	78,60	4	10
ENT.ERH-7-400-20	20	1,60	32,13	35,35	67,11	104,79	5	13
ENT.ERH-7-400-25	25	1,28	40,17	44,18	83,88	130,99	7	17,5
ENT.ERH-7-400-30	30	1,06	48,20	53,02	100,66	157,19	7	19
ENT.ERH-7-400-40	40	0,80	64,27	70,69	134,21	209,59	9	20
ENT.ERH-7-400-50	50	0,64	80,33	88,37	167,76	261,98	10	21
ENT.ERH-7-400-60	60	0,53	96,40	106,04	201,32	314,38	12	32
ENT.ERH-7-400-80	80	0,40	128,53	141,39	268,42	419,17	13	38
ENT.ERH-7-400-100	100	0,32	160,67	176,73	335,53	523,97	13	43

400V 60Hz Utility Voltage, 160Hz Resonance Frequency (p=14%)

Type	kVAr	L (mH)	I _{rms} (A)	I _{th} (A)	I _{lin} (A)	C* (uF)	Size	Weight (kg)
ENT.ERH-14-400-6,25	6,25	11,05	9,62	10,58	17,54	30,80	3	9
ENT.ERH-14-400-7,5	7,5	9,21	11,54	12,69	21,05	38,50	4	10
ENT.ERH-14-400-10	10	6,91	15,38	16,92	28,07	48,12	5	13
ENT.ERH-14-400-12,5	12,5	5,53	19,23	21,15	35,08	57,74	5	17,5
ENT.ERH-14-400-15	15	4,61	23,08	25,38	42,10	76,99	5	19
ENT.ERH-14-400-20	20	3,45	30,77	33,85	56,13	96,24	6	19,5
ENT.ERH-14-400-25	25	2,76	38,46	42,31	70,17	115,49	7	20
ENT.ERH-14-400-30	30	2,30	46,15	50,77	84,20	144,36	8	22
ENT.ERH-14-400-40	40	1,73	61,54	67,69	112,27	192,48	10	27
ENT.ERH-14-400-50	50	1,38	76,92	84,62	140,33	230,97	11	32
ENT.ERH-14-400-60	60	1,15	92,31	101,54	168,40	288,72	12	43
ENT.ERH-14-400-80	80	0,86	123,08	135,38	224,54	384,96	13	51
ENT.ERH-14-400-100	100	0,69	153,85	169,23	280,67	461,95	14	62

CAPACITOR DUTY CONTACTOR

ENT-KT Series



General

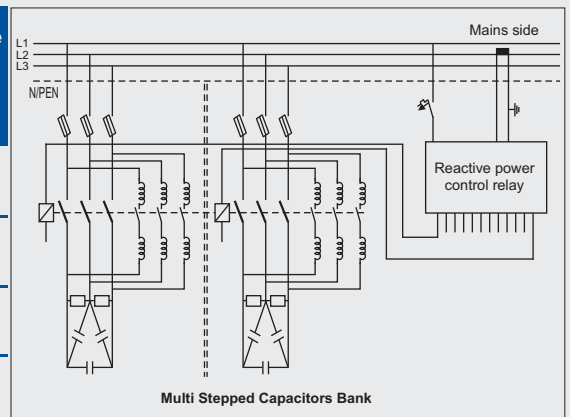
Capacitor Duty Contactors are specially designed to meet Capacitor Duty application.

- 3-phase
- 415V AC rating, 10 kVAR to 60 kVAR
- Conforming to IEC – 947

Benefits

- Saves cost of expensive replacements,
- High electrical life,
- Reduced power loss during 'ON' condition,
- No risk of dangerous voltage,
- Switching of Capacitor bank in parallel without de-rating
- Less maintenance & Down-time

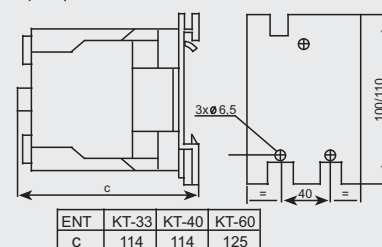
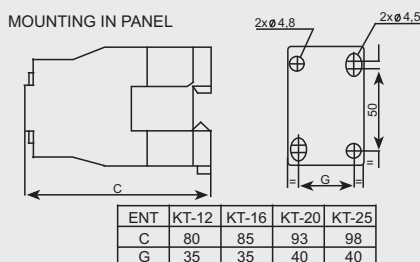
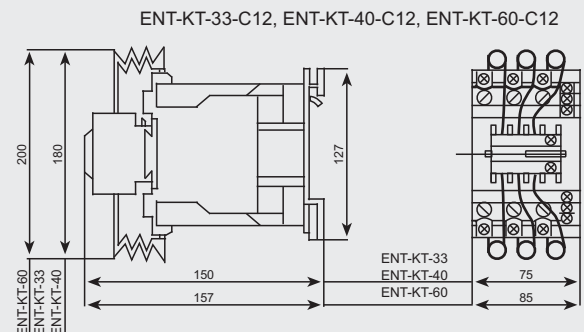
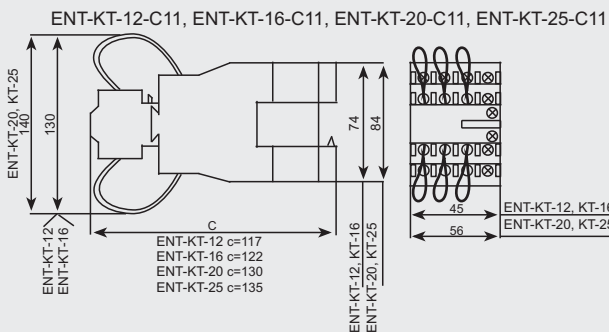
Product Code	kVA ratings at 50/60Hz		Instantaneous Auxiliary Contacts		Operations Hour	Electrical life at rated load Operations
	$\theta \leq 55^\circ\text{C}$ (3)		NO	NC		
	200V 240V	400V 440V				
ENT-KT-12-C11	6.7	12.5	1 0	1 2	240	200 000
ENT-KT-16-C11	8.5	16.7	1 0	1 2	240	200 000
ENT-KT-20-C11	10.0	20.0	1 0	1 2	240	100 000
ENT-KT-25-C11	15.0	25.0	1 0	1 2	240	100 000
ENT-KT-33-C12	20.0	33.3	1	2	240	100 000
ENT-KT-40-C12	25.0	40.0	1	2	100	100 000
ENT-KT-60-C12	40.0	60.0	1	2	100	100 000



Notes :

Contactor Type ENT-KT-12-C11 – ENT-KT-25-C11 : Suitable type clip-on mounting into 35 mm DIN rail
 Contactor Type ENT-KT-33-C12 – ENT-KT-60-C12 : Suitable type clip-on mounting into 75 mm DIN rail

- Standart Control Circuit Voltage / Frequency





TYPE	PRIMARY CURRENT(A)	NOMINAL POWER (VA)
ENS.30	30-40	1
	50	1,5
	60-75	2,5
	100	3,75
	125-150	5



ENS.30	200-250-300	10
--------	-------------	----

ENS.40	400-500-600	10
	400	15
	600	



ENS.60	750-800	10
--------	---------	----

ENS.60	1000-1200-1250	10
	1000	15
ENS.100	1000-1250	10

ENS.100	1500-1600	15
ENS.120	1600	30



ENS.120	2000	15
		30

ENS.120	2500	15
		30

ENS.120	3000	15
	3200	15
	4000	30



SPLIT CORE CURRENT TRANSFORMERS

ENS.AYS 23	100	1,25
	300	3,75

ENS.AYS	500	5
---------	-----	---

ENS.AYS 812	400	1,5
	500-600-800	2,5
	1000	5

ENS.AYS 816	1200	10
	1500-1600-2000	15
	2500-3000	
	4000	30



L.V. CURRENT TRANSFORMER	TYPE	FEATURES	PRIMARY CURRENT	
			120 A	210 A
	CT-25	Ratio : 1/2500, Class:1 Inner Diameter : 17.8 mm Outer Diameter : 47 mm	MPR-53 MPR-53S EPR-04 EPR-04S EPM-04 EPM-04C EPM-04CS EPM-06 EPM-06C EPM-06CS	EPM-4A EPM-4C EPM-4D EPM-4P
	CT-80D (only suitable for ES-80L)	Ratio : 1/2500, Class:1 Inner Diameter : 19 mm Outer Diameter : 47.5 mm		

(for ENTES Digital Measurement Devices)





CE

General

DU-3, Discharge unit is used with capacitor banks and provides fast discharge for short periods.

It withstands to short discharge periods of capacitors via discharge coil inside.

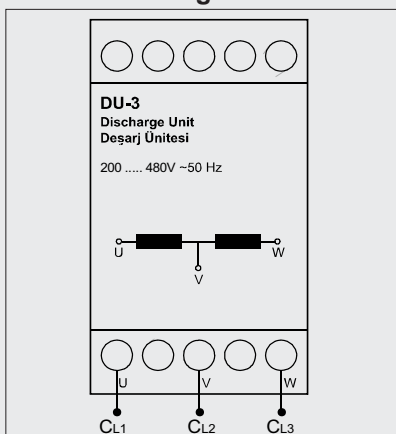
DU-3, also helps to reduce heat losses of capacitors and prevents terminal heat which is generated by discharge resistors.

SPECIFICATIONS	DU-3
Electrical Parameters	
Coil resistor	3000 Ω
Operating period	Continuous
Nominal voltage	230 500 V
Nominal frequency	50 Hz.
Number of phase	3
Capacitor Power	5....50 kVAr
Losses	< 1 W
Mechanical Parameters	
Ambient temperature	Max 40°C
Protection class	IP20
Dimensions	PK21
Weight	0.4 kg
Qty. in 1 Package	20 pcs

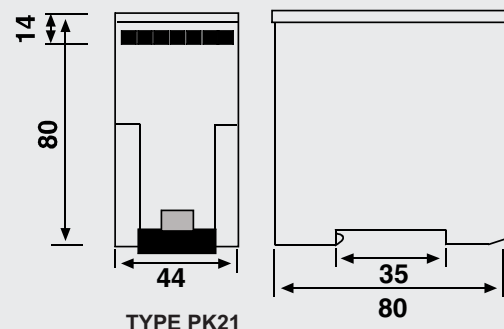
	Continuous Current (mA)		
	230 V	400 V	500 V
U	1	4	8
V	2	6	12
W	1	4	8

Reactive Power Q (kVAr)	Discharge Period (sec.)		
	230	400	450
10	4	2	2
20	8	3.5	3
25	10	4	4
30	12	5.5	5
50	20	8	6

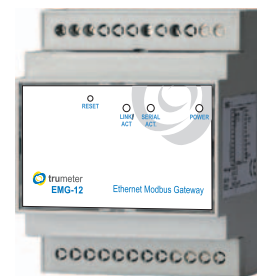
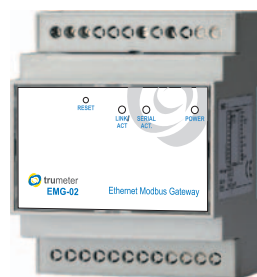
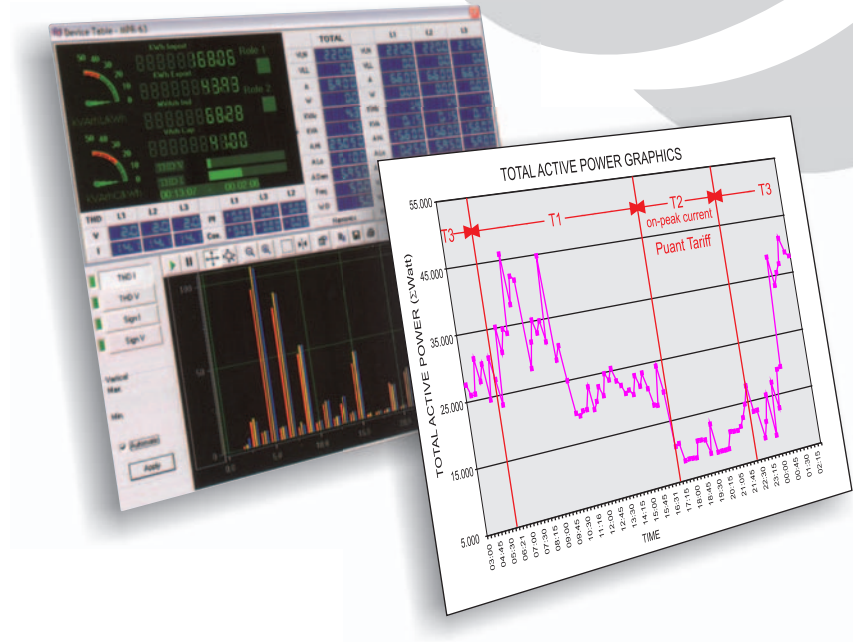
Connection Diagram



Dimension



Remote Monitoring



Software
MPR-SW
Ethernet & USB Converters
EMG Series
RS-USB2
Repeater
RPT-1

ENERGY MANAGEMENT SOFTWARE

MPR-SW Series



General

MPR-SW server-client software is designed for monitoring and recording the electrical network parameters on PC, via Internet / Intranet (Modbus RTU, Modbus TCP) to be used for energy management.

Features

- Communicating with MPR-63, MPR60S, MPR-53S, RG-CS, EPR-04S, EPM-0x series measuring instruments.
- Front panel simulations of devices on PC. (Figure 1)
- Display and analyse real time data on your PC. (Figure 2)
- Remote programming device settings via software.
- Energy consumption between determined dates.

