



# Products and Solutions For Machine Producers

- Power Quality and Energy
- Measurement
- Protection and Control







ENTES, one of the leading companies of the sector founded in 1980, manufactures devices and develops softwares with next generation production systems in its 12.000m2 modern facilities in Istanbul/Turkey. With its 350 employees and strong R&D, ENTES ranks among the most competitive industrial companies in Turkey engaged in power quality and energy, electrical measurement, power factor correction, remote monitoring and protection-control fields.

ENTES reaches the international users via its agencies in Netherlands, Greece and distributors in nearly 50 countries.

## R&D / TECHNOLOGY



ENTES places a great emphasis on research and development activities and it has one of the most advanced, most systematic R&D centers with the highest level of know-how in its sector in Turkey.

## QUALITY ASSURANCE



ENTES has defined entire processes covering design, production, sales and after-sales services. At every stage from check-in of raw materials to delivery, the products are tested in accordance with the relevant standards and technical specifications by qualified personnel using suitable and calibrated equipments.



## PRODUCTION



ENTES is placed among the strongest companies in terms of production capabilities and capacities. Entes's world-class production facilities is located in the İstanbul Dudullu Industrial Zone. Production planning, purchasing, production and control services are performed in these facilities. Entes uses advanced production technologies such as SMD and Optic Inspection.

## CUSTOMER-ORIENTED APPROACH



ENTES always follows a customer-oriented sales and after-sales policy and continuously improves the sales & service quality and performance.




MPR-3 Series (72x72)

## MPR-3 Series Mini Network Analyzers

MPR-3 series has been developed for limited areas where assembly area is important such as machine control panels and they are new generation network analyzers having compact design.

MPR-3 has wide operating range (185-300 VAC) (45-265 VAC/DC) and has the ability to sense the status of the devices connected with digital inputs and outputs. By these features, MPR-3 enables users to control these devices (breakers, switch, contactor, etc.)

### PRODUCT SELECTION TABLE

Product Code	Dimensions /mm	3xV, 3xI, Frequency, W, VAR, VA, P, Q, S, kWh, kVAh, Demand, Max., Min, Cos, I nötr	% THD-	% THD-V	RS-485	Digital Input	Digital Output	Clock (RTC)	Pulse Counter	Sampling Period	Operation Time	Alarm	Event Records	X/5, X/1	plug & meter	185-300 VAC/DC
MPR-32	72x72	●						●		128	●			●		●
MPR-32S	72x72	●			●			●		128	●			●		●
MPR-34-11	72x72	●	●	●		1	1	●	●	128	●	●	●	●		●
MPR-34S-11	72x72	●	●	●	●	1	1	●	●	128	●	●	●	●		●
MPR-34S-11-PM 	72x72	●	●	●	●	1	1	●	●	128	●	●	●		●	●
MPR-34-20	72x72	●	●	●		2		●	●	128	●		●	●		●
MPR-34S-20	72x72	●	●	●	●	2		●	●	128	●	●	●	●		●



### SAMPLE APPLICATION

**Requirement:** To measure, to record and to monitor consumption of Food Processing Machines, starting from the real data, to provide energy efficiency and to manufacture more productive machines with fewer malfunctions.

**Solution:** The manufacturer and service provider company of global agricultural machines was willing to determine whether their machines are working efficient or not by measuring machines' energy consumptions. Because of the lack of space on the panels of their machines, it was not possible to provide the solution with standard sized energy analyzers. Company started to use compact MPR-34S analyzer in size of 72x72 supporting communication feature and GEM-05 which is providing communication. With the application, company's energy consumptions and total harmonic values were monitored with ENTBUS remote monitoring system. By courtesy of these data, potential card malfunctions of the devices were determined and service cost was reduced. Also continuity of operation is provided to machine line.

**Benefits:** Reasons of the malfunctions were determined remotely without having need to send technical service and total of USD 40.000 saving per year has obtained from maintenance and energy costs only by means of this.

# Network Analyzers / Converters



MPR-1 Series

MPR-2 Series

CT-25



CT-25 is a matchless solution to reduce the measurement cost in low voltage systems.

## EMG / RS-USB Series



EMG-12

EMG-02

## MPR-1 and MPR-2 Series New Generation Network Analyzers

MPR-1 and MPR-2 series DIN type power analyzers have been designed for the measurement and analysis of electrical parameters taking place on the machine panels. By means of the communication characteristic in the devices, it is possible to follow up the energy measurements from one single monitoring center.

MPR-1/2 series are able to sense the status of the devices connected with its Digital Inputs and Outputs and provide the possibility to control of devices such as breakers, switches, contactors, etc.

## EMG-02 / EMG-12 RS-485 / Ethernet Converter

Ethernet / RS-485 Modbus Gateway for computer transmission of devices that has Modbus communication through Internet (WAN) and Intranet (LAN).  
(for details of monitoring, please refer Page:8)

### PRODUCT SELECTION TABLE

Product Code	Dimensions	LCD	3xV, 3xI, Frequency, W, VAR, VA, P, Q, S, kWh, kVAh, Demand, Max., Min., Cos φ, I nör	% THD I	% THD V	Separately Harmonic	RS-485	Digital Input	Digital Output	Analog Input	Temperature Input	Relay Output (Alarm Contact)	Clock (RTC)	Sampling Period	Memory	Current – Voltage Imbalance	Pulse Counter	Operation Time	Alarm	Event Records	Log Records	X/5, X/1	Plug & meter	85-300 VAC/DC
MPR-14-S	DIN4	●	●	●	●	●	●	2	2					128				●	●	●	●	●	●	●
MPR-15S-22	DIN4	●	●	●	●	●	●	2	2					128	4 MB		●	●	●	●	●	●	●	●
MPR-16S-21	DIN4	●	●	●	●	51	●	2				1		128	4 MB	●	●	●	●	●	●	●	●	●
MPR-17S-23	DIN4	●	●	●	●	51	●	2	2	1				128	4 MB	●	●	●	●	●	●	●	●	●
MPR-24	DIN4	●	●	●	●	●	●						●	128				●	●					●
MPR-24-PM	Plug & meter	●	●	●	●	●	●						●	128				●	●					●
MPR-25S-22	DIN4	●	●	●	●	●	●	2	2				●	128	4 MB		●	●	●	●	●	●	●	●
MPR-26S-21	DIN4	●	●	●	●	51	●	2				1	●	128	4 MB	●	●	●	●	●	●	●	●	●
MPR-26S-21-PM	Plug & meter	●	●	●	●	51	●	2				1	●	128	4 MB	●	●	●	●	●	●	●	●	●
MPR-27S-23	DIN4	●	●	●	●	51	●	2	2	1			●	128	4 MB	●	●	●	●	●	●	●	●	●
MPR-28S-32	DIN4	●	●	●	●	51	●	2	2		1		●	128	4 MB	●	●	●	●	●	●	●	●	●

