





PRODUCT CATALOG '19



POWER FACTOR
CORRECTION



ENERGY



MEASUREMENT



MONITORING



PROTECTION
AND CONTROL



PANEL
EQUIPMENT





Our company has been established for managing energy with best efficiency in our country and providing services with our expert and experienced staffs for industrial automation field which has a very important role in ever-growing electronics sector. We are one of the leading manufacturer of Industrial Electronics, producing variable “industrial protection products, control relays and measuring equipment”.

Our aim is to provide quality products for end users by using the technology developed on the basis of customer satisfaction and to put specific products in industrial electronics sector on the local market in accordance with customer demands and expectations.

We provide our dear customers with easily accessible products and also pre-sale and after-sale services thanks to distributors and agents all around the world.



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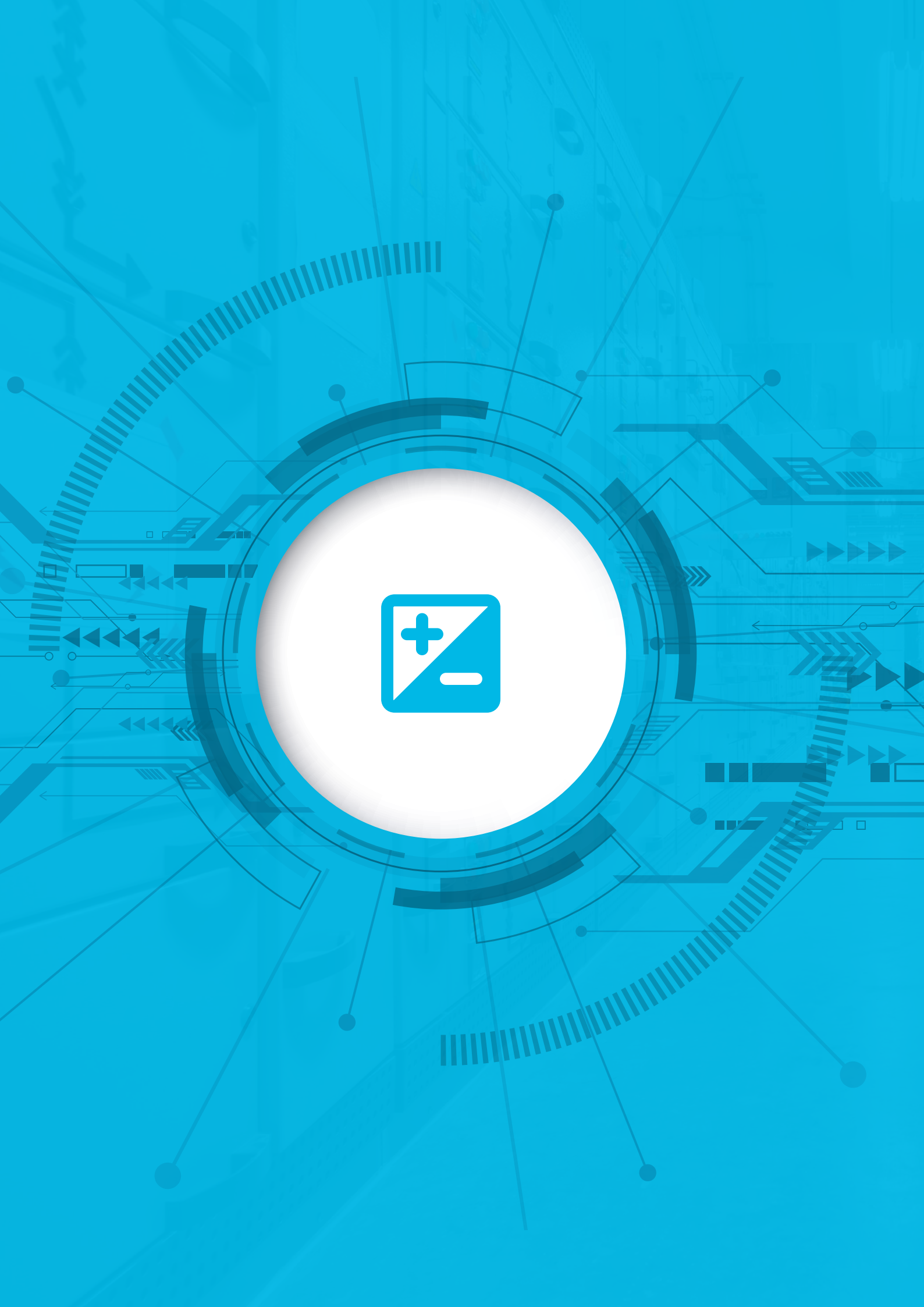
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POWER FACTOR CORRECTION



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POWER FACTOR
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THREE-PHASE POWER FACTOR CONTROL RELAY (SVC)



RGT-MT18

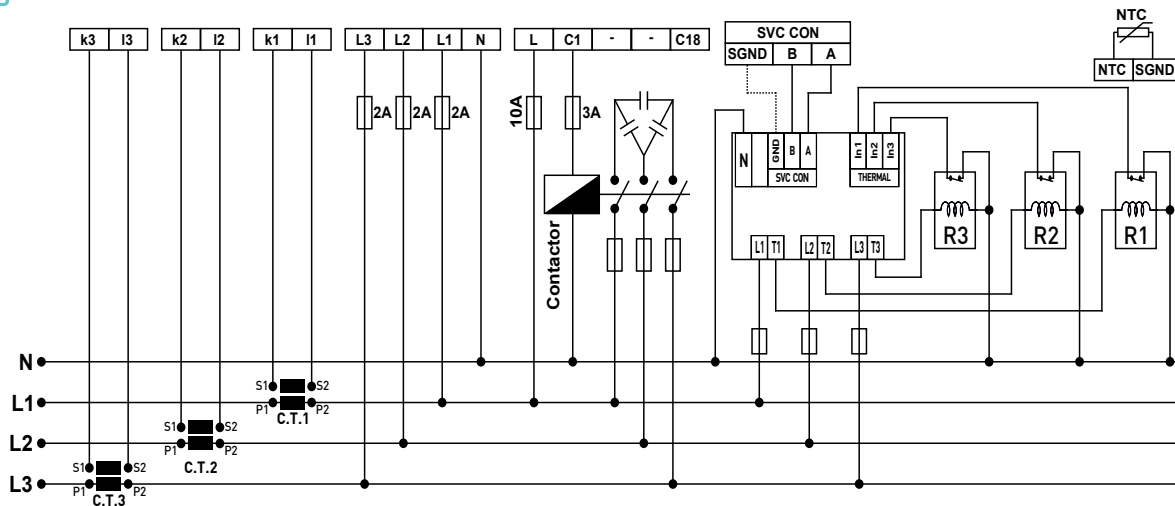
Operating Voltage (Un)	100V - 300VAC
Operating Frequency	50/60Hz.
Operating Power	<12VA
Operating Temperature	-20°C to 55°C
Voltage Measuring Range	5V -280VAC
Current Measuring Range	5mA - 5.5A
Voltage , Current Accuracy	%±0.5
Active Power Accuracy	%±1
Reactive Power Accuracy	%±2
Current Transformer Ratio	5/5A - 10000/5A
Harmonic Voltage, Current	2 - 61
Real Time Clock	>5 Years
Communication	RS485 MODBUS RTU
Display	5" Touch Color LCD
Numer of Steps	18 + SVC (Inductive Load Driver)
Connection Type	Plug-in terminal connection
Contact	3A/250VAC Resistive Load
Cable Diameter	2.5mm ²
Weight	<900gr.
Panel Hole Sizes	140mm x 140mm
Mounting	Front panel mounting
Protection Class	IP41(Front panel), IP20(Body)
Operating Altitude	<2000 meters
Case	A1



The reactive power control relays are designed to reduce the reactive powers (inductive and capacitive) not used by the loads in the system and drawn from the network due to the characteristics of the loads . If the inductive reactive power is attracted from the network, it interferes by attracting capacitor at the appropriate step. If capacitive reactive power is attracted from the network, it interferes by attracting shunt reactor at the appropriate step. Thus it endeavors to reduce the inductive/active and capacitive/active rates of the system.

It is designed to make more sensible compensation at the unbalanced inductive and capacitive systems with RGT-MT18 TCR(SVC) step.

- 5 "Easy to install and use with touch (resistive) display
- TCR (SVC) Connectable
- Generator Input and Generator Compensation
- Remote Communication with RS485 (Computer Communication)
- Temperature Measurement and Control
- Compensation for Inductive and Capacitive Systems
- Manual Step Value Enterable
- Single, Two, and Three Phase Capacitor and Shunt Reactor can be Connected
- Turkish and English Language Option
- Voltage, Harmonic Current/Voltage, Inductive and Capacitive Alarm Output Temperature Alarm Output
- Intervention, Discharge and Settling Times can be Adjustable
- Current Harmonics can be Observed Up To 61st Harmonics
- Voltage Harmonics can be Observed Up To 61st Harmonics
- Cosine Values of Each Phase Can Be Observed
- Power Factor Values of Each Phase can be Observed as Graphically
- Capacitive / Active and Inductive / Active Ratios can be Observed as Grafically.
- Total Energies (Import/Export) can be Observed.
- THD-V and THD-I values of Each Phase can be Observed.
- Creating Power Analysis (20 samples 9999 min.)
- Demand Registration (Active & Reactive & Apparent Power and Current Demand) Min, Max and Average Values of Current and Voltage of Each Phase can be Observed.
- Real Time and Clock
- Encrypted Protection
- Same Aging in Steps
- Time adjusted step feature





INDUCTIVE LOAD DRIVERS (TCR)



SRL-5T



SRL-10T



SRL-20T



SRL-30T

Operating Voltage (Un)	85V - 260VAC			
Operating Frequency	50/60Hz.			
Operating Power	<6VA			
Operating Temperature	-20°C to 55°C			
Inductive Capacity	5kVAr	10kVAr	20kVAr	30kVAr
Current (Max.)	3x16A	3x25A	3x63A	3x100A
Display	5 LEDs			
Connection Type	Terminal connection, Plug-in connection			
Cable Diameter (Data, Termik)	1,5mm ²			
Cable Diameter (Phase Input, Output)	2,5mm ²	10mm ²	10mm ²	16mm ²
Weight	<1100gr.	<2200gr.	<2200gr.	<2800gr.
Mounting	Assembled on din rail	Panel mounting		
Protection Class	IP20			IP10
Operating Altitude	<2000 meters			
Case	G1	G2		G3

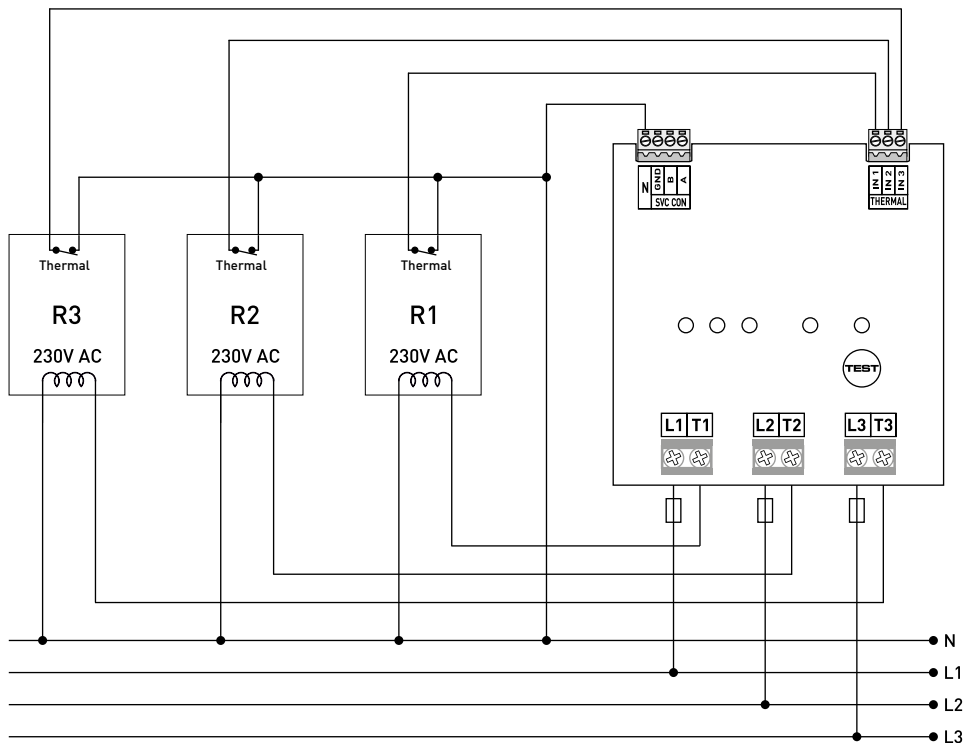


The SRL-XXT thyristor modules are designed to drive three single-phase shunt reactors via its RS485 connection. It drives by adjusting inductive load required by the system with communication connection.

Due to It checks the heat control of the shunt reactors separately, only the heated shunt reactor is disabled and continues to it drives other shunt reactors. It is only used with reactive power control relays with RS485 SVC control. When the button is pressed for 2 seconds, it drives %100 for 10 seconds.

Shunt reactors are used to compensation of the capacitive reactive Powers.

- Microprocessor-based control.
- It controls thermic for 3 phases.
- It is used places where consumes capacitive power such as school, market, bank, Office, hospital, hotel, dormitory, public buildings etc.



SRL-5T



SRL-10T/20T



SRL-30T



THREE-PHASE POWER FACTOR CONTROL RELAY



RGT-08



RGT-12



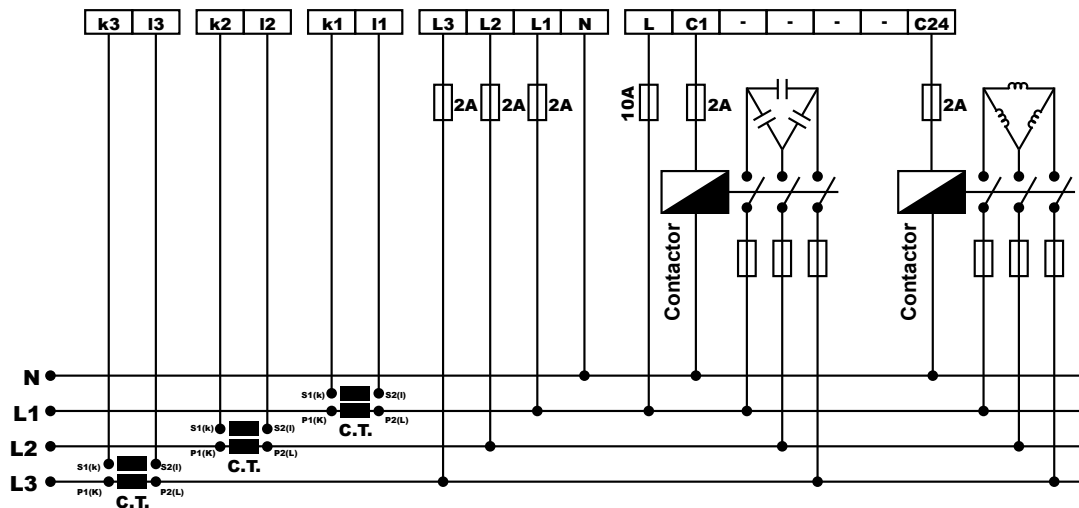
RGT-12M

Operating Voltage (Un)	160V - 240VAC		
Operating Frequency	50/60Hz.		
Operating Power	<12VA		
Operating Temperature	-20°C to 55°C		
Current Measuring Range	5mA - 5.5A		
Measuring Accuracy	%±1		
Current Transformer Ratio	5/5A - 10000/5A		
Response Time	0.4 sec. - 20 sec.		
Discharge Time	0.4 sec. - 60 sec.		
Display	2x16 LCD, 3 x 4 digits display and LEDs	2x16 LCD, 3 x 4 digits display and LEDs	2x16 LCD, 6 x 4 digits display and LEDs
Numer of Steps	8	12	12
Connection Type	Plug-in terminal connection		
Contact	3A/250VAC Resistive Load		
Cable Diameter	2.5mm ² (Current and voltage inputs), 1.5mm ² (Contact connections)		
Weight	<900gr.		
Panel Hole Sizes	140mm x 140mm		
Mounting	Front panel mounting		
Protection Class	IP41(Front panel), IP20(Body)		
Operating Altitude	<2000 meters		
Case	A1		



The reactive power control relays are designed to reduce the reactive powers (inductive and capacitive) not used by the loads in the system and drawn from the network due to the characteristics of the loads. It interferes by activating a capacitor with suitable values if inductive power is drawn from the network. It interferes by activating a shunt reactor with suitable values if capacitive power is drawn from the network. It has the characteristics indicated below.

- 3-phase voltage and 3-phase current transformer
- It can compensate the inductive and capacitive systems.
- Easy-to-use English menu.
- Single phase, two-phase and three-phase capacitor and shunt reactor may be connected.
- It shows the active power, reactive power, $\text{Cos}\phi$, THD, total active and total reactive energy values of each phase on LCD display.
- It shows the 3-phase current, 3-phase voltage or 3-phase $\text{Cos}\phi$ values on the display.
- It saves the total active and total reactive energy values.
- The stage (capacitor and shunt reactor) value can be entered manually.
- It shows the capacitor or reactor stage values individually for each phase.
- The system intervention time can be adjusted.
- Capacitor discharging time can be adjusted.
- It saves the reactive power flow of the system.
- Menu is password-protected.
- The stage layout time between two stages can be adjusted.
- It provides equal number of stage usage for the stages with the same values.
- It shows the inductive/active and capacitive/active ratios reached.
- It can set the inductive/active and capacitive/active ratios desired to be reached.
- Off set stage can be created.
- Time of intervention in the capacitive loads can be changed.
- Time of intervention in the inductive loads can be changed.





THREE-PHASE POWER FACTOR CONTROL RELAY + COMMUNICATION



RGT-12H



RGT-18H



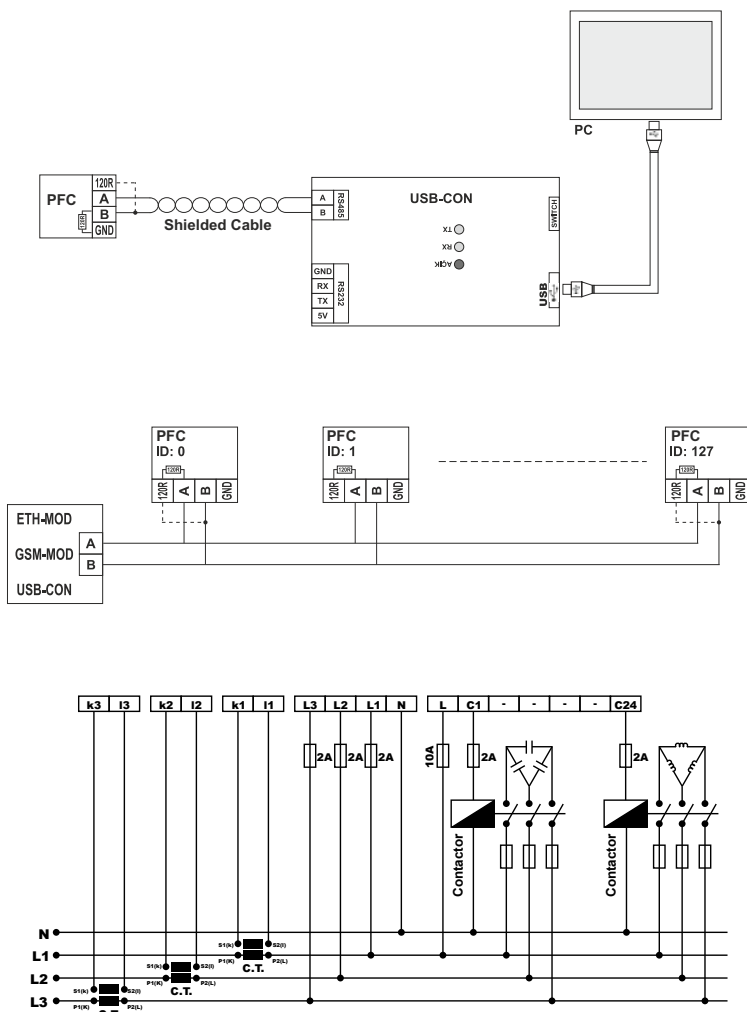
RGT-24H

Operating Voltage (Un)	160V - 240VAC		
Operating Frequency	50/60Hz.		
Operating Power	<12VA		
Operating Temperature	-20°C to 55°C		
Current Measuring Range	5mA - 5.5A		
Measuring Accuracy	%±1		
Current Transformer Ratio	5/5A - 10000/5A		
Response Time	0.4 sec. - 20 sec.		
Discharge Time	0.4 sec. - 60 sec.		
Display	2x16 LCD (blue), 3x4 digit display and LEDs		
Number of Steps	12	18	24
Connection Type	Plug-in terminal connection		
Contact	3A/250VAC Resistive Load		
Connection Isolation	2.5kV		
Connection Interface	RS485		
Connection Speed	9600bps Baudrate		
Connection Properties	Databits: 5, Stopbits: 1, Parity : None		
Cable Diameter	2.5mm ² (Current and voltage inputs), 1.5mm ² (contact connections)		
Weight	<900gr.		
Panel Hole Sizes	140mm x 140mm		
Mounting	Front panel mounting		
Protection Class	IP41(Front panel), IP20(Body)		
Operating Altitude	<2000 meters		
Case	A1		



The reactive power control relays are designed to reduce the reactive powers (inductive and capacitive) not used by the loads in the system and drawn from the network due to the characteristics of the loads. It interferes by activating a capacitor with suitable values if inductive power is drawn from the network. It interferes by activating a shunt reactor with suitable values if capacitive power is drawn from the network.

- Communication with RS485
- 3-phase voltage and 3-phase current transformer
- It can compensate the inductive and capacitive systems.
- Easy-to-use English menu.
- Single phase, two-phase and three-phase capacitor and shunt reactor may be connected.
- It shows the active power, reactive power, $\text{Cos}\phi$, THD, total active and total reactive energy values of each phase on lcd display.
- It shows the 3-phase current, 3-phase voltage or 3-phase $\text{Cos}\phi$ values on the display.
- It saves the total active and total reactive energy values.
- The stage (capacitor and shunt reactor) value can be entered manually
- It shows the capacitor or reactor stage values individually for each phase.
- The system intervention time can be adjusted.
- Capacitor discharging time can be adjusted.
- It saves the reactive power flow of the system.
- Menu is password-protected.
- Stage discharging time can be adjusted.
- It provides equal number of stage usage for the stages with the same values.
- It shows the inductive/active and capacitive/active ratios reached.
- It can set the inductive/active and capacitive/active ratios desired to be reached.
- The stage layout time between two stages can be adjusted.
- Off set stage can be created.
- Time of intervention in the capacitive loads can be changed.
- Time of intervention in the inductive loads can be changed.



User Guide



THYRISTOR TRIGGERED THREE-PHASE POWER FACTOR CONTROL RELAY



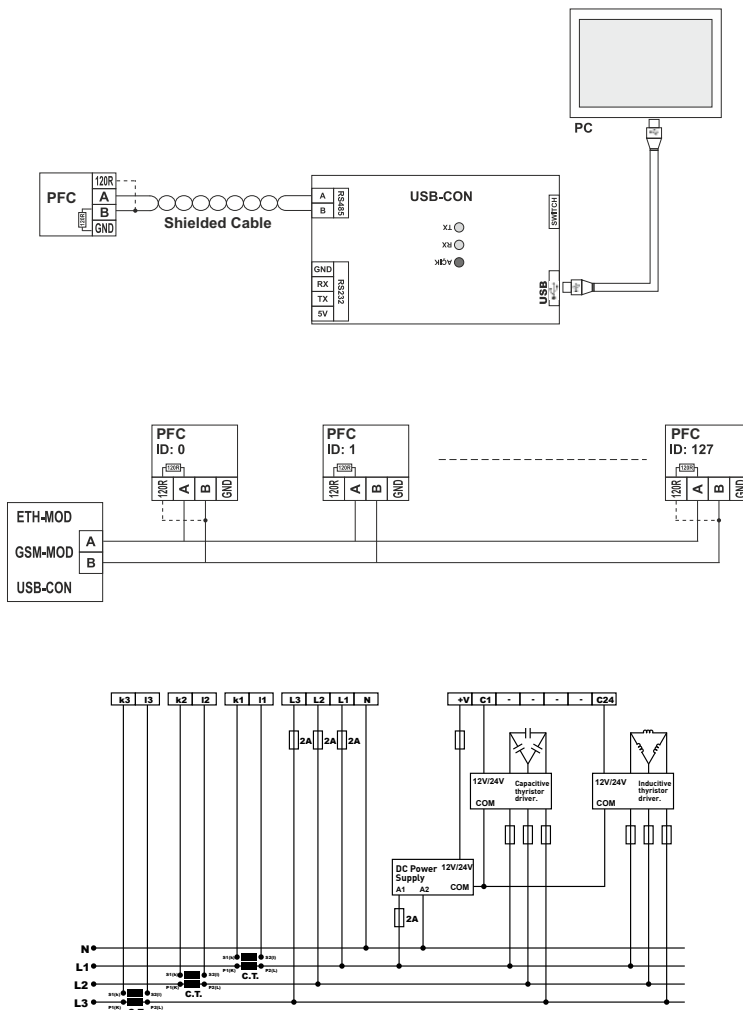
RGT-18TH

Operating Voltage (Un)	160V - 240VAC
Operating Frequency	50/60Hz.
Operating Power	<12VA
Operating Temperature	-20°C to 55°C
Current Measuring Range	5mA - 5.5A
Measuring Accuracy	%±1
Current Transformer Ratio	5/5A - 10000/5A
Display	2x16 LCD (blue), 3x4 digit display and LEDs
Numer of Steps	18
Connection Type	Plug-in terminal connection
Thyristor Trigger Output	<30V DC / <40mA
Isolation	2.5kV
Connection Interface	RS485
Connection Speed	9600bps Baudrate
Connection Values	Databits: 5, Stopbits: 1, Parity: None
Cable Diameter	2.5mm ² (current and voltages inputs), 1.5mm ² (Step outputs)
Weight	<900gr.
Panel Hole Sizes	140mm x 140mm
Mounting	Front panel mounting
Protection Class	IP41(Front panel), IP20(Body)
Operating Altitude	<2000 meters
Case	A1



The reactive power control relays are designed to reduce the reactive powers (inductive and capacitive) not used by the loads in the system and drawn from the network due to the characteristics of the loads. It intervenes by activating a capacitor with suitable values if inductive power is drawn from the network. It interferes by activating a shunt reactor with suitable values if capacitive power is drawn from the network.

- Thyristor triggered
- Communication with RS485,
- 3-phase voltage and 3-phase current transformer
- It can compensate the inductive and capacitive systems.
- Easy-to-use English menu.
- Single phase, two-phase and three-phase capacitor and shunt reactor may be connected.
- It shows the active power, reactive power, $\cos\phi$, THD, total active and total reactive energy values of each phase on lcd display.
- It shows the 3-phase current, 3-phase voltage or 3-phase $\cos\phi$ values on the display.
- It saves the total active and total reactive energy values.
- The stage (capacitor and shunt reactor) value can be entered manually
- It shows the capacitor or reactor stage values individually for each phase.
- The system intervention time can be adjusted.
- It saves the reactive power flow of the system.
- Menu is password-protected.
- It provides equal number of stage use for the stages with the same values.
- It shows the inductive/active and capacitive/active ratios reached.
- It can set the inductive/active and capacitive/active ratios desired to be reached.
- The stage emplacement time between two stages can be adjusted.
- Off set stage can be created.
- Time of intervention in the capacitive loads can be changed.
- Time of intervention in the inductive loads can be changed.





MONOPHASE POWER FACTOR CONTROL RELAY



RGM-07E



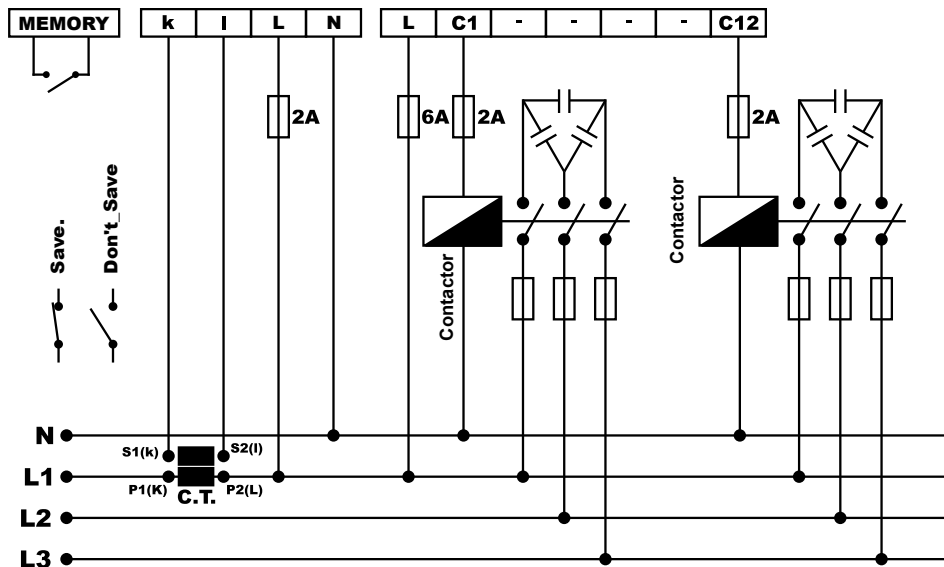
RGM-12E

Operating Voltage (Un)	160V - 260VAC	
Operating Frequency	50Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Current Measuring Range	100mA - 5.5A	
Measuring Accuracy	%±1	
Cosine Measuring Range	-0.00 to 1.00 to 0.00	
Display	3x20mm digit display and LEDs	
Numer of Steps	7	12
Connection Type	Plug-in terminal connection	
Contact	3A/250VAC Resistive Load	
Cable Diameter	1.5mm ²	
Weight	<600gr.	
Panel Hole Sizes	140mm x 140mm	
Mounting	Front panel mounting	
Protection Class	IP41(Front panel), IP20(Body)	
Operating Altitude	<2000 meters	
Case	A1	



The reactive power control relays are designed to reduce the reactive powers not used by the loads in the system and drawn from the network due to the characteristics of the loads. It intervenes by activating a capacitor with suitable values if inductive power is drawn from the network.

- Single phase voltage and single phase current transformer.
- It can compensate the inductive systems.
- Easy-to-use It shows the Cosφ value of the relevant phase to which it is connected on the display.
- It functions through the method of holding and releasing respectively.





ENERGY



ENERGY



MEASUREMENT



MONITORING



PROTECTION
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PANEL
EQUIPMENT



TPM-01



TPM-02



TPM-03

Operating Voltage (Un)	160V - 240VAC	85V - 300VAC	
Operating Frequency	50/60Hz.		
Operating Power	<7VA	<6VA	<6VA
Operating Temperature	-20°C to 55°C		
Voltage Input	5V - 330VAC		
Voltage Measuring Range	5V - 300V	5V - 600kV	
Current Input	5mA - 5.5A	5mA - 10A	
Current Measuring Range	5mA - 5.5A		
Voltage , Current Accuracy	%±1	%±0.5	
Active Power Accuracy	-	%±1	%±0.5
Reactive Power Accuracy	-	%±2	%±1
Supported Connection	3P4W	3P4W	3P3W, 3P4W
Current Transformer Ratio	5/5A - 10000/5A	1.....5000	
Voltage Transformer Ratio	-	1,0.....4000	
Display	2x16 LCD	128x64 LCD	
Harmonic Voltage	-	2-31	1-63
Harmonic Current	-	2-31	1-63
Neutral Current Measurement	-	-	Yes
Real Time Clock	-	>5Yil	
Communication	-	RS485 ModBus RTU	
Connection Type	Plug-in terminal connection		
Contact	-	-	2A/250VAC Resistive Load
Pulse Output	-	-	Yes
Cable Diameter	1.5mm ²		
Weight	<500gr.	<300gr.	
Panel Hole Sizes	91mm x 91mm		
Mounting	Front panel mounting		
Protection Class	IP40(Front panel), IP20(Body)		
Operating Altitude	<2000 meters		
Case	A3		

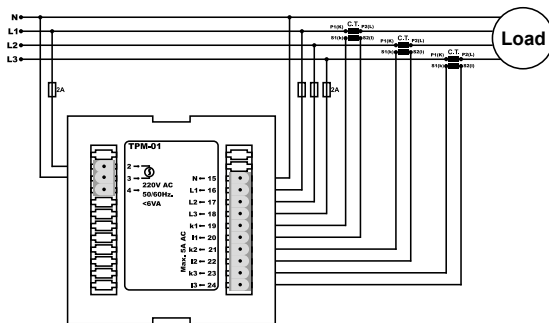


Energy analyzers are designed to measure such as voltage, current, $\cos\phi$, active power, reactive power, minimum and maximum values, demands and energy of the load(s) on the system. It provides electrical parameter measurement and energy measurement solutions. Measured and recorded parameters can be monitorable via communication function. It has the characteristics indicated below.

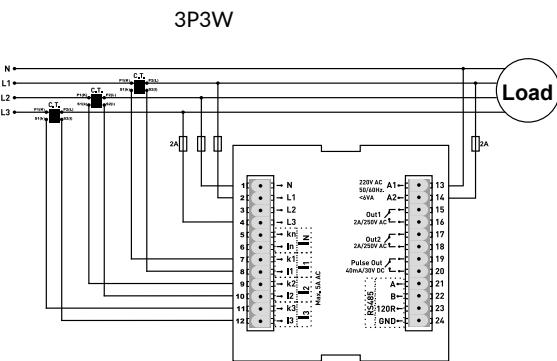
- With 3-phase voltage and 3-phase current transformers.
- Easy-to-use English menu.
- It shows per-phase and total active (P, ΣP) powers.
- It shows per-phase and total reactive (Q, ΣQ inductive and capacitive) powers.
- It shows per-phase and apparent powers(kVA).(TPM-02 and TPM-03)
- It shows $\cos\phi$ value of each phase.
- It shows voltage values (V) of each phase.
- It shows current value (I) of each phase.
- It shows total imported active energy (ΣkWh) value.
- It shows total exported active energy (ΣkWh) value.
- It shows total inductive reactive energy ($\Sigma kVarh$) value.
- -It shows total capacitive reactive energy value ($\Sigma kVarh$).
- It shows the minimum values.
- It shows the maximum values.
- It shows demand values.
- You can reset the energy values.
- The records can be reset.