Direct Printable Reporting

- Power factor report.
- Periodical values report
- Energy consumption report with tariffs. (Figure 3)
- Graphic report between determined dates. (Figure 4)
- Exporting all measured values to Ms Excel.
- Other reports can be combined after exporting to excel.

Minimum System Requirements

- Windows 98/2000/XP
- 128 MB RAM (256 MB recommended)
- 60 MB HDD (200 MB recommended)
- CD-ROM drive
- USB interface or Ethernet Port

Product Code

MPR-SW Log 10	For Text Report (for MPR-60S and MPR-63 are FREE)
MPR-SW2-1	For Single Device (FREE)
MPR-SW2-5	For 2-5 Devices
MPR-SW2-10	For 6-10 Devices
MPR-SW2-15	For 11-15 Devices
MPR-SW2-20	For 16-20 Devices
MPR-SW2-20+	More than 20 Devices (FREE, IF 20+ DEVICES ARE USED IN A PROJECT)

MPR-SW Software supports following hardwares ; MPR-6x, MPR-5x, RG-x, EPM, EPR, EMG, RS-USB2 Series (Please contact us for 3rd party product support)

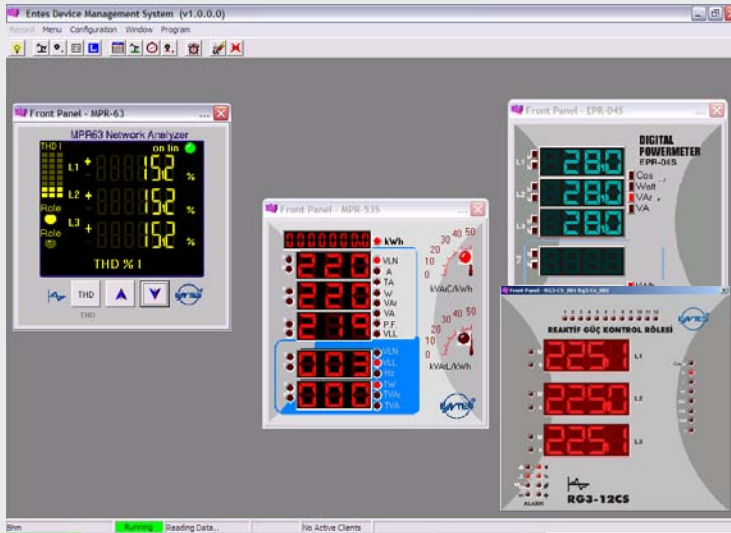


Figure 1: Front Panel Simulations



Figure 2: Data Display with Real Time

Date	Total kWh	T1 kWh	T2 kWh	T3 kWh	T4 kWh	Other kWh	Total Price (€)	T1 Price (€)	T2 Price (€)	T3 Price (€)	T4 Price (€)	Other Price (€)
23.02.2006	800	800					2800	2800				
24.02.2006	1050	800	250				2800	900				
25.02.2006	250	200	50				700	100				
26.02.2006	120	90	30				310	60				
27.02.2006	850	700	150				2450	300				
28.02.2006	830	650	180				2270	360				
01.03.2006	1100	900	200				3150	400				
02.03.2006	1070	875	200				3060	400				
03.03.2006	1100	900	200				3370	200				
04.03.2006	250	200	50				700	100				
05.03.2006	120	90	30				310	60				
06.03.2006	850	700	150				2450	300				
07.03.2006	1070	875	200				3060	400				

Figure 3: Energy Report with (4 Tariffs)

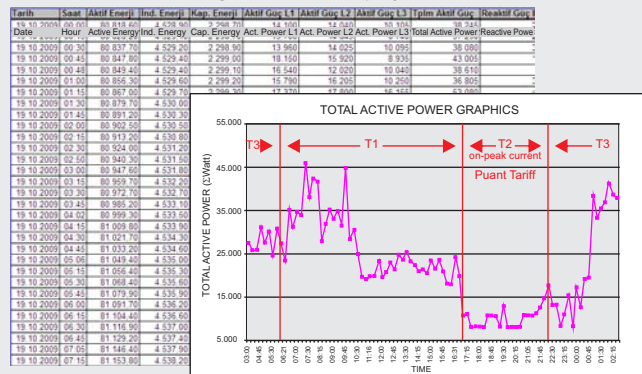
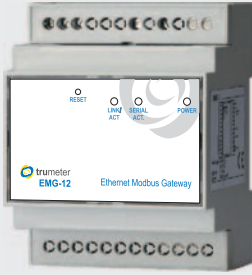
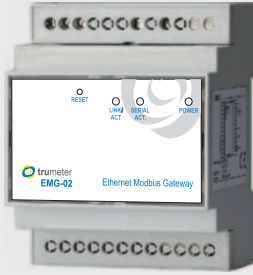


Figure 4: Active Power Graphics (kWh)



EMG-12



EMG-02

**EMG-02 / EMG-10 / EMG-12
General**

Ethernet / RS-485 Modbus Gateway for communicating PC with MPR / EPR and EPM series via Internet (WAN) and Intranet (LAN).

EMG-10 enables only one (1) online connection via internet / intranet. However, EMG-02 / EMG-12 enables max. 4 online connections via internet / intranet.

Category	Description
Network Protocols	TCP/IP, ARP, ICMP, HTTP
Serial Ports	RS485 and USB for configuration
Operation Modes	ModbusTCP/RTU and Modbus Tunnel
Network interface	10/100 Mbps auto-negotiation
Serial Communication	Data bits : 5-6-7-8 data bits Stop Bits: 1-1.5-2 Characters Parity: Odd, even, none
Serial Interface	300-115200 bps
Supply	9-24V AC - 9-30V DC or (~75 mA) by the USB Port
Insulation and Protection	RS485 port: 500V Ethernet port: 1500V 15KV ESD Protection on USB Port 10/1000 μ transient pulse protection on RS-485 port (600W)



RS-USB2

USB Converter (RS-USB2)

RS-485 / USB Converter for communicating PC with MPR / EPR and EPM-0x series.

Technical Specifications

- USB 1.1 and USB 2.0 support
- 300 - 115.200 bps baud rate
- Auto direction flow control on RS485
- Minimum 3000 V DC isolation protection
- Activation LED
- Deriving the power from USB port and no need for an external supply.
- Auto baud rate detection
- ESD (Electro-static discharge) protection



RPT-1

**RPT-1
RS-485 to RS-485 REPEATER**

- Variable Baud Rate 300,...9600,...115k
- Variable Data Format

1 online connection	4 online connections	Psc / Carton
---------------------	----------------------	--------------

Product Code

RS-USB2	RS-485/USB Converter	●	●	1
EMG-02	Ethernet-Modbus Gateway (up to max. 2 devices)	●	●	1
EMG-10	Ethernet-Modbus Gateway	●	●	1
EMG-12	Ethernet-Modbus Gateway	●	●	1
RPT-1	RS-485 to RS-485 Repeater	●	●	1

1) REMOTE ENERGY MONITORING OF MACHINES AND AREAS IN A MARBLE FACTORY

Thanks to the installation of Trumeter analysers and SW2 software; 24/7 monitoring of total energy consumption in every area and of every machine of the factory, significant energy savings by analysing the monitored energy values and taking countermeasures against labor losses were made possible.



PROBLEM AND OBJECTIVE

Performance and energy monitoring, 24/7 saving of these values, analysing the saved values and making improvements for different areas and machines in a factory were the main requests made by the managers of the business.

The system was installed for the purpose of correctly determining, recording and monitoring the energy consumption and operational hours in different areas and on various machines (cutting, polishing, aligning) of a marble factory.

1. MAIN TRANSFORMER ENTRY
2. PURIFICATION
3. LIGHTING
4. CUTTING 1
5. CUTTING 2
6. ST-1
7. ST-2
8. TILE SLIM
9. TRIMMING
10. AUTOMATIC SIZING
11. TILE OUT
12. ADMINISTRATIVE BUILDING
13. FINE CUTTING
14. COMPRESSOR
15. CRANE(INDOORS)
16. BRIDGE CUTTING
17. AUTOMATIC LOADING
18. PLATE SLIM
19. PORTAL CRANE(OUTDOORS)
20. LINING AND ROUGHENING
21. HORIZONTAL SPLITTING
22. DINING HALL

SOLUTION AND APPLICATION

22 MPR-53S energy analysers were connected to a new panel at the transformer output next to the existing panel, as shown in Table 1. SW2 software was installed to the computer in the technical manager's room and a connection with RS485/232 converter was established. An MPR-53S was connected to the main transformer input to monitor the total drawn power. A communication cable was then installed to a computer 100 meters away from the distribution panel.

As a result, the energy consumption was monitored by communicating with all 22 of the energy analysers.

The reporting interval for all devices was adjusted using the SW2 software. The values were stored on the computer. By using these stored values, the areas and machines of the factory with excess energy consumption were identified and improvements for energy saving were made.



Table 1: Monitored Areas with energy analysers and front panel view.

The additional benefits of the installed system (besides the energy savings) are:

- 1) A supervising engineer had to be in charge for the workers who stayed for a night shift. Thanks to the installed system the operational-hours data of the machines were made available, thus making the supervising engineer redundant. The factory manager was able to observe the operational hours of the machines by connecting to the system from his/her home. For example, he/she could see if the workers clocked out early, left for an early break, turned the machines off or were letting the machines operate with no load. Based on the observations, necessary warnings were made.
- 2) ST-1 and ST-2 machines are used to cut the large marble block to smaller pieces. They operate like a large saw. In order for this machine to cut the marble block as desired, the sawing speed of the machine should sometimes be fast and sometimes be slow. To achieve this speed variation, potentiometers on both machines were used. If the rotating saws on the machines are strained, they go off balance and the marble block doesn't get cut correctly, thus creating marble losses. The currents under normal current conditions for these cutting machines were saved using the installed system: At the start, the machine spins at a slow speed and draws 100 amperes. As the rotational saw proceeds through the marble block, the spinning speed increases. Near the end of the marble block, the rotational saws speed is at its maximum and the drawn current value reaches 150 amperes. If the operator doesn't adjust the saw speed according to the saw position and cuts the block with a constant saw speed, the cutting process is prolonged (10 m²/h for variable saw speed, 8 m²/h for constant saw speed) and the rotational saw goes off balance earlier than it should.

Using the newly installed system, the factory manager observed the instances with the wrong drawn currents that caused the saws to go off balance earlier than it should. Necessary warnings were made.

REPORTING

The desired values were stored with the standard report formatting of the SW2 software and imported to 24-hour graphs. Necessary information were printed out and archived.

CONCLUSION

With the newly installed system, measuring, observing and recording the energy consumption of purification systems, machines and the dining hall were made possible. By analysing the stored values on a day-to-day and long-term basis, the following hitches were found and necessary warnings and improvements were made.

ESTE (Large Saw) Balance Failure

When the saw on this machine went off balance, a 2 hours long work loss occurred which means a loss of 25m² of marble cutting. This amounted to \$750/year capital loss. If the failure occurred 4 times a year, the loss would increase to \$3000/year.

Thanks to the newly installed system, the machine operator knows that he/she is being monitored and operates the machine carefully. The employer can now see more clearly why the fault has occurred (due to the jamming of the saw when the marble is cut too fast) through the observation of the data.

Shift Tracking

If a worker starts 5 minutes late for his/her shift, this means;

226 working days*5 minutes of shift loss*12 months=1560 minutes=26 hours of work loss

That is to say annually a total work hour loss of 26 hours per worker occurs. This factory is capable of producing 2-containers-full of product in 26 hours and this means a \$30,000 capital loss. Thanks to the newly installed system, the worker knows that he/she is being monitored and tries very hard to follow the shift hours.

Overtime Supervising Engineer

When overtime was necessary, a supervising engineer had to be present for the workers; even if it was for 2 or 3 workers. Thanks to the newly installed system the working hours and working currents of the machines are accessible and a supervising engineer is no longer necessary. This saves the business at least \$2,000 a month.

Cost Calculation

One ESTE (Large Saw) has an apparent power of 110 kVA. It consumes approximately 80 kW/h. That means while an ESTE cuts 12.5 m² of marble in an hour, it consumes 80 kW/h energy. That amounts to a consumption cost of \$11.5/h. Thanks to the newly installed system, the energy consumption cost can be added to the marble cost and the average cost of marble can be calculated.

Efficient Use Of The Machines

Whether a machine is operated slower or faster than it should can be monitored since the current values of the machines can be monitored. According to these observations, information regarding whether the machines are operated efficiently or not can be obtained.

If the ESTE machine is operated for 7.5 hours in a shift, 80 m² of marble can be processed. If the machine is operated slower than it should, it causes 60 m² of marble being processed.

The loss of 20 m² processed marble loss amounts to 520 m² in a month and 6240 m² in a year.

2) ENERGY MONITORING AND REPORTING OF MACHINES AND DEPARTMENTS IN AN LPG CYLINDER FACTORY

Thanks to the installation of Trumeter analysers, power meters and MPR-SW software; 24/7 monitoring of total energy consumption in every area and of various machines of the factory, significant energy savings by analyzing the monitored energy values and taking necessary countermeasures were made possible.

PROBLEM AND OBJECTIVE

The main requirements that the new system would have to meet were:

- Comparison of energy consumption between production areas and other departments
- Cost analysis of each department, calculation of the energy costs per product from the assembly line
- Lowering the energy consumption after working hours (17:00 - 22:00) and monitoring the consumed energy from a PC
- Receiving regular reports at desired time intervals which are set on PC
- Energy analysis on the LV side of the transformers and surveying of $\cos\phi$, phase currents and phase voltages up to the 31th Harmonics
- Energy-surveillance at the 2 transformer and 23 usage points(Sub-measurement)
- Analyzing the power quality at the compressor, chiller, pressure, illumination and non-production departments
- Preventing the excess demand and moving the peak time to silent periods with getting the power load(kW)/time(h) graphics, detection and prevention of unnecessary power consumption.
- The new system was installed for the purpose of correctly determining, recording and monitoring the energy consumption and operational hours in different departments and on various machines(compressor, chiller, pressure) of an LPG cylinder factory and taking the necessary measures to save the excess energy.