### Number of Maximum Devices to be Connected

### Pcs./Carton

EMG-02	Ethernet-Modbus Gateway	2	1
EMG-12		32	1

### CURRENT TRANSFORMER (For ENTES Measurement Devices)

CT-25

Cycle Rate : 1/2500, Inner Diameter : 15.5 mm Outer Diameter: 43 mm



## SAMPLE APPLICATION

**Requirement:** Determining the energy efficiency of the machines manufacturing cooling systems.

**Solution:** Manufacturing company of cooling systems connected MPR-2 series energy analyser to its machines in order to determine the consumption difference between its own products and products of the competitor company. By means of that, they observed the quantity of the consumed energy. Their R&D works aimed to improve energy consumption and they showed the difference to their customers.

**Benefits:** By using our ENTES MPR-2 Series Products, the company certified that their products obtained **71.74%** rate of energy saving. By courtesy of this, the company has approved by **INTERNATIONAL TECHNICAL SUPERVISION ASSOCIATION (TUV)**. The company amortized the expenses by the TUV Certification within 5 months with the increase of sales turnover. Additionally, it became distinguished in the competition by the courtesy of TUV Certificate.

# Power and Energy Meters / Pulse Concentrators



## ES-32L / ES-32LS / ES-80L: Watt-Hour Meter

ES Watt-Hour meter series has compact, reliable and easy installation characteristics and measures active watt-hour (kWh) consumption directly. This series provides the possibility to monitor the measured values over pulse output or RS-485 port.

In order to be able to use the values that are read from the power and energy meters for invoices, MID Certificate is a must. ES-32 Series has MID Certificate which is accepted as the measurement standard in Europe.

## EPC-12: Pulse Concentrator

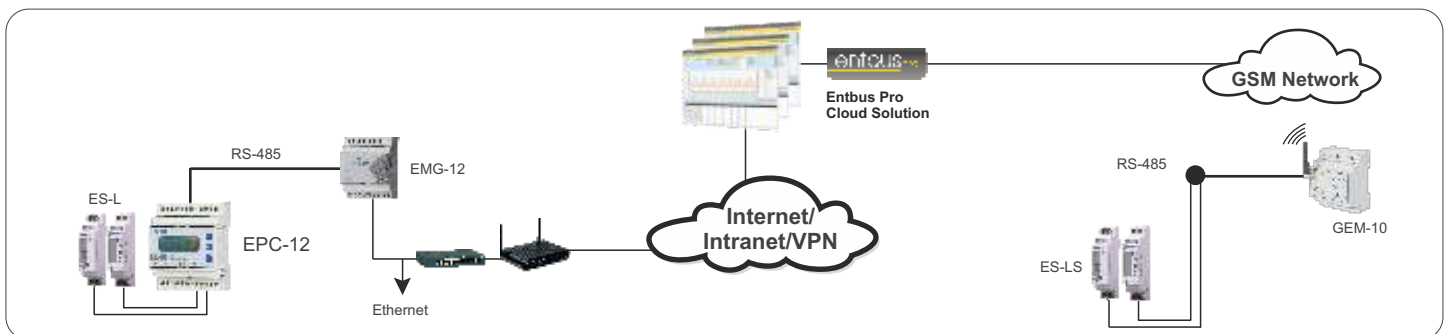
### Adjustment Software

- Data collection feature from electricity, water, gas counters
  - 12 different counter inputs
  - 8 different tariffs defining for each one of the weekdays, Saturday, Sunday and other holidays
  - Summer-Winter Time Application
  - RS-485 Communication
- With the aid of adjustment software, all of the parameters of the device can be changed and all consumption values measured by the device (electricity, water, natural gas) can be displayed on the screen of the computer
  - All device adjustments can be changed
  - Instant value page
  - Tariff based total consumption
  - Access to log records

## PRODUCT SELECTION TABLE

Product Code	MID	kWh Active Energy	Energy Pulse Output	RS-485 Communication
ES-32L Digital Energy Counter 5(32)A	○	●	●	
ES-80L Digital Energy Counter 40(80)A	○	●	●	
ES-32LS Digital Energy Counter 5(32)A	○	●		●

○ Optional



## SAMPLE APPLICATION

**Requirement:** Determining the consumed energy of the yachts and boats taking place in marinas and ports.

**Solution:** Entes ES series mono-phase Watt-Hour Meters measured active watt-hour (kWh) consumption directly and provided the tracking of the energy with the aid of pulse output over the data loggers. Users have been able to load energy to the systems with ES series in the pedestals which are designed for presenting payment required services to boats, as much as they have needed.

**Benefits:** With ES-32L, users provided their energy needs and control in their systems. In marinas, energy flow has permitted to the yachts and boats of the users by being proportional to their loadings. With correct energy management, a system is provided to them with less cost.



EPM-4C-96 (SLIM)



EPM-R4C



CT-25 is a unique solution to lower the measurement cost in low current systems

CT-25

## EPM Series

- True RMS Measurement
- Adjustable Current Transformer Primary Value (1...1000/5A, 1...5000/1A for EPM34/14)
- Double Insulation (□), Measurement Category III
- Front board mounted or rail mounted
- Operating Temperature: -5°C, +50°C