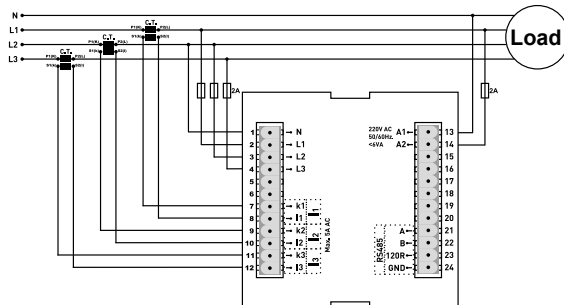
TPM-01



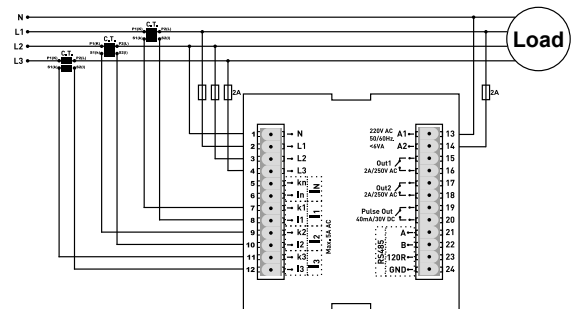
TPM-03



TPM-02



3P4W



TPM-01



TPM-02



TPM-03

For detailed technical information, you can reach product manuals by scanning the QR codes.





TPM-04



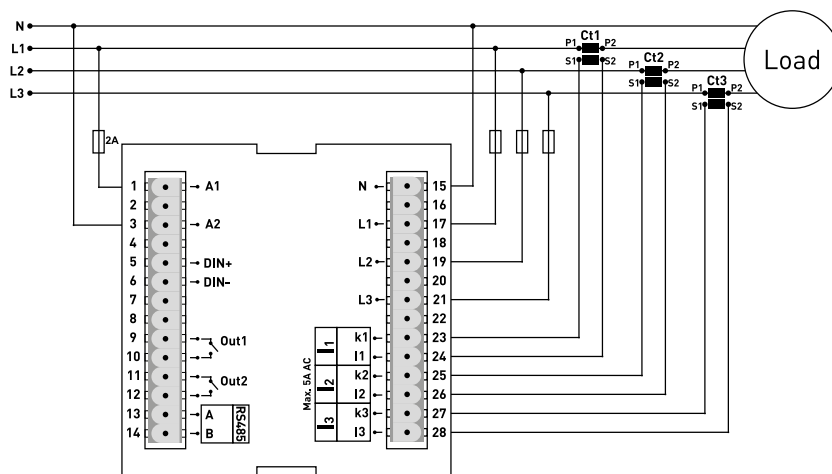
TPM-04E

Operating Voltage (Un)	85V - 300VAC	
Operating Frequency	50/60Hz.	
Operating Power	<10VA	
Operating Temperature	-20°C to 55°C	
Voltage Input	5V - 330VAC	
Voltage Measuring Range	5V - 330kV	
Current Input	10mA - 5.5A	
Current Measuring Range	10mA - 5.500A	
Voltage , Current Accuracy	%±0.5	
Active Power, Reactive Power Accuracy	%±1, %±2	
Supported Connection	3P4W	
Current Transformer Ratio	1....1000	
Voltage Transformer Ratio	1,0....999,9	
Display	71.5 x 61.5mm Glass LCD	4 x 4 Digits LED Display
Harmonic Voltage, Current	3 - 31	
Communication	RS485 MODBUS RTU	
Digital Input	9V - 24VDC	
Connection Type	Plug-in terminal connection	
Contact	2 x 3A/250VAC Resistive Load	
Cable Diameter	1.5mm ²	
Weight	<300gr.	
Panel Hole Sizes	91mm x 91mm	
Mounting	Front panel mounting	
Protection Class	IP40(Front panel), IP20(Body)	
Operating Altitude	<2000 meters	
Case	A4	



TPM-04 Energy analyzer measures the voltage, current, $\cos\phi$, active power, reactive power, minimum and maximum values, demands and energy of the load(s) on the system. It has the characteristics indicated below.

- With 3-phase voltage and 3-phase current transformer.
- It measures Voltage harmonic up to 31st.
- It measures Current harmonic up to 31st.
- Communication with RS485 Modbus RTU
- 4 x 4 Digits Led Display
- It shows total active (P1,P2,P3) Powers for each phase.
- It shows total reactive (Q1,Q2,Q3) Powers for each phase.
- It shows Power Factor (PF) and $\text{Cos}\phi$ values for each phase.
- It shows minimum, maximum and average values of Phase-Neutral and Phase-Phase voltages. It shows per-phase and total current (I1,I2,I3) value.
- It shows total imported and exported active energy (ΣkWh) value.
- It shows total inductive reactive energy (ΣkVArh) value.
- 2 relay outputs (adjustable), 1 Digital Input.
- Records (High/Low/Average voltage/Current)
- It shows demands.
- You can reset the energy values and demands records .
- Menu is password-protected.





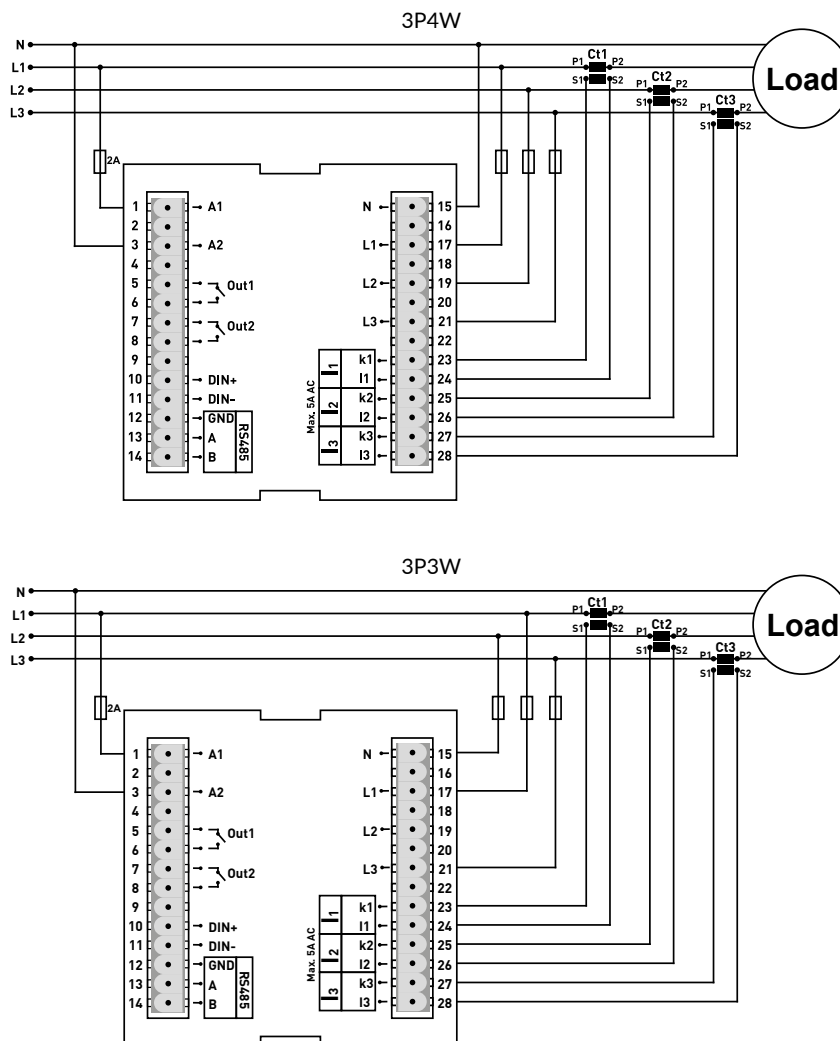
TPM-05

Operating Voltage (Un)	85V - 300VAC
Operating Frequency	50/60Hz.
Operating Power	<10VA
Operating Temperature	-20°C to 55°C
Voltage Input	5V - 330VAC
Voltage Measuring Range	1V - 600kV
Current Input	1mA - 5.5A
Current Measuring Range	1mA - 50.000A
Voltage , Current Accuracy	%±0.2
Active Power, Reactive Power Accuracy	%±0.5, %±1
Supported Connection	3P3W, 3P4W
Current Transformer Ratio	1....5000
Voltage Transformer Ratio	1.0....4000
Display	71.5 x 61.5mm Glass LCD
Harmonic Voltage, Current	3 - 55
Real Time Clock	>5 years
Communication	RS485 MODBUS RTU
Digital Input	9V - 24VDC
Connection Type	Plug-in terminal connection
Contact	2A/250VAC Resistive Load
Cable Diameter	1.5mm ²
Weight	<300gr.
Panel Hole Sizes	91mm x 91mm
Mounting	Front panel mounting
Protection Class	IP40(Front panel), IP20(Body)
Operating Altitude	<2000 meters
Case	A4



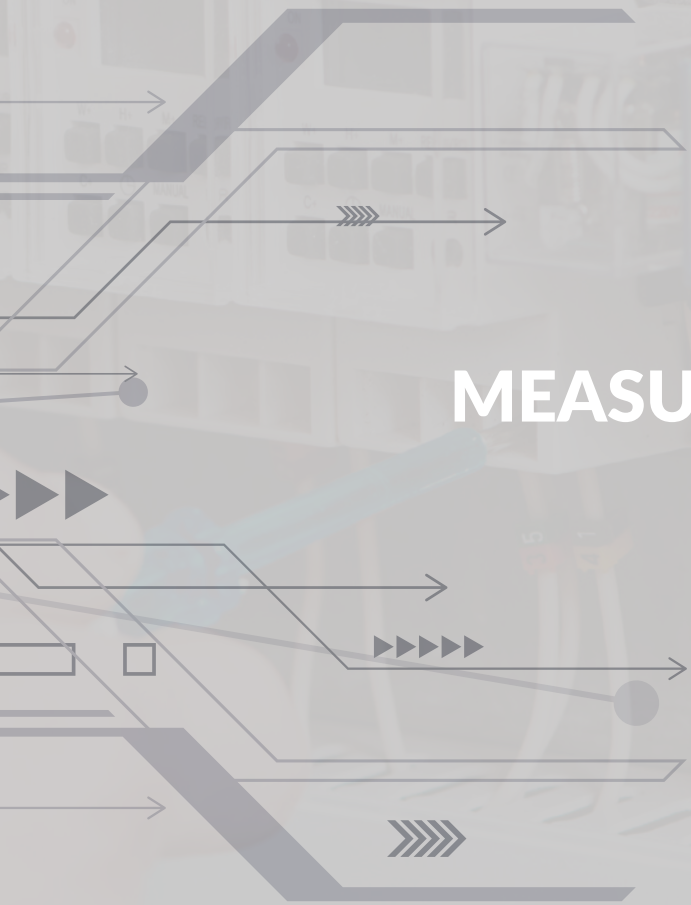
TPM-05 Energy analyzer measures the voltage, current, $\cos\phi$, active power, reactive power, minimum and maximum values, demands and energy of the load(s) on the system. It has the characteristics indicated below.

- With 3-phase voltage and 3-phase current transformer.
- It measures Voltage harmonic(L-N and L-L) up to 55th.
- It measures Current harmonic up to 55th.
- Communication with RS485 Modbus RTU
- 71.5 x 61.5 Custom Design Glass LCD
- It shows total active (P1,P2,P3, P Σ) Powers for each phase.
- It shows total reactive (Q1,Q2,Q3, Q Σ) Powers for each phase.
- It shows Power Factor(PF) and $\cos\phi$ values for each phase.
- It shows minimum, maximum and average values of Phase-Neutral and Phase-Phase voltages. It shows per-phase and total current (I1,I2,I3,I Σ) value.
- It shows total imported and exported active energy (Σ kWh) value.
- It shows total inductive reactive energy (Σ kVarh) value.
- 2 relay outputs (adjustable), 1 Digital Input.
- Events records (High voltage, Low voltage, power cut, energy disorder, High current, current disorder, THDV and THDI limits)
- Date and clock can be adjusted.
- Real time clock.
- It shows demands.
- You can reset the energy values, demands and event records .
- Menu is password-protected.





MEASUREMENT



PANEL
EQUIPMENT



PROTECTION
AND CONTROL



MONITORING



MEASUREMENT


EM-07

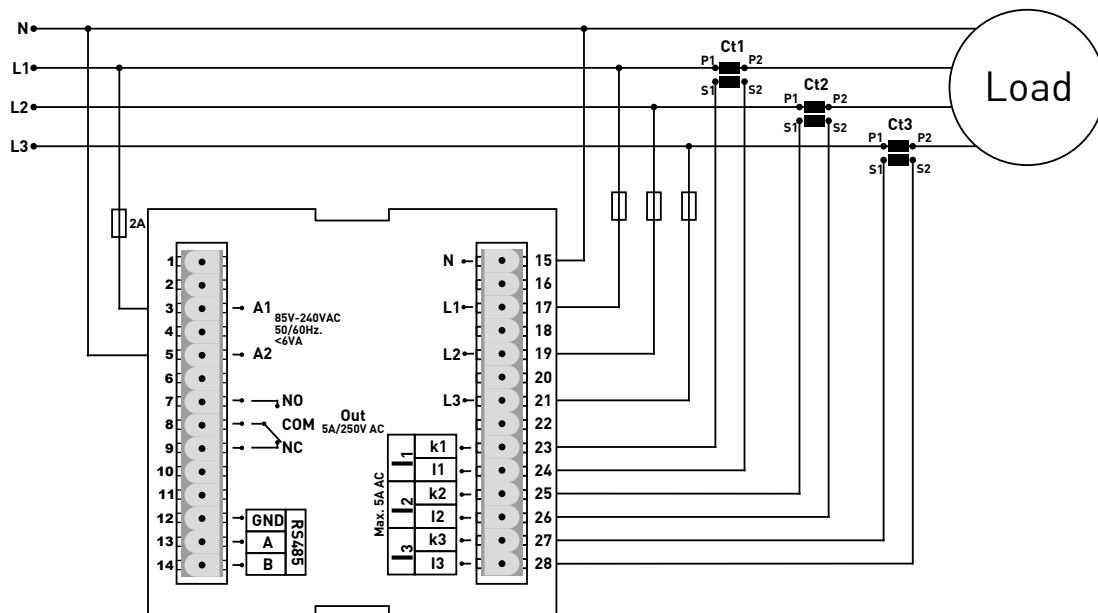
EM-07K

Operating Voltage (Un)	85V - 240VAC	
Operating Frequency	50/60Hz.	
Operating Power	<10VA	
Operating Temperature	-20°C to 55°C	
Voltage Input	5V - 300VAC	
Voltage Measuring Range	5V - 300kV	
Current Input	50mA - 5.5A	
Current Measuring Range	50mA - 10.000A	
Voltage , Current Accuracy	%±1	
Supported Connection	3P4W	
Current Transformer Ratio	1.....2000	
Voltage Transformer Ratio	1.....999	
Display	71.5 x 61.5mm Glass LCD	
Communication	RS485 ModBus RTU (1200 - 38400bps)	
Contact	2A/250VAC Resistive Load	-
Connection Type	Plug-in terminal connection	
Cable Diameter	1.5mm ²	
Weight	<300gr.	
Panel Hole Sizes	91mm x 91mm	
Mounting	Front panel mounting	
Protection Class	IP41(Front panel), IP20(Body)	
Operating Altitude	<2000 meters	
Case	A4	



EM-07 and EM-07K multimeter is designed to monitor voltage, current, frequency, apparent power values and their minimum, average and maximum values, demands and energy of the load(s) on the system. They have the common characteristics indicated below.

- Communication with RS485 Modbus RTU
- Glass LCD.
- With 3-phase voltage and 3-phase current transformer.
- It shows value of L1, L2, L3, L12, L23, L31, I1, I2, I3, S1, S2, S3, F.
- It shows minimum, maximum and average values of L1, L2, L3, L12, L23, L31, F.
- It shows minimum, maximum and demand values of I1, I2, I3, S1, S2, S3.
- Additional features of EM-07 are indicated below.
- High/Low voltage, current, frequency(adjustable).
- Line to Line or Line to Neutral protection (adjustable)
- 1 relay output
- Voltage, current and frequency Protection.



EM-07



EM-07K




EM-06

EM-60D

EM-250D

Operating Voltage (Un)	140V - 270VAC		
Operating Frequency	50/60Hz.		
Operating Power	<6VA		
Operating Temperature	-20°C to 55°C		
Current Measuring Range	100mA - 5.5A AC	1A - 100A AC	2A - 250A AC
Current Transformer	10/5A - 9995/5A (X5)	CT-120	CT-300
Measuring Accuracy	±1%		
Voltage Measuring Range	1V - 500VAC		
Display	6 x 9 mm 3 digit display and LEDs		
Connection Type	Plug-in terminal connection		
Cable Diameter	1.5 mm ²		
Weight	<325gr.		
Panel Hole Sizes	91mm x 91mm		
Mounting	Front panel mounting.		
Protection Class	IP41(Front panel), IP20(Body)		
Operating Altitude	<2000 meters		
Case	A2		



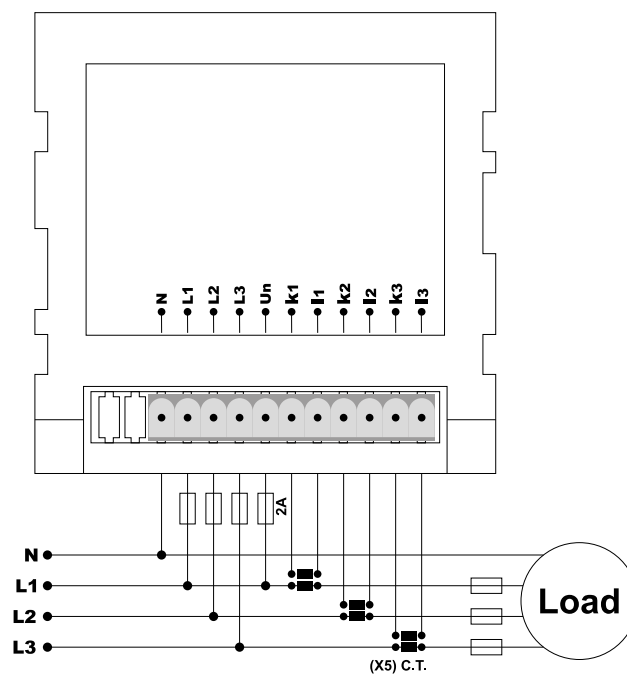
Digital multimeter is designed to monitor the current and voltage values of the threephase operating loads. It is used in industry or any place to desire voltage and current measurement.

EM-06: it is used with X5 current transformer.

EM-60D: it is used with 3 pieces CT120 current transformers which are given with device.

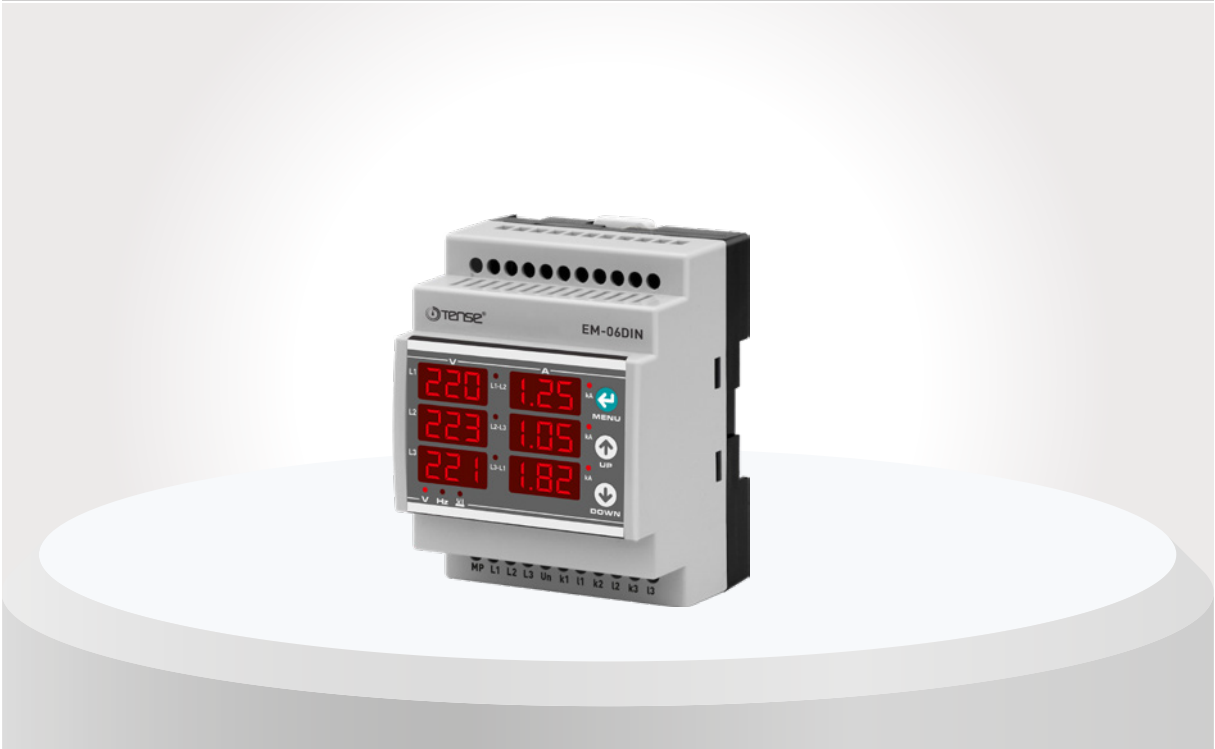
EM-250D: it is used with 3 pieces CT300 current transformers which are given with device.

- True RMS voltage and current measurement
- 50/60 Hz measurement
- Frequency measurement
- Phase sequence measurement
- It shows 3 phase voltage and current at the same time.
- 6 x 9mm 3 digit display and 9 x leds.





DIN TYPE MULTIMETER



EM-06DIN



EM-60DIN



EM-250DIN

Operating Voltage (Un)	140V - 270VAC		
Operating Frequency	50/60Hz.		
Operating Power	<6VA		
Operating Temperature	-20°C to 55°C		
Current Measuring Range	100mA - 5.5A AC	1A - 100A AC	2A - 250A AC
Current Transformer	10/5A - 9995/5A (X5)	CT-120	CT-300
Measuring Accuracy	±1%		
Voltage Measuring Range	1V - 500VAC		
Display	6 adet 9 mm 3 digit display LEDs		
Connection Type	Plug-in terminal connection		
Cable Diameter	1.5mm ²		
Weight	<325gr.		
Mounting	DIN rail mounting		
Protection Class	IP20		
Operating Altitude	<2000 meters		
Case	E2		



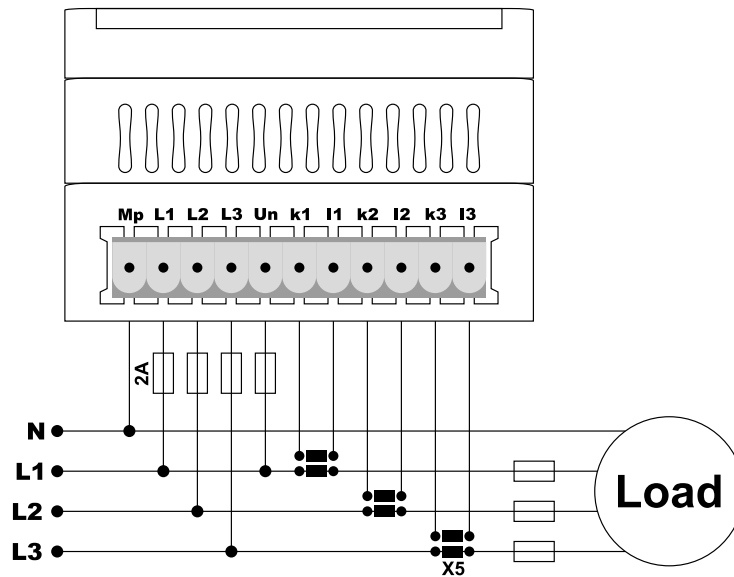
Digital multimeter is designed to monitor three phase current and voltage values in three phase systems continuously.

EM-06DIN: it uses with X5 current transformer.

EM-60DIN: it uses with 3 pieces CT120 current transformers which are given with device.

EM-250DIN: it uses with 3 pieces CT300 current transformers which are given with device

- True RMS voltage and current measurement
- 50/60 Hz measurement
- Frequency measurement
- Phase sequence measurement
- It shows 3 phase voltage and current at the same time.
- 6 x 8mm 3 digit display and 9 x leds.





ADJUSTABLE MULTIMETER



EM-04S



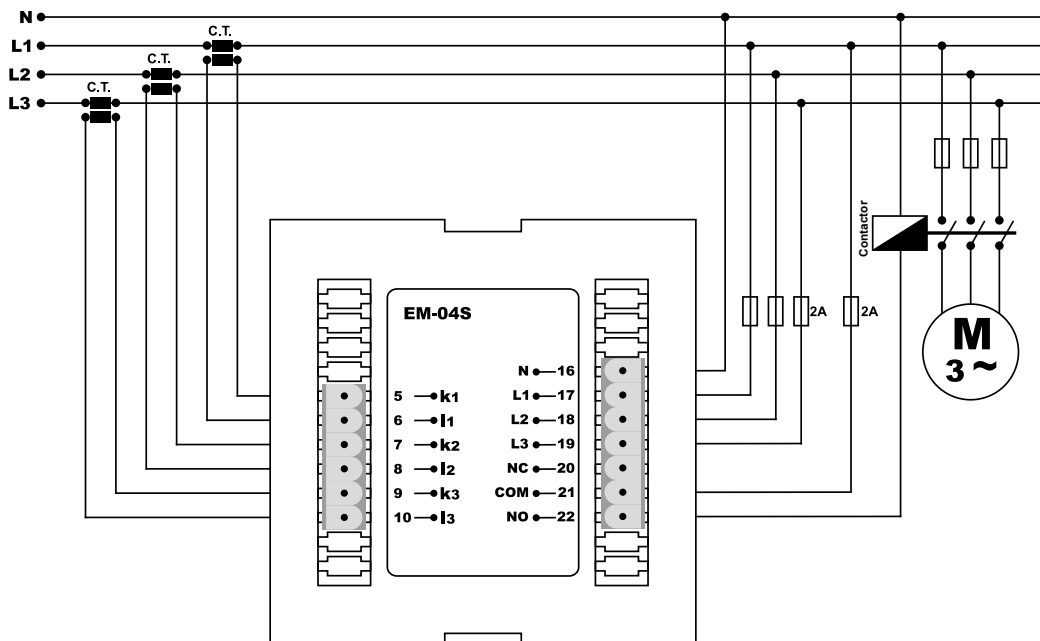
EM-04SD

Operating Voltage (Un)	140V - 270VAC	
Operating Frequency	50Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Current Measuring Range	100mA - 5.5A AC	2A - 250A AC
Current Transformer	10/5A - 9995/5A (X5)	CT-300
Measuring Accuracy	±1%	
Voltage Measuring Range	1V - 500VAC	
Display	4 x 9 mm 4 digit display, LEDs	
Connection Type	Plug-in terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	1.5mm ²	
Weight	<250gr.	
Panel Hole Sizes	91mm x 91mm	
Mounting	Front panel mounting.	
Protection Class	IP41(Front panel), IP20(Body)	
Operating Altitude	<2000 meters	
Case	A3	



Digital set multimeter is designed to protect the three-phase operating precise loads against the faults likely to arise from currents or voltages.

- High and low voltage can be adjusted.
- High and low current can be adjusted.
- Demurrage (starting) multiplier and time can be adjusted.
- High and low current automatic reset times can be adjusted.
- High and low current error waiting times can be adjusted.
- Voltage and current asymmetry can be adjusted.





DJ-F96



DJ-F72



DJ-F48



DJ-F36



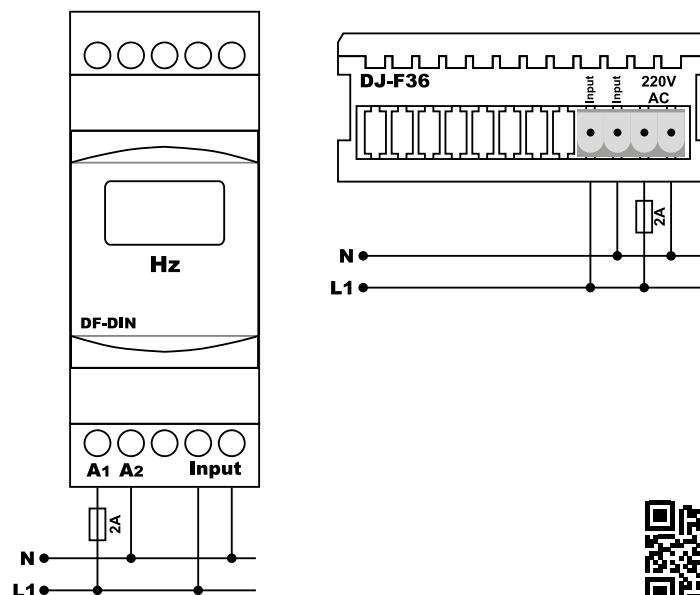
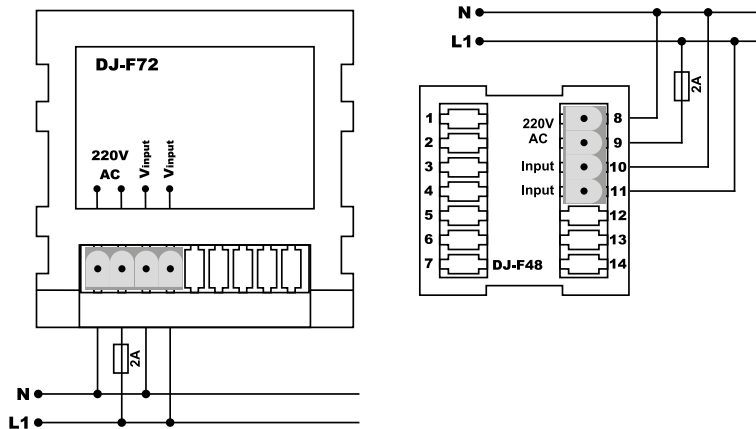
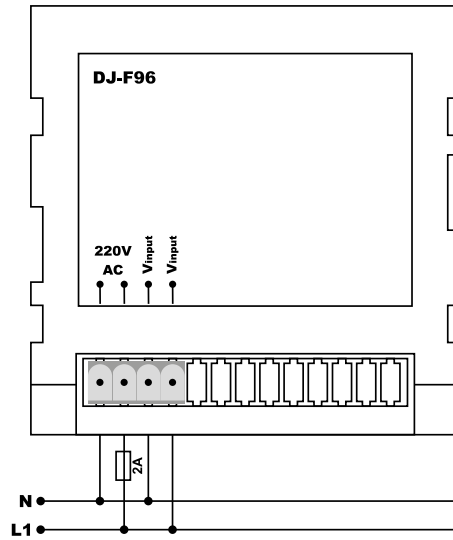
DF-DIN

Operating Voltage (Un)	140V - 260VAC				
Operating Frequency	50/60Hz.				
Operating Power	<6VA				
Operating Temperature	-20°C to 55°C				
Frequency Measuring Range	1 - 400 Hz. (15V - 500VAC)				
Measuring Accuracy	±1%				
Display	20mm 3 digits display	14mm 3 digits display	9mm 3 digits display	14mm 3 digits display	9mm 3 digits display
Connection Type	Plug-in terminal connection				Terminal connection
Cable Diameter	1.5mm ²				2.5mm ²
Weight	<220gr.				
Panel Hole Sizes	91mm x 91mm	68mm x 68mm	45mm x 45mm	30mmx72mm	-
Mounting	Front panel mounting				DIN rail mounting
Protection Class	IP41(Front panel), IP20(Body)				IP20
Operating Altitude	<2000 meters				
Case	A2	A5	A7	A9	B4



Digital frequency meters are designed to monitor AC voltage frequency value continuously.

When the device is energized, it shows the frequency value of the phase-to-neutral or phase-to-phase AC voltage coming to Vinput constantly on the display. The voltage the frequency value of which is desired to be measured should be between 15V - 500V.



DJ-FXX



DF-DIN

For detailed technical information, you can reach product manuals by scanning the QR codes.