SOLUTION AND APPLICATION

Hardware aspect of the system:

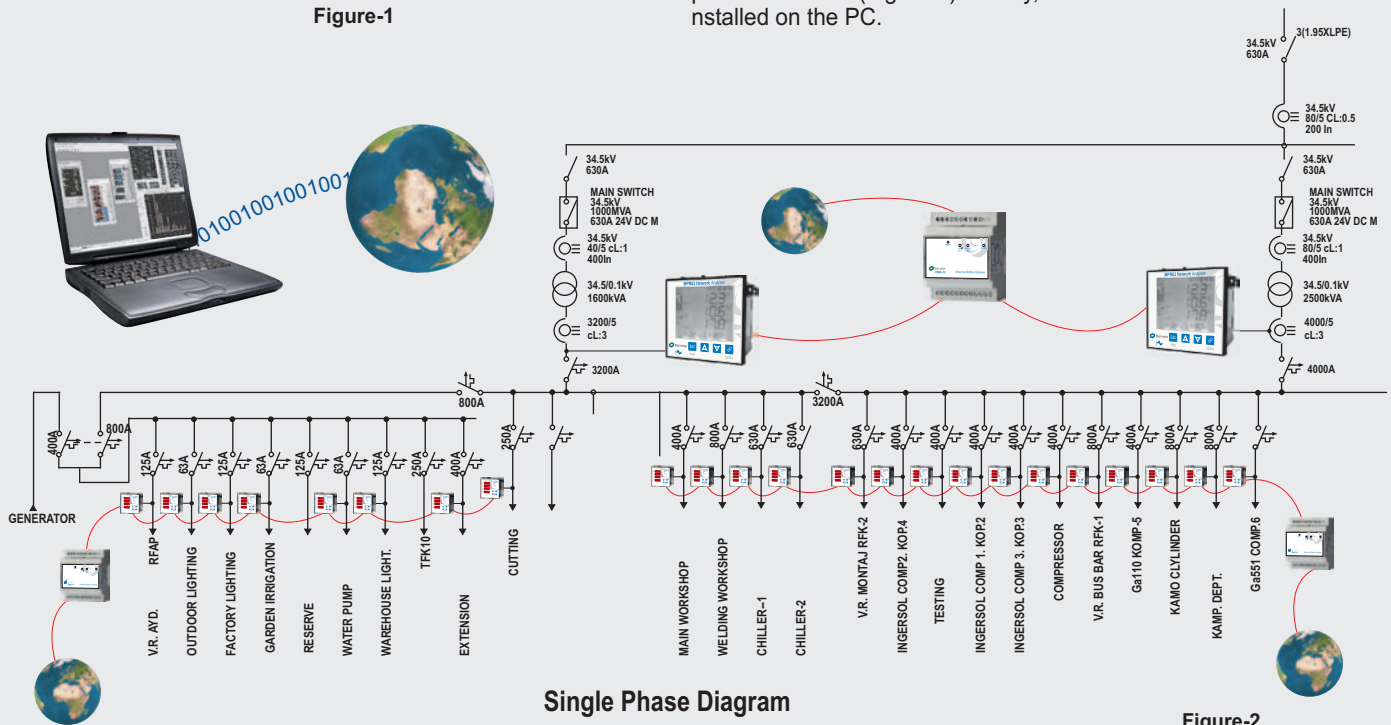
- 2 pcs MPR-63 network analysers(For measuring the phase currents, phase voltages, power factor, $\cos\phi$, frequency, active power, reactive power, apparent power, total active power, total reactive power, total apparent power, active energy, inductive reactive energy, capacitive reactive energy and harmonics values up to 31th Harmonic at the LV side of the transformers)
- 23 pcs EPR-04S power and energy measuring devices(For measuring the $\cos\phi$, active power, reactive power, apparent power, active energy, inductive reactive energy and capacitive reactive energy for each phase machine-based and department-based)
- 3 pcs EMG-12 MODBUS gateways(For enabling the communication between the devices and the PC of the factory)
- 2 pcs LV current transformers(For transforming the currents to measurable levels)

Software aspect of the system

- MPR-SW monitoring software(For monitoring and recording the electrical network parameters)
- 15 pcs EPR-04S power and energy measuring devices were linked to each other and connected to the PC network via RS-485 using an EMG-12. 2 pcs MPR-63 network analysers and 8 pcs EPR-04S power and energy measuring devices were connected using the previous method(Figure 2). Finally, the MPR-SW software was installed on the PC.



Figure-1



Single Phase Diagram

Figure-2

As a result, the energy consumption was monitored by communicating with all 23 pcs EPR-04S power and energy measuring devices and 2 pcs MPR-63 energy analysers. The reporting interval for all devices was adjusted using the MPR-SW software. The values were stored on devices and on the computer. By using these stored values, the departments and machines of the factory with excess energy consumption were identified and improvements for energy saving were made.

CONCLUSION

Lighting Consumption

A nightly unnecessary electric consumption of 100 kWh on the warehouse lighting was surveyed by MPR-SW software. It turned out that the security staff forgot to turn the lights off at nights. In order to prevent this, photoelectric sensors were installed for warehouse lighting. 3000 kWh of energy was saved per month (Figure-3)

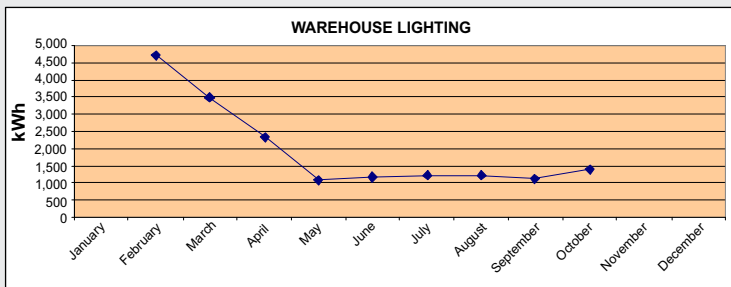


Figure-3

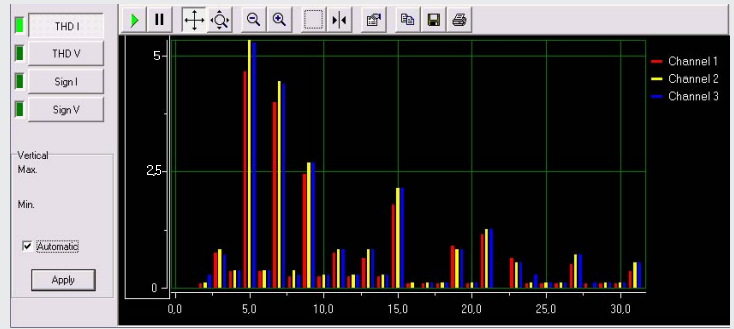
Machine Consumption

The compressors were switched on 2 hours before the start of the shift for the purpose of a warm-up. It was monitored with MPR-SW software that this warm-up process energy was causing a consumption of 280 kWh per day. To keep the compressors warm, heaters were installed. In doing so, a monthly energy saving of 7500 kWh occurred (Figure-4)

An unnecessary energy consumption at the compressor machines was monitored on the MPR-SW energy report. One of the compressors were turned off and put into service. After the repairs have been completed, an increase in production and an energy saving of 10000 kWh has been observed with the MPR-SW Software (Figure-4)

Application Project			
	February	March	April
Device No	KWh-Active	KWh-Active	KWh-Active
Warehouse Light.	4.739,80	3.488,50	2.331,20
Garden Irrigation	0	16,4	21,4
Street Light.	2.680,20	2.693,10	2.308,50
DC H 1	29.074,20	38.273,90	23.414,30
DC H 2	33.093,30	36.731,40	25.243,40
Source	49.919,70	58.361,70	38.042,00
Departments	32.339,60	29.438,80	23.230,10
Compressor 1	1.061,70	2.441,30	419,6
Compressor 2	28.111,90	30.998,30	16.543,60
Compressor 3	34.680,30	30.297,30	23.625,10
Compressor 4	16.425,60	5.305,30	28.415,80
Compressor 5	0	12.659,10	25.966,20
Compressor 6	3.116,80	8.073,90	994,5
Compressor	69.695,10	45.575,10	40.340,30
PKH	8.408,20	10.309,20	7.436,80
Chiller	17.378,90	16.091,10	15.350,20
Tank factory	45.591,10	33.150,20	28.460,50
TFK3	20.000,00	25.000,00	34.279,70
TFK7	50.000,00	40.000,00	52.923,50
LPG factory Light.	18.267,90	15.683,20	9.686,50
Regulator valve	54.130,80	56.876,10	46.697,40
Regulator valve	16.693,70	8.678,80	7.089,00
VR Light.	9.341,20	4.375,00	2.989,50
Pressure	605,4	1.030,40	870,8
Total Energy	545.355	515.548	456.680

Figure-4



The energy consumption of the departments was monitored through the MPR-SW software. Unit energy costs per product can be now calculated by dividing the total number of products with the total energy consumption of the production department (Figure 5).

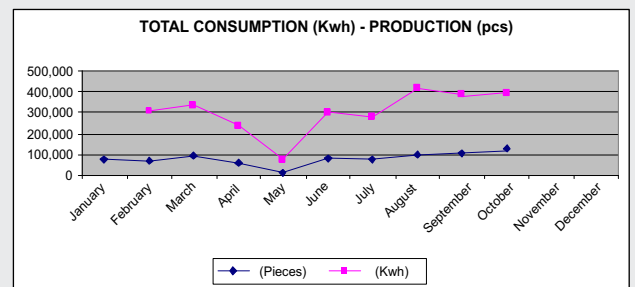


Figure-5

An energy consumption after main working hours (17:00 to 22:00) on the machines such as presses and compressors was detected through MPR-SW software and it was planned that these machines should only work at normal working hours(08:00 to 17:00). This way, the energy consumption in the more expensive time zone(17:00 to 22:00) was decreased. These energy consumption values were observed in the MPR-SW software in periodical graphical reports.

In conclusion, the company redeemed the cost of the newly installed Trumeter Energy Monitoring System in under 4 months (Figure 6 and 7).

Date	Hour	Active Energy Ind.	Energy Cap.	Energy Act.	Power L1 Act.	Power L2 Act.	Power L3	Total Active Power	Reactive Power
19 10 2009	00:00	80 819 600	4 539 300	2 299 700	14 1000	14 0400	10 1050	38 2450	
19 10 2009	00:15	80 829 200	4 539 100	2 299 700	13 7000	14 0400	8 7400	37 2900	
19 10 2009	00:30	80 837 700	4 539 200	2 299 900	13 9600	14 0250	10 0950	38 0800	
19 10 2009	00:45	80 847 800	4 539 400	2 299 000	16 1500	15 9200	8 9350	43 0050	
19 10 2009	00:48	80 849 400	4 539 400	2 299 100	16 5400	12 0200	10 0400	38 6100	
19 10 2009	01:00	80 856 300	4 539 500	2 299 200	16 7900	16 2050	10 2500	38 8050	
19 10 2009	01:15	80 867 000	4 539 700	2 299 300	17 3700	17 0000	16 1550	53 0000	
19 10 2009	01:30	80 879 700	4 539 000	2 299 400	12 7900	22 6850	14 7550	55 7150	
19 10 2009	01:45	80 891 200	4 539 200	2 299 500	11 9150	19 0650	13 3900	51 2250	
19 10 2009	02:00	80 902 500	4 539 500	2 299 600	14 1300	14 1450	19 3600	47 6550	
19 10 2009	02:15	80 913 200	4 539 800	2 299 700	12 9200	15 9350	13 9250	42 7950	
19 10 2009	02:30	80 924 000	4 531 200	2 299 800	11 6400	22 7550	14 3050	53 4400	
19 10 2009	02:50	80 940 300	4 531 500	2 299 900	20 2100	12 6600	17 3500	50 2200	
19 10 2009	03:00	80 947 600	4 531 800	2 300 000	16 6900	15 4700	14 1500	49 5100	
19 10 2009	03:15	80 959 700	4 532 200	2 300 000	16 2750	19 1700	16 9250	52 3750	
19 10 2009	03:30	80 972 700	4 532 700	2 300 200	20 1100	19 9400	15 9950	56 0600	
19 10 2009	03:45	80 985 200	4 533 100	2 300 200	18 3400	16 1350	14 0250	48 5100	
19 10 2009	04:00	80							
19 10 2009	04:15	81							
19 10 2009	04:30	81							
19 10 2009	04:45	81							
19 10 2009	05:00	81							
19 10 2009	05:15	81							
19 10 2009	05:30	81							
19 10 2009	05:45	81							
19 10 2009	06:00	81							
19 10 2009	06:15	81							
19 10 2009	06:30	81							
19 10 2009	06:45	81							
19 10 2009	07:00	81							
19 10 2009	07:15	81							