### PRODUCT SELECTION TABLE

Product Code			1 - Current	CT-25 (210A)	Double Demand*	X1 CT	X5 CT	Demand	Output Contact	Board Type	Rail Type	Fixed Terminal Blocks	24-250V AC/DC
EPM-4A-72	Direct Ammeter with CT-25 (210A)	(CT-25 included)	●	●			●	●		●			
EPM-4A-96	Direct Ammeter with CT-25 (210A)	(CT-25 included)	●	●			●	●		●			
EPM-4C-48	Ammeter (with Contact Output)	(CT-25 not included)	●	●			●	●	●	●			
EPM-4C-72	Ammeter (with Contact Output)	(CT-25 not included)	●	●			●	●	●	●			
EPM-4C-96	Ammeter (with Contact Output)	(CT-25 not included)	●	●			●	●	●	●			
EPM-4C-OG-96	Ammeter with Contact Output	(for the OG application)	●				●	●	●	●		●	
EPM-4D-48	Ammeter		●				●	●		●			
EPM-4D-72	Ammeter		●				●	●		●			
EPM-4D-96	Ammeter		●				●	●		●			
EPM-4P-96	Ammeter	(CT-25 not included)	●	●			●	●	●	●			
EPM-R4C	Ammeter with Contact Output (Rail Mounted)	(CT-25 not included)	●	●			●	●	●		●		
EPM-R4D	Ammeter	(Rail Mounted)	●				●	●			●		
EPM-14-96	Ammeter		●		●	●	●			●		●	●

### CURRENT TRANSFORMER (For ENTES Measurement Devices)

CT-25

Cycle Rate : 1/2500, Inner diameter : 15.5 mm Outer Diameter: 43 mm



### SAMPLE APPLICATION

**Requirement:** Taking timely precaution against malfunction of the wire cutting and marble machines due to motors' excess current consumption at startup, regulation of the saws to prevent overload.

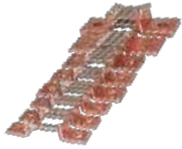
**Solution:** It has been ensured that the EPM-4C ammeter generates an error alarm signal when it exceeds the set overcurrent limit or falls below the set low current limit by switching on the output contact at the end of the adjusted delay time. In marble cutting machines, excess current is consumed during the first 10 seconds at startup of the motors. After this duration current value is reduced to the nominal current and the routine marble cutting operation proceeded with. It has been ensured by using EPM-4C that the motors proceed with the cutting operation within the optimum range of operating conditions. The machines have been checked for efficient and continuous operation during night shift. Besides, an error signal has been received from the ammeter when the machines have entered the status of breakdown, which in turn ensured a prompt maintenance planning.

**Benefits:** Employee productivity, savings in saw balancing and a drastic reduction in technical service costs have been achieved.

# DC Ammeters and Voltmeters



DCA Series



Shunts



DCV Series

## DCA / DCV Series

Devices having been designed in order to measure current and voltage of a DC System.

- Current in the ammeters is measured with a shunt resistance connected externally.
- Wide operating ranges, 85-265 VAC/DC (DCA-DCV-10) 10-56 VDC (DCA-DCV-11)
- Recording of measured maximum-minimum values
- Easy access to adjustments with illuminated LCD Screen
- Sensitive measuring period which can be adjusted in 1-600 second range
- **Communication with MODBUS RTU Protocol over RS-485 (S Series)**
- Contact ON/OFF feature with software in the monitored devices (C Series)

### PRODUCT SELECTION TABLE

Product Code	Voltmeter	Ammeter	Class 0.5	Measurement Range +/- 10kA+DC	Measurement Range +/- 200 VDC	2 Output Contacts	RS-485 Communication	85-265 VAC/DC	10-56 VDC
DCA-10		●	●	●				●	
DCA-10S		●	●	●			●	●	
DCA-10C		●	●	●		●		●	
DCA-10CS		●	●	●		●	●	●	
DCA-11		●	●	●					●
DCA-11S		●	●	●			●		●
DCA-11C		●	●	●		●			●
DCA-11CS		●	●	●		●	●		●
SA60-30				30A, 60mV Shunt					
SA60-40				40A, 60mV Shunt					
SA60-50				50A, 60mV Shunt					
SA60-60				60A, 60mV Shunt					
SA60-100				100A, 60mV Shunt					
SA60-150				150A, 60mV Shunt					
SA60-250				250A, 60mV Shunt					
SA60-500				500A, 60mV Shunt					
SA60-1000				1000A, 60mV Shunt					
DCV-10	●		●		●			●	
DCV-10S	●		●		●		●	●	
DCV-10C	●		●		●	●		●	
DCV-10CS	●		●		●	●	●	●	
DCV-11	●		●		●				●
DCV-11S	●		●		●		●		●
DCV-11C	●		●		●	●			●
DCV-11CS	●		●		●	●	●		●



### SAMPLE APPLICATION

**Requirement:** Measurement and monitoring of DC Current and voltage changes.

**Solution:** DC Ammeter and voltmeter have used in the company that manufacturer welding machines in order to determine the malfunctions arising from voltage and current in the network.

**Benefits:** Thanks to easy detection of the malfunctions that reduces maintenance and malfunction costs.





New generation Entbus<sup>®</sup>Pro web-based energy monitoring software supports enhancement for energy consumption & operating costs and ensures the consumption target is reached. ENTBUS<sup>®</sup> Pro monitors your facility's energy consumption and supports the possibility of control at anywhere and anytime. Parameters transferred over Ethernet/GPRS are instantly monitored, recorded and archived.

## Entbus<sup>®</sup> Pro Basic Characteristics

- Online Monitoring
- Real-time Data Collection
- Alarm Management
- Remote Configuration of Measurement Devices
- Reporting of collected data, graph options and export files in pdf or xls format
- Access over Internet / Intranet
- Multiple Language Feature
- Adding Modbus compliant devices with different brand and model
- Defining virtual devices and virtual parameters
- Detailed filtering characteristics for the Reports
- Sending alarms via e-mail and SMS

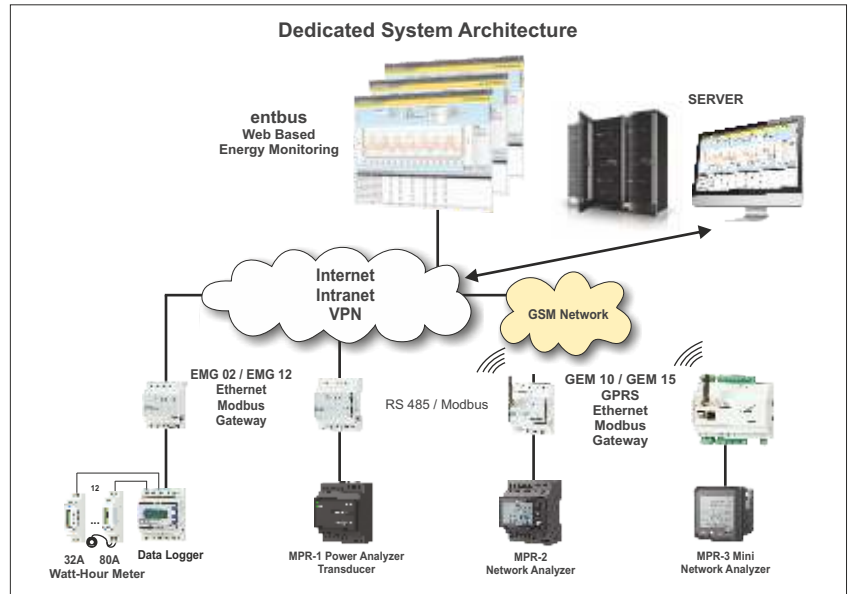
## Entbus Pro – Cloud Solution

### System Architecture

ENTBUS<sup>®</sup> Pro Software can be used in two ways.