ADJUSTABLE AMMETER



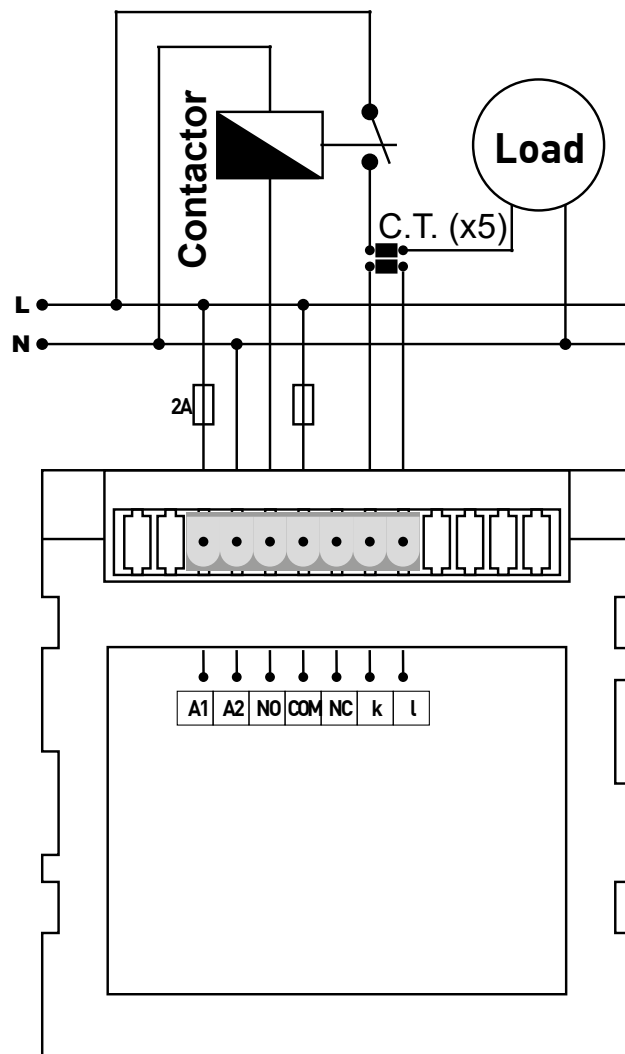
DA-VIP04

Operating Voltage (Un)	150V - 240VAC
Operating Frequency	50/60Hz.
Operating Power	<6VA
Operating Temperature	-20°C to 55°C
Current Measuring Range	100mA - 5.5A AC
Current Transformer	5/5A - 800/5A (X5)
Measuring Accuracy	±3%
Display	3 digits 20mm and 3 digits 14mm display
Contact	5A/250VAC Resistive Load
Connection Type	Plug-in terminal connection
Cable Diameter	1.5mm ²
Weight	<300gr.
Panel Hole Sizes	91mm x 91mm
Mounting	Front panel mounting.
Protection Class	IP41(Front panel), IP20(Body)
Operating Altitude	<2000 meters
Case	A2



Digital set ammeters are designed to prevent the faults likely to arise from the current drawn by the loads. The device shows the current drawn by the load on the 1st display (20 mm large). It shows the high current set value on the 2nd display (14 mm small). You can adjust the high voltage set value by pressing Up and Down buttons. It is used in industry, stone and marble quarries.

- True RMS current measurement
- 50/60Hz measurement
- Easy to use
- 20mm 3 digit display, 14mm 3 digit display
- It is used with X5 current transformer and may be set up to 800A/5A.
- It responds faster than normal ammeter.





ADJUSTABLE AMMETER



DJ-A96S



DJ-A72S

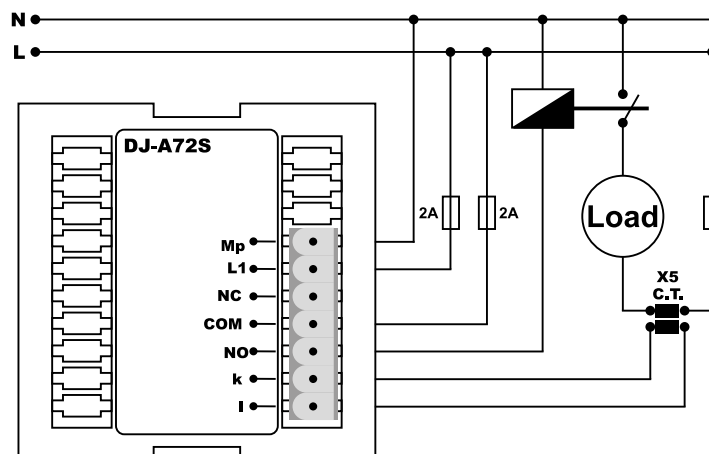
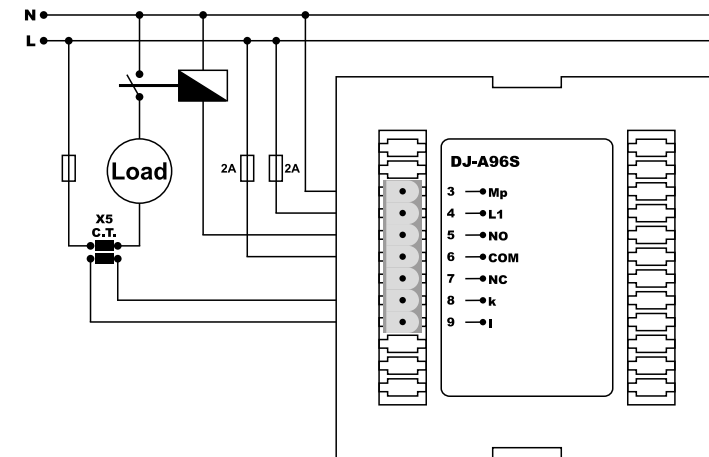
Operating Voltage (Un)	150V - 260VAC	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Current Measuring Range	150mA - 5.5A AC	
Current Transformer	10/5A - 995/5A (X5)	
Measuring Accuracy	±1%	
Display	20mm 3 digits display, LEDs	14mm 3 digits display, LEDs
Contact	5A/250VAC Resistive Load	
Connection Type	Plug-in terminal connection	
Cable Diameter	1.5mm ²	
Weight	<220gr.	
Panel Hole Sizes	91mm x 91mm	68mm x 68mm
Mounting	Front panel mounting	
Protection Class	IP41(Front panel), IP20(Body)	
Operating Altitude	<2000 meters	
Case	A3	A6



Digital Adjustable Ammeter are designed to prevent the faults likely to arise from the current drawn by the loads.

The device shows the current drawn by the load on the 1st display (20 mm large). It shows the high current set value on the 2nd display (14 mm small). It is used for loads (motor, resistance, machine, etc.) which requiring single phase current control in industry.

- High and low voltage can be adjusted,
- High and low current can be adjusted,
- Demurrage (starting) Multiplier and time can be adjusted,
- High and low current automatic reset times can be adjusted,
- High and low current error waiting times can be adjusted,
- Current automatic reset value can be adjusted,
- High and low current hysteresis values can be adjusted,
- True RMS current measurement
- Easy to use
- 20mm 3 digit display, 14mm 3 digit display
- It is used with X5 current transformer





THREE PHASE AMMETER



DJ-A96T

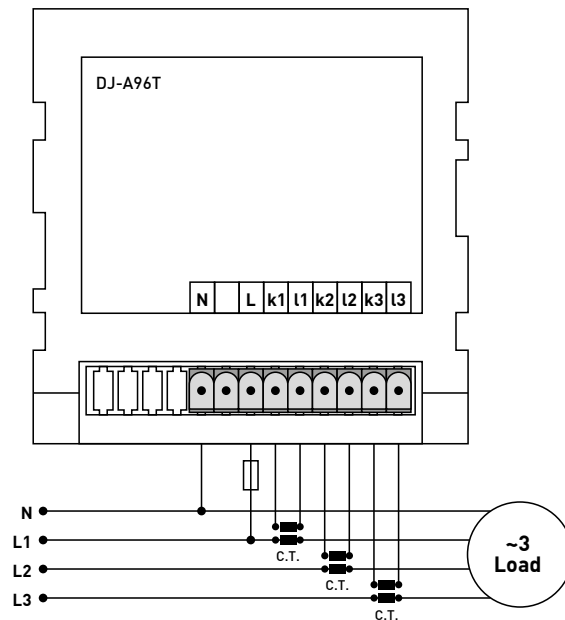
Operating Voltage (Un)	150V - 240VAC
Operating Frequency	50/60Hz.
Operating Power	<4VA
Operating Temperature	-20°C to 55°C
Measuring Range	5mA - 5.5A
Measuring Accuracy	±2%
Current Transformer Ratio	5/5A - 10000/5A
Display	3 x 14mm 4 digits display
Connection Type	Plug-in terminal connection
Cable Diameter	1.5mm ²
Weight	<300gr.
Panel Hole Sizes	91mm x 91mm
Mounting	Front panel mounting
Protection Class	IP41(Front panel), IP20(Body)
Operating Altitude	<2000 meters
Case	A2









Digital ammeters are designed to monitor AC current values in three-phase systems continuously.

It is used for loads (motor, resistance, machine, etc.) which requiring three phase current tracking in industry.

- True RMS current measurement
- 50/60Hz measurement
- 14mm 3 digit Display
- It uses with X5 current transformer





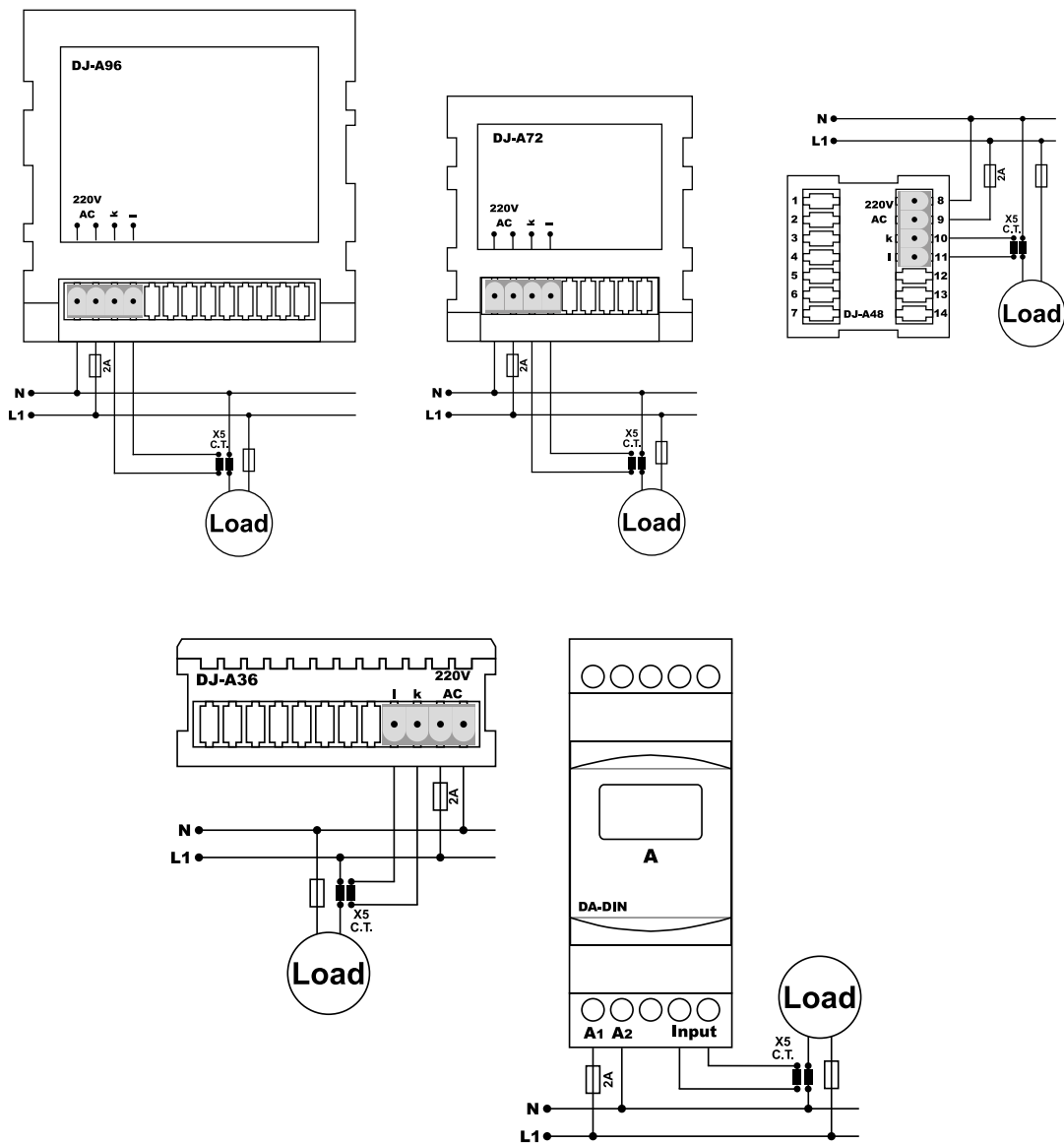
	 DJ-A96	 DJ-A72	 DJ-A48	 DJ-A36	 DA-DIN
Operating Voltage (Un)	150V - 260VAC				
Operating Frequency	50/60Hz.				
Operating Power	<6VA				
Operating Temperature	-20°C to 55°C				
Current Measuring Range	100mA - 5.5A AC				
Current Transformer	10/5A - 9995/5A (X5)				
Measuring Accuracy	±1%				
Display	20mm 4 digits display	14mm 4 digits display	9mm 4 digits display	10mm 4 digits display	9mm 3 digits display
Connection Type	Plug-in terminal connection				Terminal connection
Cable Diameter	1.5mm ²				2.5mm ²
Weight	<220gr.				
Panel Hole Sizes	91mm x 91mm	68mm x 68mm	45mm x 45mm	30mmx72mm	-
Mounting	Front panel mounting				DIN rail mounting
Protection Class	IP41(Front panel), IP20(Body)				IP20
Operating Altitude	<2000 meters				
Case	A2	A5	A7	A9	B4



Digital ammeters are designed to monitor AC current values in single-phase systems continuously. It is used for loads (motor, resistance, machine, etc.) which requiring single phase current tracking in industry.

DA-DIN: Product should be demanded depending on the current transformer value to be used.

- True RMS current measurement
- 50/60Hz measurement
- 14mm 4 digit display
- It is used with X5 current transformer





DIRECT AMMETER (100A)



DJ-A96D



DJ-A72D



DJ-A48D



DJ-A36D



DA-120



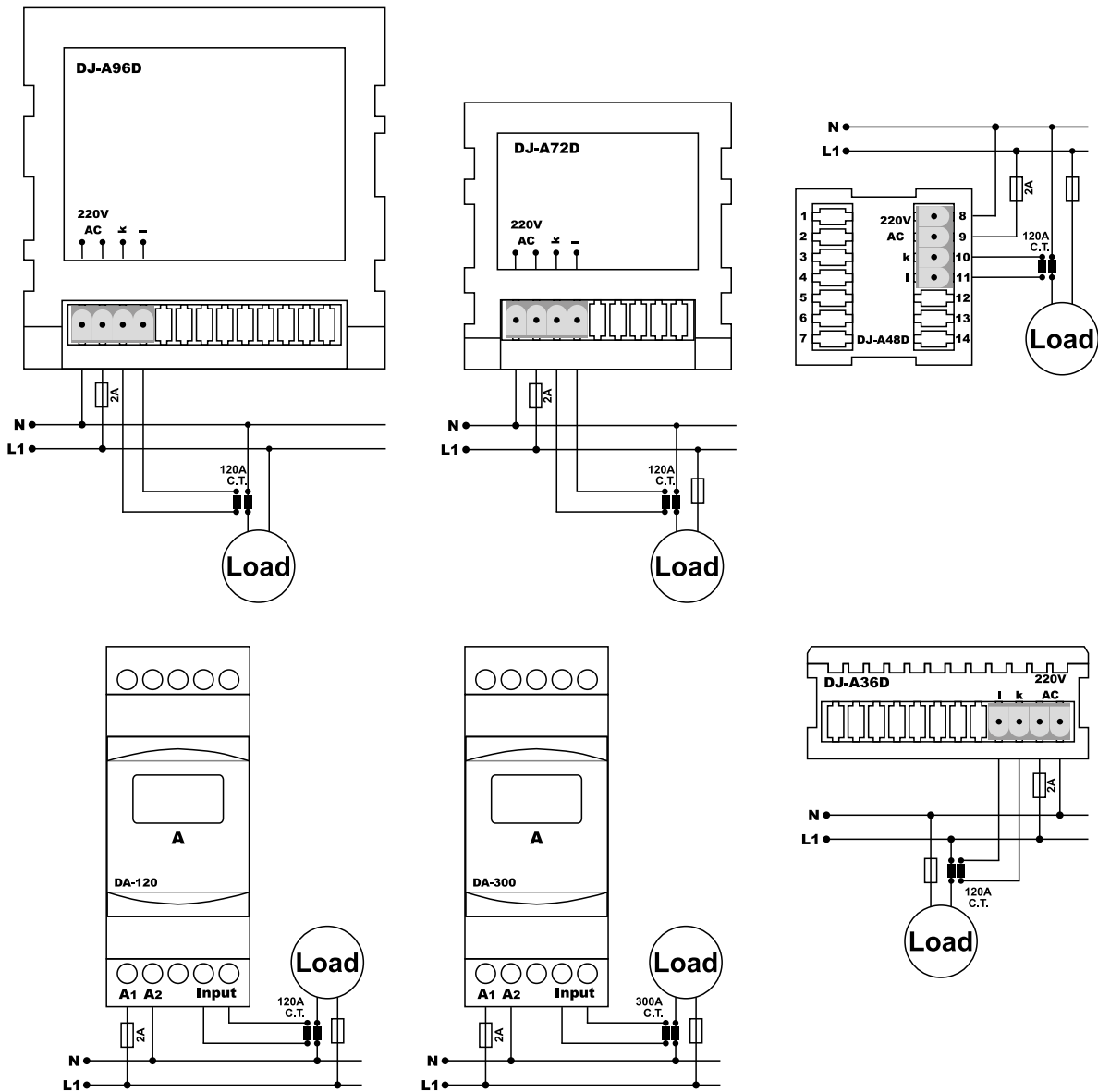
DA-300

Operating Voltage (Un)	150V - 260VAC					
Operating Frequency	50/60Hz.					
Operating Power	<6VA					
Operating Temperature	-20°C to 55°C					
Current Measuring Range	1A - 100A					2A - 250A
Current Transformer	CT-120					CT-300
Measuring Accuracy	±1%					
Display	20mm 3 digits display	14mm 3 digits display	9mm 3 digits display	14mm 3 digits display	9mm 3 digits display	
Connection Type	Plug-in terminal connection				Terminal connection	
Cable Diameter	1.5mm ²				2.5mm ²	
Weight	<220gr.					
Panel Hole Sizes	91mm x 91mm	68mm x 68mm	45mm x 45mm	30mmx72mm	-	
Mounting	Front panel mounting				DIN rail mounting	
Protection Class	IP41(Front panel), IP20(Body)				IP20	
Operating Altitude	<2000 meters					
Case	A2	A5	A7	A9	B4	



Digital ammeters are designed to monitor AC current values in single-phase systems continuously. It is used for loads (motor, resistance, machine, etc.) which requiring single phase current tracking in industry.

- True RMS current measurement
- 50/60Hz measurement
- 3 digit display
- It is used with CT-120 current transformers which are given with device. (CT-300 for DA-300)





DAV-72D



DAV-DIN



DAV-120



DAV-300

Operating Voltage (Un)	140V - 270VAC			
Operating Frequency	50/60Hz.			
Operating Power	<6VA			
Operating Temperature	-20°C to 55°C			
Current Measuring Range	1A - 100A	100mA - 5.5	1A - 100A	2A - 250A
Current Transformer	CT120	10/5A - 995/5A (X5)	CT120	CT300
Voltage Measuring Range	150V - 260VAC			
Measuring Accuracy	±1%			
Display	2x14mm 3 digits display	2x9mm 3 digits display		
Connection Type	Plug-in terminal connection	Terminal connection		
Cable Diameter	1.5mm ²	2.5mm ²		
Weight	<220gr.			
Panel Hole Sizes	68mm x 68mm	-		
Mounting	Front panel mounting	DIN rail mounting		
Protection Class	IP41(Front panel), IP20(Body)	IP20		
Operating Altitude	<2000 meters			
Case	A5	B4		



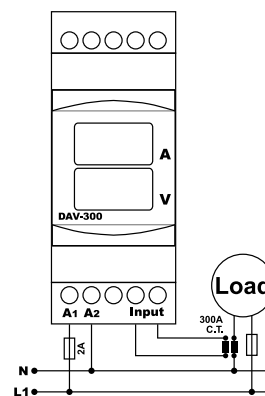
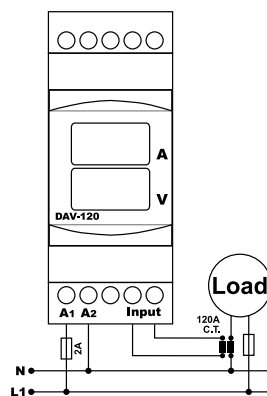
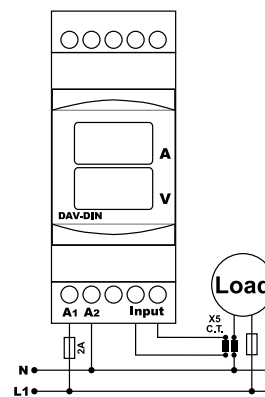
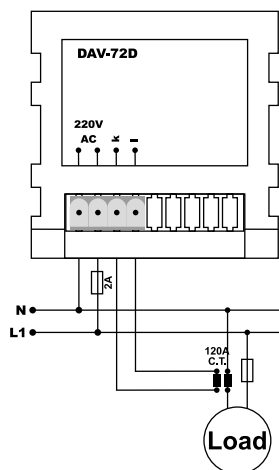
Digital voltmeters-ammeters are designed to monitor both AC current value drawn by the loads and the voltage value of the relevant phase continuously. It uses for loads which requiring single phase voltage and current tracking in industry.

DAV-DIN: it is used with X5 current transformer. Product should be demanded depending on the current transformer value to be used

DAV-72D/DAV-120: it is used with CT-120 current transformers which are given with device.

DAV-300: it is used with CT-300 current transformers which are given with device.





- True RMS current measurement
- 50/60Hz measurement
- It shows voltage and current simultaneously
- 2 x 3 digit Display





DC AMMETER

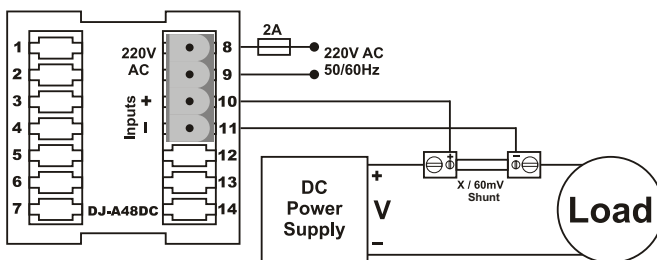
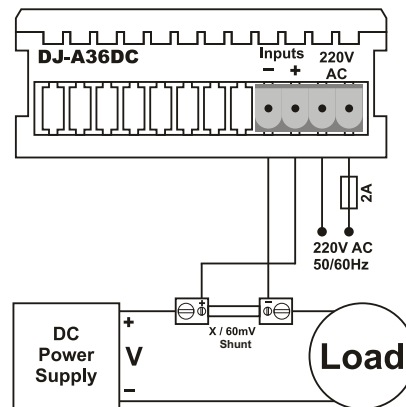
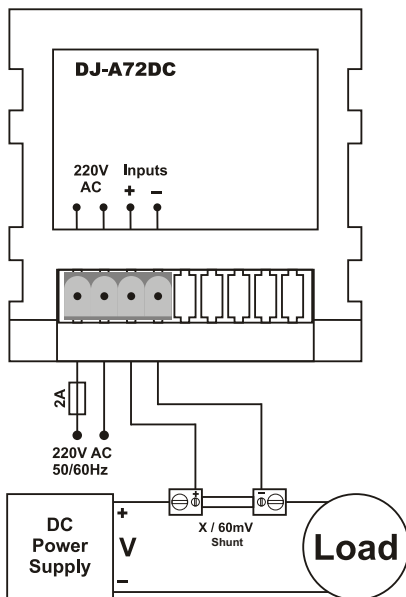


	 DJ-A72DC	 DJ-A48DC	 DJ-A36DC
Operating Voltage (Un)	140V - 270VAC		
Operating Frequency	50/60Hz.		
Operating Power	<6VA		
Operating Temperature	-20°C to 55°C		
Current Measuring Range	0.3mV - 70mV		
Shunt Value	10A - 990A (60mV Shunt)		
Measuring Accuracy	±1%		
Display	14mm 3 digits display	9mm 3 digits display	14mm 3 digits display
Connection Type	Plug-in terminal connection		
Cable Diameter	1.5mm ²		
Weight	<200gr.		
Panel Hole Sizes	68mm x 68mm	45mm x 45mm	30mm x 72mm
Mounting	Front panel mounting		
Protection Class	IP41(Front panel), IP20(Body)		
Operating Altitude	<2000 meters		
Case	A5	A7	A9



Digital DC ammeters are designed to monitor the DC current value drawn by the loads continuously. It can be used everywhere that work with direct current in industry.

- 60mV shunt is used
- 3 digit Display





THREE-PHASE VOLTMETER



DJ-V96T

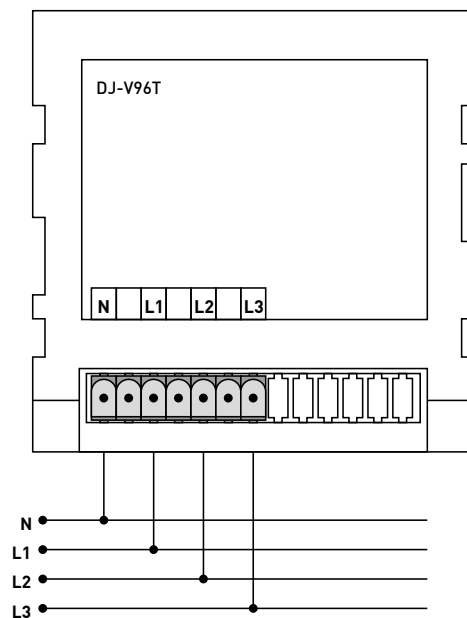
Operating Voltage (Un)	140V - 300VAC
Operating Frequency	50/60Hz.
Operating Power	<4VA
Operating Temperature	-20°C to 55°C
Measuring Range (L-N)	5V - 300VAC (L1 must be at least 140V)
Measuring Range (L-L)	5V - 500VAC (L1 must be at least 140V)
Measuring Accuracy	%±1
Display	3 adet 14mm 3 digits display
Connection Type	Plug-in terminal connection
Cable Diameter	1.5mm ²
Weight	<300gr.
Panel Hole Sizes	91mm x 91mm
Mounting	Front panel mounting
Protection Class	IP41(Front panel), IP20(Body)
Operating Altitude	<2000 meters
Case	A2









Digital voltmeters are designed to monitor AC voltage value of three-phase continuously. It can be used everywhere which requiring three phase voltage measurement in industry.

When the device is energized, it shows the voltage value between N - L. When the SELECT button is pressed , it shows the voltage value between L - L. When the SELECT button is pressed again, it shows phase order. If phase sequence is correct, it shows L1, L2, L3 on Displays from top to bottom respectively. If phase sequence is wrong, it shows L1, L3, L2 on Displays from top to bottom respectively.

- True RMS voltage measurement
- 50/60Hz measurement
- Phase sequence measurement
- It shows three phase voltage simultaneously
- 3 x 14mm 4 digit Display





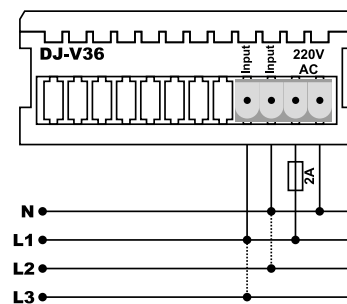
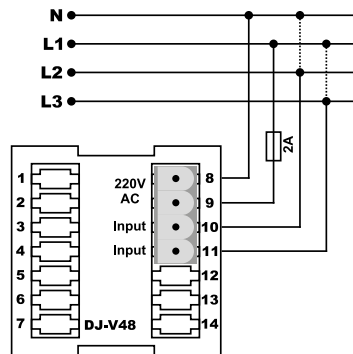
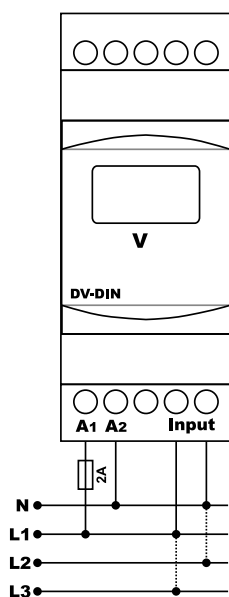
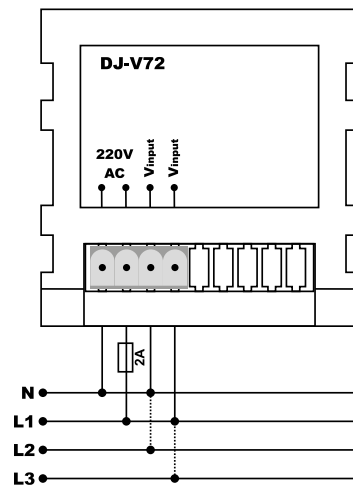
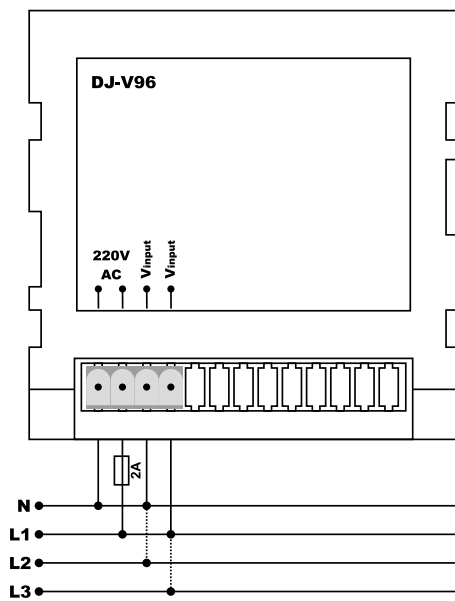
	 DJ-V96	 DJ-V72	 DJ-V48	 DJ-V36	 DV-DIN
Operating Voltage (Un)	140V - 260VAC				
Operating Frequency	50/60Hz.				
Operating Power	<6VA				
Operating Temperature	-20°C to 55°C				
Voltage Measuring Range	1V - 500VAC				
Measuring Accuracy	±1%				
Display	20mm 3 digits display	14mm 3 digits display	9mm 3 digits display	14mm 3 digits display	9mm 3 digits display
Connection Type	Plug-in terminal connection				Terminal connection
Cable Diameter	1.5mm ²				2.5mm ²
Weight	<220gr.				
Panel Hole Sizes	91mm x 91mm	68mm x 68mm	45mm x 45mm	30mm x 72mm	-
Mounting	Front panel mounting				DIN rail mounting
Protection Class	IP41(Front panel), IP20(Body)				IP20
Operating Altitude	<2000 meters				
Case	A2	A5	A7	A9	B4







Digital voltmeters are designed to monitor AC voltage value continuously. It is used everywhere that required voltage measurement in industry.

You may apply Line to Neutral or Line to Line to Vinputs of device.

- True RMS voltage measurement
- 50/60Hz measurement
- 3 digits Display





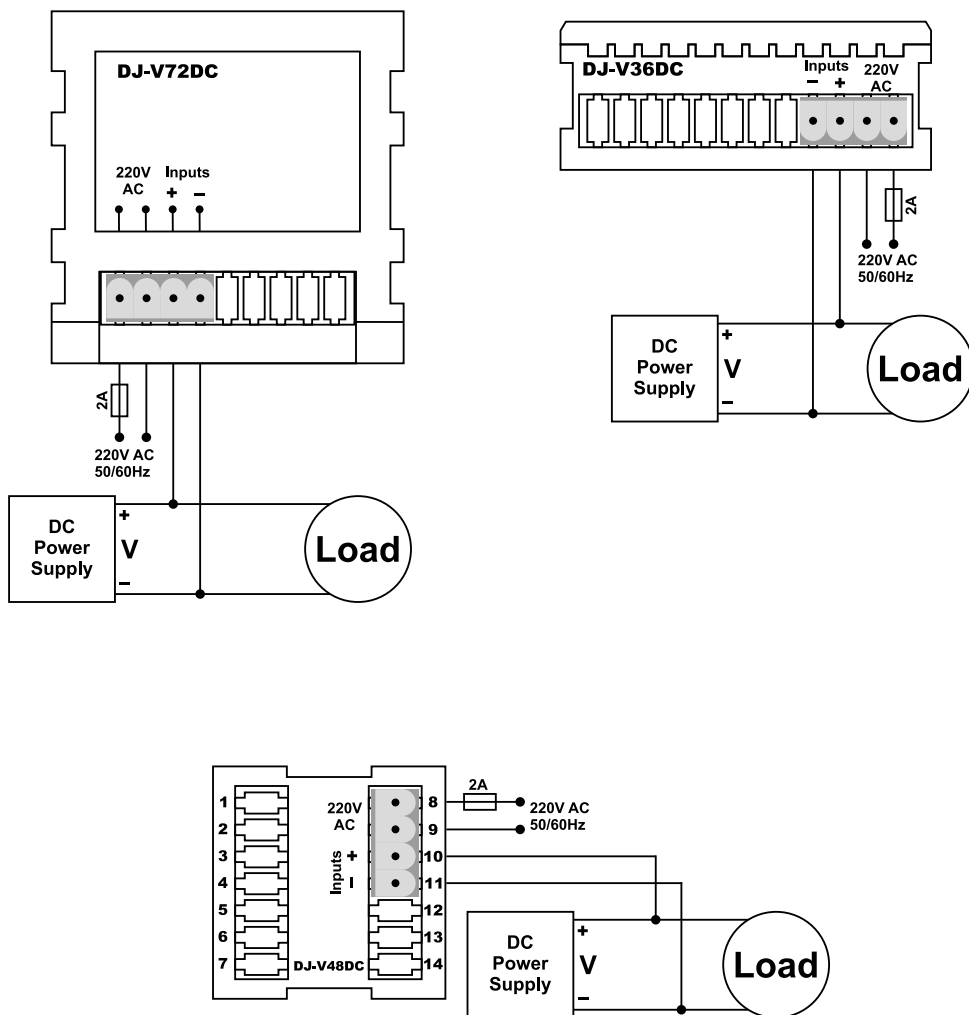
	 DJ-V72DC	 DJ-V48DC	 DJ-V36DC
Operating Voltage (Un)	140V - 270VAC		
Operating Frequency	50/60Hz.		
Operating Power	<6VA		
Operating Temperature	-20°C to 55°C		
Voltage Measuring Range	1V - 300V DC		
Measuring Accuracy	±1%		
Display	14mm 3 digits display	9mm 3 digits display	14mm 3 digits display
Connection Type	Plug-in terminal connection		
Cable Diameter	1.5mm ²		
Weight	<200gr.		
Panel Hole Sizes	68mm x 68mm	45mm x 45mm	30mm x 72mm
Mounting	Front panel mounting		
Protection Class	IP41(Front panel), IP20(Body)		
Operating Altitude	<2000 meters		
Case	A5	A7	A9



Digital DC voltmeters are designed to monitor the DC current value drawn by the loads continuously. It can be used everywhere which worked with direct current in industry.