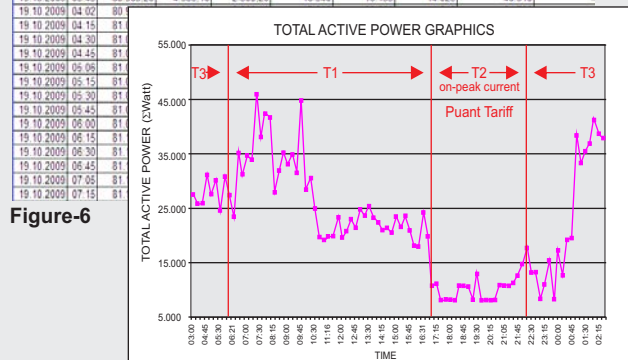
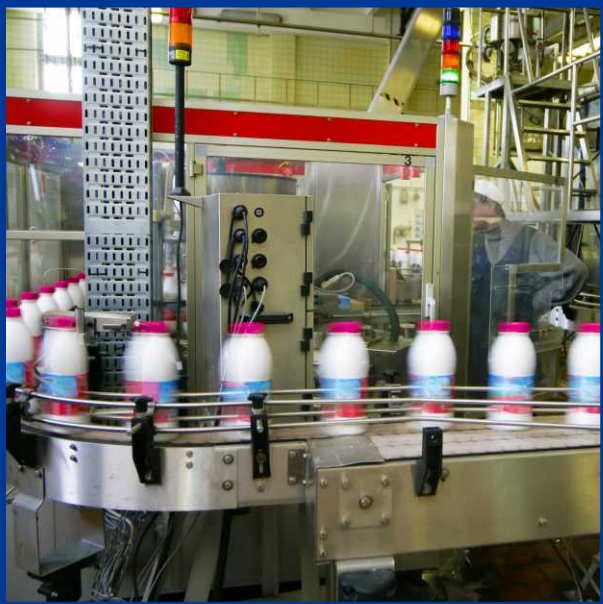
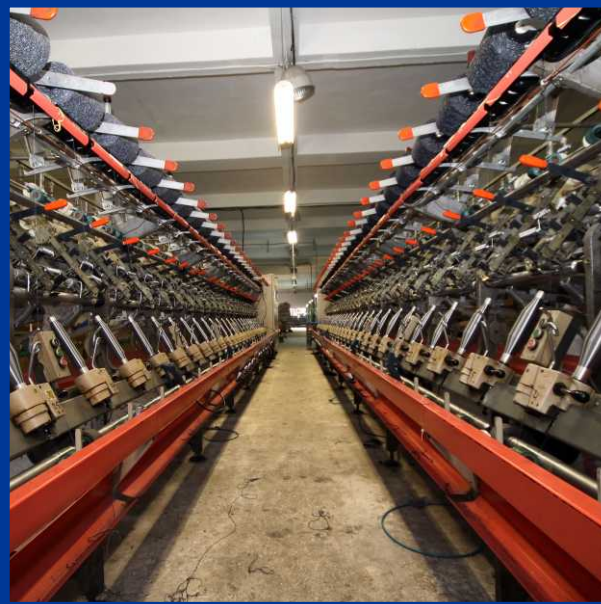


Figure-6

Figure-7



Protection & Control



Phase Failure Relays

MKS Series

MKC Series

Thermistor Relays

PT-01

Phase Sequence Relays

FR-02

Current Monitoring Relays

AKC Series

Voltage Monitoring Relays

DGRC-01

GKRC Series

MCC Series

Liquid Level Controller

SSRC-04

LLS Series

Time Relays

ERTC-01

MCB Series

DG Series

SSR-2x

SER-YU

Astronomic Time Relays

DTR-10 Series

DTR-14

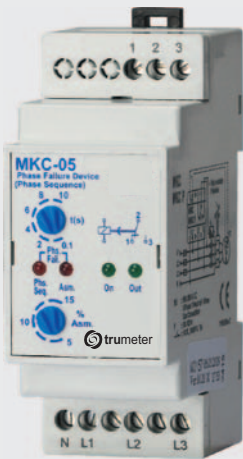
DTR-20

Digital Time Relay

MCB-50 Serisi

Overcurrent Protection Relays

CKR Series



MKC-05



MKC-06



MKC-20



MKS-03

General

One of the common faults faced in industrial plants is overheating and damaging of 3 phase motors due to phase failure. "Thermal-magnetic relay" which is an essential element in motor protection is generally too slow due to both its electromechanical structure and the use of high current setting range, to assure demurrage without tripping.

Product Code

Product Code		Phase Failure Relay	Phase Seq. Failure	PTC protection	Fixed Asymmetry	Adjustable Asymmetry	Without Neutral	1 C/O Contact	1 N/O Contact	DIN1 Rail Mount	DIN2 Rail Mount	pcs / carton
MKC-01	Phase Failure Relay	●			●			●			●	10
MKS-01	Phase Failure Relay	●			●				●	●		24
MKC-03	Phase Failure Relay	●	●		●			●			●	10
MKS-03	Phase Failure Relay	●	●		●				●	●		24
MKC-04	Phase Failure Relay	●	●		●		●	●			●	10
MKC-05	Phase Failure Relay	●	●			●		●			●	10
MKC-05P	Phase Failure Relay (with PTC)	●	●	●		●		●			●	10
MKC-06	Phase Failure Relay	●	●			●	●	●			●	10
MKC-06P	Phase Failure Relay (with PTC)	●	●	●		●	●	●			●	10
PTC-3	Triple Thermistor Group											50
MKC-20		●	●			●		●		●		10

Protection Features

1. Phase Failure

When the monitored 3 phase voltages are valid, the output relay is ON (i.e., activated) and if any of 3 phases fails, the output device switches OFF immediately.

2. Phase Sequence

When the phase sequence is correct (L1, L2, L3 in clockwise direction) the output relay is ON (i.e., activated); however, if the sequence is altered by any reason, the output relay switches OFF immediately.

3. PTC Protection

If coil temperature in motors exceed T_c , the limit temperature of PTC (please see PTC-3 below), the output relay switches off immediately.

4. Fixed Voltage Unbalance

When the neutral-phase voltage unbalance is greater than a fixed value (of 20% or 40%), the output relay is switched OFF within 0,2 seconds.

5. Adjustable Voltage Unbalance

When the phase-phase voltage unbalance is less than the user adjusted value, output relay is activated (ON).
If the unbalance value exceeds the user set limit value (5% - 15%), output relay is switched OFF at the end of user set delay time (0,1 ... 10s).
If the fault disappears within the delay time, the output relay doesn't switch OFF and motor continues to normal operation.
In addition to these features, MKC-05P relays are switched on if the R-phase voltage exceeds 178 V AC. Their phase sequence and asymmetry LEDs flash simultaneously.

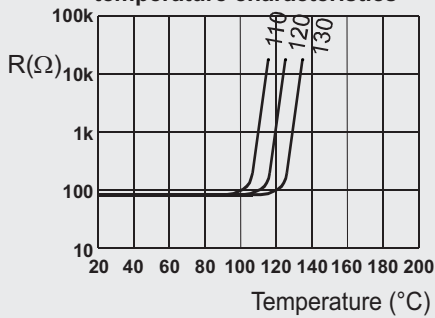
- Ambient Operating Temperature : -5°C, +50°C
- Non-flammable enclosure
- Rail-mounted or surface mounted with clips
- Protection Degree : IP20
- IEC 60255-3, IEC 60255-6, IEC 60870-5, IEC 60529

PHASE FAILURE RELAYS

MKS - MKC Series

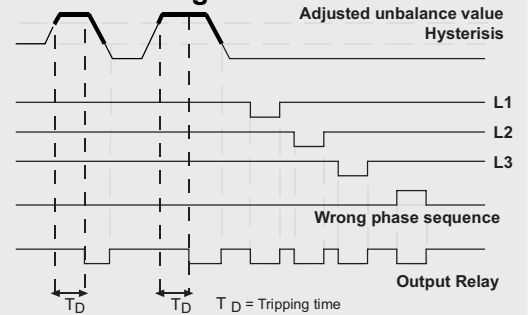
MODEL	MKS-01	MKS-03	MKC-01	MKC-03	MKC-04	MKC-05	MKC-05P	MKC-06	MKC-06P	MKC-20
SPECIFICATIONS										
HOUSING										
Dimensions	PK22					PK25			PK22 Din 1	
Weight	0,1kg/device; One package 24 pcs.				0,3kg/device; One package 10 pcs.				0,1kg/device; One package 10 pcs.	
MEASUREMENTS										
Voltage Unbalance	%20 fixed	%40 fixed				5%-15%adjustable			%5-%25 adjustable	
SUPPLY										
Operating Voltage	230VAC				400VAC	230VAC		400VAC		230VAC
Operating Frequency	50/60 Hz									
Operating Range	±20%Un				±10%Un				±%30Un	
OUTPUT										
Contact Output	1N/O,8A,2000VA				1C/O,8A,2000VA				1C/O 5A,1250VA	
Delay Time	0,2 sec.fixed				0,1-10sec.adjustable				0,1-20sec.adjustable	
AMBIENT CONDITIONS										
Ambient Temperature/ Humidity	-5;+55°C / %90									
Overvoltage Category	III									
CONNECTIONS										
Installation	Rail mount									
Connection Types	3 Phase+Neutral				3 Phase	3 Phase+Neutral		3 Phase		3 Phase+Neutral

Figure for typical resistance of PTC vs temperature characteristics

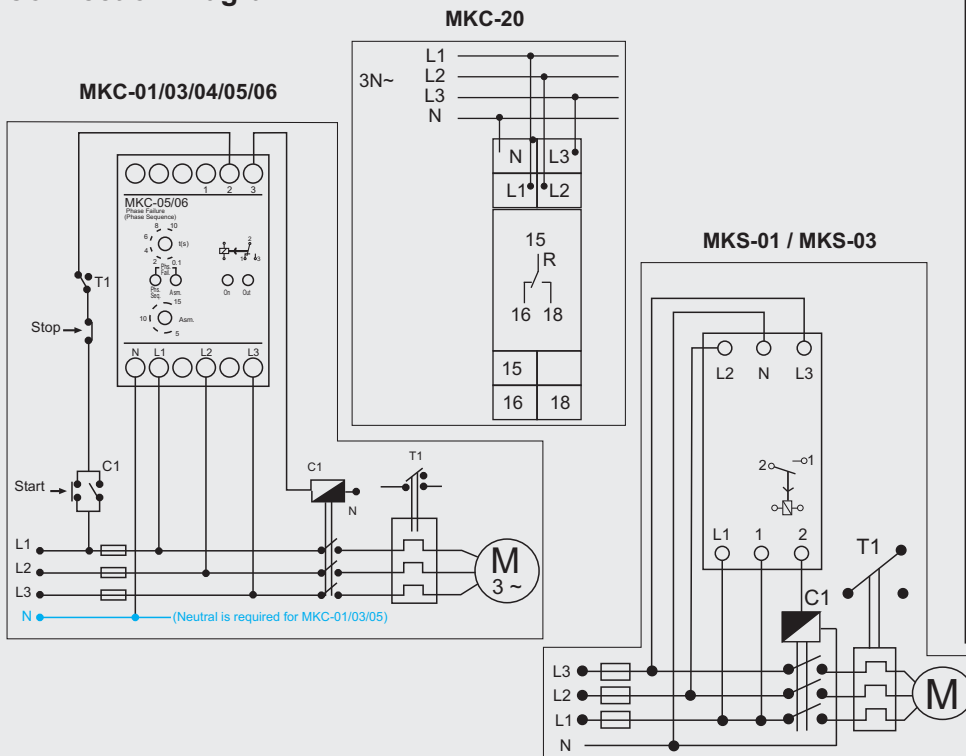


PTC-3 (110°C) Thermistance

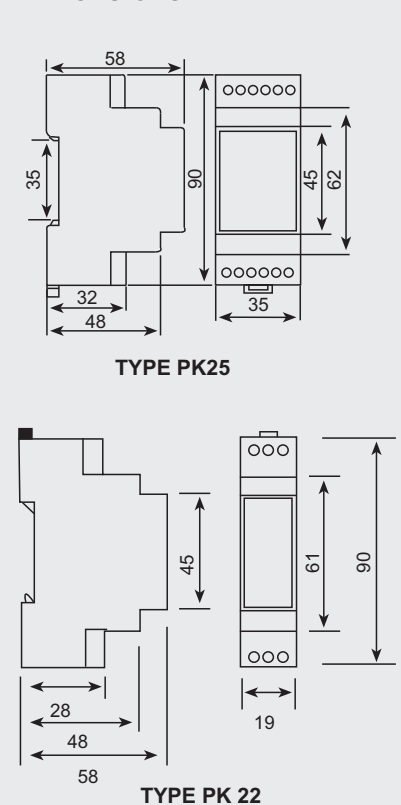
Function Diagram



Connection Diagram



Dimensions





PT-01

**FR-02
General**

FR-02 is an electronic relay, which monitors the L1,L2,L3 phase sequence. FR-02 Phase Sequence Relay is developed to check the phase sequence. If the input R, S and T phases are in correct phase sequence, the light on the front panel turns ON and the output relay switches ON. When the phase sequence is wrong, the light turns OFF and output relay switches OFF. FR-02 phase relay is used in pumping systems, air compressors and elevators. FR-02 is suggested to be used in such systems where, reverse rotation of motors can cause damage to people or systems.



FR-02

**PT-01
General**

PT-01 is an electronic relay, which monitors the motor temperature. PT-01 Thermistor Relay is developed for PTC protection. When the coil temperature of motor exceeds Tc -the limit temperature of PTC- then the output relay switches OFF immediately.