#### Application Model 1: You can install the software easily.

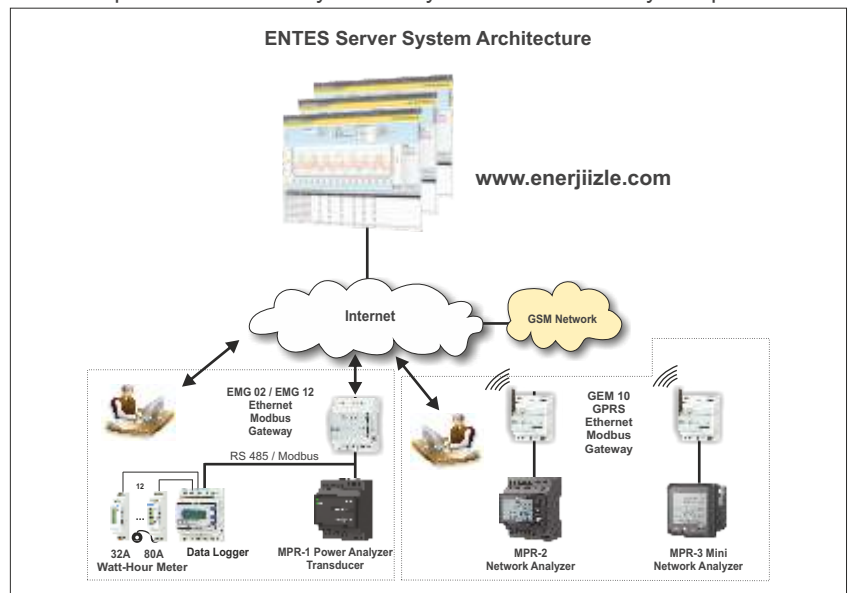
In this model, user purchases the software license, installs the application into own server and collects the processed data through its own intranet or web, changes the adjustments of its own devices, analyses the data and prepare reports.



#### Application Model 2: You can use the software over [www.entbus.com](http://www.entbus.com) cloud service.

As to this application, program is downloaded in ENTES Server. Users can monitor their devices from ENTES cloud server without having the need to purchase server and extra labor force.

All data are stored and analyzed in ENTES cloud server. Users reach their own data over the web ([www.entbus.com](http://www.entbus.com)) by connecting to ENTES cloud server with their own passwords and they can analyse all data and analyze reports.



# Remote Monitoring Equipments



EMG-12

EMG-02



GEM-05 / GEM-10 / GEM-10SH



## Converters – EMG / RS-USB Series

### EMG-02 / EMG-12 RS-485 / Ethernet Modem

Ethernet / RS-485 Modbus Gateway is a communication bridge between computer and the devices communicating with Modbus through Internet (WAN) and Intranet (LAN).

While EMG-02 provides economic data transfer up to two devices, EMG-12 can transmit data up to 32 devices.

## Modem RTU - GEM-05 / GEM-10 / GEM-10SH

**GEM-05** GPRS/Modbus Gateway (Modem) provides the possibility of access to devices communicating with Modbus protocol over GPRS network. With GEM-05, Modbus TCP communication can be established over GPRS.

**GEM-10** GPRS/Modbus Gateway (Modem) provides the possibility of access to devices communicating with Modbus protocol over GPRS or Ethernet network. With GEM-10, it is possible to establish Modbus TCP communication over GPRS or Ethernet and at the same time, these two connection options can be used as the substitute of each other.

**GEM-10SH**, can read the meters supporting IEC 62056-61 OBIS (Object Identification System) protocol over serial port. It has been designed to read the meter from a single center via Entbus software

## GPRS Modems

**GEM-15** Modem RTU is a communication device with I/O features. It can use GPRS and Ethernet infrastructures to backup of each other. It realizes the control processes by remotely monitoring the values such as temperature, humidity, pressure, electrical magnitude with analogue and digital inputs/outputs and relay outputs.

It can provide transmission between all devices using Modbus RTU protocol, information taking place in their registers can be read, alarm can be adjusted on them one by one and a control mechanism can be developed by being connected to these. Through its software, their parameters can be adjusted remotely. Analogue and digital inputs on it can be monitored and reports can be prepared in order to form analysis. Alarms defined by the user can be sent as SMS with the SIM Card integrated on it.

## Pulse Concentrator – EPC-12

- Data collection characteristic from electric, water and gas meters
- 12 different counter inputs
- 8 different tariffs defining for each one of the weekdays, Saturday, Sunday and other holidays
- Summer-Winter Time
- RS-485 Communication

## PS-242/361/362/722



PS series power supplies provide safe DC output voltage for the systems with broad wide supply (AC/DC voltage range) and adjustable output voltage.

### PRODUCT SELECTION TABLE

Product Code		Universal Input Voltage 85-265 VAC 11—350 VDC	1A Output Current	1,5 A Output Current	3 A Output Current	Contact Output	Parallel/Serial Connection	LED Indicator	Adjustable Output Voltage	Low/High Voltage Supply Protection	Over Load Protection	Thermal Protection	Output Short Circuit Protection	DIN 3 Box	DIN 4 Box
PS-242	24W-1A-24 VDC	●	●				●	●			●	●	●	●	
PS-361	36W-3A-12 VDC	●		●			●	●		●	●	●	●		●
PS-362	36W-1,5A-24 VDC	●		●	●		●	●	●	●	●	●	●		●
PS-722	72W-3A-24 VDC	●			●		●	●	●	●	●	●	●		●

# Liquid Level Control Relay

## SSRC-04



SSRC-04 is used for the level control of the liquid taking place in the water wells and liquid tanks in the industrial facilities. Its sensitivity (resistivity/impedance between the electrodes) can be adjusted between 5-50 kΩ for different liquids.