When the device is energized, DC voltages on the inputs are shown on the display.

- DC Voltage measurement between 1V-300VDC.
- 3 digits Display





VOLTMETER (SELECTABLE)



DJ-V96S



DJ-V72S

Operating Voltage (Un)	140V - 260VAC	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Voltage Measuring Range	1V - 500VAC	
Measuring Accuracy	±1%	
Display	20mm 3 digits display, 3 LEDs	14mm 3 digits display, 3 LEDs
Connection Type	Plug-in terminal connection	
Cable Diameter	1.5mm ²	
Weight	<220gr.	
Panel Hole Sizes	91mm x 91mm	68mm x 68mm
Mounting	Front panel mounting	
Protection Class	IP41(Front panel), IP20(Body)	
Operating Altitude	<2000 meters	
Case	A2	A5



Digital optional voltmeters are designed to monitor AC voltage value of three-phase continuously. It can be used everywhere which requiring three-phase voltage measurement in industry.

When the device is energized, it shows the voltage value between N - L1 at first and L1 led lights up.

When the button is pressed, it shows the voltage value between N - L2 and L2 led lights up.

When the button is pressed, it shows the voltage value between N - L3 and L3 led lights up.

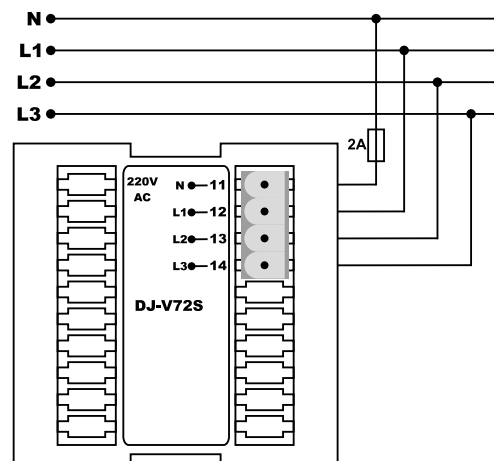
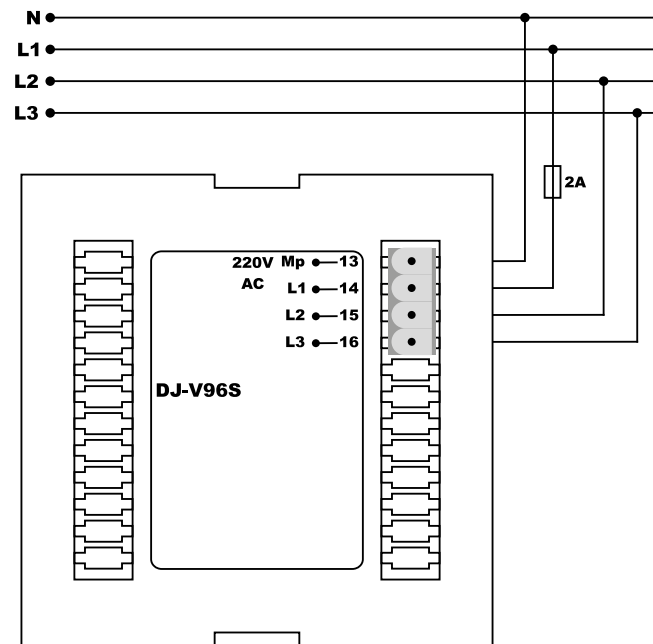
When the button is pressed, it shows the voltage value between L1 - L2 and L1 led and L2 led light up.

When the button is pressed, it shows the voltage value between L2 - L3 and L2 led and L3 led light up.

When the button is pressed, it shows the voltage value between L1 - L3 and L1 led and L3 led light up.

When the button is pressed, it shows the voltage value between N - L1.






- True RMS voltage measurement
- 50/60Hz measurement
- 3 digits Display





VOLTMETER (FOR REGULATORS)



	 RG-96	 RG-72E	 RG-72EB	 DV-B
Operating Voltage (Un)	130V - 280VAC			140V - 270VAC
Operating Frequency	50/60Hz.			
Operating Power	<6VA			
Operating Temperature	-20°C to 55°C			
Voltage Measuring Range	1V - 300VAC			140V - 270VAC
Measuring Accuracy	±1%			
Display	20mm 3 digits display, 14mm 3 digits display	2x 14mm 3 digits display		14mm 3 digits display
Connection Type	Plug-in terminal connection			
Cable Diameter	1.5mm ²			
Weight	<200gr.			
Panel Hole Sizes	91mm x 91mm	68mm x 68mm		
Buzzer	No		Yes	
Mounting	Front panel mounting			
Protection Class	IP41(Front panel), IP20(Body)			
Operating Altitude	<2000 meters			
Case	A2	A5		

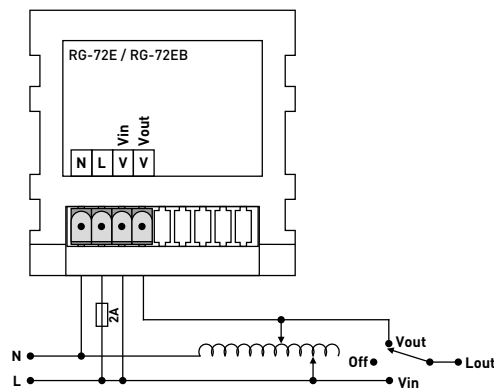
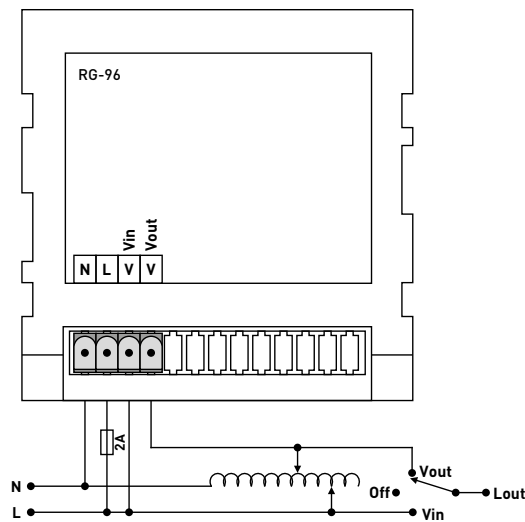


It is designed for the regulators to monitor the network input voltage and regulator output voltage in the same time and continuously.

Vin: Network input voltage phase is connected

Vout: Regulator output voltage phase is connected.

- True RMS voltage measurement
- 50/60Hz measurement
- 2 x 3 digits Displays
- It can be used for regulators





VOLTMETER (SERVO CONTROL FOR REGULATORS)



RG-96K



RG-72K



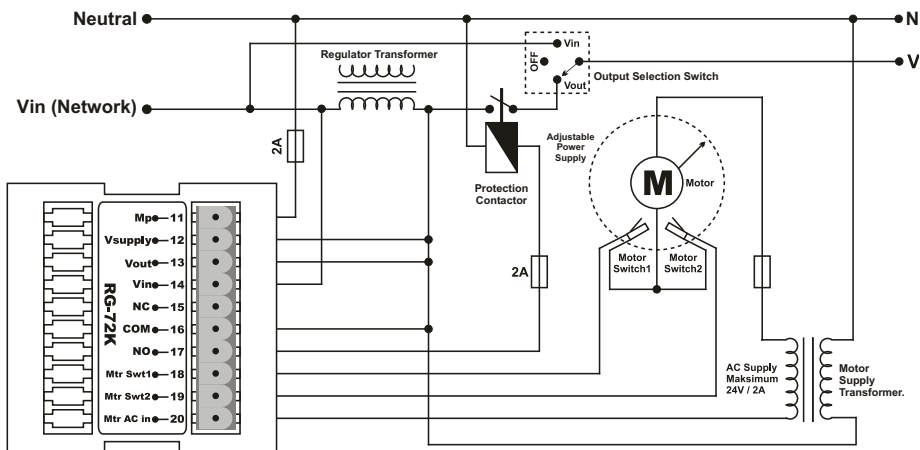
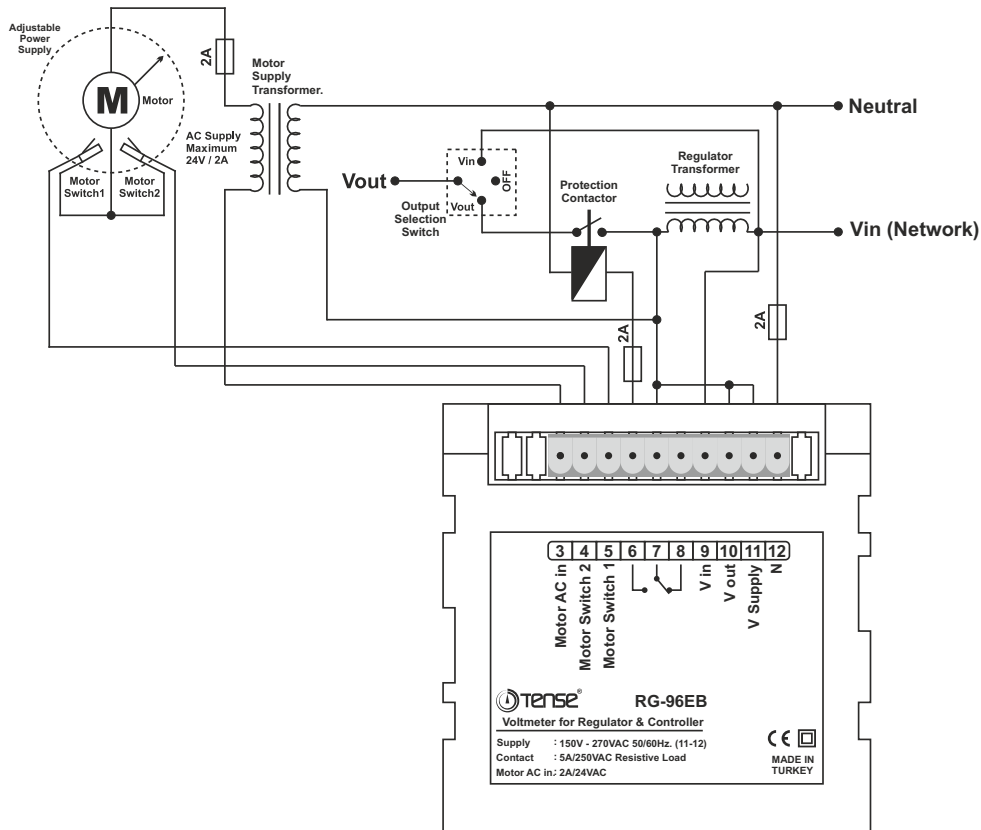
RG-72C

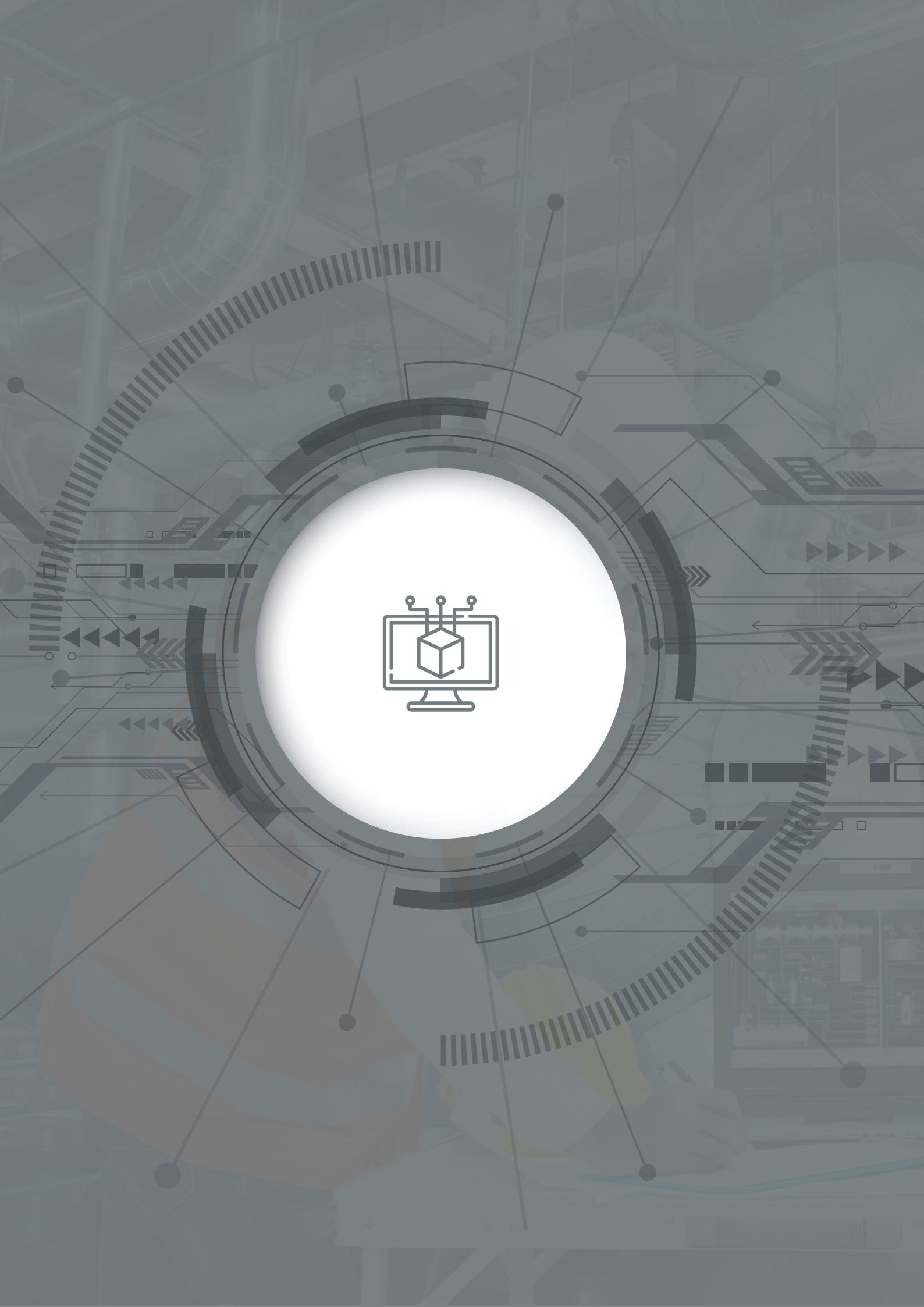
Operating Voltage (Un)	130V - 280VAC	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
High Voltage Protection	230V - 255V	
Low Voltage Protection	150V - 210V	
Voltage Measuring Range	1V - 300VAC	
Measuring Accuracy	±1%	
Motor Output	12V - 24V / 2A DC	
Non-Switch Working	No	Yes
Measuring Accuracy	±1%	
Display	20mm 3 digits display, 14mm 3 digits display	2x 14mm 3 digits display
Connection Type	Plug-in terminal connection	
Cable Diameter	1.5mm ²	
Weight	<250gr.	
Panel Hole Sizes	91mm x 91mm	68mm x 68mm
Mounting	Front panel mounting	
Protection Class	IP41(Front panel), IP20(Body)	
Operating Altitude	<2000 meters	
Case	A3	A6



It is designed for the regulators to monitor the network input voltage and regulator output voltage continuously in the same time and to obtain the desired output voltage value by performing servo control.

- True RMS voltage measurement
- 50/60Hz measurement
- 2 x 3 digit Displays
- It can be used for regulators
- Regulator output voltage can be adjusted,
- Regulator output voltage high and low hysteresis values can be adjusted.
- Regulator output upper and lower protection voltage values can be adjusted.
- Protection start and end times of regulator output voltage can be adjusted
- Regulator output voltage motor slow motion area can be adjusted
- The speed value in regulator output voltage motor slow motion area can be adjusted.





MONITORING

MONITORING



PROTECTION
AND CONTROL



PANEL
EQUIPMENT





GSM-MOD

Operating Voltage (Un)	85V - 300VAC
Operating Frequency	50/60Hz.
Operating Temperature	-20°C to 55°C
Air ESD Protection	10kV
Impact Resistance	4kV
Operating Power	1VA(system standby), 10VA(system communicate)
Display	Power Led, Relay LED, Signal level LED, Rx and Tx LEDs
Connection Values	Max. 19200bps (For meters IEC62056-21 protocol) Modbus communication (For energy analyzers and power factor controllers) RS485 Connection Interface Max. 128 devices RS232 Connection Interface Optic probe Interface TCP/IP Communication protocol
Connection Type	GSM
Antenna	2.2dBi SMA replaceable antenna
Bandwidth	Quand band GSM/GPRS/EDGE
Weight	<200gr.
Protection Class	IP20
Operating Altitude	<2000 meters
Case	E1



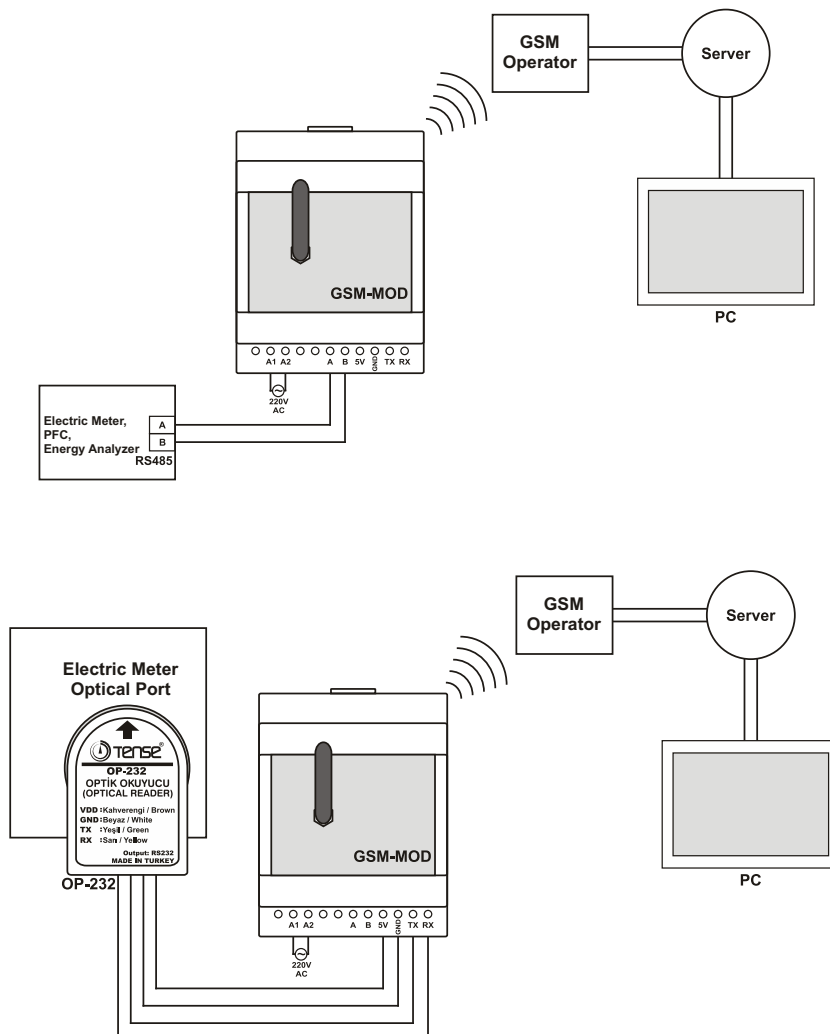
All data of the meter and the relay in the line connected to the modem can be read and controlled from a distance through Meter reading and Compensation Monitoring via RS-485/RS-232 port (by using GSM data line).

Periodically, data can be obtained from the devices which defined in the system via www.tenseenerji.com web server.

It can read, archive and report the instant energy consumption of the company by obtaining the meter data.

Compatible with all GSM Operators

- RS485 Connect Interface Max. 128 devices
- RS232 Connect Interface
- Optical port with Connect Interface
- TCP/IP





ETHERNET MODEM



ETH-MOD-T

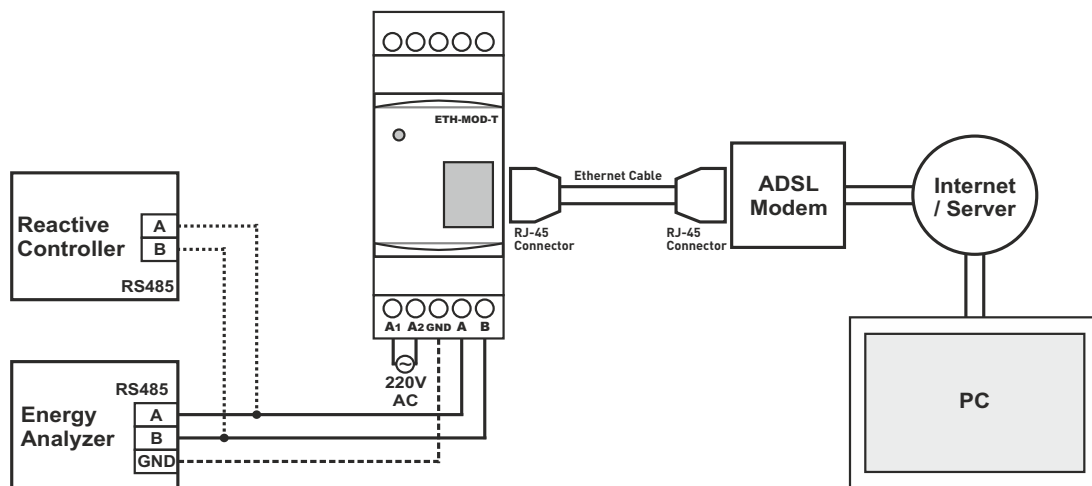
Operating Voltage (Un)	85V - 300VAC
Operating Frequency	50/60Hz.
Operating Temperature	-20°C to 55°C
Air ESD Protection	10kV
Impact Resistance	4kV
Operating Power	1VA(System standby), 6VA(System communicate)
Display	Power, relay, Rx and Tx LEDs
Connection Values	Max. 19200bps
	Modbus communicate (Energy Analyzers and Power Factor Controllers)
	RS485 Connection Interface Max. 32 devices
	TCP/IP Communication protocol
Connection Type	Modem with internet connection
Connection Speed	10 / 100 Mbps Ethernet
Weight	<200gr.
Protection Class	IP20
Operating Altitude	<2000 meters
Case	B4



All data of the meter and the relay in the line connected to the modem via RS-485 port can be read and controlled from a distance through Meter reading and Compensation Monitoring (by using internet connection).

Periodically, data can be obtained from the devices which defined in the system via www.tenseenerji.com web server.

- RS485 Connect Interface Max. 32 devices
- TCP/IP
- 10 / 100 Mbps Ethernet





SMS CONTROLLED RELAY



SMS-440

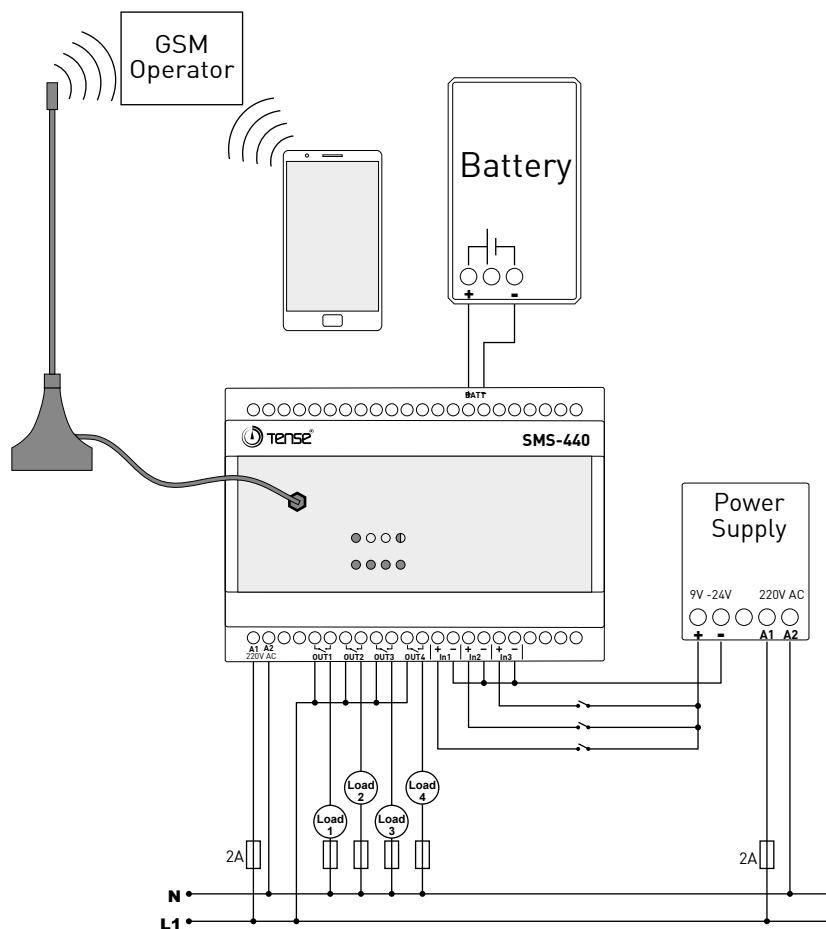
Operating Voltage (Un)	85 - 285VAC	
Operating Frequency	50/60Hz.	
Operating Power	<1VA (System Standby)	<15VA (system communicate)
Operating Temperature	-20°C to 55°C	
Communication	SMS	
Communication Infrastructure	GSM/GRPS	
Contact	4 adet 3A/250VAC Resistive Load	
Digital Input	3 adet 9-24VDC (External)	
Battery	7.2V - 7.4V 2200mAh (External)	
Antenna	5dBi, 3 meters SMA replaceable antenna	
Bandwidth	Quad band GSM/GPRS/EDGE	
Display	8 LEDs	
Connection Type	Terminal connection	
Cable Diameter	1.5mm ²	
Weight	<300gr.	
Mounting	DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	E3	



It is designed to control relay via SMS. It is compatible with all GSM Operators. If the battery will be used, please connect battery before run device. If battery will not be used, please make device's connection to grid power. When the device is energized after the device's connection, power led lights up continuously, RX's led blinks fastly and if the GSM data line is not connected signal led blinks red color. If the GSM data line is connected signal led blinks green color. Then, When the SMS-440 connect to GSM operator, signal led lights up continuously.

Note : The pin code of sim card should not be activated that used for SMS-440. Firstly, change pin code inactive by using mobile. After that, you may use sim card for SMS-440.

- Encrypted communication
- 4 relays can be controlled via SMS
- 3 digital input can be queried.
- It can be used with battery



User Guide



GSM-MOD-TR and GSM-MOD-RC

Operating Voltage (Un)	85 - 265VAC	
Operating Frequency	50/60Hz.	
Operating Power	<1VA (System Standby)	<15VA (System Communication)
Operating Temperature	-20°C to 55°C	
Communication	GPRS	
Communication Infrastructure	GSM/GRPS	
Contact	3A/250VAC Resistive Load (Only on GSM-MOD-RC)	
Digital Input	9-24VDC (Only on GSM-MOD-TR)	
Antenna	2.2dBi SMA Replaceable antenna	
Bandwidth	Quad band GSM/GPRS/EDGE	
Display	4 LEDs	
Connection Type	Terminal connection	
Cable Diameter	1.5mm ²	
Weight	<300gr.	
Mounting	DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	E1	

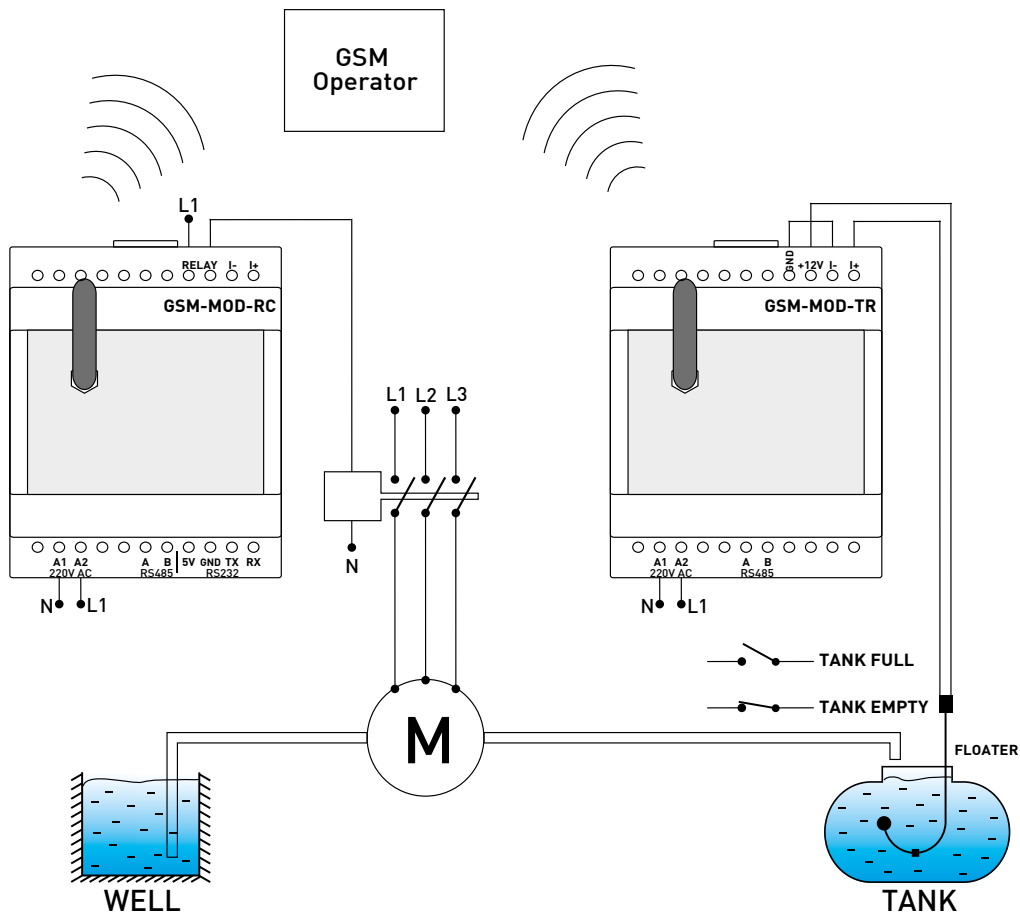


It is designed to transfer water from well to tank by communication with GPRS according to the water requirement of the tank in long distance well storage systems.

GSM-MOD-RC : It provides to working the motor via turn off the relay contact according to received information about whether there is water in the tank. Or it turns on relay contact to stop the motor.

GSM-MOD-TR : According to adjusted time(1 min-60 min), It gets information from floater whether there is water in tank or not and transmits this information to GSM-MOD-RC modem via GPRS.

- Remote software updating via GSM(Tank)
- Supply facility with solar panel for no grid connection(tank) places
- It tracks tank's and well's condition via Web server
- Automatic / manual mode selection via Web server
- Remote Well-tank Control and Monitoring System works with 2 M2M lines.
- DES / 3DES Authentication (Cryptographic communication)





REMOTE WELL- TANK CONTROL AND MONITORING SYSTEM(RF)



RF-MOD-TR and RF-MOD-RC

Operating Voltage (Un)	85 - 265VAC	
Operating Frequency	50/60Hz.	
Operating Power	<1VA (System standby)	<15VA (system communicate)
Operating Temperature	-20°C to 55°C	
Communication	RF	
Communication Infrastructure	RF	
Contact	3A/250VAC Resistive Load (Only on RF-MOD-RC)	
Antenna	9dBi SMA Replaceable antenna	
Communication Range	5 km. (It may vary according to land and environment conditions.)	
Display	4 LEDs	
Connection Type	Terminal connection	
Cable Diameter	1.5mm ²	
Weight	<300gr.	
Mounting	DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	E1	

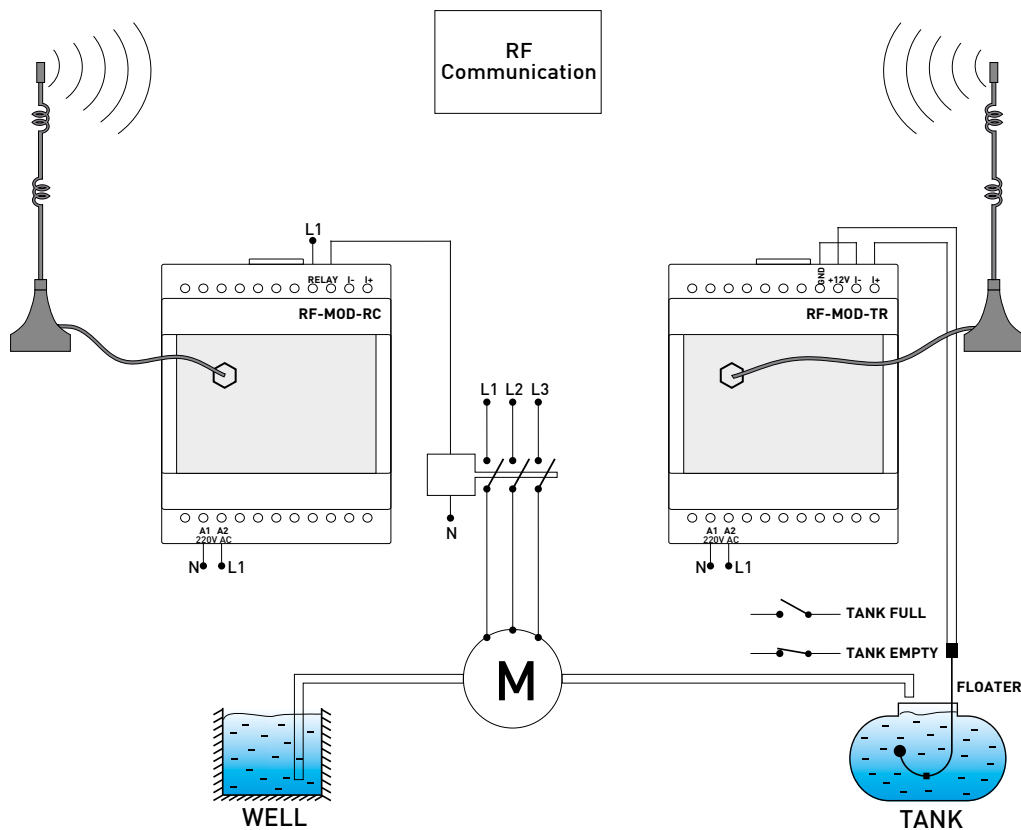


It is designed to transfer water from well to tank by communication with GPRS according to the water requirement of the tank in long distance well storage systems.