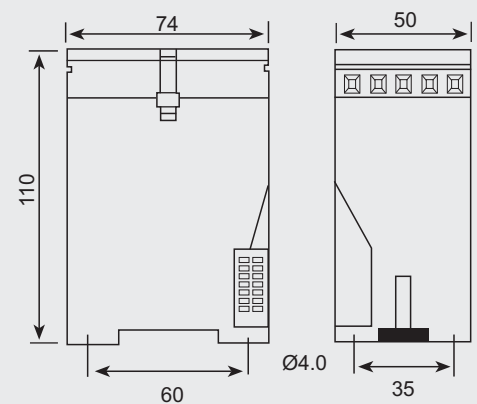
Please see the below graph for typical resistance of PTC temperature characteristics for 3 different switching temperatures (110°C, 120°C, 130°C) normally. As seen from the figure, when $T < T_c - 5^\circ\text{C}$, the PTC resistance is smaller than 100 Ω and when $T > T_c + 5^\circ\text{C}$, PTC resistance is greater than 10 kΩ.

COMMON SPECIFICATIONS

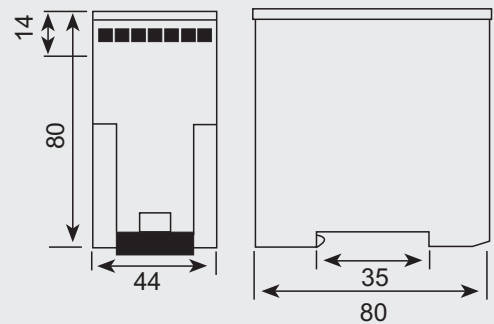
Operating Voltage (Un)	230 V AC; 50/60 Hz
Operating Range	(0,9-1,1) x Un
Network Type	3-phase / 4-wire (FR-02) 1-phase / 2-wire (PT-01)
Output contact	1 C/O contact, 8 A, 2000 VA
Degree of Protection	IP 20
Ambient Temperature	-5°C to +50°C
Dimensions	PK10 (FR-02, PT-01)
Installation	Surface mounted
Weight / each	0,3 kg
Quantity in 1 package	10 pcs



Dimensions



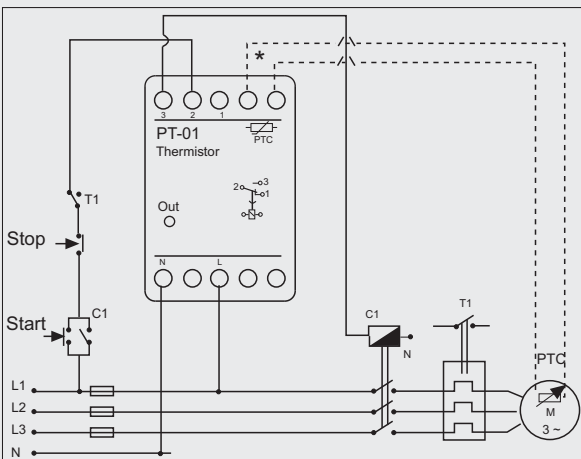
TYPE PK 10



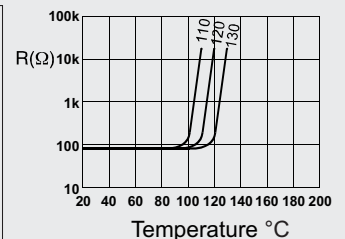
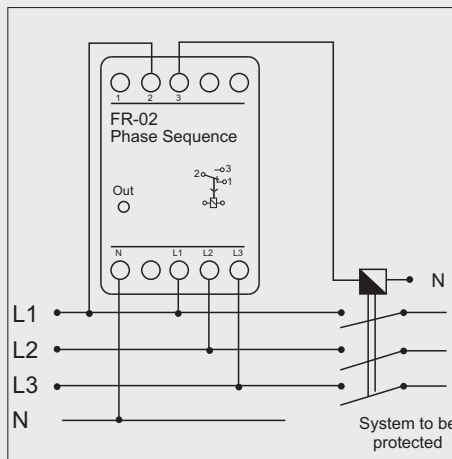
TYPE PK 21

Connection Diagram

PT-01



FR-02



Connection diagrams are given for reference. Please always check the latest user manual given with product or download from www.entes.com.tr.



AKC-01D



AKC-03D

General

AKC Series "Current Monitoring Relays" measure the current of motor or protected systems and turn Off it when measured current is above / below the adjusted level.

Over Current Protection	Under Current Protection	.../5A	CT-25	pcs / carton
-------------------------	--------------------------	--------	-------	--------------

Product Code

AKC-01A	Over Current Protection (1-10000/5A or 0,5-5A Direct)	●			10
AKC-01D	Under Current Protection (1-10000/5A veya 0,5-5A Direct)		●		10
AKC-03A	Over Current Protection (Between 1,5 and 60A with CT-25) (CT-25 included)	●		●	10
AKC-03D	Under Current Protection (Between 1,5 and 60A with CT-25) (CT-25 included)		●	●	10

Operating Principles

AKC Series:

When the current value is within the preset limits, the output relay switches on.

When the current is out of these limits, the output relay switches - Off after an adjustable tripping time delay.

(Please see the following figures).

AKC-01A, AKC-01D, AKC-03A, AKC-03D provides 2 protection functions:

1. Over Current : Measures the current of motor and protected systems. When this current is above the adjusted level, the output relay switches Off within adjustable tripping delay (0,5-2,5 sec) **by turning** Off motor or protected system.

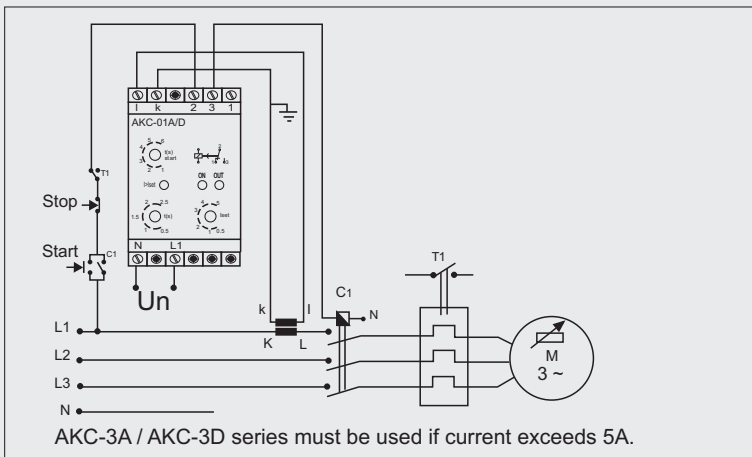
2. Under Current: If the current falls to zero, device resets itself and returns to normal state.

- Non-flammable enclosure
- Rail-mounted or surface mounted with clips
- Protection Degree : IP20
- Ambient Operating Temperature : -5°C, +55°C
- IEC 61010-1, IEC61000-4, IEC61000-6

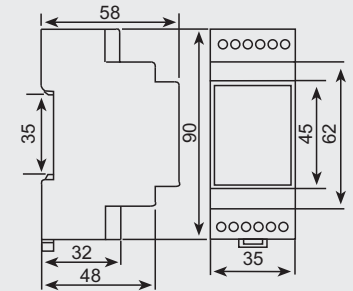
MODELS	AKC-01A	AKC-01D	AKC-03A	AKC-03D
SPECIFICATIONS				
Electrical Parameters				
Operating Voltage (Un)	230 V AC, ±10%; 50/60 Hz			
Current Adjustment Interval	0,5 - 5A (AC)	6 - 60 A with 1 turn 3 - 30 A with 2 turns 2 - 20 A with 3 turns 1,5 - 15 A with 4 turns		
Current Transformer Ratio	.../5A	With CT-25		
Voltage Unbalance	-			
Start-up Delay	1 - 6 sec.			
Tripping Delay	0,5 - 2,5 sec.			
Output Contact	1 C/O with 8 A, 2000 VA			
Mechanical Parameters				
Dimensions	DIN II, PK25			
Weight / each	0,25 kg			
Quantity in 1 package	24 pcs			

Connection Diagram

AKC-01A/AKC-01D

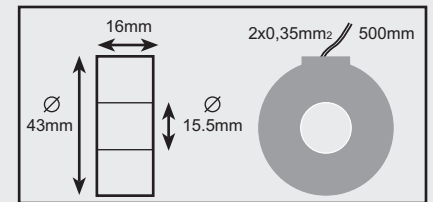
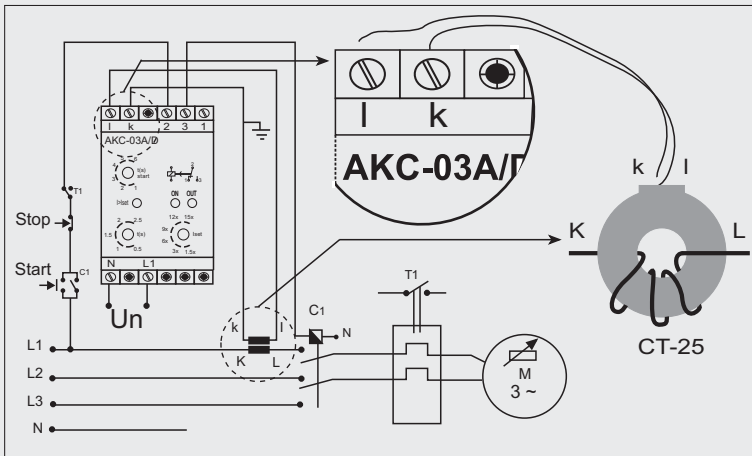


Dimensions



TYPE PK25

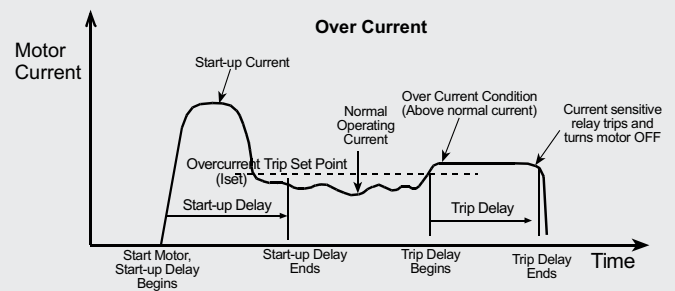
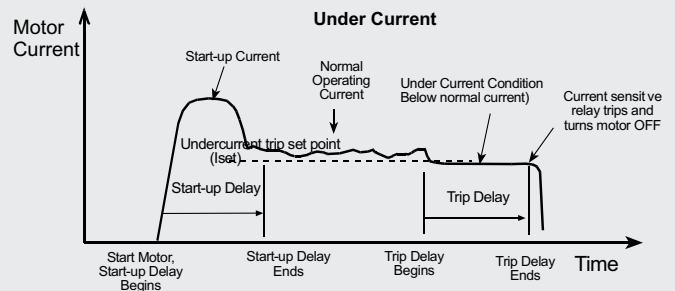
AKC-03A/AKC-03D



CT-25

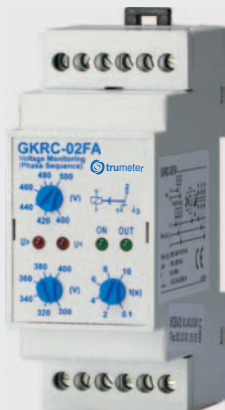


Please check page 43 for further information about CT-25.



Connection diagrams are given for reference. Please always check the latest user manual given with product or download from www.entes.com.tr.

GKR / DGRC / MCC Series (Under / Over Voltage)



GKRC-02FA



GKRC-20F



MCC-3D



General

GKRC type over and under / over voltage monitoring relays are designed to protect single phase or three phase systems from voltage variations and phase sequence failure.

Note: These relays include the feature of switching OFF immediately if any of the phases exceeds (or reduces from) the nominal voltage by 50%.

DGRC type under voltage monitoring relays are designed to protect single phase or three phase systems from lasting under voltage variations.

- Non-flammable enclosure
- Rail-mounted or surface mounted with clips
- Protection Degree: IP20
- Ambient Operating Temperature : -5°C, +50°C
- IEC 60255-3, IEC 60255-6, IEC 60870-5, IEC 60529

Product Code

		3-Phase	Single-phase	Over Voltage	Under Voltage	Phase Seq. Failure	Delay-On	Delay-Off	Without Neutral	Auxiliary Supply	DIN 2 Rail Mount	DIN 1 Rail Mount	pcs / carton
DGRC-01													10
GKRC-01													10
GKRC-02													10
GKRC-02F													10
GKRC-02FA													10
GKRC-03													10
GKRC-03F													10
GKRC-M2													10
MCC-1D	5-15 min. Delay-Off												24
MCC-3D	5-15 min. Delay-Off												24
GKRC-20F													10

Operating Principle

The relay is directly connected to the network and the required under / over voltage limit is adjustable by knobs.

When the monitored voltages of all 3-phase are within the preset limits, then the output relay switches ON. Faulty tripping operations effected

from instantaneous voltage peaks are prevented with the adjustable delayed tripping between 0,1 and 10 seconds. If any of the monitored phase voltage exceeds the set value, delay time starts to count. If any of the phase voltages exceed 1,5xUn, the relay switches OFF without

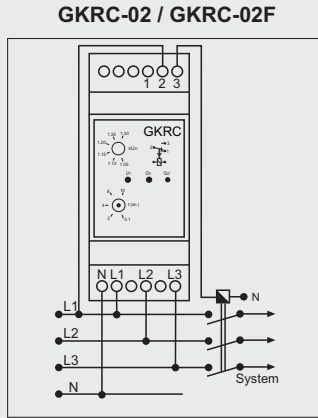
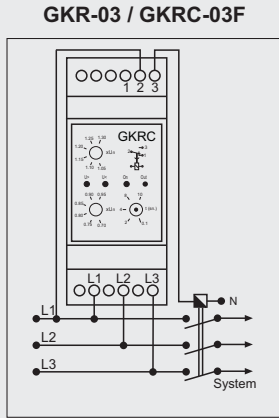
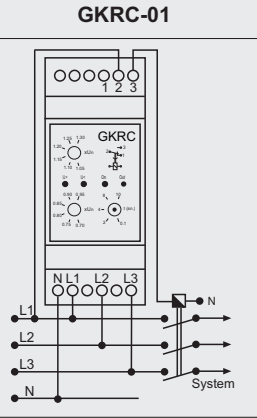
delay (within less than 500msec.). If any of the phase voltages falls below 0,5xUn, the relay switches OFF without delay (within less than 500 msec.) If the voltage value returns within preset limits before the end of counting time, the delay time ends and relay continues to its normal operation.