### PRODUCT SELECTION TABLE

Product Code		5-50 k Adjustable	Small Electrode	Big Electrode
SSRC-04	Liquid Level Control Relay	●		
LLS-01	Liquid Level Electrode		●	
LLS-02	Liquid Level Electrode			●

# Motor (Phase) Protection Relays

## MKC-MKS Series

MKS-MKC Motor Protection Relays are developed in order to prevent extreme heating and damage of 3-phase motors due to phase faulty or unbalance voltage in industrial facilities.



MKC-01



MKC-06

### PRODUCT SELECTION TABLE

Product Code		Neutral Rupture Sensing	Phase Absence	Phase Sequence Error	PTC Protection	Fixed Asymmetry	Adjustable Asymmetry	No Neutral	Adjustable Pulling Delay	Adjustable Opening Delay	1 C/O Contact	1 N/O Contact	DIN1 Railed Assembly	DIN2 Railed Assembly
MKC-01	Motor (Phase) Protection Relay	●	●			●					●			●
MKS-01	Motor (Phase) Protection Relay	●	●			●						●	●	
MKC-03	Motor (Phase) Protection Relay	●	●	●		●					●			●
MKC-03P	Motor (Phase) Protection Relay	●	●	●	●	●					●			●
MKS-03	Motor (Phase) Protection Relay	●	●	●		●						●	●	
MKC-04	Motor (Phase) Protection Relay		●	●		●		●			●			●
MKC-04-U69	Motor (Phase) Protection Relay		●	●		●		●			●			●
MKC-05	Motor (Phase) Protection Relay	●	●	●			○		●	●	●			●
MKC-05P	Motor (Phase) Protection Relay (with PTC3)	●	●	●	●		○		●	●	●			●
MKC-06	Motor (Phase) Protection Relay		●	●			○	●	●	●	●			●
MKC-06-U69	Motor (Phase) Protection Relay		●	●			○	●	●	●	●			●
MKC-06P	Motor (Phase) Protection Relay (with PTC3)		●	●	●		○	●	●	●	●			●
MKC-20	Motor (Phase) Protection Relay		●	●			○			●	●		●	

● UL Certificate

○ Can be Closed

# Current and Voltage Protection Relays



## AKC Series Current Protection Relays

They measure the current of the systems and turns off the systems when the measured current values are below or over the adjusted limit.



## GKRC Series Voltage Protection Relays

They have been designed to prevent from instant tension changes and phase sequence faults in mono or three-phase systems. When nominal voltage of any phase increases or decreases 50%, relay switches to OFF (Closed) position.

## DGRC Series Voltage Protection Relay

It has been designed to protect mono or three-phase systems in permanent voltage drops.

### PRODUCT SELECTION TABLE

Product Code	Low Current Protection	Over Current Protection	.../5A	Including CT-25	Neutral Rupture Sensing	3 Phase	Mono Phase	Low Voltage	Over Voltage	Phase Absence	Phase Sequence Protection	Pulling Delay	Opening Delay	No Neutral	Auxiliary Supply	DIN1 Railed Assembly	DIN2 Railed Assembly
DGRC-01				●	●	○						●	●				●
GKRC-01				●	●				○			●	●				●
GKRC-02				●	●			○	○			●	●				●
GKRC-02F				●	●			○	○	●	●	●	●				●
GKRC-02FA						●		○	○	●	●	●	●	●	●		●
GKRC-03						●		○	○			●	●	●			●
GKRC-03F						●		○	○	●	●	●	●	●			●
GKRC-M2				●		●		○	○			●	●				●
MCC-1D	5-15 min. Off Delay			●		●		●		●		●					●
MCC-3D	5-15 min. Off Delay			●		●		●		●		●					●
GKRC-20F						●		○	○	●	●		●				●
AKC-01D	Low Current Protection (0,5-5 A)		●														
AKC-01A	Over Current Protection (0,5-5 A)			●	●												
AKC-03D	Low Current Protection (between CT-25 and 1,5A-60A)		●		●												
AKC-03A	Over Current Protection (between CT-25 and 1,5A-60A)			●	●												

○ Can be Closed

### CURRENT TRANSFORMER (For ENTES Measurement Devices)

CT-25

Cycle Rate : 1/2500, Inner diameter : 15.5 mm Outer Diameter: 43 mm



MCB-25

MCB-20

MCB-9

ERTC-01



SER-Y/U

DG-60

## MCB-SER-ERTC-SSR-DG Series

- Wide function range devoted for industrial applications
- With their wide supply voltage range (12-240 VAC/DC), flexible solutions in applications fit the purposes.
- Adjustable time range (0,1 second – 100 hours)
- User friendly interface

### PRODUCT SELECTION TABLE

Product Code		Time	On Delay (Er)	Off Delay (Em)	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)	Triggering Input	Delay in Pulling on Rising Side Releasing on the Falling Side	Delay in Triggered Releasing on Rising and Falling Side	On Flasher	Off Flasher	Down Timer	Star - Delta	Right-Left	Delayed Impulse
ERT-01-72	Multi-Fnc. Time Relay	1sn - 100 Hour	●	●	●	●				●			●	●	●			
ERTC-01-DIN	Multi-Fnc. Time Relay	1 sec. - 100 Hour	●	●	●	●				●			●	●	●			
MCB-7	Time Relay	0,1 sec. - 30 Hour	●	●														
MCB-8	Time Relay	0,1 sec. - 999 min.	●	●														
MCB-9	Time Relay	0,5 sec. - 30 Hour	●	●									●	●				
MCB-15	Multi-Fnc. Time Relay	0,05 sec. - 100 Hour	●	●	●				●	●								
MCB-20	Multi-Fnc. Time Relay	0,1 sec. - 100 Hour	●	●	●	●	●	●	●	●								
MCB-25	Multi-Fnc. Time Relay	0,1 sec. - 999 Hour	●	●	●				●	●	●	●	●	●				
MCB-30	Time Relay	2-30 sec.	●															
MCB-60	Time Relay	4-60 sec.	●															
SER-YU	Star – Triangle Relay	( $\lambda/U$ ) 20-500ms ( $\lambda$ ) 1-60sec.															●	
SSR-2X	Right – Left Relay	0,1 sec. - 60 Hour																●
DG-10	Time Relay	0,6 sec. - 10 min.																●
DG-60	Time Relay	0,1 sec. - 60 min.																●
EF-10	Flasher Relay	1 - 10 sec. / 0,5 sec.											●					
EF-10T	Flasher Relay	1 - 10 sec. / 0,5 sec.											●					
ERB-50	Dishwasher Relay	Yıkama 30, 60, 90,120,180sn, Bekleme 3sn, Durulama 1-30sn																



### SAMPLE APPLICATION

**Requirement:** Adjustment of washing – waiting – rinsing periods in industrial dishwashing machines.

**Solution:** In the company that manufactures industrial dishwashing machines, ERB-50 dishwasher relay is used for automatic adjustment.