RF-MOD-RC : It provides to working the motor via turn off the relay contact according to received information about whether there is water in the tank. Or it turns on relay contact to stop the motor.

RF-MOD-TR : Periodically, It gets information from floater whether there is water in tank or not and transmits this information to RF-MOD-RC modem via RF.

- Capability solar panel connection(tank) where without grid connectivity.
- 9dBi SMA changeable antenna





RS232/RS485 to USB CONVERTER - USB-CON



RS232 / RS485 TO USB CONVERTER (USB-CON)

Communication Protokolü	RS232, RS485, USB1.0/USB 1.1/USB 2.0 with compatible
Operating Temperature	-20°C to 55°C
Optical Isolation Protection	1.5KV optical isolation protection
Electrostatic discharge	4KV
Display	Power, Rx ve Tx LEDs
Connection Speed	300bps – 230,4 Kbps Baudrate
Connection Values	Databits: 5,6,7,8 Databits Stopbits: 1, 1.5, 2 Stopbits Parity : None, Even, Odd, Space, Mark
Connection Type	FIFO: 128 bytes receive buffer, 256 bytes transmit buffer USB Connector (USB B type female) and terminal connection
Weight	<100gr.
Protection Class	IP20
Operating Altitude	<2000 meters
Case	F2



USB-CON converter is used to convert the data in the devices (meter, energy analyzer, reactive power control relays etc.) with communication characteristics such as RS485, RS232 or optic (RS232) ports to USB protocol. Use insulated converter, if the devices used in communication have no insulation. Otherwise, the devices used in the communication unit may be damaged.

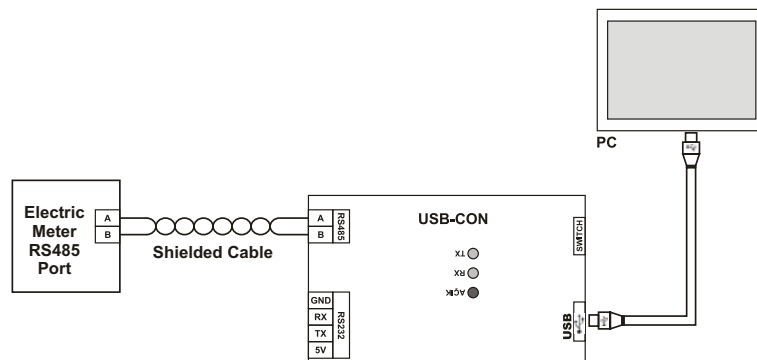
Determine the protocol (RS485 or RS232) that you want to convert to USB. Adjust from dip switch as belows. Do the connections based on the protocol to be used. RS485 connection cable length should be about 800 meters. The length of the cable may vary depending on whether you use A and B terminals as spirally wound to each other and whether you use a cable having low ohm value. When the cable distance or the number of the devices increases, 120R resistance given with the device can be connected to the network. Maximum 128 devices can be connected.

If RS232 connection cable is longer than 2 meters, data loss may occur. You can connect maximum one device. If you use RS485 or RS232 ports for connection with the meters, You may need to cover the optic head of the meter with black tape. Otherwise, there may be distortion in data.

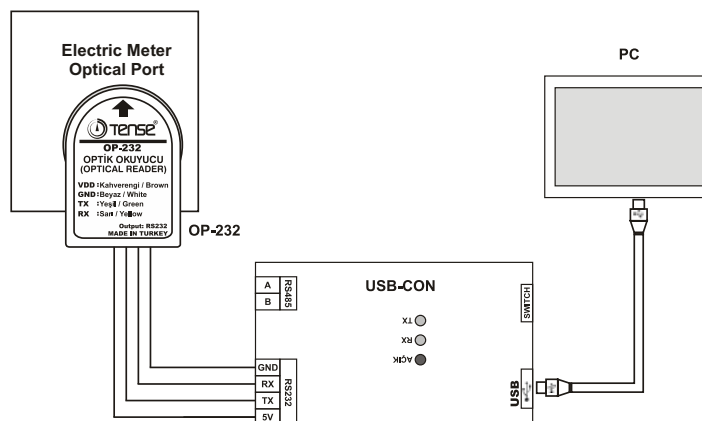
- Compatible with USB1.0/USB 1.1/USB 2.0
- FIFO: 128 bytes receive buffer, 256 bytes transmit buffer
- 300bps – 230,4 Kbps Baudrate



RS-485 Connection Diagram



RS-232 Connection Diagram



User Guide





OPTICAL READER – RS232



OPTICAL READER (RS232)

Communication Protocol	IEC1107 (IEC62056-21) RS232
Cable Length	4 x 0.22mm ² 2 meters cable (LIYY)
Operating Temperature	-20°C to 55°C
Magnet	Neodymium magnet
Connection Type	Terminal connection
Weight	<100gr. (with cable)
Mounting	Mounting on optical port
Protection Class	IP20
Operating Altitude	<2000 meters
Case	F1



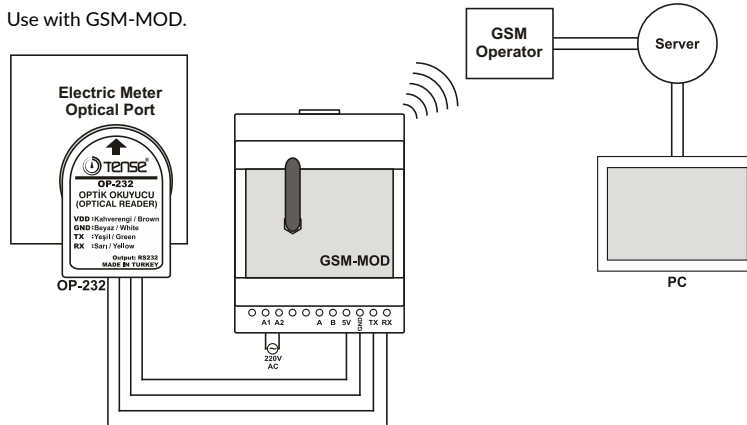
It is designed for providing information exchange through electronic devices providing communication by using IEC1107 (IEC62056-21) protocol on optical port.

GSM/Ethernet or PSTN-based modems providing communication with counters are used for reading data on the counters. Their connection type is as given below.

- 6 pcs neodymium magnets
- RS232 communication protocol



Use with GSM-MOD.





OPTICAL READER – USB



OPTICAL READER - USB

Communication Protocol	Compatibility with IEC1107 (IEC62056-21) USB1.0 / USB 1.1 / USB 2.0
Operating Temperature	-20°C to 55°C
Magnet	Neodymium magnet
Connection Type	USB connector (USB Type B connector)
Weight	<70gr.
Mounting	Mounting on optical port
Protection Class	IP20
Operating Altitude	<2000 meters
Case	F1

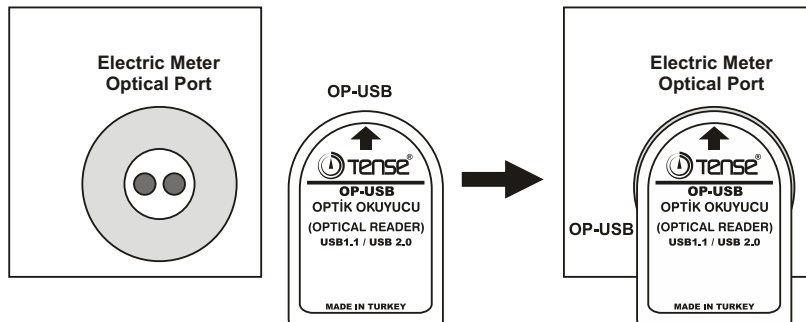


It is designed for providing information exchange through electronic devices providing communication by using IEC1107 (IEC62056-21) protocol on optical port. You may connect it to computer directly.

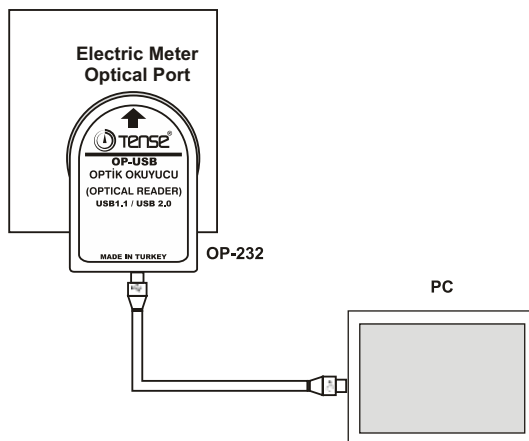
- 6 pcs neodymium magnets
- USB communication protocol



Mounting to optical port.



Connection with PC.







PROTECTION AND CONTROL



PANEL
EQUIPMENT



PROTECTION
AND CONTROL



DIGITAL OVERLOAD RELAYS

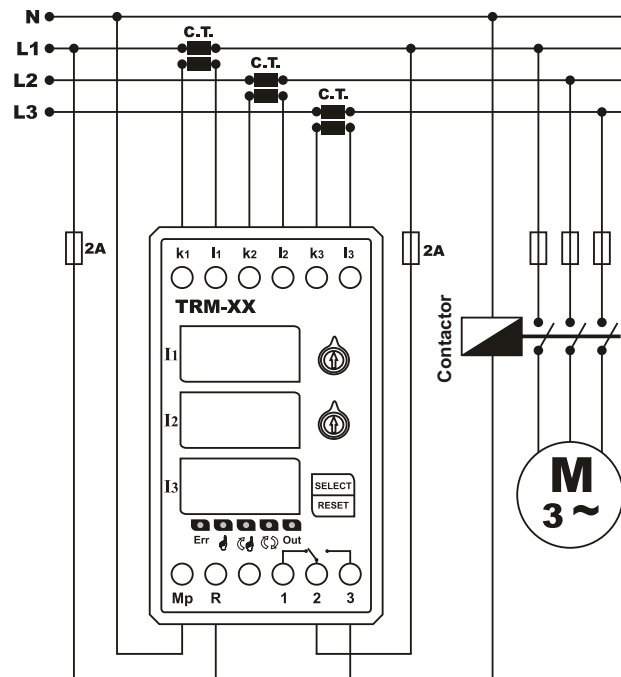


Operating Voltage (Un)	110V - 270VAC				
Operating Frequency	50/60Hz.				
Operating Power	<6VA				
Operating Temperature	-20°C to 55°C				
High Current (Overload A>)	15A-50A	40A-100A	90A-200A	190A-300A	290A-400A
Delay (t)	0.1sec. - 20sec.	0.1sec. - 20sec.	1sec. - 200sec.	1sec. - 200sec.	1sec. - 200sec.
Display	3 x 9mm 3 digit display and 4 LEDs				
Connection Type	Terminal connection				
Contact	5A/250VAC Resistive Load				
Cable Diameter	2.5mm ²				
Weight	<250gr.				
Mounting	DIN rail mounting				
Protection Class	IP20				
Operating Altitude	<2000 meters				
Case	B2				



Digital Overload Relays are designed to protect the devices having precise operating current values against the errors likely to arise from excessive current. There are High (Overload Relay A>) current set button and error latency (t) time set button and Reset/ Select button on the device. There are 3 operating modes on the device: manual, semiautomatic and automatic.

- Manual operation mode: The device is required to be reset by pressing the button manually when current error occurs.
- Semi-automatic operation mode: The device resets 3 times current errors automatically by waiting the error time. The device is required to be reset by pressing the button manually For 4th current error occurs.
- Automatic operation mode: The device resets the current errors automatically after waiting the error time.





DIGITAL OVERLOAD RELAYS (Internal Current Transformer)



TRM-03



TRM-12



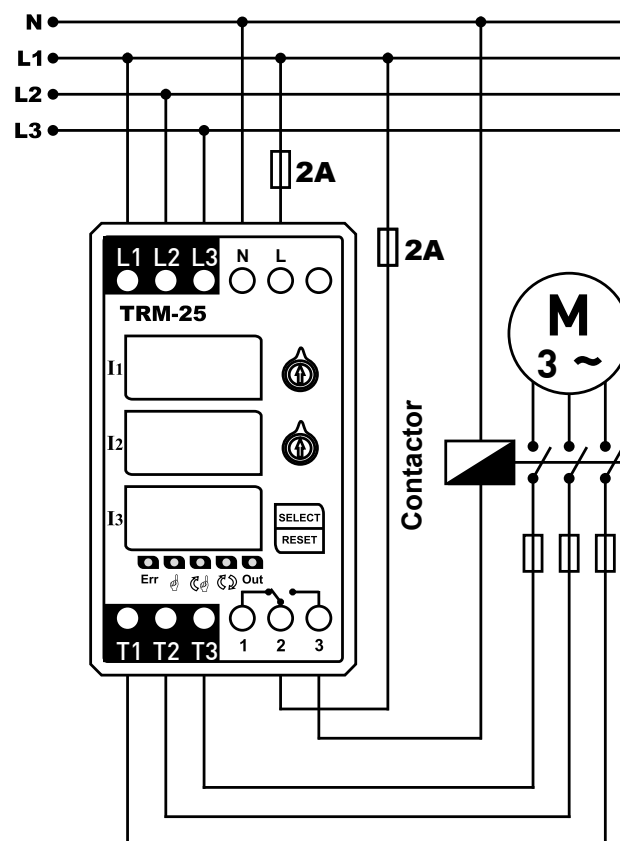
TRM-25

Operating Voltage (Un)	110V - 270VAC		
Operating Frequency	50/60Hz.		
Operating Power	<6VA		
Operating Temperature	-20°C to 55°C		
High Current (Overload A>)	0.1A-3A	3A-12A	0.1A- 25A
Delay (t)	0.1sec. - 10sec.	0.1sec. - 10sec.	1sec. - 20sec.
Asymmetry	%50 Fixed		
Demurrage	5 sec.		
Display	3 x 9mm 3 digit display and 4 LEDs		
Connection Type	Terminal connection		
Contact	5A/250VAC Resistive Load		
Cable Diameter	2.5mm ²		
Weight	<250gr.		
Mounting	DIN rail mounting		
Protection Class	IP20		
Operating Altitude	<2000 meters		
Case	B2		



Digital Overload Relays are designed to protect the devices having precise operating current values against the errors likely to arise from excessive current. There are High (Overload Relay A>) current set button and error latency (t) time set button and Reset/ Select button on the device. There are 3 operating modes on the device: manual, semiautomatic and automatic.

- Manual operation mode: The device is required to be reset by pressing the button manually when current error occurs.
- Semi-automatic operation mode: The device resets 3 times current errors automatically by waiting the error time. The device is required to be reset by pressing the button manually when 4th current error occurs.
- Automatic operation mode: The device resets the current errors automatically after waiting the error time.
- Asymmetry : If there is more than 50% difference between the lowest current and the highest current that pass from phases, the device switches on to asymmetry fault after 2 seconds.
- Demurrage (starting current) : it doesn't current control for 5 seconds after relay switches on. it is allowed to Demurrage current.





DIGITAL CONTACTOR AND OVERLOAD RELAY (Internal Current Transformer)



KON-TER-12



KON-TER-18



KON-TER-25



KON-TER-32

Operating Voltage (Un)	120V - 240VAC			
Operating Frequency	50/60Hz.			
Operating Power	<10VA			
Operating Temperature	-20°C to 55°C			
High Current (Overload A>)	1A-12A	1A-18A	1A-25A	1A-32A
Asymmetry	%50 (Fixed)			
Delay	1sec. - 10sec.			
Display	3 x 3 digits display, 2 LEDs			
Connection Type	Terminal connection			
Contact	3A/250VAC Resistive Load			
Cable Diameter	2.5mm ² , 6mm ² (Current input and outputs)			
Weight	<380gr.			
Mounting	DIN rail mounting			
Protection Class	IP20			
Operating Altitude	<2000 meters			
Case	D1			

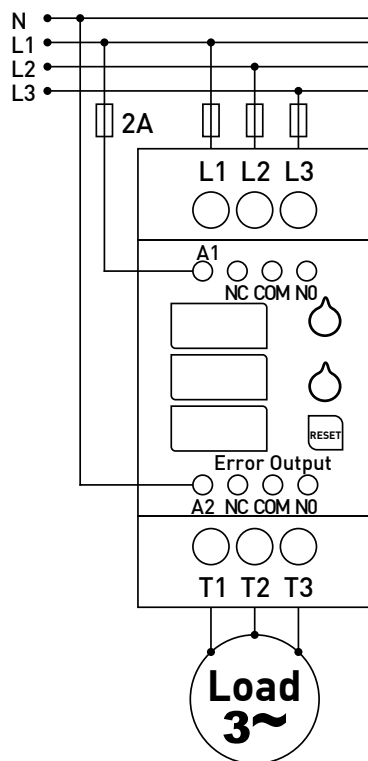


KON-TER-XX Digital contactor and overload relay is designed to protect and control for the load(s) which working with three phase against the errors likely to arise from excessive current.

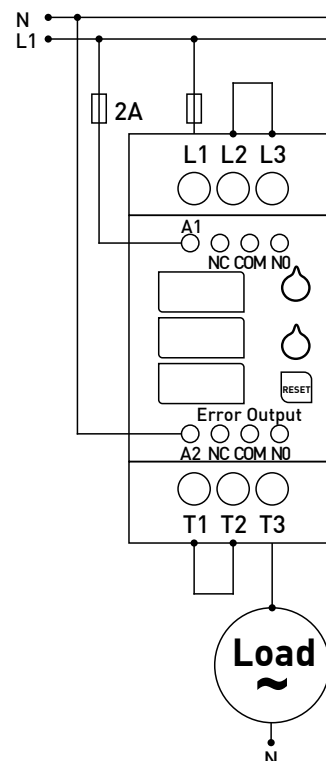
- It is not suitable for using in capacitive loads.
 - Depending on ambient temperature of thermics, it is not affected by step in early (in hot weather) step in late (in cold weather)
 - 50% current asymmetry function prevents the failure of the motors due to their working conditions in two phases.
- It shows total operating time
 - It shows count of contact's pull/drop
 - 50% constant asymmetry control
 - 3 x 9mm 3 digit Displays



Three-phase Connection Diagram



Monophase Connection Diagram





DIGITAL CONTACTOR AND OVERLOAD RELAY (Internal Current Transformer)



KON-TER-50

Operating Voltage (Un)	120V - 240VAC
Operating Frequency	50/60Hz.
Operating Power	<10VA
Operating Temperature	-20°C to 55°C
High Current (Overload A>)	25A-50A
Asymmetry	%50 (Fixed)
Delay	1sec. - 20sec.
Display	3 x 3 digits display, 2 LEDs
Connection Type	Terminal connection
Contact	4 x 3A/250VAC Resistive Load (2NC + 2NO)
Error Output	2 x 3A/250VAC Resistive Load (1NC + 1NO)
Cable Diameter	2.5mm ² , 95mm ² (Current Input and outputs, maximum Cable Diameter)
Weight	<700gr.
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	D2

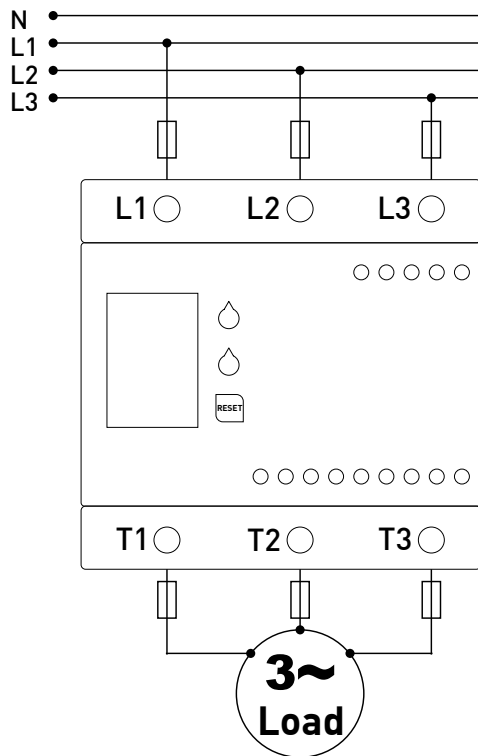


KON-TER-XX Digital contactor and overload relay is designed to protect and control for the load(s) which working with three phase against the errors likely to arise from excessive current.

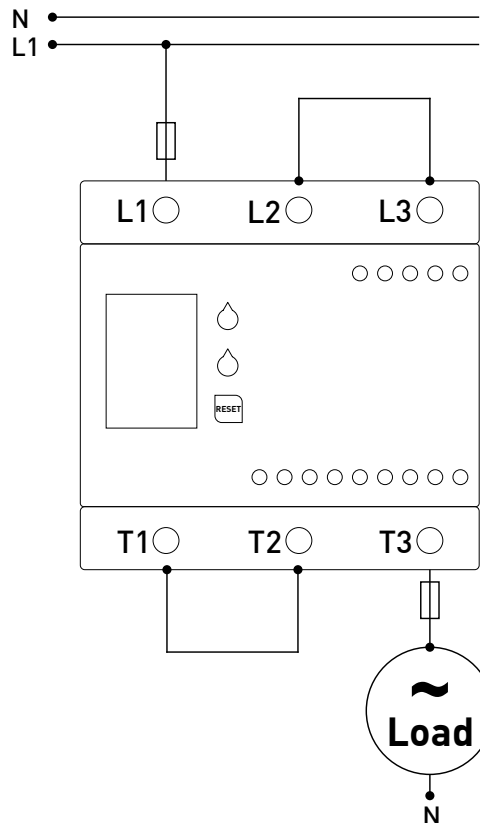
- It is not suitable for use in capacitive loads.
 - Depending on ambient temperature of thermics, it is not affected by step in early(in hot weather) step in late (in cold weather)
 - 50% current asymmetry function prevents the failure of the motors due to their working conditions in two phases.
- It shows total operating time
 - It shows count of contact's pull/drop
 - 50% constant asymmetry control
 - 3 x 9mm 3 digit Display



Three-phase Connection Diagram



Monophase Connection Diagram



User Guide



DIGITAL CONTACTOR (Internal Current Transformer)



KON-50

Operating Voltage (Un)	120V - 240VAC
Operating Frequency	50/60Hz.
Operating Power	<10VA
Operating Temperature	-20°C to 55°C
Display	3 x 3 digits display
Connection Type	Terminal connection
Contact	4 x 3A/250VAC Resistive Load (2NC + 2NO)
Cable Diameter	2.5mm ² , 95mm ² (Current Input and outputs, maximum Cable Diameter)
Weight	<700gr.
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	D2



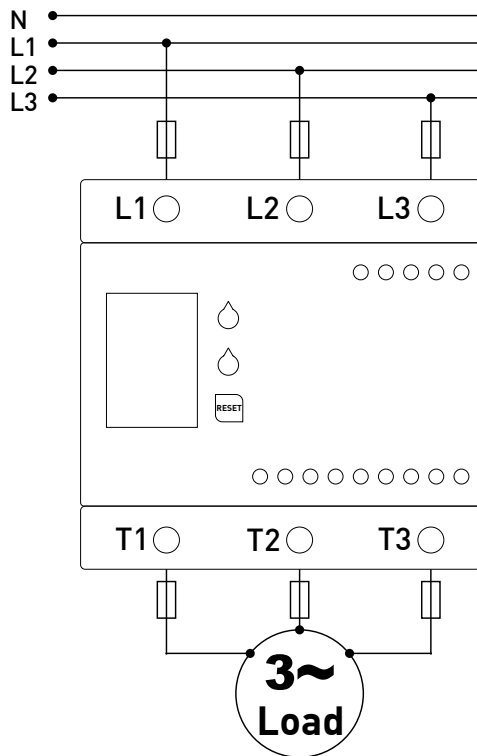
It used for remote control of circuits (generally electrical motors, resistance, lighting etc.). There are auxiliary contacts, "Normally open" and "Normally closed".

- It is not suitable for use in capacitive loads.
- Depending on ambient temperature of thermics, it is not affected by step in early (in hot weather) step in late (in cold weather)

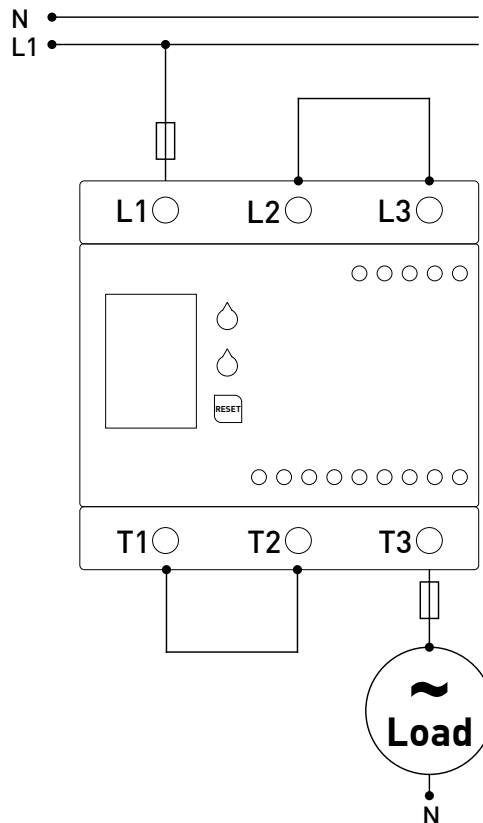
- It shows count of contact's pull/drop
- 3 x 9mm 3 digit Display
- It shows phase to phase voltage values.







Three-phase Connection Diagram



Monophase Connection Diagram

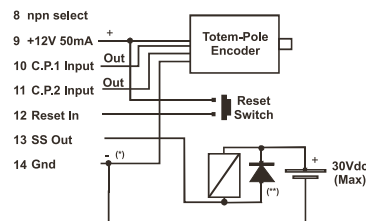
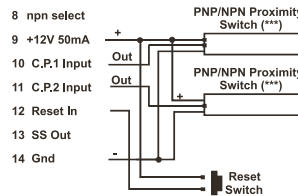
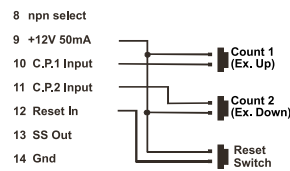




	 DS-72A	 DS-72	 DS-48
			
Operating Voltage (Un)	230VAC +10%, -20%		
Operating Frequency	50/60Hz.		
Operating Power	<8VA		
Operating Temperature	-20°C to 55°C		
Input	2 x (Max:7500 Hz, 5-30V)		
NPN Select	"nnp select" input "+12V" if on the "+12V" is short circuit CP1 and CP2 input are NPN. Always reset input is PNP. Totem pole or PNP type sensor will use "NPN select" is not connect anywhere.		
Sensor	PNP/NPN proximity switch - NPN/PNP/Totem-pole output encoder		
Frequency	20, 500, 2500, 7500Hz can programmable		
Reset Input	10ms (min), Positive input (PNP input) (5..30V)		
Output	2 x Relay, 250VAC, 2A, Resistive Load 2 x open collector (NPN output), 30V, 100mA max.	250VAC, 2A, Resistive Load 1 x open collector (NPN output), 30V, 100mA max.	
Sensor Supply	12VDC, 50mA(max), without regulated		
Measuring Accuracy	±1%		
Display	2 x 6 digit display	2 x 4 digit display	
Connection Type	Plug-in terminal connection		
Cable Diameter	1.5mm ²		
Weight	<270gr.	<170gr.	
Panel Hole Sizes	69mm x 69mm	46mm x 46mm	
Mounting	Front panel mounting		
Protection Class	IP20		
Operating Altitude	<2000 meters		
Case	H2	H3	



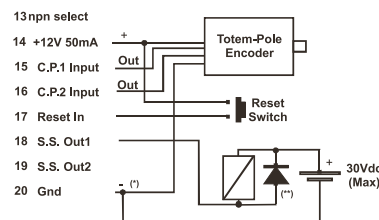
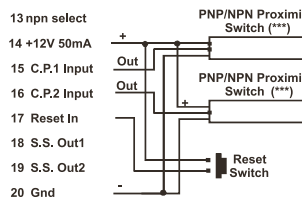
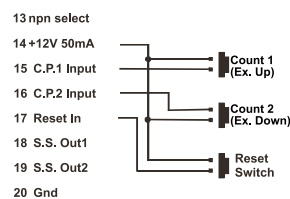
- 2x4 digit, single set, single output forward/backward counter (DS-48, DS-72)
- 2x6 digit, double set, double contact, forward/backward counter (DS-72A)
- Forward/backward counter with different phase input
- Password-protected
- Selectable counting frequency
- Calibration multiplier selectable between 0.001 and 9.999 (DS-48, DS-72)
- Calibration multiplier selectable between 0.00001 and 9.99999 (DS-72A)
- Decimal point adjustable between the 1st and 3rd digit (DS-48, DS-72)
- Decimal point adjustable between the 1st and 5th digit (DS-72A)
- 7 different inputs / 9 different outputs options (DS-48, DS-72)
- 7 different inputs / 10 different outputs options (DS-72A) adding OFFSET feature
- Output contact; continuous output or 0.1..999.9 sec.
- When the device is re-started after it is de-energized, last counted value can be restored.
- Feature of RESETTING on the panel
- Feature of monitoring the preset value on the display
- Keeping the control parameters continuously in the memory.



(*) Connect SS Out return pin directly to GND.

(**) Use free-wheeling diode to protect SS Out.

(***) To select PNP option; connect "npn select" to "+12V".



(*) Connect SS Out return pin directly to GND.

(**) Use free-wheeling diode to protect SS Out.

(***) To select PNP option; connect "npn select" to "+12V".