MODELS	GKRC-02	GKRC-02F	GKRC-20F	GKRC-02FA	GKRC-03	GKRC-03F	GKRC-M2	DGRC-01	MCC-1D	MCC-3D
SPECIFICATIONS										
Electrical Parameters										
Operating Voltage (Un)	230 V AC, ±10%	230 V AC, ±30%	400 V AC, ±30%	400 V AC, ±10%	230 V AC, ±10%					
Operating Frequency	50/60 Hz									
Network Type	3-phase / 4 wire (Star)	1-phase / 2 wire 3-phase / 4 wire (Star)	3-phase / 3 wire (Delta)	1phase / 2 wire	3-phase / 4 wire (Star)	1 phase / 2 wire	3-phase / 4 wire (Star)			
Under Voltage Adj. Interval	(0,70-0,95)xUn	(0,70-1,20)xUn	(0,70-0,95)xUn	(0,70-0,95)xUn	(0,70-0,95)xUn					
Over Voltage Adj. Interval	(1,05-1,30)xUn	(0,80-1,30)xUn	(1,05-1,30)xUn							
Instant Tripping	≤ 0,5xUn ≥ 1,5xUn	-	≤ 0,5xUn ≥ 1,5xUn	≤ 0,5xUn ≥ 1,5xUn	≤ 0,5xUn		168 V AC			
Instant Tripping Time	< 500 msec									
Hysteresis	3%									
Output Contact	1 C/O, 8 A, 2000 VA (cosφ = 1)							1 N/O, 8 A, 2000 VA (cosφ = 1)		
Mechanical Parameters										
Dimensions	PK25	PK22 (DIN1)	PK25				PK22 (DIN I)			
Weight / each	0,25 kg	0,1 kg	0,25 kg				0,1 kg			
Quantity in 1 package	24 pcs									

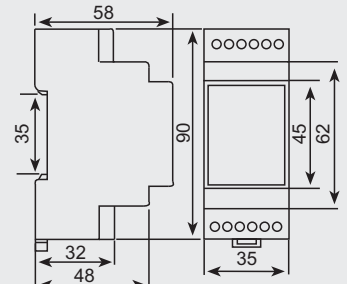
VOLTAGE MONITORING RELAYS

GKR / DGRC / MCC Series (Under / Over Voltage)

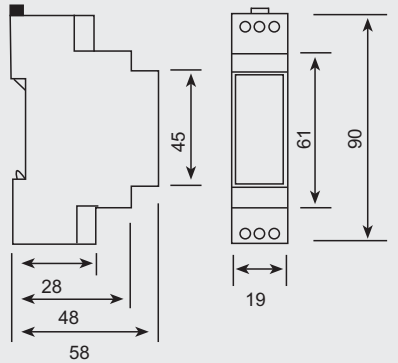
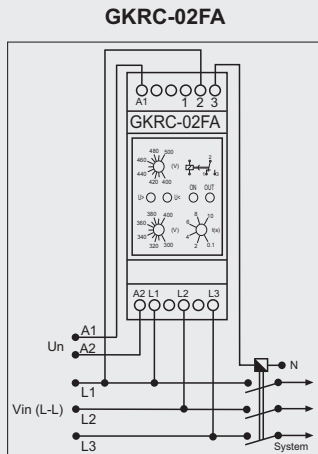
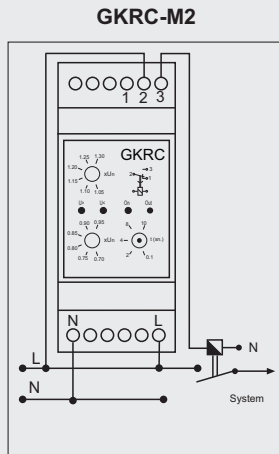
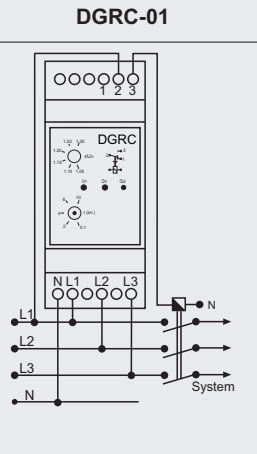
Connection Diagram



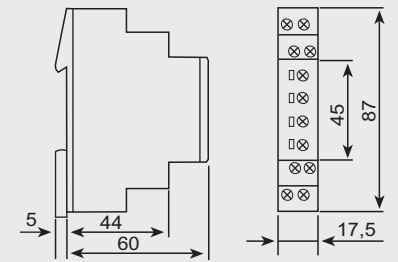
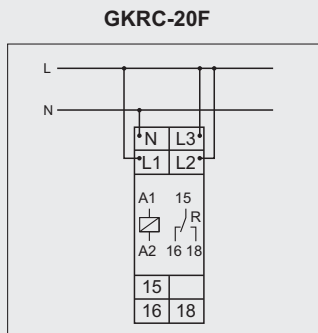
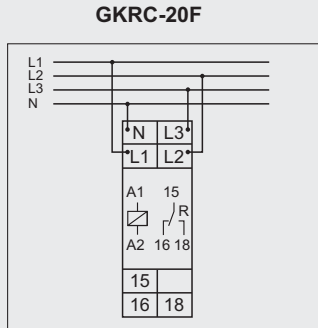
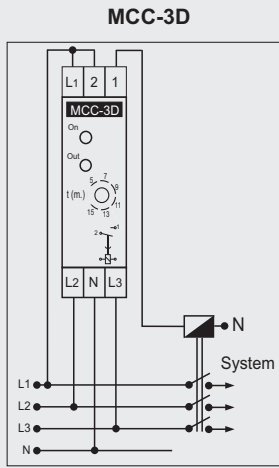
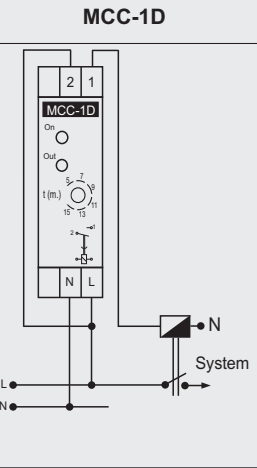
Dimensions



TYPE PK25

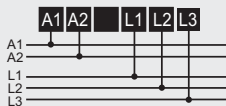


TYPE PK 22



TYPE PK 27

Auxiliary Supply Connection Diagram (For only GKRC-02FA)



Utilization with Single-Phase and Two-Phase Systems
(For only GKR-01/02, GKRC-01/02, DGR-01, DGRC-01)

See following connection diagrams for both cases:



Two Phase Connection Diagram

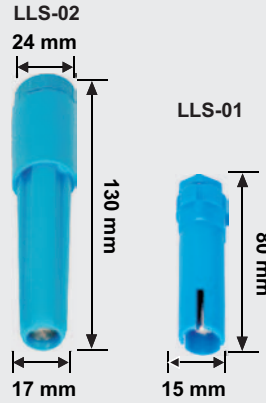


Single Phase Connection Diagram

Connection diagrams are given for reference. Please always check the latest user manual given with product or download from www.entec.com.tr.



SSRC-04



NOTE: Liquid Level Electrodes can not be used with flammable liquids.

General

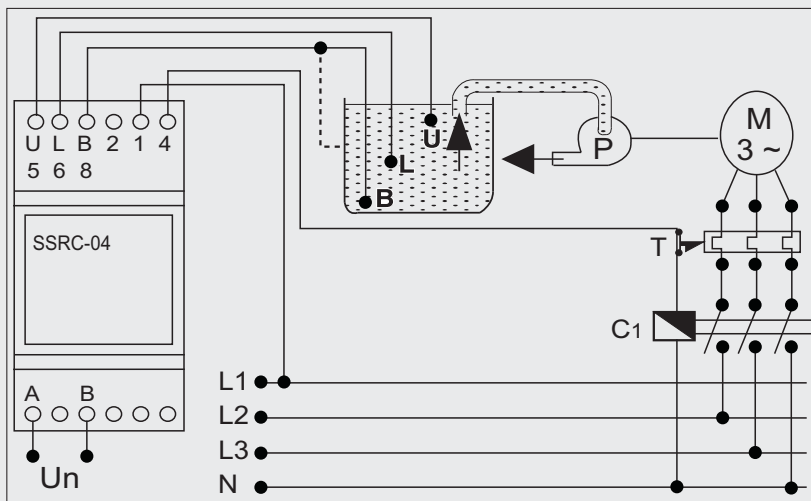
SSRC-04 is used for the level and discharge control of conductive liquids in tanks located in industrial plants and domestic applications.

Single Tank	5-50 kΩ Adjustable	Small Electrode	Large Electrode	Pcs / Carton
-------------	--------------------	-----------------	-----------------	--------------

Product Code

SSRC-04	Liquid Level Cotroller				10
LLS-01	Liquid Level Electrode				100
LLS-02	Liquid Level Electrode				100

MODEL	SSRC-04
SPECIFICATIONS	
Electrical Parameters	
Operating Voltage (U _n)	230 V AC ±10% ; 50/60 Hz
Operating Range	(0,9 - 1,1) x U _n
Sensitivity	5 - 50 kΩ (adjustable)
Warning Light	LED on front panel
Output Contacts	1 C/O, 8 A, 2000 VA
Mechanical Parameters	
Ambient Operating Temperature	-5°C, +50°C
Degree of Protection	IP20
Dimensions	PK25
Weight / each	0,25 kg
Quantity in 1 package	24 pcs



Operating Principle

The output relay switches ON when the liquid reaches the upper level electrode U (terminal 5).

The output relay switches OFF when the lower level electrode is no longer in contact with the liquid (in order to prevent the system to work with empty containers).

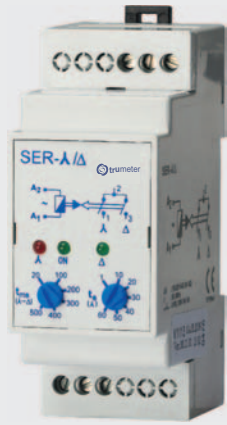
Base electrode B (terminal 8) has to be connected to the container in order to determine the bottom level. If the container is made of a non-conductive material, an additional electrode, connected to terminal 8, must be used.

The sensitivity (i.e., impedance between electrodes) can be adjusted to 5-50 kΩ for different liquids by means of the knob on the front panel. The LED on the front panel lights when the relay is ON position.

Connection diagrams are given for reference. Please always check the latest user manual given with product or download from www.entes.com.tr.

TIME RELAYS

MCB / SER / ERT / SSR / MT-ST Series



SER-Y/U



DG-60



MCB-20



ERTC-01



Product Code

ON Delay (Er)	OFF Delay (Em-1)	Single shot leading edge voltage controlled (Em-2)	OFF Delay with Control Input (R)	ON Delay with Control Input (Es)	Single shot leading edge with control input (Ts)	Single shot trailing edge with control input (Ta)	Symmetric Flasher (Ef)	Control Input	ON Flasher	OFF Flasher	Down-timer	Star-Delta	Left-Right	No Voltage, Delayed Impulse	24 VAC / DC	230 VAC	12-240 VAC / DC	24-240 VAC / DC
---------------	------------------	--	----------------------------------	----------------------------------	--	---	------------------------	---------------	------------	-------------	------------	------------	------------	-----------------------------	-------------	---------	-----------------	-----------------

Product Code	Description	Range	Er	Em-1	Em-2	R	Es	Ts	Ta	Ef	Control Input	ON Flasher	OFF Flasher	Down-timer	Star-Delta	Left-Right	No Voltage, Delayed Impulse	24 VAC / DC	230 VAC	12-240 VAC / DC	24-240 VAC / DC
ERTC-01	Multi-function T. Relay	1sec - 100h	●	●							●	●	●					●	●		
MCB-7	Time Relay	0,1sec - 60 h	●															●	●		
MCB-8	Time Relay	0,1sec - 30 h	●	●														●	●		
MCB-9	Time Relay	0,1sec - 30 h	●	●							●	●						●	●		
MCB-15	Multi-function T. Relay	0,05sec-100 h	●		●	●				●	●										●
MCB-20	Multi-function T. Relay	0,05sec-100 h	●		●	●	●	●	●	●	●										●
MCB-30	Time Relay	2-30sec	●															●	●		
MCB-60	Time Relay	4-60sec	●															●	●		
SER-YU	λ / U Relay (λ/U) 20-500msec. (λ) 1-60sec.														●			●	●		
SSR-2X	Left-Right Relay	1sec - 60 h														●				●	
DG-06	Time Relay	0,1 - 6sec															●			●	
DG-10	Time Relay	0,6 - 10 mins															●			●	
DG-60	Time Relay	1sec - 60 mins															●			●	

MODELS	MCB-7	MCB-8	MCB-9	MCB-15	MCB-20	MCB-30	MCB-60	SSR-2X	ERTC-01	SER-Y/U	DG-06	DG-10	DG-60	
SPECIFICATIONS														
Electrical Parameters														
Operating Voltage (Un)	230 V AC & 24 V AC / DC			pls.refer to table above			230 V AC & 24 V AC / DC		230 V AC					
Operating Range	Un±20% (for AC) ; Un±10% (for DC)													
Network Type	Single - phase / 2 wires													
Power Consumption	< 8 VA		< 4 VA		< 8 VA			< 3 VA		< 8 VA		< 3 VA		
Repetition Error	±0.1%		±5 msec.			±0.1%								
Reset Time	≤150 msec.		=100 msec.		≤200 msec.		≤100 msec.		≤80 msec.		≤120 msec.		-	
Connection Type	A (Terminal)							C	(Terminal)		E	A		
Output Contact	1 C/O; 8 A, 2000 VA, cosφ=1							2 C/O; 8A,2000VA, cosφ=1		1 C/O; 8A,2000VA, cosφ=1	2 NO; 5A,1250VA		1 C/O; 8A,2000VA	1 C/O; 16A,4000VA
Mechanical Parameters														
Degree of Protection	IP20			IP40			IP20		IP40 (front panel)	IP20				
Dimensions	PK22		PK27			PK22		PK15	PK20	PK25	PK10	PK25		
Weight / each	0,1 kg		0,1 kg			0,1 kg		0,3 kg	0,1 kg	0,25 kg	0,3 kg			
Quantity in 1 package	24 pcs		10 pcs			24 pcs		16 pcs	24 pcs	10 pcs	24 pcs			

Functions of MCB-15 and MCB-20

ON Delay (Er) [MCB-15 & MCB-20]

When the supply voltage U is applied, the set interval t begins (green LED U/t flashes). After the interval t has expired (green LED U/t illuminated) the output relay R switches into on-position (yellow LED illuminated). This status remains until the supply voltage is interrupted. If the supply voltage is interrupted before the expiry of the interval t, the interval already expired is erased and restarted when the supply voltage is next applied.