**Benefits:** Adjustments of washing – waiting – rinsing periods in dishwashing machines used to be done with separate time relays. With ERB-50, saving was obtained on the panel with one time relay, material and labor costs were reduced and potential malfunction and maintenance times were reduced.

# Multifunction Time Relays



## New Generation Multifunction Digital Time Relays

- Ability to operate with internal battery without external power supply (MCB-200)
- 10 years of battery life or 1,000,000 cycles of contact switching life (MCB-200)
- Easy installation due to its user-friendly menu
- Purpose-specific flexible solutions in the applications with its triggering-controlled sub-functions in addition to the main functions.
- Thanks to its memory feature, saving the time and status data when the energy is cut and resuming the operation from the same point when reenergised in certain functions.
- Performance of the functions according to the real time thanks to its digital timer feature.

### PRODUCT SELECTION TABLE

Product Code		Time	Triggering Input	Delay in Pulling	Delay in Release	Pulse	Asymmetrical Flasher	Symmetrical Flasher	Start/Stop	Counter	Right-Left	Star/Delta	2 Step -Delay in Drawing	2 Step -Delay in Release	10-30 VAC/DC	85-315 VAC/DC	Internal Battery	DIN II Box
MCB-100	Multifunction Time Relay	0.1-9999 sec/min	●								●	●	●	●		●		●
MCB-101	Multifunction Time Relay	0.1-9999 sec/min	●								●	●	●	●	●			●
MCB-120	Multifunction Time Relay	0.1-9999 sec/min	●	●	●	●	●									●		●
MCB-121	Multifunction Time Relay	0.1-9999 sec/min	●	●	●	●	●								●			●
MCB-125	Multifunction Time Relay	0.1-9999 sec/min	●	●	●	●	●		●	●						●		●
MCB-126	Multifunction Time Relay	0.1-9999 sec/min	●	●	●	●	●		●	●					●			●
MCB-130	Multifunction Time Relay	0.2-9999 sec/0.1-9999min	●	●	●	●	●		●	●	●	●	●	●		●		●
MCB-131	Multifunction Time Relay	0.2-9999 sec/0.1-9999min	●	●	●	●	●		●	●	●	●	●	●		●		●
MCB-200	Multifunction Time Relay <b>without power supply</b>	0.1-9999 sec/min	●	○	○	○	○	○									●	●
ERTC-100	Counter/Pulse Time Relay	0.1-9999 sec/min	●			●			●							●		●
ERTC-101	Counter/Pulse Time Relay	0.1-9999 sec/min	●			●			●						●			●

○ Functions with triggering



### SAMPLE APPLICATION

**Requirement:** Automatic setting of the operation time in Auto Sweeping machines.

**Solution:** ERTC-100 multifunction time relay has been used in order to set operation time of car cleaning machines at petrol stations. Thus it has been ensured that a machine runs for 1 minute when one \$0,50 coin is inserted and for 3 minutes when two \$0,50 consecutive coins or \$1 coin are inserted.


**Benefits:** The solution has been obtained by using only one ERTC-100 multifunction time relay instead of using several different time relays. Thereby savings have been achieved in labour, time and cost.

# Current Transformers / CT Series



CT-25

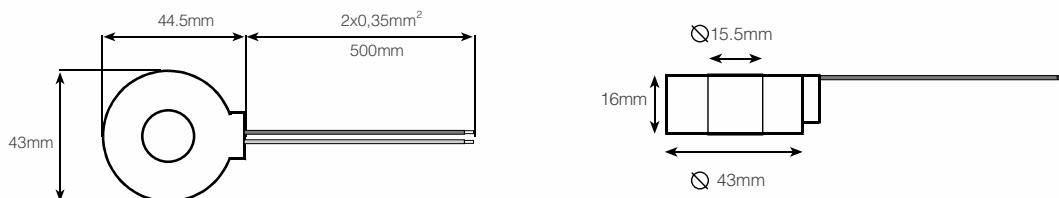
CT Series current transformers provide an economical solution for energy monitoring and electrical measurement by their compact design.

L.V. Current Transformer	Type	ENTES Products used in*		
		Maximum Nominal Current		
		80 A	120 A	210 A
 (For ENTES Digital Measuring Devices)	CT-25		MPR-53      EPM-04h MPR-53S    EPM-06 EPR-04       EPM-06C EPR-04S     EPM-06CS EPM-04       EPM-07 EPM-04C     EPM-07S EPM-04CS	EPM-4A EPM-4C EPM-4D EPM-4P
	CT-80D (only for ES-80L)	ES-80L		

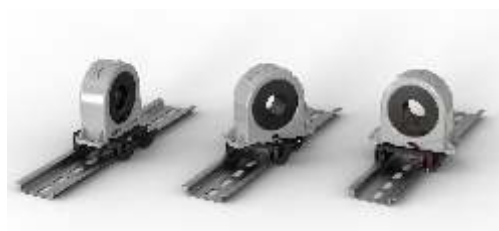
## Technical Specifications

	CT-25	CT-80D (only for ES-80L)
Cycle Rate	1/2500	1/2500
Inner Diameter	15,5 mm (70 mm <sup>2</sup> cable)	13 mm (35 mm <sup>2</sup> cable)
Outer Diameter	43 mm	47,5 mm
Primary Nominal Current	210 A	80 A
Secondary Nominal Current	0,084 A	0,032 A
Operating Temperature	-40 °C ..+70 °C	-40 °C ..+70 °C
Frequency	50 Hz	50 Hz

## Dimensions



RMS-CT-25  
(Rail assembly set for CT-25)





# Control and Isolation Transformers

## ENT, PST and ENT, IST Series



ENT, PST and ENT, IST Series

ENTES Control Transformers provide safe operating of devices with 24 VAC output voltage. Alongside of 230V or 400V fixed input options, they also have the options with alternative input voltage (400; 230±15-15). They are designed to operate continuously under full load in 50 °C environment temperature. On the other hand, Isolation Transformers provide the possibility operating of devices by isolating secondary side from primary voltage. Input and output voltages of Isolation Transformers are fixed (230V or 400V). In general, they are used in places that need galvanic isolation. Also they are used in electric networks that does not have neutral point.