DS-72A







DS-72







DS-48





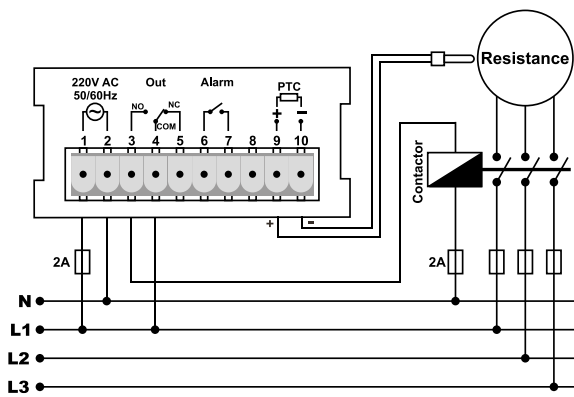
	 DT-96	 DT-72	 DT-48	 DT-Y	 DT-D
					
Operating Voltage (Un)	100V - 240VAC				
Operating Frequency	50/60Hz.				
Operating Power	<6VA				
Operating Temperature	-20°C to 55°C				
Input	J,K,T,S,R type T/C, Pt100, selectable				
Measuring Scale	-100 .. 600 °C, J type T/C, (Inpt=J), -100 .. 1300 °C, K type T/C, (Inpt=k), -100 .. 400 °C, T type T/C, (Inpt=t), 0 .. 1750 °C, S type T/C, (Inpt=S), 0 .. 1750 °C, R type T/C, (Inpt=r), -100 .. 600 °C, Pt100, (Inpt=Pt), -99.9 .. 600.0 °C, Pt100, (Inpt=Pt.0)				
Sensitivity, Accuracy	±1 °C or ± 0.1 °C, ±%0.3 (Full Scale)				
Control Form	ON-OFF or P,PI,PD,PID - selectable				
Output	Relay (NA + NK), 250VAC, 2A, Resistive Load, (optional SSR)				
Proportional Band	1 .. 130 °C (Pb.C)				
Integral Time	0 .. 30,0 min. (if 0=OFF)				
Derivative Time	0.. 10,0 min. (if 0=OFF)				
Control Period	4 .. 200 sn (Ct)				
Heating/Cooling	Selectable (only on-off for cooling function)				
Display	2 x 4 digits display			2 x 3 digits display	
Connection Type	Plug-in terminal connection				
Cable Diameter	1.5mm ²				
Weight	<500gr.				
Panel Hole Sizes	92 mm x 92 mm	69 mm x 69 mm	46mm x 46mm	93mm x 45mm	45mm x 93mm
Mounting	Front panel mounting				
Operating Altitude	<2000m				
Case	H1	H2	H3	H4	



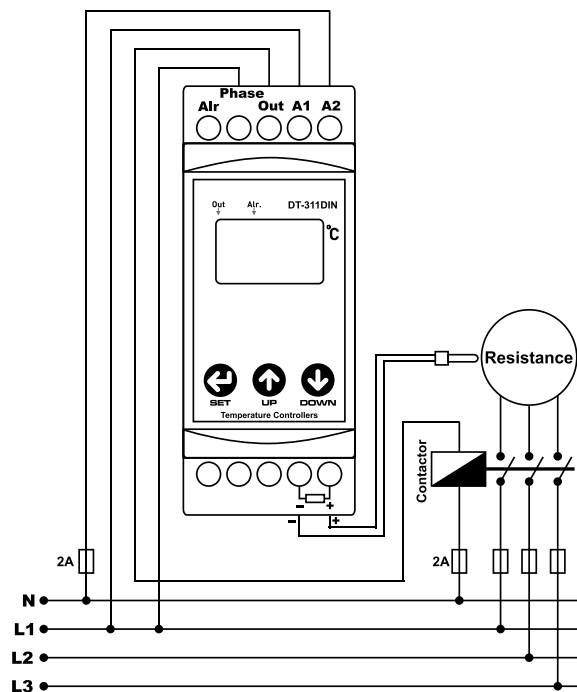
	 DT-311	 DT-312	 DT-311DIN
Operating Voltage (Un)	100V - 240VAC		
Operating Frequency	50/60Hz.		
Operating Power	<6VA		
Operating Temperature	-20°C to 55°C		
Input	SPR-311, PR-11		
Measuring Scale	-50..+150°C	-19.9..+99.9°C	-50..+150°C
Sensitivity	±1°C	±0.1°C	±1°C
Accuracy	±%1 (Full scale)		
Control Form	ON-OFF		
Output	Relay (NO + NC), 250VAC, 2A, Resistive Load		
Alarm Output	Relay (NO), 250VAC, 2A, Resistive Load		
Heating/Cooling	Selectable (Only ON/OFF for cooling function)		
Display	1 adet 3 digits display		
Connection Type	Plug-in terminal connection	Terminal connection	
Cable Diameter	1.5mm ²		
Weight	<500gr.		
Panel Hole Sizes	33 mm x 68 mm	-	
Mounting	Front panel mounting	DIN rail mounting	
Operating Altitude	<2000m		
Case	A9	B3	



- Microprocessor based, temperature control device
- Sensor type: PTC
- Measurement and control scale: -50 °C ... +150 °C (DT-311) -19.9 °C ... +99.9 °C (DT-311DIN)
- ON-OFF control form
- OUT and ALARM output (dry contact)
- Heating and Cooling functions; optional
- Adjustable upper limit for Set and Alarm values
- Adjustable lower limit for Set and Alarm values
- Individually adjustable hysteresis for Set and Alarm values
- Conditional, unconditional or "Sensor failure" alarm options
- Internal adjustable latency time relay before start-up for cooling function (compressor protection feature)
- Adjustable internal ON/OFF time relay for OUT terminal in case any sensor failure occurs (for heating and cooling function)
- Input "Offset" feature
- Curve adjustment through the conversion tables of °C/ Ohm stored in the memory
- Password-protected
- High precision, accuracy
- Keeping the program and control parameters continuously in the memory.
- Easy connection with socket clamp



DT-311 and DT-312



DT-311DIN



DT-311



DT-312



DT-311DIN



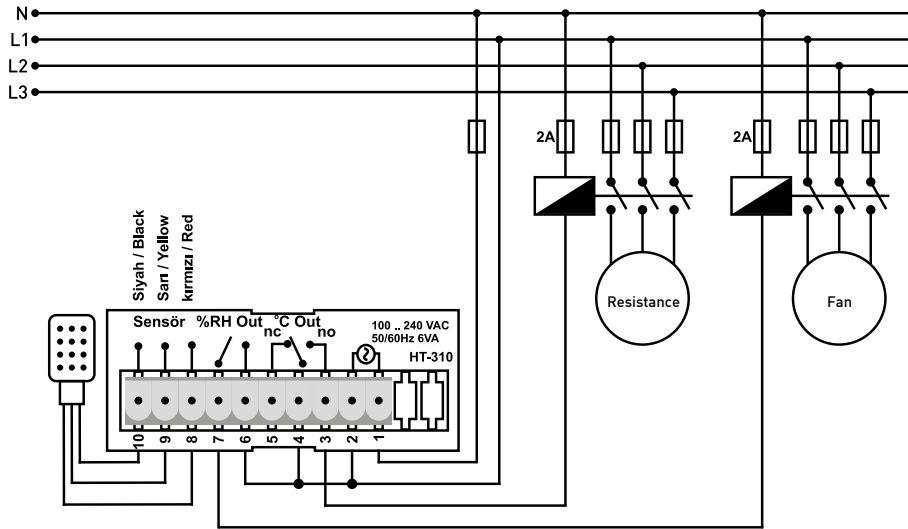


HT-310






Operating Voltage (Un)	100V - 240VAC
Operating Frequency	50/60Hz.
Operating Power	<6VA
Operating Temperature	-20°C to 55°C
Input	NT-310
Heating Measurement Scale	-19.9..+80.0°C
Heating Sensitivity	±0.1°C
Heating Accuracy	±%1 (Full scale)
Humidity Measurement Scale	%5..%95RH
Humidity Sensitivity	±0.1 %RH
Humidity Accuracy	±%3RH (Full scale)
Control Form	ON-OFF
Heating Output	Relay (DT-311DIN), 250VAC, 2A, Resistive Load
Humidity Output	Relay (NO), 250VAC, 2A, Resistive Load
Heating / Cooling	Selectable
Humidity Increase / Decrease	Selectable
Display	1 x 3 digits display
Connection Type	Plug-in terminal connection
Cable Diameter	1.5mm ²
Weight	<500gr.
Panel Hole Sizes	33 mm x 68 mm
Mounting	Front panel mounting
Operating Altitude	<2000m
Case	A9



- Microprocessor based, temperature and humidity control device
- Sensor type: Digital temperature and humidity sensor
- Measurement and control scale: -19.9 °C ... +80.0 °C 5%RH.....95%RH
- ON-OFF control form
- Individually control outputs for temperature and humidity
- Heating and Cooling functions; optional
- Adjustable upper limit for Temperature and Humidity values
- Adjustable lower limit for Temperature and Humidity values
- Individually adjustable hysteresis for Temperature and Humidity values
- Internal adjustable latency time relay before start-up for cooling function (compressor protection feature)
- Individually Input "Offset" feature for Temperature and Humidity values
- Feature of monitoring the selectabe values.
- Password-protected
- High precision, accuracy
- Keeping the program and control parameters continuously in the memory.
- Easy connection with socket clamp

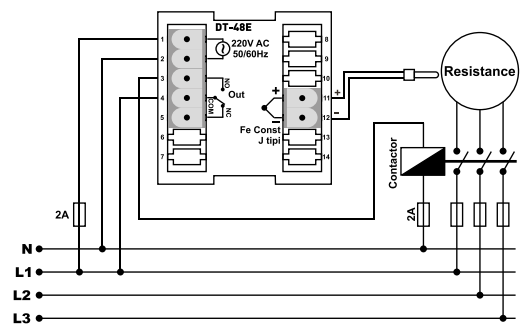
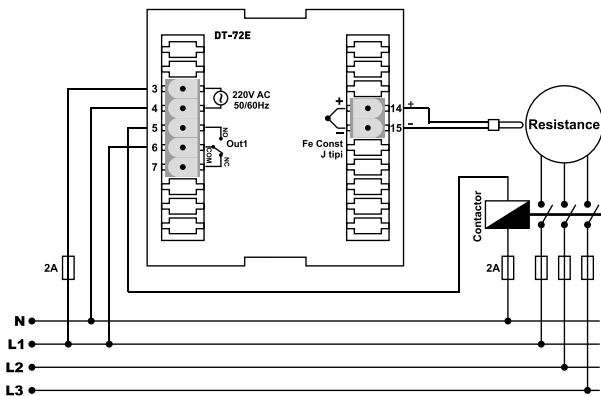
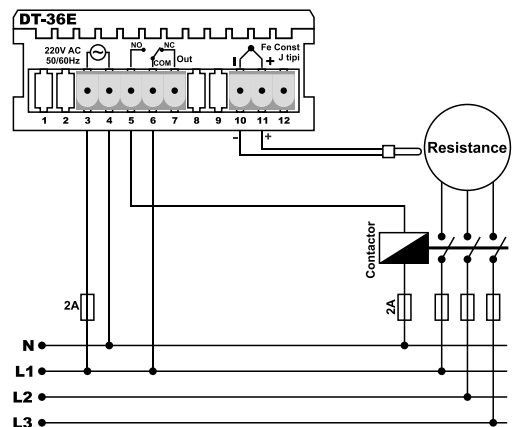
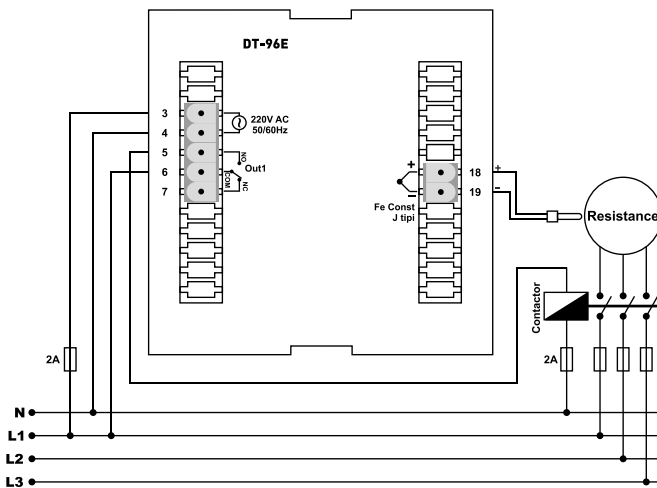




	 DT-96E	 DT-72E	 DT-48E	 DT-36E
Operating Voltage (Un)	100V - 240VAC			
Operating Frequency	50/60Hz.			
Operating Power	<6VA			
Operating Temperature	-20°C to 55°C			
Input	Fe-Const, J type T/C			
Measurement Scale	0 .. 600 °C, J type			
Sensitivity	±1°C			
Accuracy	±%0.3 (Full scale)			
Control Form	ON-OFF			
Output	Relay (NO + NC), 250VAC, 2A, Resistive Load			
Display	1 x 3 digits display			
Connection Type	Plug-in terminal connection			
Cable Diameter	1.5mm ²			
Weight	<500gr.			
Panel Hole Sizes	92 mm x 92 mm	69 mm x 69 mm	46mm x 46mm	33mm x 68mm
Mounting	Front panel mounting			
Operating Altitude	<2000 m			
Case	H1	H2	H3	A9



- Microprocessor based, single contact temperature control device
- Sensor type:T/C, Fe-Const, J type
- ON-OFF control form
- Adjustable Hysteresis value
- Adjustable Upper Limit Value for SET
- Monitoring of Set and Process values on the display
- T/C ambient temperature compensation
- Curve adjustment through the conversion tables of C/mV stored in the memory
- High precision, accuracy
- Keeping the program and control parameters continuously in the memory.
- Easy connection with socket clamp





ANALOGUE CONTROLLED TEMPERATURE CONTROL DEVICE

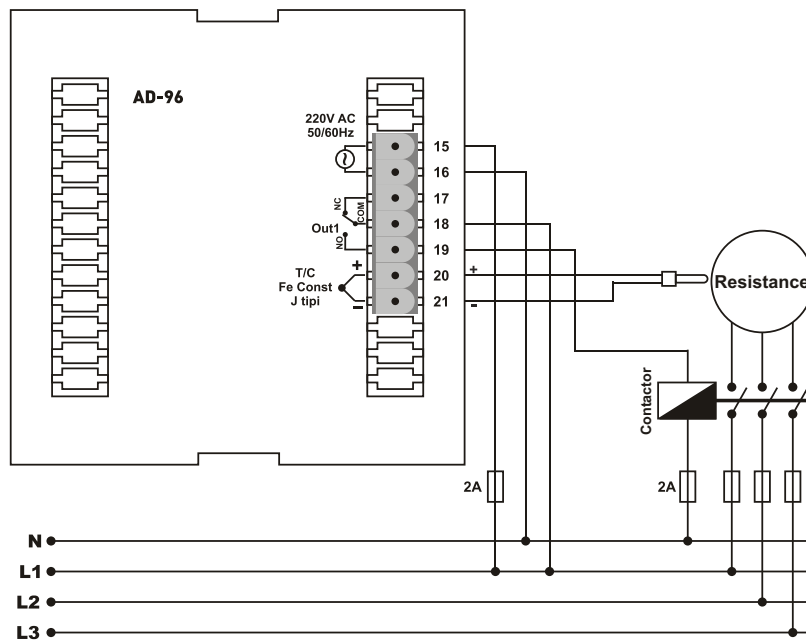


AD-96

Operating Voltage (Un)	100V - 240VAC
Operating Frequency	50/60Hz.
Operating Power	<6VA
Operating Temperature	-20°C to 55°C
Input	Fe-Const, J type T/C
Measurement Scale	0 - 400 °C
Sensitivity	±1°C
Accuracy	±%1 (Full scale)
Control Form	ON-OFF, or Programmable Timed / ON-OFF control form (optional)
Output	Relay (NO + NC), 250VAC, 2A, Resistive Load
Display	1 x 3 digits display
Connection Type	Plug-in terminal connection
Cable Diameter	1.5mm ²
Weight	<500gr.
Panel Hole Sizes	92mm x 92mm
Mounting	Front panel mounting.
Protection Class	IP20
Operating Altitude	<2000 meters
Case	H1



- Microprocessor based, analog SET operated single contact temperature control device
- Sensor type: Fe-Const, J type T/C
- Programmable Time Proportional and ON-OFF control form
- Monitoring of Set or Process values on the digital display
- T/C ambient temperature compensation
- Curve adjustment through the conversion table of C/mV stored in the memory
- Easy connection with socket clamp





TEMPERATURE CONTROL DEVICES WITH INTERNAL TIME RELAY



DTZ-96



DTZ-72

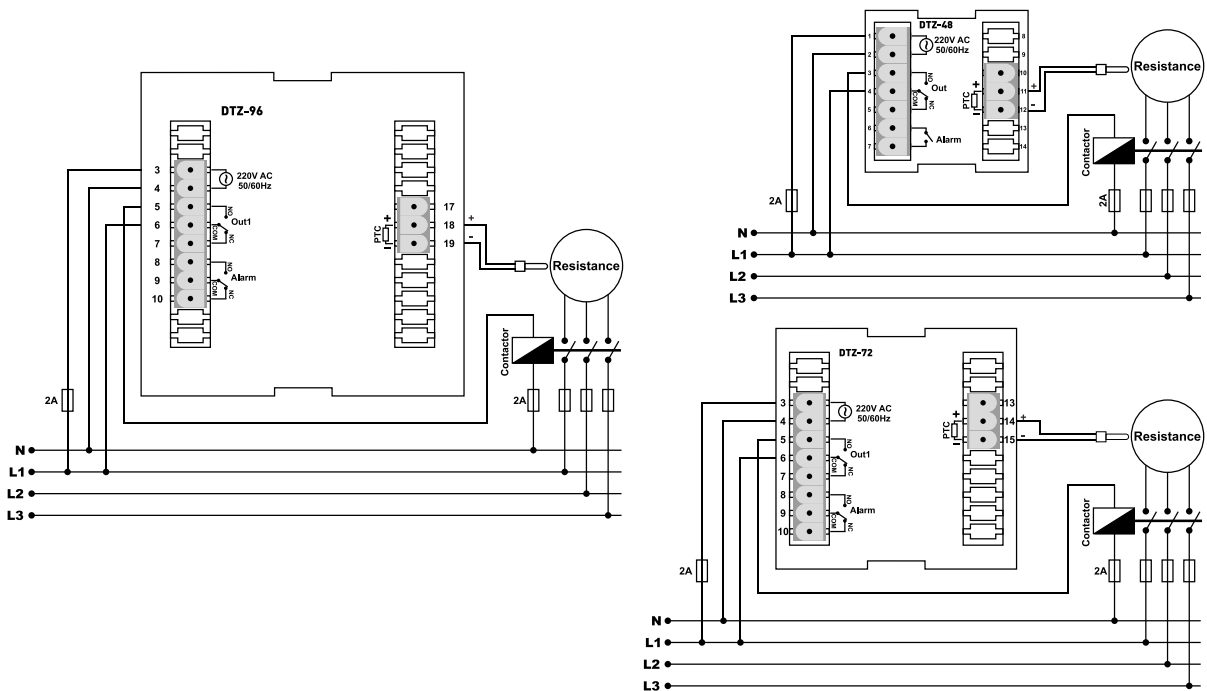


DTZ-48

Operating Voltage (Un)	230VAC +10%, -20%		
Operating Frequency	50/60Hz.		
Operating Power	<8VA		
Operating Temperature	-20°C to 55°C		
Input	J, K, T, S, R type T/C, Pt100, selectable		
Measuring Scale	-100 .. 600 °C, J type T/C, (Inpt=J), -100 .. 1300 °C, K type T/C, (Inpt=k), -100 .. 400 °C, T type T/C, (Inpt=t), 0 .. 1750 °C, S type T/C, (Inpt=S), 0 .. 1750 °C, R type T/C, (Inpt=r), -100 .. 600 °C, Pt100, (Inpt=Pt), -99.9 .. 600.0 °C, Pt100, (Inpt=Pt.0)		
Sensitivity, Accuracy	±1 °C or ± 0.1 °C, ±%0.3 (Full Scale)		
Control Form	ON-OFF or P, PI, PD, PID - selectable		
Output	Relay (NA + NK), 250VAC, 2A, Resistive Load, (optional SSR)		
Alarm Output	Relay (NO + NC), 250VAC, 2A, Resistive Load	Only (NO)	
Time Setting, Accuracy	00:00 .. 99:59 time (t.SET), ±%1.5 (t.SET or A.Off values)		
Time Setting Step	1 Minute Increasing/Decreasing		
ALARM ON Time	00:00 .. 99:59 Minutes (A.Off). 00:00 is not automatic OFF (latch)		
ALARM ON Steps	1 Second Increasing/Decreasing		
Display	2 x 4 digit display		
Connection Type	Plug-in terminal connection		
Cable Diameter	1.5mm ²		
Weight	<500gr.		
Panel Hole Sizes	92 mm x 92 mm	69 mm x 69 mm	46 mm x 46 mm
Mounting	Front panel mounting		
Operating Altitude	<2000 metre		
Case	H1	H2	H3



- PID temperature control device with internal time relay
- Automatic calculation of PID parameters through Auto-tune feature.
- Time setting up to 99:59
- ALARM ON time adjustable up to 99:59
- Automatic OFF feature selectable at the end of Timer T.SET duration for OUT terminal.
- Sensor type: T/C (J,K,T,S,R), Pt100, optional- multi input
- P, PI, PD, PID or ON-OFF control form - optional
- "Overshoot" prevention feature – PID mode
- "Anti-windup" feature
- Adjustable upper and lower limits for SET value
- Feature of monitoring the Set and Residual Time values intermittently.
- Ambient temperature compensation for T/C
- Line compensation for Pt100
- Curve adjustment through the conversion tables of °C/mV and °C/Ω stored in the memory
- Input "Offset" feature
- Password-protected
- High precision, accuracy
- Keeping the program and control parameters continuously in the memory.
- SSR output option
- Easy connection with socket clamp



DTZ-96



DTZ-72



DTZ-48





For detailed technical information, you can reach product manuals by scanning the QR codes.





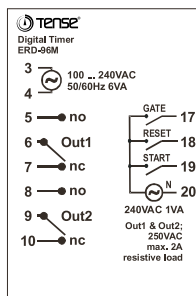
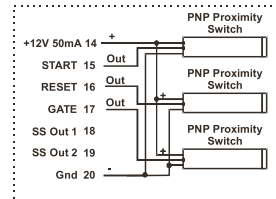
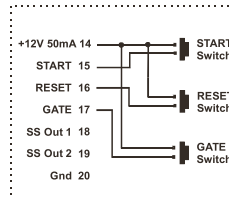
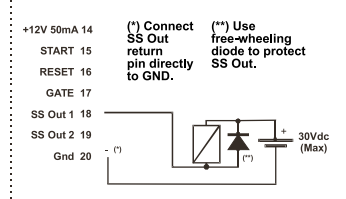
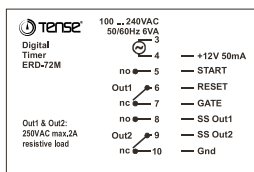
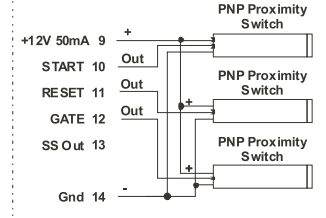
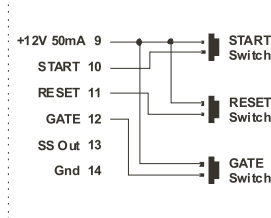
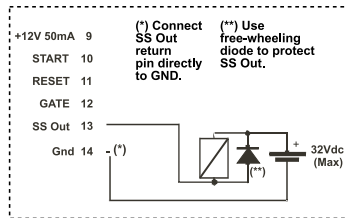
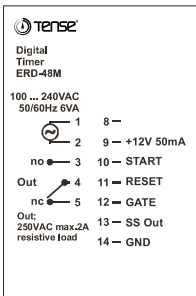
DIGITAL TIME RELAYS



	 ERD-96M	 ERD-72M	 ERD-48M
	Operating Voltage (Un) 230VAC +10%, -20%		
Operating Frequency 50/60Hz.			
Operating Power <8VA			
Operating Temperature -20°C to 55°C			
Input START / RESET / GATE Input			
Time Select 99:59 hour / 99:59 minutes / 599.9 seconds			
Output Function Selectable 8 kinds		Selectable 13 kinds	
Sensor Supply Output 12VDC, 50mA max.			
Output Out1, Out2; 2 x Relay (NO-O-NC), 250VAC, 2A, Resistive Load, SS Out; open collector (NPN output),30V,100mA max.			
Heating/Cooling Selectable (Only cooling function for ON-OFF)			
Display 2 x 4 digit display			
Connection Type Plug-in terminal connection			
Cable Diameter 1.5mm ²			
Weight <500gr.			
Panel Hole Sizes	92mm x 92 mm	69mm x 69mm	46mm x 46mm
Mounting Front panel mounting			
Operating Altitude <2000 m			
Case	H1	H2	H3



- START / RESET / GATE input, double output time relay
- 2x4 7 Segment LED display
- 8 different operation modes (ERD-96M, ERD-72M)
- 13 different operation modes (ERD-48M)
- Hour / Minute / Second counting option
- Feature of keeping the last counting value in the memory together with Out1 & Out2 positions in case of energy interruption (reserving feature)
- Keeping the control parameters continuously in the memory.
- 24VDC input (Proximity switch connection (ERD-72M, ERD-48M))



ERD-96M



ERD-72M








ERD-48M





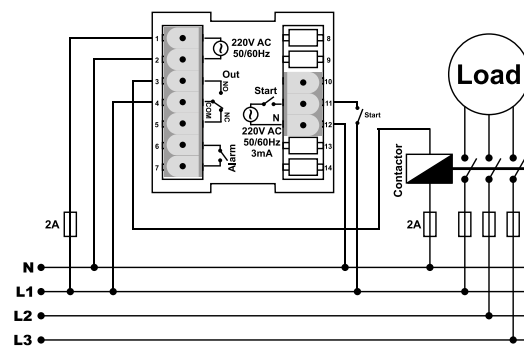
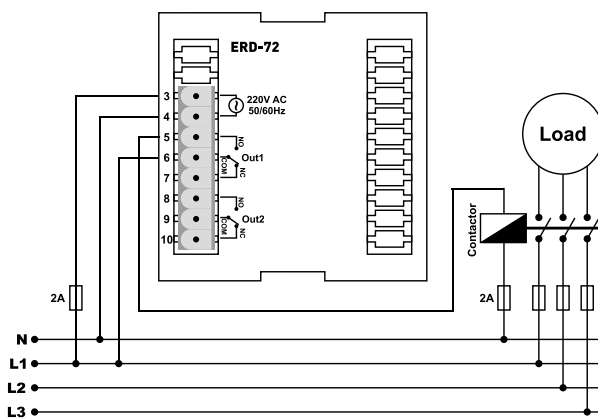
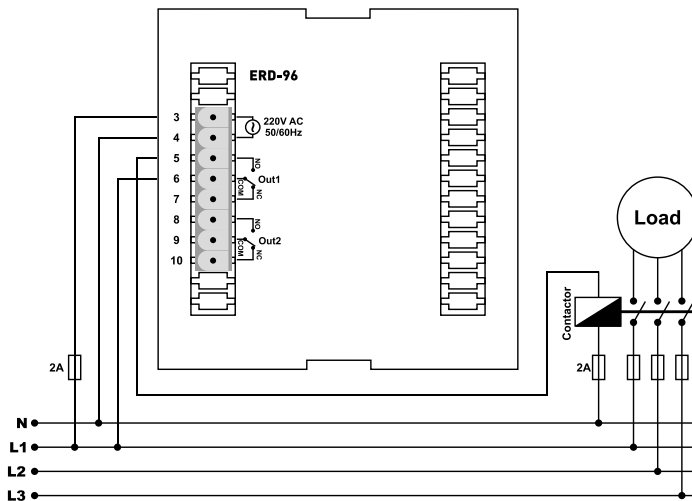
DIGITAL TIME RELAYS



	 ERD-96	 ERD-72	 ERD-48	 ERD-48K
	<p>Operating Voltage (Un) 100 ... 240VAC</p> <p>Operating Frequency 50/60Hz.</p> <p>Operating Power <5VA</p> <p>Operating Temperature -20°C to 55°C</p>			
Input	Instant contact with ON and delay or flasher; optional		Start ON with sudden contact and delay or flasher; optional.	Instant contact with ON and delay or flasher; optional.
Time Select	99.9 seconds, 999 second, 99.9 minutes or 999 minutes			
Output Function	Delay or flasher			
Output	Relay (NO+NC), 250VAC, 2A Resistive Load			
Display	20 mm 3 digits	14 mm 3 digits	9 mm 3 digits	
Connection Type	Plug-in terminal connection			
Cable Diameter	1.5mm ²			
Weight	<300gr.			
Panel Hole Sizes	92mm x 92 mm	69mm x 69mm	46mm x 46mm	
Operating Altitude	<2000m			
Case	H1	H2	H3	



- Instantaneous contact and latency or Flasher with START ON; optional
- Feature of monitoring the Set and Residual Time values on the digital display
- 99.9 seconds, 999 seconds, 99.9 minutes, 999 minutes (optional)
- Easy connection with socket clamp





STANDARD TIME RELAYS



ER-XX

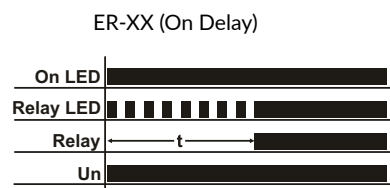
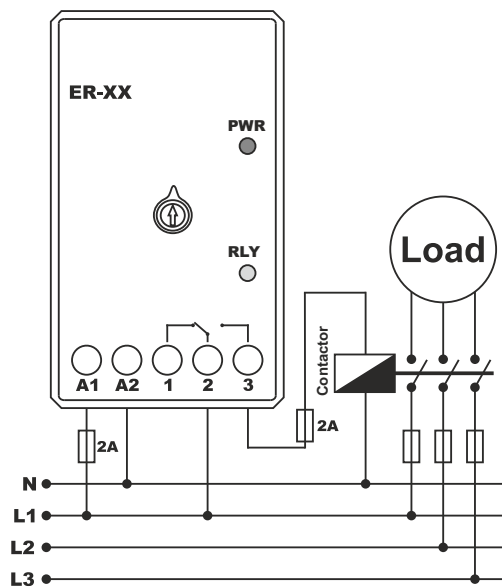
Operating Voltage (Un)	150V – 260VAC					
Operating Frequency	50/60Hz.					
Operating Power	<4VA					
Operating Temperature	-20°C to 55°C					
Time Select	0.1-30 Sec	0.1-60 Sec	0.1-3 Min	0.1-12 Min	0.1-30 Min	0.1-60 Min
Output	5A/250VAC Resistive Load					
Display	2 LEDs					
Connection Type	Terminal connection					
Cable Diameter	2.5mm ²					
Weight	<100gr.					
Mounting	DIN rail mounting					
Protection Class	IP20					
Operating Altitude	<2000 meters					
Case	B1					



ER-XX is a time relay delayed in drawing and designed to be used where time based control is required (industry, house, factory etc.). Waiting time (t) is adjusted with button.

When the device is energized, it starts counting the waiting time. While it is counting the time, ON led lights up and OUT led blinks. At this stage, 1(NC) and 2(COM) contacts become short-circuit.

Relay led lights constantly after the time is up, 3(NO) and 2(COM) contacts become short-circuit. The device maintains its position until it is de-energized.





DIN TYPE TIME RELAYS

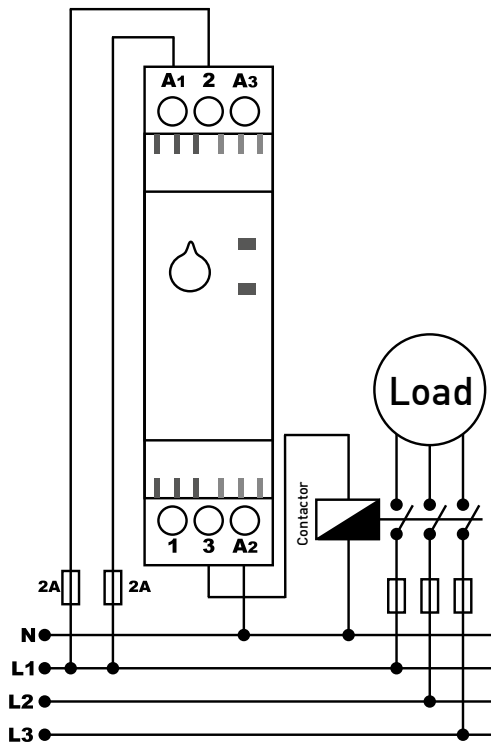


ERV-XX

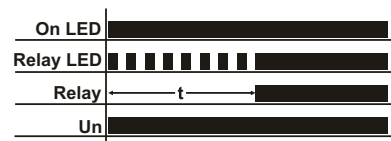
Operating Voltage (Un)	150V - 260VAC(A1-A2), 24VAC/DC(A3-A2)							
Operating Frequency	50/60Hz.							
Operating Power	<4VA							
Operating Temperature	-20°C to 55°C							
Time Select	0.1-3 Sec	0.1-12 Sec	0.1-30 Sec	0.1-60 Sec	0.1-3 Min	0.1-12 Min	0.1-30 Min	0.1-60 Min
Output	5A/250VAC Resistive Load							
Display	2 LEDs							
Connection Type	Terminal connection							
Cable Diameter	1.5mm ²							
Weight	<100gr.							
Mounting	DIN rail mounting							
Protection Class	IP20							
Operating Altitude	<2000 meters							
Case	C1							



ERV-XX is a time relay delayed in drawing and designed to be used where time based control is required (industry, house, factory etc.). Waiting time (t) is adjusted with button. When the device is energized, it starts counting the waiting time. While it is counting the time, ON led lights up and OUT led blinks. At this stage, 1(NC) and 2(COM) contacts become short-circuit. Relay led lights constantly after the time is up, 3(NO) and 2(COM) contacts become short-circuit. The device maintains its position until it is de-energized.



ERV-XX (On delay)





SOCKET TYPE TIME RELAYS



ERS-XX

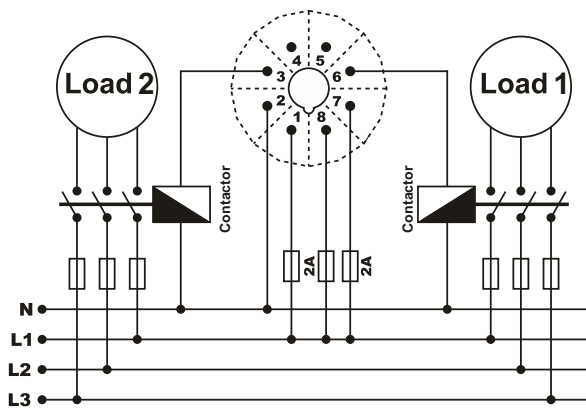
Operating Voltage (Un)	150V – 260VAC							
Operating Frequency	50/60Hz.							
Operating Power	<4VA							
Operating Temperature	-20°C to 55°C							
Time Select	0.1-3 Sec	0.1-12 Sec	0.1-30 Sec	0.1-60 Sec	0.1-3 Min	0.1-12 Min	0.1-30 Min	0.1-60 Min
Display	2 LEDs							
Connection Type	8 pin socket							
Output	5A/250VAC Resistive Load							
Cable Diameter	1.5mm ²							
Weight	<100gr.							
Panel Hole Sizes	44mm x 44mm							
Mounting	Front panel mounting							
Protection Class	IP41 (Front Panel), IP00 (Body)							
Operating Altitude	<2000 meters							
Case	A8							



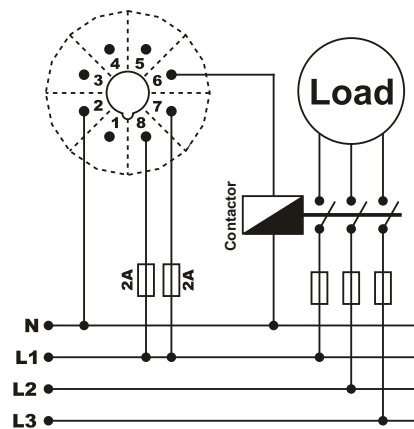
ERS-XXY is a time relay delayed in drawing and designed to be used where time based control is required (industry, house, factory etc.). Waiting time (t) is adjusted with button. When the device is energized, it starts counting the waiting time. While it is counting the time, ON led lights up and OUT led blinks. At this stage, 5(NC) and 8(COM) contacts become short-circuit. Relay led lights constantly after the time is up, 6(NO) and 8(COM) contacts become short-circuit. The device maintains its position until it is de-energized.