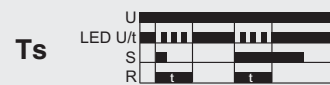
OFF Delay with control input (R) [MCB-15 & MCB-20]

The supply voltage U must be constantly applied to the device (green LED U/t illuminated). When the control contact S is closed, the output relay R switches into on-position (yellow LED illuminated). If the control contact is opened, the set interval t begins (green LED flashes). After the interval t has expired (green LED U/t illuminated) the output relay switches into off-position (yellow LED not illuminated). If the control contact is closed again before the interval t has expired, the interval already expired is erased and restarted at the the next opening of control contact S.



Single shot leading edge with control input (Ts) [MCB-20]

The supply voltage U must be constantly applied to the device (green LED U/t illuminated). When the control contact S is closed, the output relay R switches into on-position (green LED U/t illuminated) and the set interval t begins (green LED U/t flashes). After the interval t has expired (green LED U/t illuminated) the output relay switches into off-position (yellow LED not illuminated). During the interval, the control contact can be operated any number of times. A further cycle can only be started when the cycle run has been completed.



Single shot trailing edge with control input (Ta) [MCB-20]

The supply voltage U must be constantly applied to the device (green LED U/t illuminated). Closing the control contact S has no influence on the condition of the output R. When the control contact is opened, the output relay switches into on-position (yellow LED illuminated) and the set interval t begins (green LED U/t flashes). After the interval t has expired (green LED U/t illuminated), the output relay switches into off-position (yellow LED not illuminated). During the interval, the control contact can be operated any number of times. A further cycle can only be started when the cycle run has been completed.



ON delay with control input (Es) [MCB-20]

The supply voltage U must be constantly applied to the device (green LED U/t illuminated). When the control contact S is closed, the set interval t begins (green LED U/t flashes). After the interval t has expired (green LED U/t illuminated) the output relay R switches into on-position (yellow LED illuminated). This status remains until the control contact is opened again. If the control contact is opened before the interval t has expired, the interval already expired is erased and restarted with the next cycle.



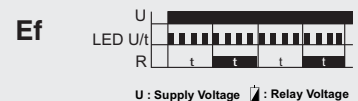
Single shot leading edge voltage controlled (Em-2) [MCB-15 & MCB-20]

When the supply voltage U is applied, the output relay R switches into on-position (yellow LED illuminated) and the set interval t begins (green LED U/t flashes). After the interval t has expired (green LED U/t illuminated) the output relay switches into off-position (yellow LED not illuminated). This status remains until the supply voltage is interrupted. If the supply voltage is interrupted before the interval t has expired, the output relay switches into off-position immediately. The interval already expired is erased and restarted when the supply voltage is next applied.



Flash (Ef) [MCB-15 & MCB-20]

When the supply voltage U is applied, the set interval t begins (green LED U/t flashes). After the interval t has expired, the output relay R switches into on-position (yellow LED illuminated) and the set interval t begins again. After the interval t has expired, the output relay switches into off-position (yellow LED not illuminated). The output relay is triggered at a ratio of 1:1 until the supply voltage is interrupted.

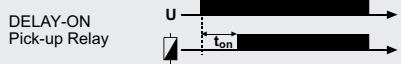


U : Supply Voltage : Relay Voltage

Common Functions of SM-9; MCB-7/8/9; ERTC-01

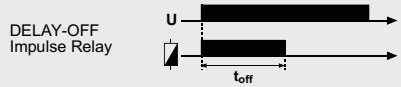
On Delay (Er)

In the On Delay mode, after the device is energized, the timer starts to count up and when it reaches the adjusted time, the relay is energized.



Off Delay (Em-1)

In the Off Delay mode, after the device is energized and with start input, the relay is energized and becomes de-energized at the end of the time adjusted by the user.

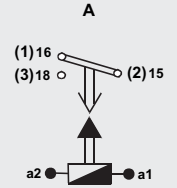
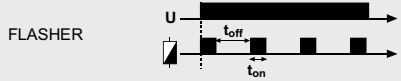


Down Timer

In the Down Timer mode, after the device is energized, the down counter starts to count down from the time adjusted by the user and when it reaches zero, the relay is energized.

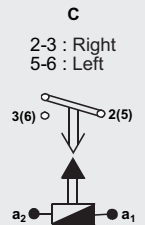
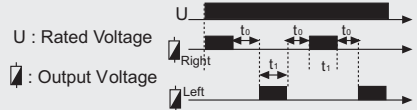
Flasher

In the Flasher mode, after the device is energized, when tOFF time ends the relay is energized and becomes de-energized at the end of the delay. The starting mode of the flasher mode can be chosen as ON or OFF mode. In the OFF mode flasher starts with tOFF and energized after the tOFF value, then continues to tOn mode. In the On mode flasher starts with tOn and deenergized after the tOn value, then continues to tOFF mode. The Flasher function is continuously repetitive.



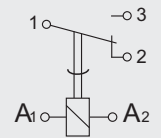
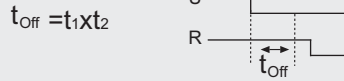
Functions of SSR-2x

When the line voltage is applied, the right output relay starts to work as "switching ON" and the left output relay as "switching OFF". At the end of "t₁" time both of two output relays switch OFF and this condition is kept for "t₀" times. At the end of this period, the left output relay "switches OFF" and the right output relay "switches ON" and also this situation is kept during "t₁" time.



Functions of DG-06 / DG-10 / DG-60

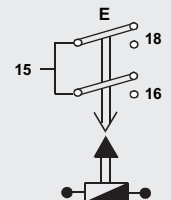
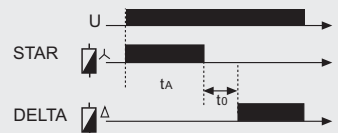
When the supply voltage is off, relay stays energized during adjusted t_{off} time (0.6 sec. - 10 min. for DG-10, 1 sec. - 60 min. for DG-60). At the end of that time, output relay turns OFF. If the supply is applied before t_{off} time isn't up, output relay continues to stay energized.



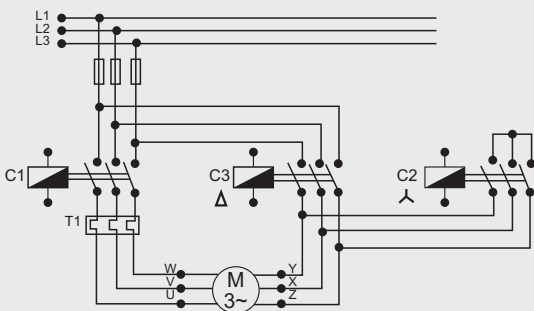
(No Voltage, Delayed Impulser)

Functions of SER-Y/U

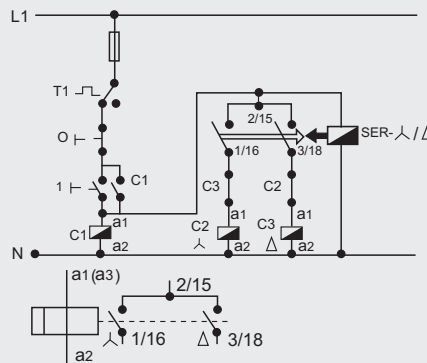
When the operating voltage is applied, the star contacts [(1/16, 2/15) for PK21/PK15, for PK25], are closed and then released after the operating time, t_a. The delta contacts [(2/15, 3/18) for PK21/PK15] are closed after the transition time, t_o = 50 msec (fixed at factory). The fault of the transition time is ± 5 msec. This transition time can be adjusted (to= 20-500 msec.) in PK25 type.



Main Connection



Circuit Plan

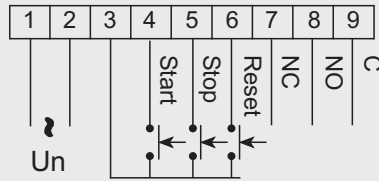
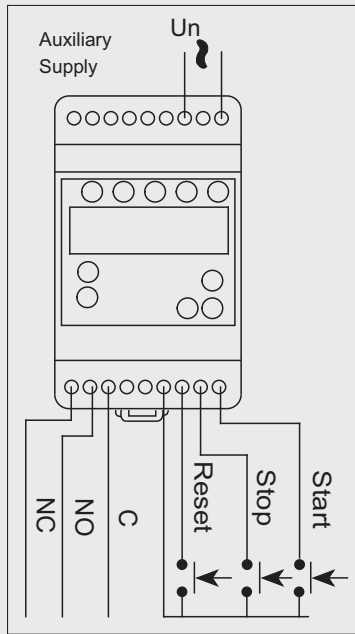


Note: 24 VAC/DC supply of SER - Y/U is applied between A2-A3

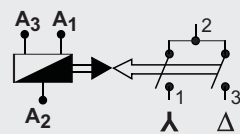
This transition time can be adjusted (to= 20-500 msec.) in PK25 type.

Connection Diagram

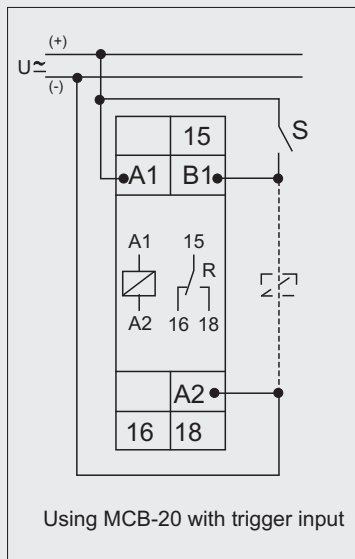
ERTC-01:



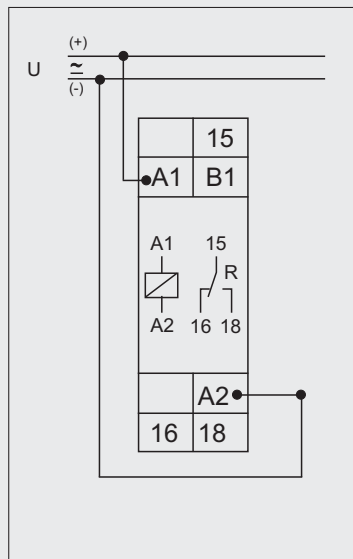
SER Y/U



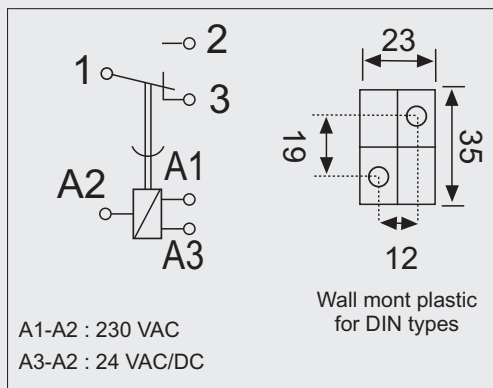
MCB-20



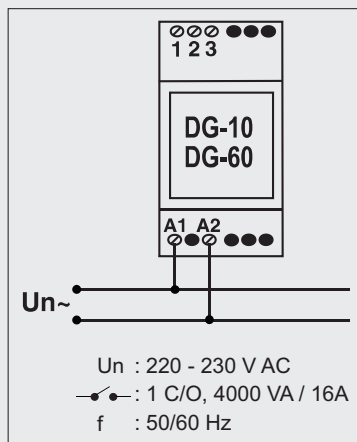
MCB-15



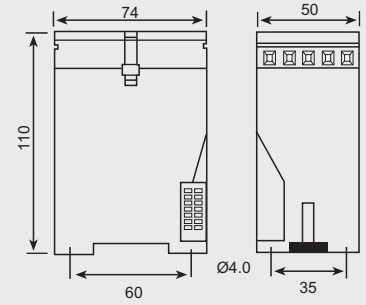
MCB 7-8-9



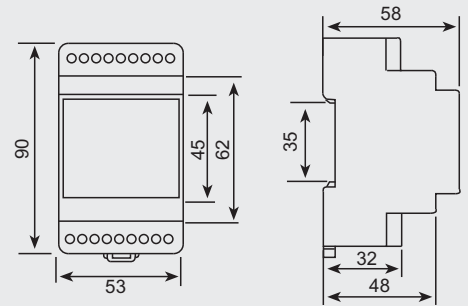
DG Series



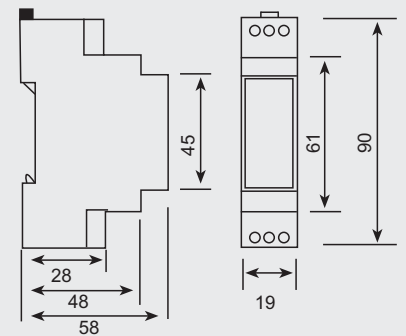
Dimensions



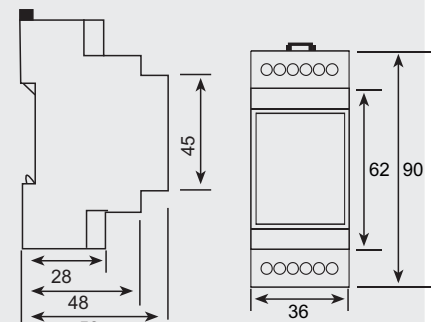
TYPE PK 10



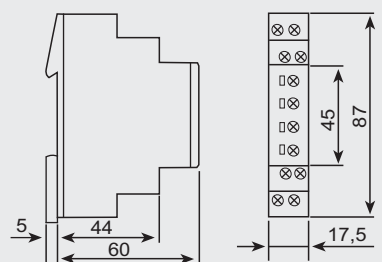
TYPE PK 20



TYPE PK 22



TYPE PK 25



TYPE PK 27

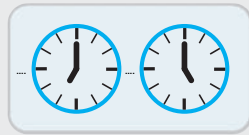
Connection diagrams are given for reference. Please always check the latest user manual given with product or download from www.entec.com.tr.