All ENTES Control and Isolation Transformers are compliant with EN Standards and are **CE** marked.

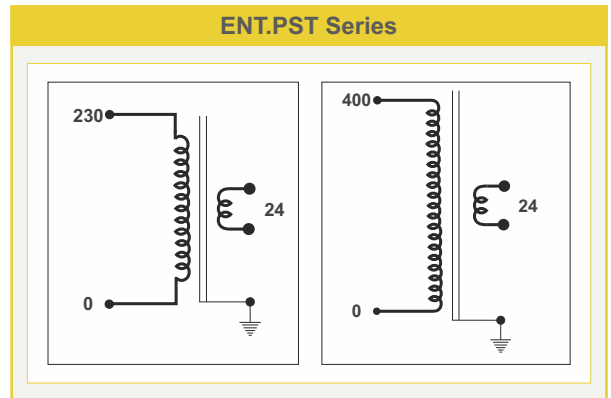
### Control Transformers (PTS)

	Nominal Power (VA) (at 50 °C)	Short-Term Power	Weight (kg)	Terminal Cross Section	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	H (mm)
<b>230V / 24V</b>											
ENT.PST.2324.25	25	51	1	4 mm <sup>2</sup>	66	76	80	50	64	80	5*8
ENT.PST.2324.50	50	97	1,5	4 mm <sup>2</sup>	84	76	91	64	64	82	5*8
ENT.PST.2324.100	100	209	1,9	4 mm <sup>2</sup>	84	76	91	64	64	96	6*9
ENT.PST.2324.160	160	338	2,4	4 mm <sup>2</sup>	96	89	99	84	74	100	6*9
ENT.PST.2324.200	200	419	3	4 mm <sup>2</sup>	96	89	99	84	74	100	6*9
ENT.PST.2324.250	250	559	3,4	4 mm <sup>2</sup>	96	102	99	84	87	114	6*9
ENT.PST.2324.320	320	689	4,4	4 mm <sup>2</sup>	120	90	127	90	83	92	6*9
ENT.PST.2324.400	400	961	5,6	4 mm <sup>2</sup>	120	102	127	90	95	106	7*13
ENT.PST.2324.500	500	1260	7,1	4 mm <sup>2</sup>	120	122	127	90	109	126	7*13
ENT.PST.2324.630	630	1520	7,6	10 mm <sup>2</sup>	150	113	141	122	89	120	7*13
<b>400V / 24V</b>											
ENT.PST.4024.25	25	51	1	4 mm <sup>2</sup>	66	76	80	50	64	80	5*8
ENT.PST.4024.50	50	96	1,5	4 mm <sup>2</sup>	84	76	91	64	64	82	5*8
ENT.PST.4024.100	100	218	2	4 mm <sup>2</sup>	84	76	91	64	64	96	6*9
ENT.PST.4024.160	160	344	2,4	4 mm <sup>2</sup>	96	89	99	84	74	100	6*9
ENT.PST.4024.200	200	460	2,9	4 mm <sup>2</sup>	96	89	99	84	74	100	6*9
ENT.PST.4024.250	250	584	3,4	4 mm <sup>2</sup>	96	102	99	84	87	114	6*9
ENT.PST.4024.320	320	749	4,4	4 mm <sup>2</sup>	120	90	127	90	83	92	6*9
ENT.PST.4024.400	400	909	5,5	4 mm <sup>2</sup>	120	102	127	90	95	106	7*13
ENT.PST.4024.500	500	1241	7,1	4 mm <sup>2</sup>	120	122	127	90	109	126	7*13
ENT.PST.4024.630	630	1556	7,6	10 mm <sup>2</sup>	150	113	141	122	89	120	7*13

\*Production option for different voltage values up to 2500VA upon request.

### 400 - 230 / 24 V Alternate Input (15-0-15 V)

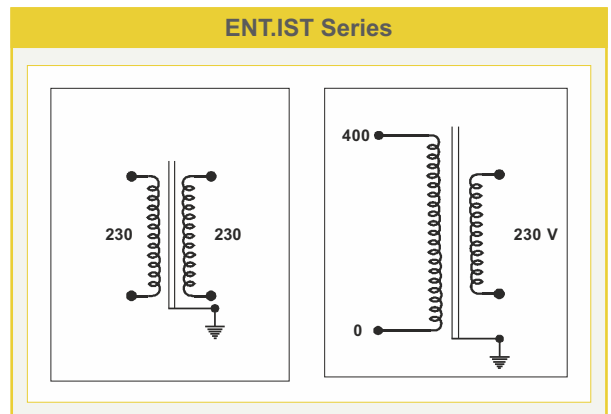
400-230/24V	Nominal Power (VA) (at 50 °C)	Primer Voltage (V)	Short-Term Power (VA)	Weight (kg)	Terminal Cross Section	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	H (mm)
ENT.PST.A4024.25	25	400	51	1	4 mm <sup>2</sup>	66	76	80	50	64	80	5*8
ENT.PST.A4024.50	50	400	97	1,5	4 mm <sup>2</sup>	84	76	91	64	64	82	5*8
ENT.PST.A4024.100	100	400	218	2	4 mm <sup>2</sup>	84	76	91	64	64	96	6*9
ENT.PST.A4024.160	160	400	344	2,4	4 mm <sup>2</sup>	96	89	99	84	74	100	6*9
ENT.PST.A4024.200	200	400	460	2,9	4 mm <sup>2</sup>	96	89	99	84	74	100	6*9
ENT.PST.A4024.250	250	400	584	3,4	4 mm <sup>2</sup>	96	102	99	84	87	114	6*9
ENT.PST.A4024.320	320	400	749	4,4	4 mm <sup>2</sup>	120	90	127	90	83	92	6*9
ENT.PST.A4024.400	400	400	909	5,5	4 mm <sup>2</sup>	120	102	127	90	95	106	7*13
ENT.PST.A4024.500	500	400	1241	7,1	4 mm <sup>2</sup>	120	122	127	90	109	126	7*13
ENT.PST.A4024.630	630	400	1556	7,6	10 mm <sup>2</sup>	150	113	141	122	89	120	7*13