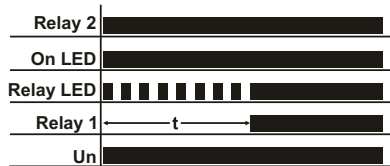
ERS-XXR (instantaneous contact)



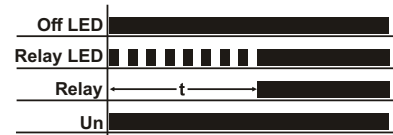
ERS-XXY



ERS-XXR (On delay)



ERS-XXY (On delay)





PANEL TYPE TIME RELAYS



ERP-XX

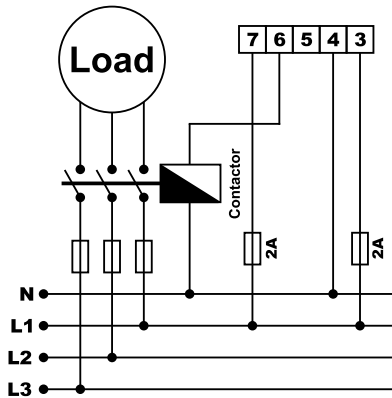
Operating Voltage (Un)	150V – 260VAC							
Operating Frequency	50/60Hz.							
Operating Power	<4VA							
Operating Temperature	-20°C to 55°C							
Time Select	0.1-3 Sec	0.1-12 Sec	0.1-30 Sec	0.1-60 Sec	0.1-3 Min	0.1-12 Min	0.1-30 Min	0.1-60 Min
Display	2 LEDs							
Connection Type	Plug-in terminal connection							
Output	5A/250VAC Resistive Load							
Cable Diameter	1.5mm ²							
Weight	<100gr.							
Panel Hole Sizes	44mm x 44mm							
Mounting	Front panel mounting							
Protection Class	IP41 (Front Panel), IP20 (Body)							
Operating Altitude	<2000 meters							
Case	A8							



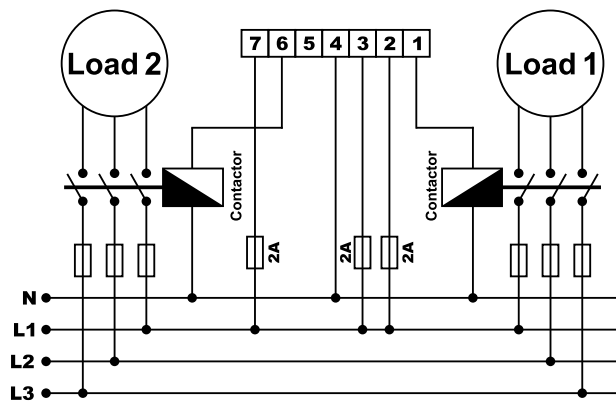
ERP-XX is a time relay delayed in drawing and designed to be used where time based control is required (industry, house, factory etc.). Waiting time (t) is adjusted with button. When the device is energized, it starts counting the waiting time. While it is counting the time, ON led lights up and OUT led blinks. At this stage, 1(NC) and 2(COM) contacts become short-circuit. Relay led lights constantly after the time is up, 3(NO) and 2(COM) contacts become short-circuit. The device maintains its position until it is de-energized



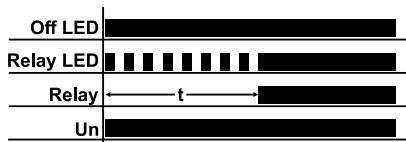
ERP-XXY



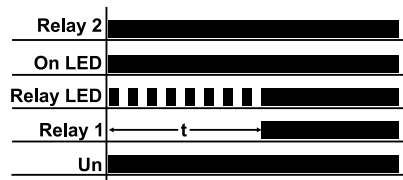
ERP-XXYR



ERP-XXY



ERP-XXYR





MULTI-FUNCTIONAL TIME RELAYS



ERX-10

Operating Voltage (Un)	12V - 240VAC/DC
Operating Frequency	50/60Hz.
Operating Power	<4VA
Operating Temperature	-20°C to 55°C
Program Select	10 different programs
Time Select	0.1 Sec. - 30 hours
Display	4 LEDs
Connection Type	Terminal connection
Output	5A/250VAC Resistive Load
Cable Diameter	1.5mm ²
Weight	<100gr.
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	C3



ERX-10 is a multi-time relay delayed in drawing and designed to be used where time based control is required (industry, house, factory etc.).

Function button(Fn) : It defines functions. You can select the function that you want to use from the table.

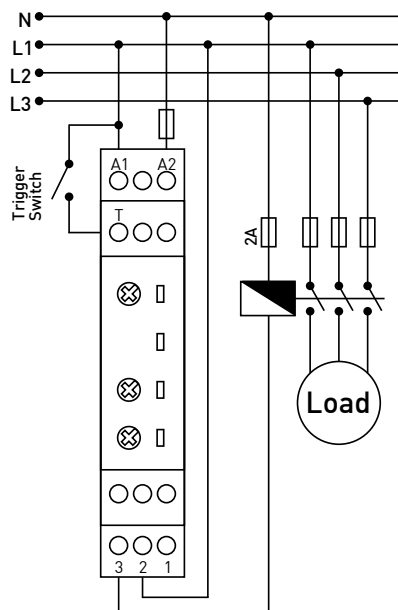
Maximum Time Button(tm) : It defines the maximum time you want to use in functions. Function values are indicated on the cover as letter.

There are 10 different time levels. You can see the function that you want to use from the table.

Time Multiplier button (Xn):It multiplies the maximum time to reach the intermediate values. it has 10 stepped multiplying values between 0.1 and 1.

Programs on the device are as follows :

-1- ON Delay		-7- ON delay and OFF Delay with Control	
-2- OFF Delay		-8- Pulse out-put with Control	
-3- Control ON Delay		-9- Equivalent timed flasher (t=ton=toff)	
-4- Control OFF Delay		-10- Equivalent timed flasher with control (t=ton=toff)	
-5- Single Shot Leading Edge with Control Input			
-6- Single Shot Trailing Edge with Control Input			





MULTI-FUNCTIONAL TIME RELAYS



ERV-08



ERV-08M

Operating Voltage (Un)	150V - 260VAC(A1-A2), 24VAC/DC(A3-A2)	12V - 240VAC/DC
Operating Frequency	50/60Hz.	
Operating Power	<4VA	
Operating Temperature	-20°C to 55°C	
Time Select	0.1 Sec - 100 Hours	
Display	2 LEDs	
Connection Type	Terminal connection	
Output	5A/250VAC Resistive Load	
Cable Diameter	2.5mm ²	
Weight	<100gr.	
Mounting	Inside of panel vertical or DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	C1	C3

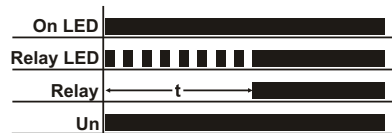
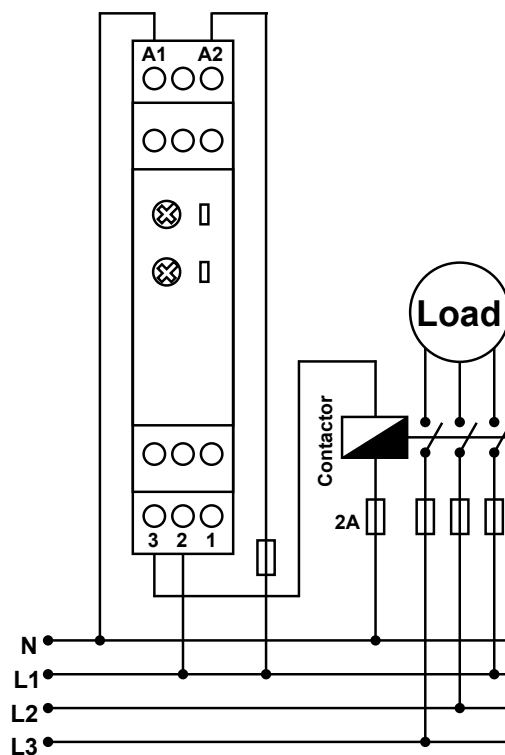
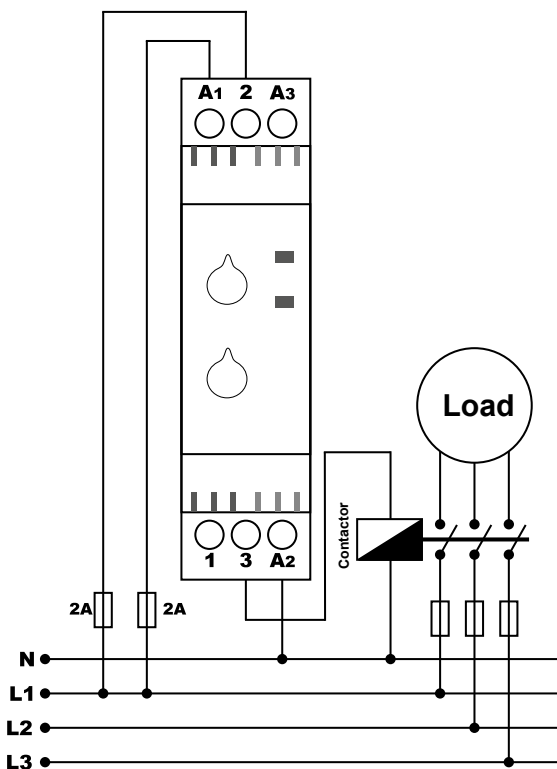


ERV-08 is a multi-time relay delayed in drawing and designed to be used where time based control is required (industry, house, factory etc.). 6 different time levels (A=10s., B=100s., C=10m., D=100m., E=10h. and F=100h) are available. Waiting time is adjusted with level and time set button. Level set button shows the maximum (10) value of time set button.



ERV-08

ERV-08M





MULTI-FUNCTIONAL FLASHER RELAYS



ERF-09



ERV-09



ERP-2F



DFR-72

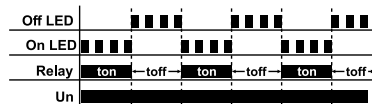
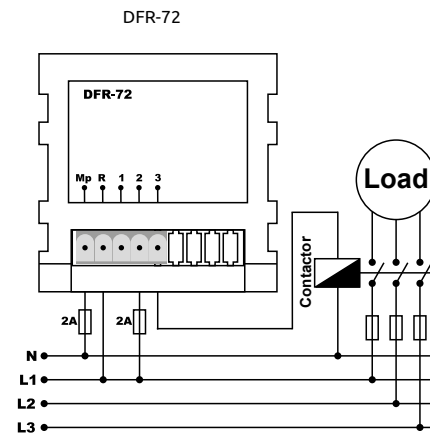
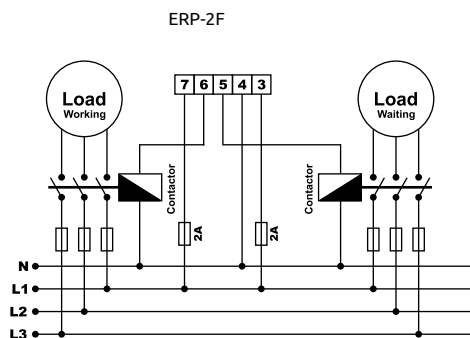
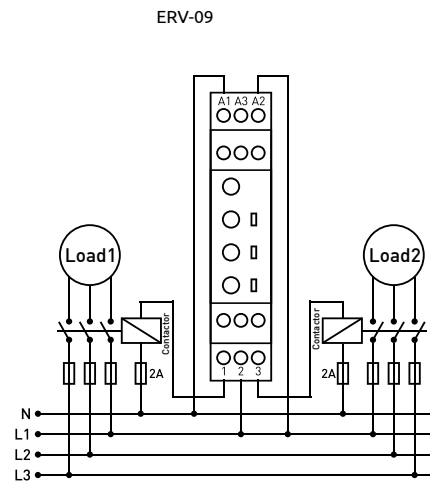
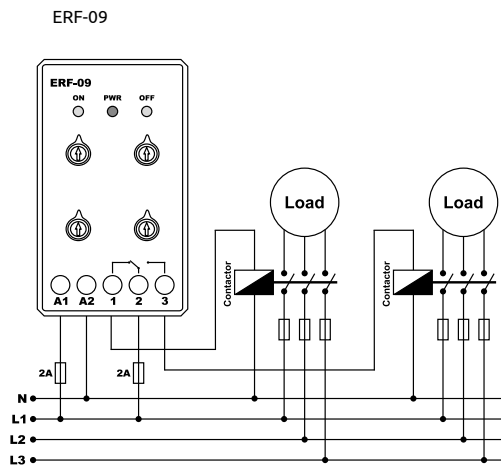
Operating Voltage (Un)	150V – 260VAC			
Operating Frequency	50/60Hz.			
Operating Power	<4VA			
Operating Temperature	-20°C to 55°C			
Time Select	0.1Sec. - 100 Hours		0.1Min. - 60 Min.	1 Sec. - 99 Min.
Display	3x LEDs		2x LEDs	5x LEDs
Connection Type	Terminal connection		Plug-in terminal connection	
Output	5A/250VAC Resistive Load			
Cable Diameter	2.5mm ²		1.5mm ²	
Weight	<110gr.		<80gr.	<200gr.
Mounting	Inside of panel vertical or DIN rail mounting		Front of Panel Mounting	
Panel Hole Sizes	-		45mm x 45mm	68mm x 68mm
Protection Class	IP20		IP41 (Front Panel), IP20 (Body)	
Operating Altitude	<2000 meters			
Case	B1	C3	A8	A5



ERF-09 is a multi-time flasher relays are designed to be used where time based control is required (industry, house, factory etc.). There are 6 different time levels (A=10s, B=100s, C=10m, D=100m, E=10h and F=100h) Operating time is adjusted with level (ton) and time (ton) set button. Level set buttons show the maximum (10) value of time set buttons. "ton" is written under the time set button of the operating time. The level set button of the operating time is under this button. "toff" is written under the time set button of the waiting time. The level set button of the waiting time is under this button.

ERP-2F: ERP-2F is panel type two functions flasher relays and designed to be used where time based control is required (industry, house, factory etc.).

DFR-72: Flasher relay's operating (ON) time and waiting (OFF) time can be adjustable as analog. When the device is energized, it starts with operating time. There are 4 operating modes (sec.- sec.), (sec.-min), (min.-sec.)(min.-min.). It has 2 x 2 digit 14mm Displays. It shows the time by counting backward on display.



ERF-09/ERV-09



DFR-72





MULTI FUNCTIONAL RIGHT-LEFT RELAY WITH DOUBLE-ADJUSTMENT



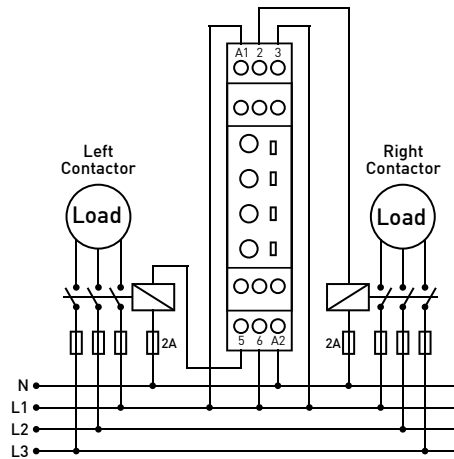
ERS-07

Operating Voltage (Un)	150V - 260VAC
Operating Frequency	50/60Hz.
Operating Power	<4VA
Operating Temperature	-20°C to 55°C
On Time	0.1 sec. - 100 min.
Off Time	0.1 sec. - 100 min.
Display	3 x LEDs
Connection Type	Terminal connection
Output	5A/250VAC Resistive Load
Cable Diameter	2.5mm ²
Weight	<125gr.
Mounting	Inside of panel vertical or DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	C3



ERS-07 is a multi-time right/left relay with double-adjustment and designed to be used where time based control is required (industry, house, factory etc.). There are 4 different time levels (10s, 100s, 10m and 100m).

Operating (ton) time is applied for both right and left contacts. Level set buttons show the maximum (10) value of time set buttons. "ton" is written under the time set button of the operating time. The set button under this is the level set button of the operating time. "toff" is written under the time set button of the waiting (toff) time. The set button under this is the level set button of the waiting time.



Left Contact			ton			ton		
Waiting		toff		toff		toff		toff
Right Contact	ton			ton				ton
Un (Supply)								





STAR DELTA RELAY



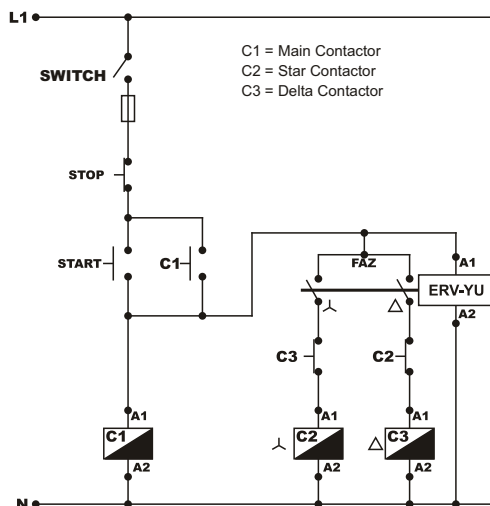
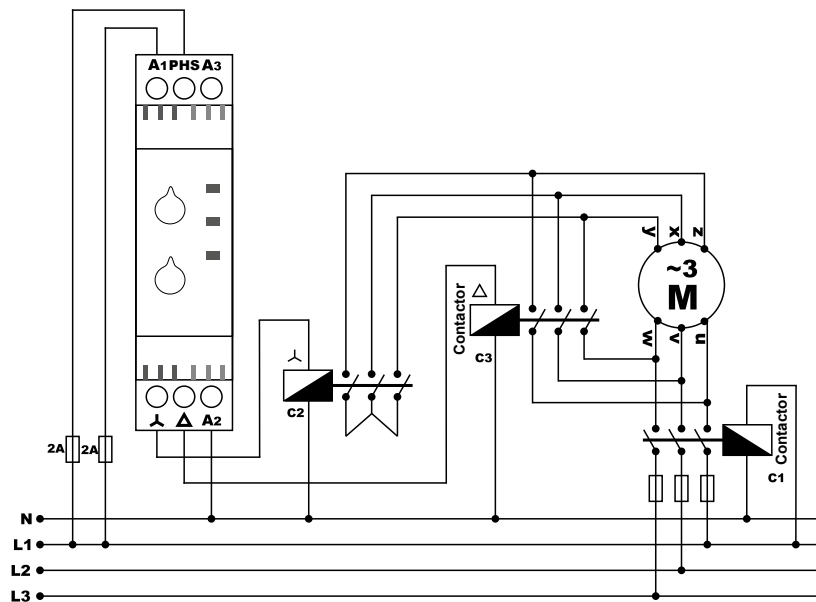
ERV-YU

Operating Voltage (Un)	150V – 260VAC(A1-A2), 24VAC/DC(A3-A2)
Operating Frequency	50/60Hz.
Operating Power	<4VA
Operating Temperature	-20°C to 55°C
Star Contact Waiting	0.1 Sec. - 30 Sec.
Star to Delta Passing	10 msec - 500msec.
Display	3 LEDs
Connection Type	Terminal connection
Output	5A/250VAC Resistive Load
Cable Diameter	1.5mm ²
Weight	<110gr.
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	C1



ERV-YU star delta relay is designed to control the three-phase motor take-offs. There are star contact waiting time set button (1sec.- 30sec.) and the time set button for drawing the delta contact after releasing the star contact (10msec.- 500msec.)

When the device is energized, the star draws the contact, it counts the star contact waiting time that you adjusted, ON led and "star" led lights up. At this stage, PHASE and star terminals are short-circuit, PHASE and delta terminals are open-circuit. After the star waiting time is up, it releases the star contact. Star led turns off. It starts counting the time of switching to delta. At this stage, PHASE terminal is open-circuit with the other terminals. After the time of switching from star to delta, PHASE and delta contacts become short-circuit and the delta led lights up. The device maintains its position until it is de-energized.



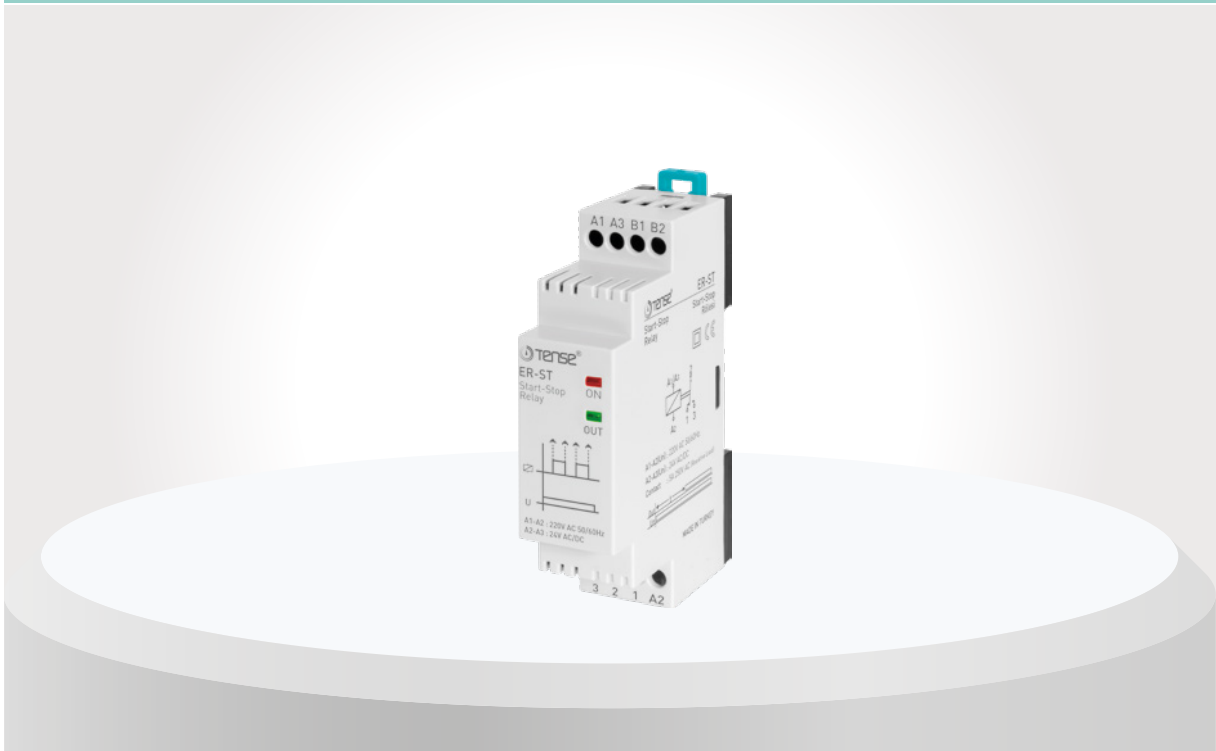
C1 = Main Contactor
C2 = Star Contactor
C3 = Delta Contactor

Delta LED			
Delta Contact			
Waiting Time			
Star LED			
Star Contact			
Un			





START-STOP RELAY



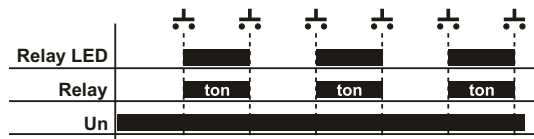
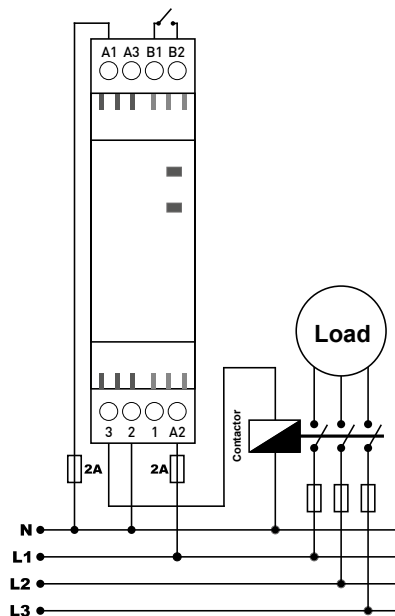
ERV-ST

Operating Voltage (Un)	150V - 260VAC
Operating Frequency	50/60Hz.
Operating Power	<4VA
Operating Temperature	-20°C to 55°C
Display	2 LEDs
Connection Type	Terminal connection
Contact	5A/250VAC Resistive Load
Cable Diameter	2.5mm ²
Weight	<90gr.
Mounting	Inside of panel vertical or DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	B1



ERV-ST start stop relay is designed to control the loads by electronic sealing with a single button.

When the device is energized, "on" led lights up, the contact terminals no. 2(COM) and 1(NC) are short-circuit and the contact terminals no. 2(COM) and 3(NO) become open-circuit. When the button is pressed, the relay led lights up, contact terminals no. 2(COM) and 3(NO) become short-circuit and contactor terminals no. 2(COM) and 1(NC) become open-circuit. Whenever the button is pressed, the contact terminals switches and it maintains the contact position in this way until the next button is pressed.





IMPULSE DELAYED TIME RELAY



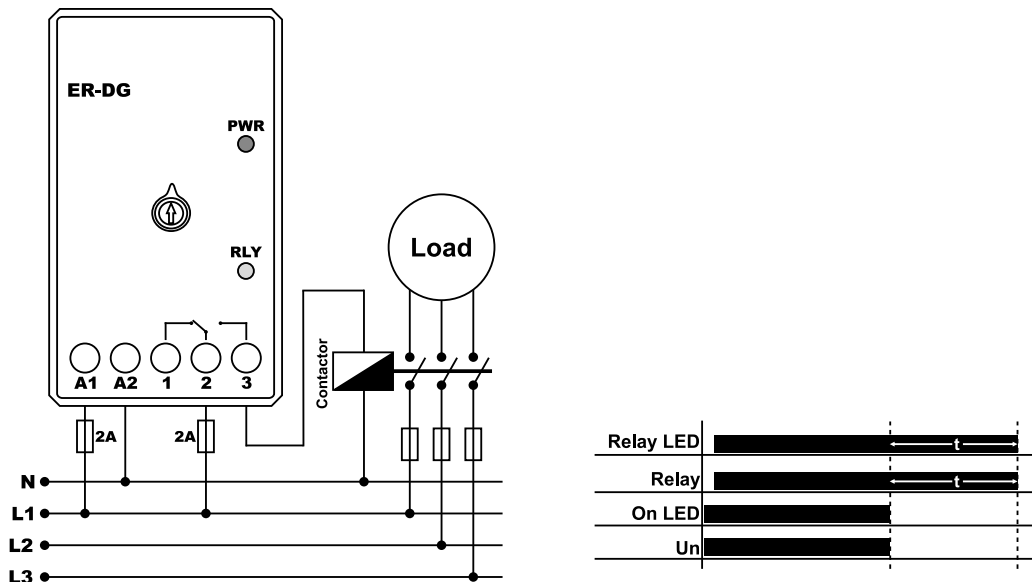
ER-DG

Operating Voltage (Un)	150V - 260VAC
Operating Frequency	50/60Hz.
Operating Power	<4VA
Operating Temperature	-20°C to 55°C
Display	2 LEDs
Delay Time	0.1 Sec. - 6 Sec.
Connection Type	Terminal connection
Contact	5A/250VAC Resistive Load
Cable Diameter	2.5mm ²
Weight	<150gr.
Mounting	Inside of panel vertical or DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	B1



ER-DG impulse delayed time relay is designed to control the loads to engage after de-energizing.

When the device is energized, "on" led lights up, the contact terminals no. 2(COM) and 1(NC) are short-circuit and the contact terminals no. 2(COM) and 3(NO) become open-circuit. After about 1-2 seconds, the relay led lights up, the contact terminals no. 2(COM) and 1(NC) are open-circuit and the contact terminals no. 2(COM) and 3(NO) become short-circuit. While the device is de-energized, "on" led turns off and the device starts counting the adjusted latency time. After the latency time is up, the relay led turns off, the contact terminals no. 2(COM) and 1(NC) are short-circuit and the contact terminals no. 2(COM) and 3(NO) become open-circuit.





OPERATING TIME COUNTER



DHM-DIN



DHM-48

Operating Voltage (Un)	150V - 260VAC	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Display	2 x 3 digits display	
Maximum Time	99.999 hours	
Accuracy	1/10.000 Sec.	
Connection Type	Terminal connection	Plug-in terminal connection
Cable Diameter	2.5mm ²	1.5mm ²
Weight	<100gr.	
Panel Hole Sizes	-	45mm x 45mm
Mounting	Inside of panel vertical or DIN rail mounting	Front panel mounting
Protection Class	IP20	IP41(Front panel), IP20(Body)
Operating Altitude	<2000 meters	
Case	B4	A7



Operating time counter is designed to calculate the operating duration between a certain time of period (max.99.999hours) of a load operating with a network.

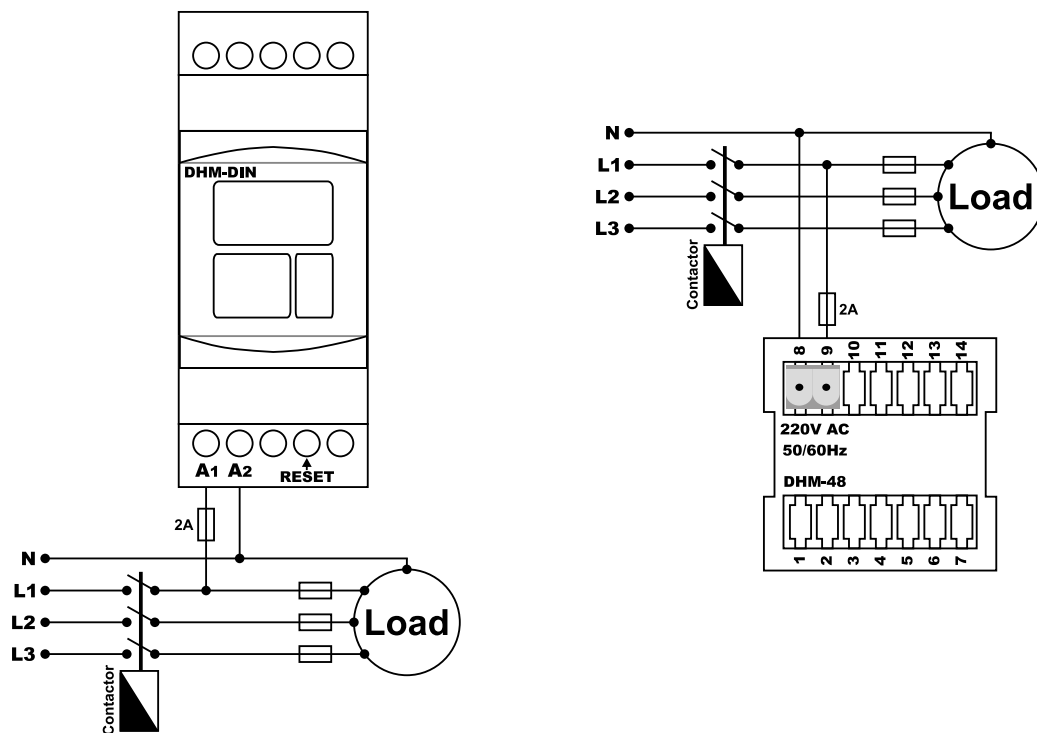
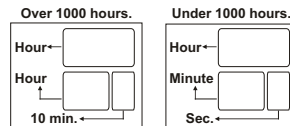
Connect the device to the load the operating time of which you want to measure. When the device is energized first, it starts counting the time from hour(3 digits), minute (2 digits) and seconds (1 digit) 0 When the device is de-energized, it saves its latest time. When the device is reenergized, it counts starting from its latest time.

The device counts up to 99.999 hours at maximum. After this time is up, it counts the section of second.

The second section increases by one every 6 seconds under 1000 hours. The second section increases by one every 10 minutes over 1000 hours.

DHM-DIN: Hold down the reset button for about 5 seconds by using the non-conductive bar through the electric terminal screw hole where “reset” is written to reset the time of the device and see the values on the display are reset.

DHM-48 : Hold down the reset button for about 5 seconds to reset the time of the device and see the values on the display are reset.





FTV-04



FT-GR

Operating Voltage (Un)	150V - 260VAC	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Display	2 LEDs	-
Lux Measuring Range	1 - 10 Lux	10 Lux (Fixed)
Delay	15 Sec. (Fixed)	
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	7A/250VAC Resistive Load
Cable Diameter	1.5mm ²	1mm ²
Weight	<100gr.	
Mounting	DIN rail mounting	Vertical to the Wall Mounting
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	C1	F3



FT-04: It has been designed for the systems requiring control depending on the light intensity.