ASTRONOMIC PHOTOCELL RELAYS / WEEKLY TIMER

DTR-14 / DTR-10 / MCB-50



DTR-14



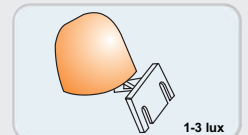
7/24

and / or



Astronomic

and / or



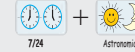
Photocell

General

DTR-14 : 7/24 Weekly Timer with Geographical Coordinates Programming and Photocell Input.



DTR-10 : 7/24 Weekly Timer with Geographical Coordinates Programming.



MCB-50 : 7 days / 24 hours Weekly Timer.



A photocell sensor must be connected for using the photocell feature.

2 Zones Programs

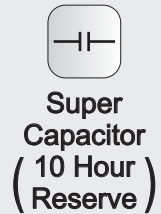
24h Time Programming	Geographical Coordinate Programming (Astronomic)	Photocell Sensor Input	18 Programs	15 Programs	1 Relay Output (8A)	1 Relay Output (16A)	2 Relay Outputs (8A)	5 Years Battery Life	Additional Reserve (Super Capacitor 10 hours)	pcs / carton
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Product Code

Product Code	Description	24h Time Programming	Geographical Coordinate Programming (Astronomic)	Photocell Sensor Input	18 Programs	15 Programs	1 Relay Output (8A)	1 Relay Output (16A)	2 Relay Outputs (8A)	5 Years Battery Life	Additional Reserve (Super Capacitor 10 hours)	pcs / carton
DTR-14	Astronomic Photocell Relay, 15 Prog.	●	●	●					●	●	●	5
DTR-10	Astronomic Relay, 15 Prog.	●	●						●	●	●	5
DTR-10t	Astronomic Relay, 15 Prog.	●	●				○		●	●	●	5
MCB-50	Weekly Timer, 18 Prog.	●			●				●	●	●	5
MCB-50t	Weekly Timer, 18 Prog.	●			●		○		●	●	●	5
FG-GOZ	Photocell Sensor (1-3 lux) for DTR-14											

● Standart ○ Optional

MODELS	DTR-14	DTR-10	MCB-50
SPECIFICATIONS			
Electrical Parameters			
Network Type	Single-phase / 2-wire		
Operating Voltage (Un)	230 V AC*, 50/60 Hz		
Operating Range (Auxiliary Supply)	190-260 V AC		
Output Contacts	1 C/O Output Contact / 8 A, 250 V AC, 4.000 VA 1 C/O Output Contact / 16 A, 250 V AC, 4.000 VA (MCB-50t, DTR-10t) 2 C/O Output Contacts / 8 A, 250 V AC, 2.000 VA		
Refresh Time	60 sec.		
Sensor	CdS (Light Dependent Resistor)	-	-
Light Intensity	1-3 lux	-	-
Power Consumption	< 3 VA		
Accuracy	≤ 1 sec. / day		
Display	1,3" LCD		
Mechanical Parameters			
Equipment Protection	Class II		
Ambient Operating Temperature	-5°C, +50°C		
Degree of Protection	IP20		
Installation	Rail mounted		
Dimensions / Weight / Quantity	PK25** (DIN II) / 0,2 kg / 5pcs		



5 Years Battery Life

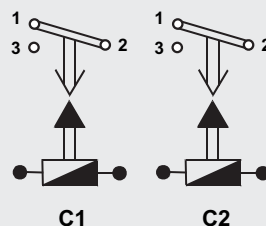
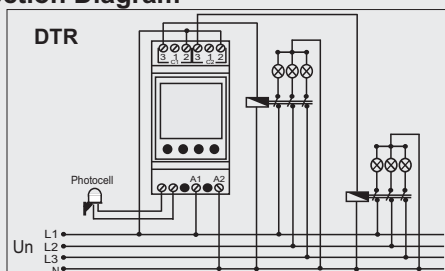


2 Output Contacts

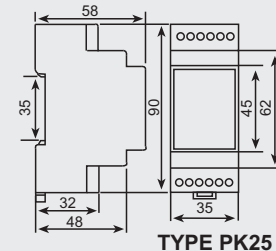


Manual on / off

Connection Diagram



Dimension





CKR-93T (144x144mm)



General

Microcontroller based CKR series overcurrent relays combine both inverse time and independent time relays in one unit. These relays are used for protecting transformers, motors, generators, and power lines in energy distribution systems against short circuits and grounding faults. The most important point to achieve the uppermost protection is to apply "selective protection". The main purpose of selective protection is locating and disconnecting the faulty circuit from the network as soon as possible but leaving the rest of the network active.

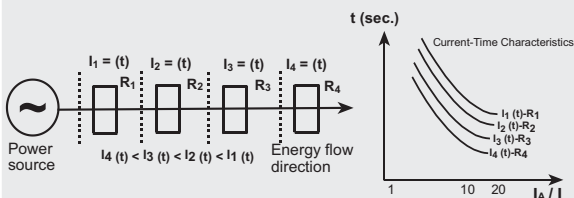
pcs / carton

Product Code

CKR-94T	3 Phase + Earth (Adjustable Inverse and Fixed Times for Phase & Earth) 85-265 VAC / DC	4
CKR-93T	3 Phase + Earth (Adjustable Inverse and Fixed Times for Phase & Earth) 85-265 VAC / DC	4
CKR-81T-96	1 Earth; 24 V AC / DC, 230 V AC	12

The accurate protection by the inverse-time overcurrent relays can be accomplished with the following conditions :

- 1) Relays having the same operation characteristics should be used in series with each other.
- 2) Tripping intervals of the relays used within the system must be adjusted in the form of "current/time steps". Current dependent tripping-time adjustment of the relays should be done in such a way that the "current/time steps" should be reduced as getting away from the source. Thus, the relay at the end of the line (R4 in the following figure) should have the shortest tripping time. This situation can be best observed from the schematics and current-time characteristics below:



A. CKR series have the following I/t characteristics. According to IEC-255, BS-142 these are:

- a - Normal Inverse
- b - Very Inverse
- c - Extremely Inverse
- d - Long Time Inverse (CKR-93T) / Moderately Inverse (CKR-94T and CKR-81T-96)
- e - Independent Time 1 (2.5 sec.)
- f - Independent Time 2 (5 sec.)
- g - Independent Time 3 (10 sec.) (not available in CKR-81T-96)
- h - Independent Time 4 (15 sec.)

The instantaneous tripping current, the time multiplication factor, and current-time characteristics adjustments both for the phases and neutral can be selected separately.

- o Non-flammable enclosure
 - o Double Insulation (),
 - o Measurement Category III
 - o Terminal Connection
 - o Flush mounting with rear terminals
- CKR SERIES**
- o IP40 (front panel)
 - o IEC 60255-3
 - o IEC 60255-6
 - o IEC 529

MODELS

SPECIFICATIONS

Functions

Three-phase protection

Earth fault protection

Time and current setting

Overcurrent pick-up $I >$

Overcurrent instant $I >>$

Definite time

Inverse time

Time multiplier for curves

Electrical Parameters

Operating Voltage(U_n)

Operating Current(I_n)

Power Consumption

Burden

Relay output

Accuracy

Mechanical Parameters

Operating Temperature

Dimensions

Packing Weight

Quantity in 1 package

CKR-81T-96

CKR-93T

CKR-94T

0.2 - 3.35 x I_n , Step 0.25

2 - 17 x ($I >$), Step 1

2.5, 5, 15 sec. 0.1-1 Step 0.1

According IEC255, ANSI
(normal, very, extremely, longtime, moderately)
CKR-9XT series don't have moderately inverse time.

0.1-1, Step 0.1

24 V AC / DC, 230VAC±10%	24 V DC, 85-265 V AC / DC ±10%
50/60 Hz	50/60 Hz

1 A (earth), 5 A (phase)

< 2 VA

< 3 VA

1 NO for phase
1 NO for neutral
10A/1400VA

Current 5% I_n or Iset;
Time 7,5% or ±40 msec.

-5°C, +55°C

96x96mm (PR24)	144x144mm (PR17)
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0,6 kg	1,3 kg
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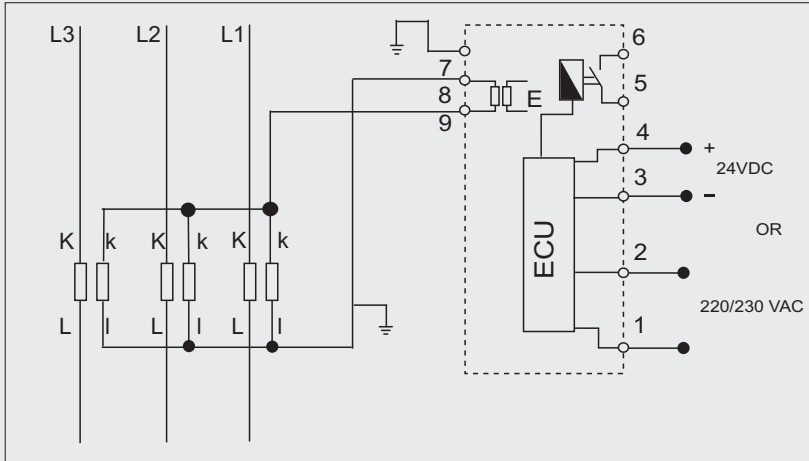
16 pcs	4 pcs
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OVERCURRENT PROTECTION RELAYS

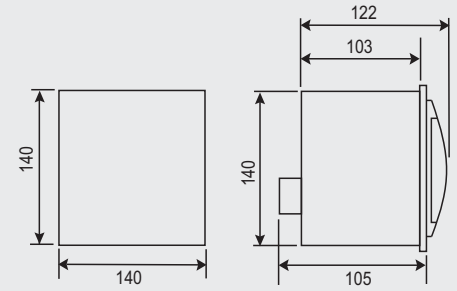
CKR Series

Connection Diagram

A- Earth Fault Overcurrent Protection Device

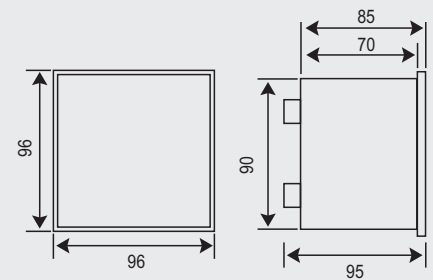
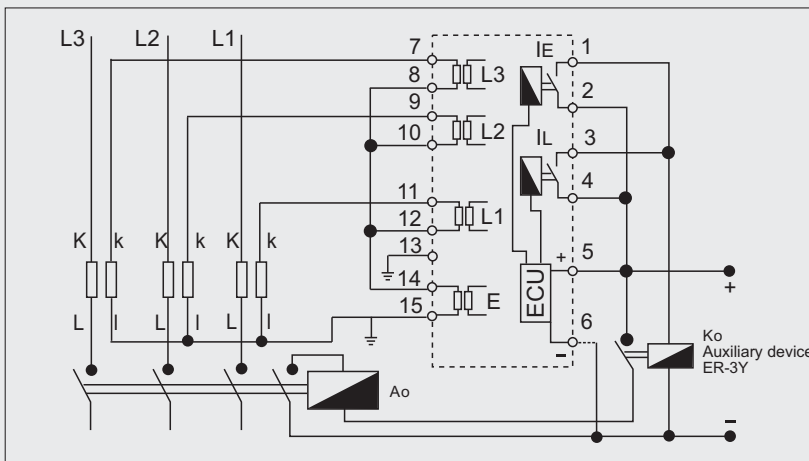


Dimensions



TYPE PR 17

B- Three Phase and Earth Fault Overcurrent Protection Device



TYPE PR 24

Connection diagrams are given for reference. Please always check the latest user manual given with product or download from www.entec.com.tr.



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