### Isolation Transformers (IST)

	Nominal Power (VA) (at 50 °C)	Short-Term Power	Weight (kg)	Terminal Cross Section	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	H (mm)
<b>230/230</b>											
ENT.IST.2323.25	25	51	1	4 mm <sup>2</sup>	66	76	80	50	64	80	5*8
ENT.IST.2323.50	50	104	1,5	4 mm <sup>2</sup>	84	76	91	64	64	82	5*8
ENT.IST.2323.100	100	199	2	4 mm <sup>2</sup>	84	76	91	64	64	96	6*9
ENT.IST.2323.160	160	338	2,4	4 mm <sup>2</sup>	96	89	99	84	74	100	6*9
ENT.IST.2323.200	200	428	2,9	4 mm <sup>2</sup>	96	89	99	84	74	100	6*9
ENT.IST.2323.250	250	548	3,4	4 mm <sup>2</sup>	96	102	99	84	87	114	6*9
ENT.IST.2323.320	320	701	4,4	4 mm <sup>2</sup>	120	90	127	90	83	92	6*9
ENT.IST.2323.400	400	959	5,4	4 mm <sup>2</sup>	120	102	127	90	95	106	7*13
ENT.IST.2323.500	500	1259	7,1	4 mm <sup>2</sup>	120	122	127	90	109	126	7*13
ENT.IST.2323.630	630	1493	8,1	4 mm <sup>2</sup>	150	113	141	122	89	102	7*13
<b>400/230</b>											
ENT.IST.4023.25	25	51	1	4 mm <sup>2</sup>	66	76	80	50	64	80	5*8
ENT.IST.4023.50	50	95	1,5	4 mm <sup>2</sup>	84	76	91	64	64	82	5*8
ENT.IST.4023.100	100	216	2	4 mm <sup>2</sup>	84	76	91	64	64	96	6*9
ENT.IST.4023.160	160	330	2,5	4 mm <sup>2</sup>	96	89	99	84	74	100	6*9
ENT.IST.4023.200	200	454	3	4 mm <sup>2</sup>	96	89	99	84	74	100	6*9
ENT.IST.4023.250	250	555	3,6	4 mm <sup>2</sup>	96	102	99	84	87	114	6*9
ENT.IST.4023.320	320	744	4,5	4 mm <sup>2</sup>	120	90	127	90	83	92	6*9
ENT.IST.4023.400	400	942	5,6	4 mm <sup>2</sup>	120	102	127	90	95	106	7*13
ENT.IST.4023.500	500	1174	7,1	4 mm <sup>2</sup>	120	122	127	90	109	126	7*13
ENT.IST.4023.630	630	1555	8,3	4 mm <sup>2</sup>	150	113	141	122	89	102	7*13

\*Production option for different voltage values up to 2500VA upon request.



## POWER QUALITY AND ENERGY



### Network Analyzer

- MPR-1 Series
- MPR-2 Series
- MPR-3 Series
- MPR-4 Series
- MPR-5 Series
- MPR-6 Series
- EPM-07 Series

### Power and Energymeter

- EPR-04 Series
- ES Series

## ELECTRICAL MEASUREMENT



### Multimeters

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

### Ammeters

- EPM Series
- EPM-4X Series
- EPM-R4X Series

### Voltmeters

- EVM Series
- EVM-3X Series
- EVM-R3X Series

### Cos Meter

- ECR-3

### Frequencymeter

- EFC-3

### Transducer

- TA
- TV

### DC Ammeter

- DCA Series

### DC Voltmeter

- DCV Series

## POWER FACTOR CORRECTION



### Power Factor Controller

- RG3-C Series
- RG-B Series
- RG-T Series
- RGA Series
- RGSR Series

### L.V. Power Capacitors

- ENT-CF Series
- ENT-CM Series
- ENT-CXD Series
- ENT.C100 Series
- ENT.THN Series

### Shunt Reactors

- ENT.ERS Series

### Discharge Unit

- DU-3

### Harmonic Filters

- ENT.ERH Series

### Capacitor Duty Contactor

- ENT.KT Series

### Thyristor Switches

- SC Series
- SPD Surge Voltage Protection Device

### Line Reactors

- ENT.SGR Series

### Current Transformers

- ENT Series
- ENS.AYS Series
- ENS.AYC Series
- ENS.3PH Series
- CT Series

## REMOTE MONITORING



### Remote Monitoring Software

- Entbus® Pro
- Entbus® Plus
- Energy Doc

### Ethernet & USB Converters

- EMG Series
- RS-USB2
- RPT-1

### GPRS Modems

- GEM-05/10/10SH
- GEM-15
- GEM-25

### Pulse Concentrator

- EPC-12

## PROTECTION & CONTROL



### Power Supply

- PS 242/361/362/722

### Motor (Phase) Protection Relays

- MKS / MKC Series

### Phase Sequence Protection Relays

- FR-02

### Thermistor Relay

- PT-01

### Current and Voltage Protection Relays

- AKC Series
- DGRC-01
- GKRC / MCC Series

### Liquid Level Control Relay

- SSRC-04

### Multi-Function Time Relays

- MCB-100/200
- ERTC-100 Series

### Time Relay

- ERTC Series
- ERB Series
- MCB Series
- EF Series
- DG Series
- SSR-2X
- SER-YU

### Astronomic Time Relays

- DTR Series
- MCB-50 Series

### Photocell Relays

- FG Series
- Overcurrent Secondary Protection Relay

- CKR Series

### Control-Isolating Transformers

- ENT.PST/ENT.IST Series

## CONNECTION PRODUCTS



### Screw Type Terminal Blocks

### Spring Type Terminal Blocks

### Cable Ties

### Cable Ferrules and Terminals

### Accessories

- End Brackets
- Terminal Block Covers
- Separators
- Mounting Rails

### Labelling Solutions

- Inkjet Printer
- Cable Tags
- Tag Holders
- Adhesive Type Board and Device Tags





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