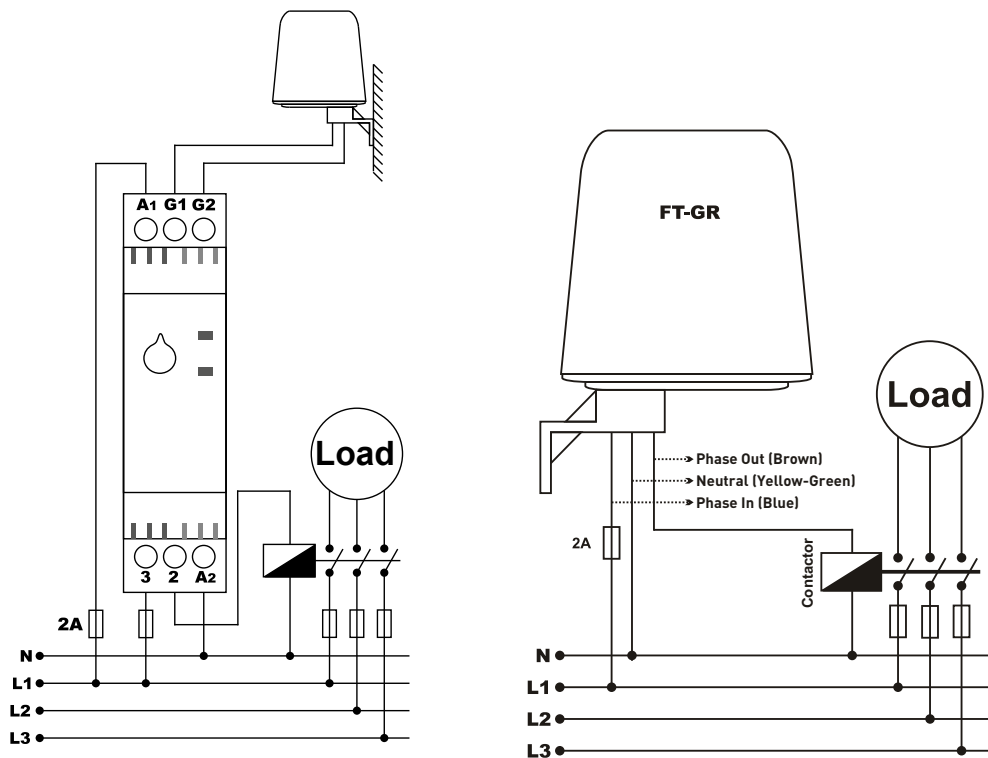
There is lux adjustment knob on the device. When the device is energized for the first time, contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. If the lux value of the area where the photocell element is installed is lower than the adjusted lux value, the device counts for about 15 seconds and after the time is up, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

If the lux value of the area is higher than the adjusted lux value, the device counts for about 15 seconds and after the time is up, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit.

FT-GR: It has been designed for the systems requiring control depending on the light intensity.

When the device is energized for the first time, it does not conduct the energy on the phase input (blue) to the phase output (brown). If the lux value of the area where the photocell element is mounted is lower than 10 lux, the device counts for about 15 seconds and the energy on the phase input (blue) is conducted to the phase output (brown). If the lux value of the area where the photocell element is mounted is higher than 10 lux, the device counts for about 15 seconds and the energy on the phase input (blue) is not conducted to the phase output (brown).

Note: While mounting the photocell element, make sure that it will not be affected from street lamp, headlights of vehicles and other light sources and that it is mounted in a way that the arrow mark points straight up.





HYDROPHORE SEQUENCING RELAYS



HSR-02



HSR-03

Operating Voltage (Un)	160V - 260VAC	
Operating Frequency	50/60Hz.	
Operating Power	<4VA	
Operating Temperature	-20°C to 55°C	
Display	5 LEDs	7 LEDs
Time	10 Min. (Fixed)	
Pressure Switch Number	2 pieces	3 pieces
Hydrophore Number	2 pieces	3 pieces
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	2.5mm ²	
Weight	<210gr.	
Mounting	DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	C2	B3



Hydrophore sequencing relay is designed for adjusting the number of hydrophores on the installations operated with hydrophores and providing that the hydrophores are operated for equal time periods and in sequence.

HSR-02

Operation with 2 pressure switches and 2 hydrophore.

If the pressure on the installation is lower than the low pressure value set on the pressure switch, the switch contractor is closed.

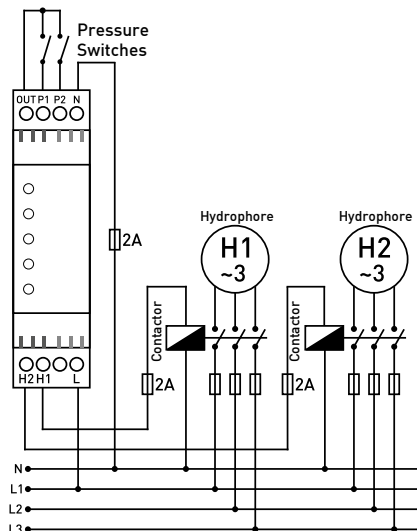
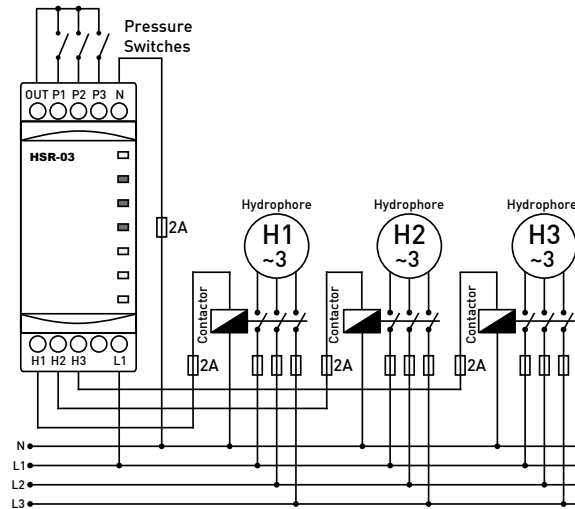
If the pressure on the installation is higher than the high pressure value set on the pressure switch, the switch contractor is opened.

HSR-03

Operation with 3 pressure switches and 3 hydrophore.

If the pressure on the installation is lower than the low pressure value set on the pressure switch, the switch contractor is closed.

If the pressure on the installation is higher than the high pressure value set on the pressure switch, the switch contractor is opened.





TBM-50

Operatin Voltage (Un)	150V - 260VAC
Operating Frequency	50/60Hz.
Operating Power	<6VA
Operating Temperature	-20°C to 55°C
Display	7 LEDs
Washing Time	30sec. (Tm1), 60sec. (Tm2), 90sec. (Tm3), 120sec. (Tm4), 180sec. (Tm5)
Rinsing Time	1sec. - 30sec.
Waiting Time	3sec. (Fixed)
Connection Type	Terminal Connection
Contact	7A/250VAC Resistive Load
Cable Diameter	2.5mm ²
Weight	<300gr.
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters.
Case	B1



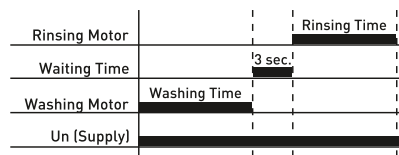
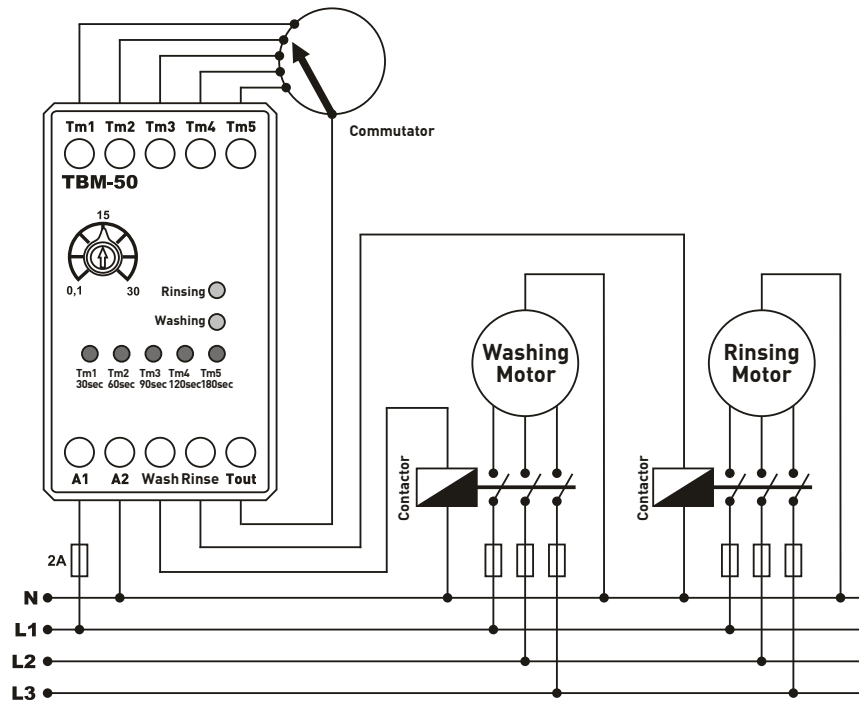
Connect the device according to the connection diagram.

Adjust the rinsing time with the adjustment knob on the device. To set the washing time, short-circuit the Tout end with one of the appropriate terminals. (Tm1 (30sec.), Tm2 (60sec.), Tm3 (90sec.), Tm4 (120sec.)) When the device is energized, the LED associated with the set wash time is lit. The washing led lights and the washing motor is energized (Phase at input A1). After the washing time has elapsed, the washing led goes off and the washing motor is de-energized. After 3 seconds the device switches to counting the rinsing time set. During the rinsing period, the motor is energized and the rinse led on the device is on (Phase at input A1). After the rinsing time has elapsed, the rinsing led goes off and the rinsing motor is de-energized.

Note 1: The washing or rinsing motors will not be energized if the device is energized before adjusting the wash time. If one of the time terminals is not short-circuited to the Tout terminal.

Note 2: Do not apply external energy to the terminals Tout, Tm1, Tm2, Tm3, Tm4 and Tm5.

Note 3: The washing and rinsing outputs of the appliance are supplied from the A1 input.





THREE-PHASE SUBMERSIBLE PUMP CONTROL RELAY



TDK-01



TDK-02

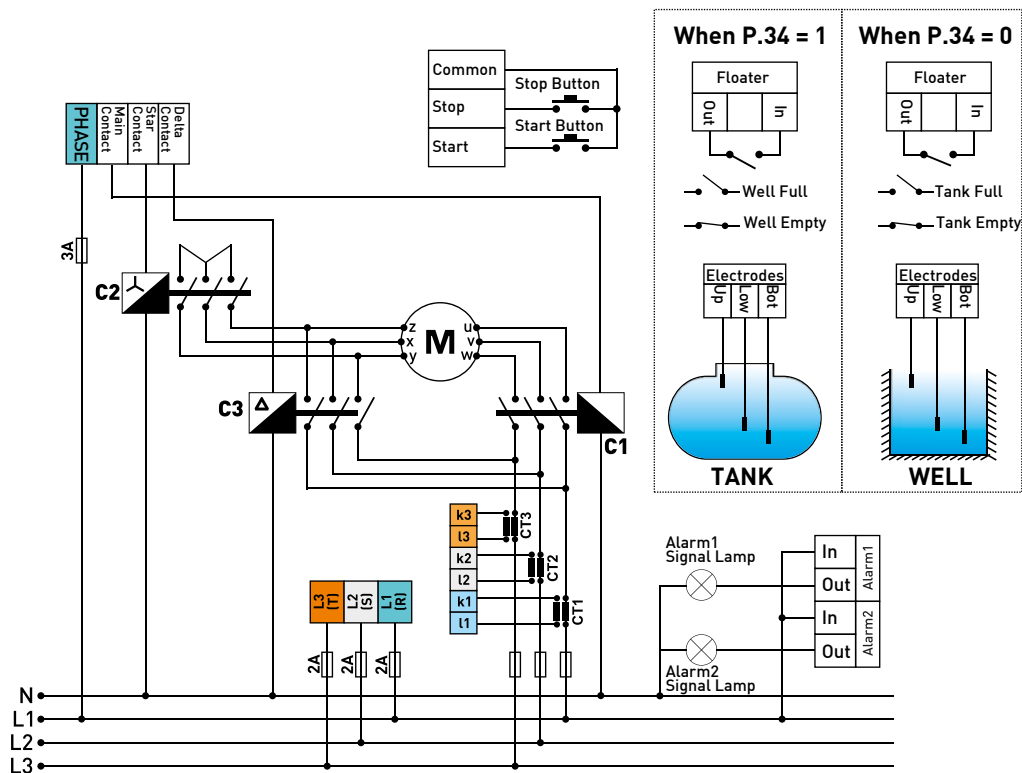
Operating Voltage (Un)	260V - 470VAC	
Operating Frequency	50/60Hz.	
Operating Power	<8VA	
Operating Temperature	-20°C to 55°C	
Low Voltage Set	210V - 370VAC	
High Voltage Set	390V - 470VAC	
Low Current Set	0A - 120A	0A - 300A
High Current Set	1A - 120A	2A - 300A
Sensitivity	<50KΩ	
Display	4 x 20 LCD and 2 x LEDs	
Connection Type	Plug-in terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	1.5mm ²	
Weight	<850gr.	
Panel Hole Sizes	140mm x 140mm	
Mounting	Front panel mounting	
Protection Class	IP41(Front panel), IP20(Body)	
Operating Altitude	<2000 meters	
Case	A1	



TDK-XX three-phase relays for controlling motor pumps are designed for protecting motor pumps and water motors against failure likely to arise from dry operation and also current and voltage fluctuations. When you energize the device by connecting it according to the connection diagram, you should make required adjustment in terms of voltage and current values. Default settings may not be suitable for the pump to be used.

Note : Do not use electrode liquid level relays with flammable and explosive liquids.

- While the pump is draining water within the well, do not directly contact (using, drinking or swimming) with water. Otherwise, if the material isolating water from energy is damaged, serious injuries or even death may occur.
- High and low voltage can be adjusted,
- High and low current can be adjusted,
- Demurrage (starting) Multiplier and time can be adjusted,
- Current auto reset time and current auto reset number can be adjusted,
- Current error waiting time can be adjusted,
- Motor maintenance time can be adjusted,
- It can be operated in flasher mode,
- High and low cosine can be adjusted,
- Liquid conductivity level can be adjusted, It can be used with star-delta contactor terminals, It can be operated without electrode.
- It prolongs the life of electrodes,
- Upper electrode waiting time can be adjusted,
- It controls wells via electrode and controls tanks via float.





THREE-PHASE SUBMERSIBLE PUMP CONTROL RELAY



TDK-30

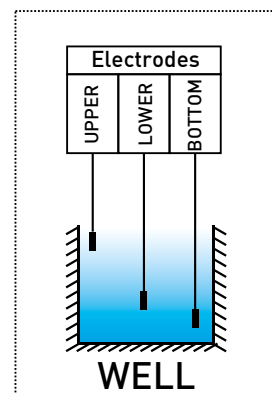
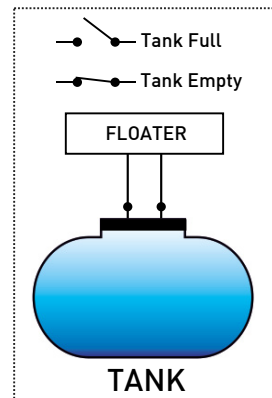
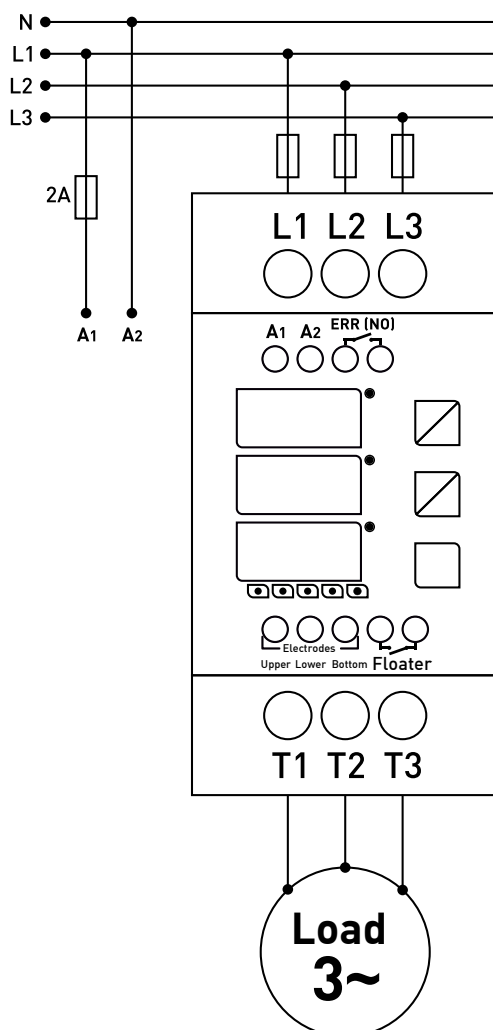
Operating Voltage (Un)	100V - 240VAC
Operating Frequency	50/60Hz.
Operating Power	<10VA
Operating Temperature	-20°C to 55°C
Low Voltage Set	200V - 360VAC
High Voltage Set	400V - 460VAC
Low Current Set	0A - 30A
High Current Set	1A - 30A
Liquid Sensitivity	<50KΩ
Display	3 x 3 digits display, 8 LEDs
Connection Type	Terminal connection
Contact	30A/250VAC Resistive Load
Error Contact	3A/250VAC Resistive Load
Cable Diameter	2.5mm ² , 6mm ² (Current Input and Output)
Weight	<380gr.
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	D1



TDK-30 three-phase relays for controlling motor pumps without using external current transformer up to 30A with internal current transformer are designed for protecting motor pumps and water motors against failure likely to arise from dry operation and also current and voltage fluctuations. When you energize the device by connecting it according to the connection diagram, you should make required adjustment in terms of voltage and current values. Default settings may not be suitable for the pump to be used.

Note : Do not use electrode liquid level relays with flammable and explosive liquids.

- While the pump is draining water within the well, do not directly contact (using, drinkin or swimming) with water. Otherwise, if the material isolating water from energy is damaged, serious injuries or even death may occur.
- High and low voltage can be adjusted,
- High and low current can be adjusted,
- Demurrage (starting) Multiplier and time can be adjusted,
- Current auto reset time and current auto reset number can be adjusted,
- Current error waiting time can be adjusted,
- Motor maintenance time can be adjusted,
- It can be operated in flasher mode,
- High and low cosine can be adjusted,
- Liquid conductivity level can be adjusted, It can be used with star-delta contactor terminals, It can be operated without electrode.
- It prolongs the life of electrodes,
- Upper electrode waiting time can be adjusted,
- It controls wells via electrode and controls tanks via float.



User Guide





MONOPHASE SUBMERSIBLE PUMP CONTROL RELAY (60A)



MDK-02

Operating Voltage (Un)	140V - 280VAC
Operating Frequency	50/60Hz.
Operating Power	<6VA
Operating Temperature	-20°C to 55°C
Low Voltage Set	150V - 210VAC
High Voltage Set	230V - 270VAC
Low Current Set	0A - 60A
High Current Set	1A - 60A
Liquid Sensitivity	<50KΩ
Display	2 x 3 digits display, 7 LEDs
Connection Type	Plug-in terminal connection
Contact	5A/250VAC Resistive Load
Cable Diameter	1.5mm ²
Weight	<325gr.
Panel Hole Sizes	91mm x 91mm
Mounting	Front panel mounting
Protection Class	IP41(Front panel), IP20(Body)
Operating Altitude	<2000 meters
Case	A3



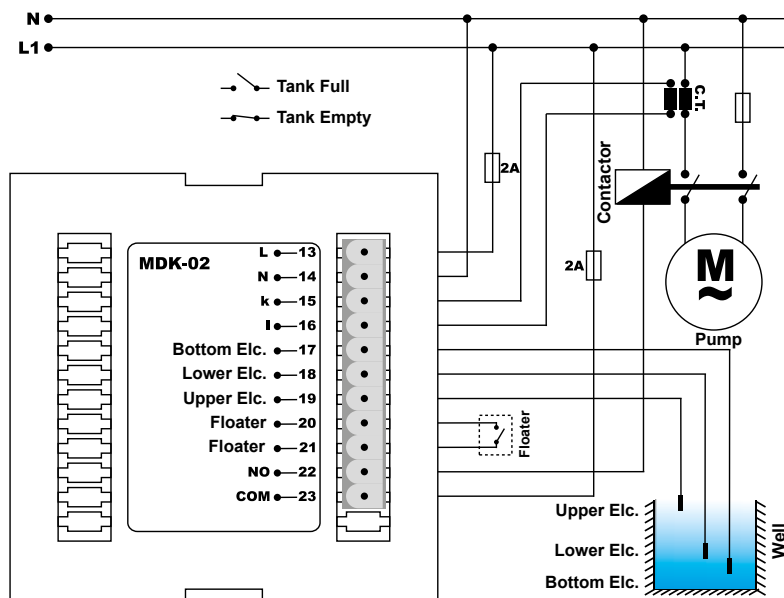
MDK-02 mono-phase relays for controlling motor pumps are designed for protecting motor pumps and water motors against failure likely to arise from dry operation and also current and voltage fluctuations. When you energize the device by connecting it according to the connection diagram, you should make required adjustment in terms of voltage and current values. Default settings may not be suitable for the pump to be used.

Thanks to stop-start memory feature, when the device is restarted after it is de-energized, last values can be restored. For this feature, the value on the start-stop memory menu should be 1.

While the pump is draining water within the well, do not directly contact (using, drinking or swimming) with water. Otherwise, if the material isolating water from energy is damaged, serious injuries or even death may occur.

Note: Do not use electrode liquid level relays with flammable and explosive liquids.

- High and low voltage can be adjusted,
- High and low current can be adjusted,
- Demurrage (starting) Multiplier and time can be adjusted,
- Current auto reset time and current auto reset number can be adjusted,
- Current error waiting time can be adjusted,
- It prolongs the life of electrodes,
- Upper electrode waiting time can be adjusted.
- It controls wells via electrode and controls tanks via float.





MONOPHASE SUBMERSIBLE PUMP CONTROL RELAY (30A)



MDK-03

Operating Voltage (Un)	150V - 270VAC
Operating Frequency	50/60Hz.
Operating Power	<6VA
Operating Temperature	-20°C to 55°C
Low Voltage Set	150V - 210VAC
High Voltage Set	230V - 270VAC
Low Current Set	0A - 30A
High Current Set	1A - 30A
Liquid Sensitivity	<50K Ω
Display	2 x 3 digits display, 7 LEDs
Connection Type	Terminal connection
Contact	30A/250VAC Resistive Load
Cable Diameter	2.5mm ² , 10mm ² (phase input and output)
Weight	<250gr.
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	D1



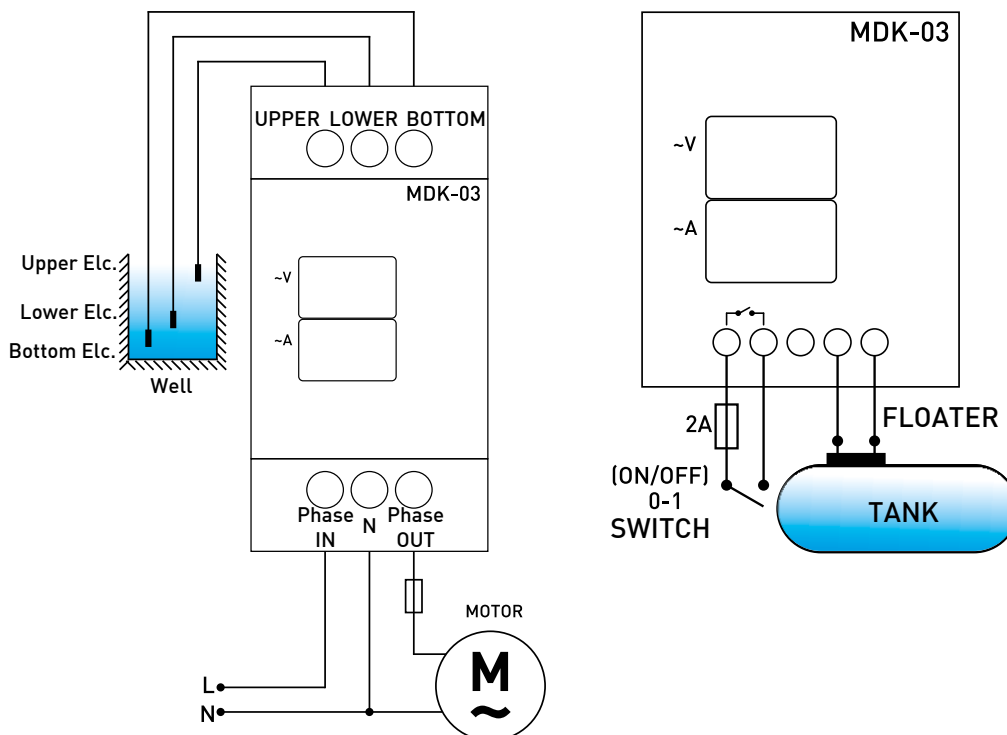
MDK-03 mono-phase relays for controlling motor pumps without using external current transformer up to 30A with internal current transformer are designed for protecting motor pumps and water motors against failure likely to arise from dry operation and also current and voltage fluctuations. When you energize the device by connecting it according to the connection diagram, you should make required adjustment in terms of voltage and current values. Default settings may not be suitable for the pump to be used.

Thanks to stop-start memory feature, when the device is restarted after it is de-energized, last values can be restored. For this feature, the value on the start-stop memory menu should be 1.

-While the pump is draining water within the well, do not directly contact (using, drinking or swimming) with water. Otherwise, if the material isolating water from energy is damaged, serious injuries or even death may occur.

-Do not use electrode liquid level relays with flammable and explosive liquids.

- High and low voltage can be adjusted,
- High and low current can be adjusted,
- Demurrage (starting) Multiplier and time can be adjusted,
- Current auto reset time and current auto reset number can be adjusted,
- Current error waiting time can be adjusted,
- It prolongs the life of electrodes,
- Upper electrode waiting time can be adjusted.
- It controls wells via electrode and controls tanks via float.





SSR-05D



SSR-05



VSR-05

Operating Voltage (Un)	150V - 260VAC		
Operating Frequency	50/60Hz.		
Operating Power	<6VA		
Operating Temperature	-20°C to 55°C		
Upper Electrode Waiting Time	2 Sec. - 10 Min.	-	
Liquid Sensitivity	<100KΩ		
Display	4 LEDs	2 LEDs	
Connection Type	Terminal connection		
Contact	5A/250VAC Resistive Load		
Cable Diameter	2.5mm ²		1.5mm ²
Weight	<250gr.		
Mounting	In DIN rail mounting		DIN rail mounting
Protection Class	IP20		
Operating Altitude	<2000 meters		
Case	B4	B1	C2



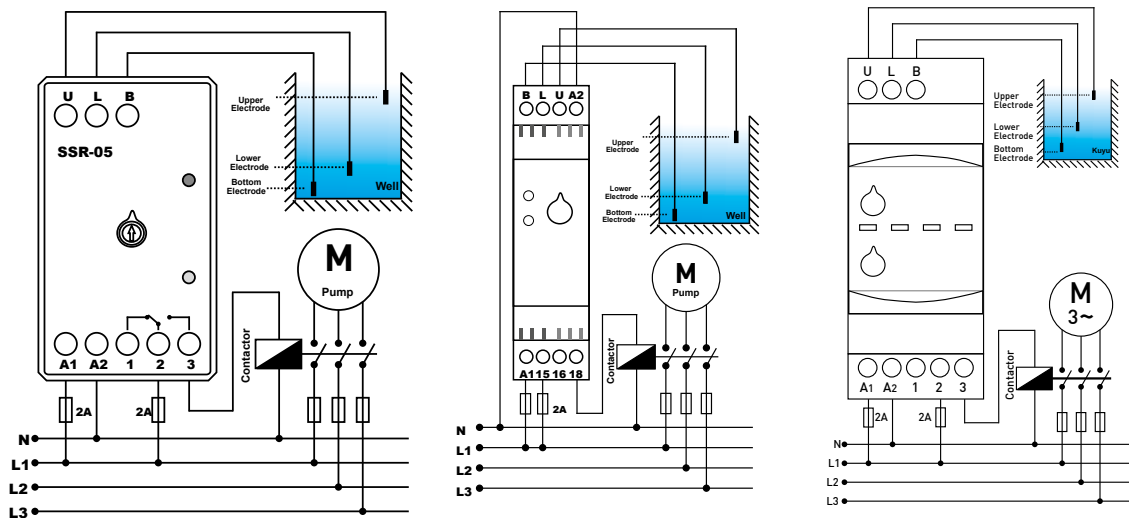
SSR-05 and VSR-05 liquid level relays are designed for controlling drainage of tanks and wells including conductive liquids. The adjusting knob on the device is used to adjust the liquid conductivity level ($k\Omega$) in order to enable the electrodes to detect each other when liquid contact with one electrode. Only if the liquid conductivity level is lower than the value set by the adjustment button, electrodes detect each other.

If liquid conductivity level is high, the liquid conducts electricity better and $k\Omega$ value is low. If liquid conductivity level is lower than this, the liquid conducts electricity less and $k\Omega$ value is high. Conductivity of drinking waters is generally low and high $k\Omega$ adjustment is required. Conductivity level of tap water and municipal water is higher and low $k\Omega$ adjustment is required.

SSR-05D liquid level relays are designed to control drainage of wells and tanks including conductive liquids and to prolong the life of electrodes. There are two adjusting knobs on the device. The adjusting knob with a symbol of " $k\Omega$ " is used to adjust the liquid conductivity level ($k\Omega$) in order to enable the electrodes to detect each other when liquid contact with one electrode. The other adjusting knob with a symbol of "dk." (minute) is used to adjust the electrode waiting time. Only if the liquid conductivity level is lower than the value set by the adjustment button, electrodes detect each other.

Upper electrode waiting time is used to adjust the time during which the upper electrode will stop operating when the liquid level exceeds it. By this way, the pump drain more water at once and it delivers higher performance. For two-electrode usages, form single electrode by shorting-out the upper and lower electrodes and use this electrode as the base electrode.

-Do not use electrode liquid level relays with flammable and explosive liquids.



	When the well is filling.			When the well is draining.		
	Low Level	Med. Level	High Level	High Level	Med. Level	Low Level
Relay LED						
Relay						
Liquid Level						
Un						



SSR-05D



SSR-05/VSR-05





LIQUID LEVEL RELAYS FOR STEAM BOILER IRON



SSR-09



SSR-19

Operating Voltage (Un)	170V - 260VAC	
Operating Frequency	50/60Hz.	
Operating Power	<4VA	
Operating Temperature	-20°C to 55°C	
Liquid Sensitivity	<50KΩ	
Tank Function	-	Yes
Display	3 LEDs	
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	2.5mm ²	
Weight	<150gr.	
Mounting	Inside of panel vertical or DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	B1	



SSR-09 liquid level relay is designed for controlling the steam boiler irons.

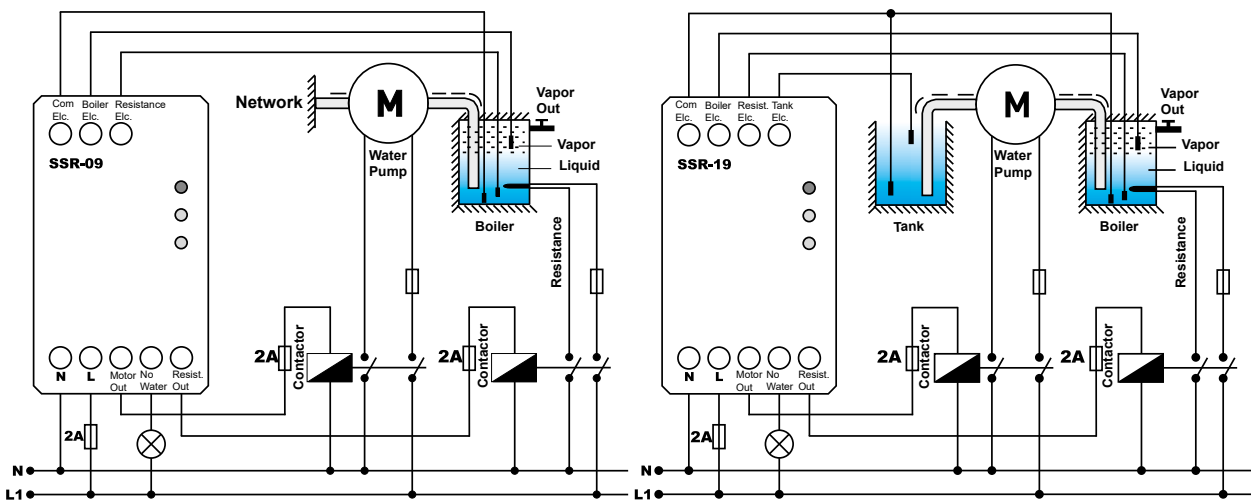
A common resistance and boiler electrode are connected to the steam boiler. After connecting the device according to the connection diagram, energize the device. The phase (R) on the supply input of the device and the motor output are shorted out, motor led lights up and the water pump starts to pump water to the tank. If the water within the tank contact with only the common electrode, phase (R) and “no water” output are shorted out. The system continues to fill water into the tank.

When the water contacts with the resistance electrode, phase (R) and the resistance output become short-circuit, the resistance led lights up and phase (R) and “no water” output become open-circuit. The resistance starts to heat water and produces steam. System continues to fill water into the tank and when water contacts with the electrode of the tank, phase (R) and motor output become open-circuit and water pump stops pumping water and motor led turns off. As steam is being used, the water level inside the tank decreases by time and the electrode of the tank does not contact with water. In this situation, the phase (R) and the motor output become short-circuit again, motor led lights up and the water pump continues to pump water. When the water level drops below the resistance electrode, phase (R) and the resistance output become open-circuit, the resistance led turns off and phase (R) and “no water” output become short-circuit. Suitable for using together with residual current relays.

SSR-19 liquid level relay is designed for controlling the steam boiler irons. A common electrode is connected to the tank. A common resistance and boiler electrode are connected to the steam boiler.

After connecting the device according to the connection diagram, energize the device. When the water contact with the electrode of the tank, the phase (R) on the supply input of the device and the motor output are shorted out, motor led lights up and the water pump starts to pump water to the tank. If the water within the tank contact with only the common electrode, phase (R) and “no water” output are shorted out. The system continues to fill water into the tank. When the water contact with the resistance electrode, phase (R) and the resistance output become short-circuit, the resistance led lights up and phase (R) and “no water” output become open-circuit. The resistance starts to heat water and produces steam. System continues to fill water into the tank and when water contacts with the electrode of the tank, phase (R) and motor output become open-circuit and water pump stops pumping water and motor led turns off. As steam is being used, the water level inside the tank decreases by time and the electrode of the tank does not contact with water. In this situation, the phase (R) and the motor output become short-circuit again, motor led lights up and the water pump continues to pump water. When the water level drops below the resistance electrode, phase (R) and the resistance output become open-circuit, the resistance led turns off and phase (R) and “no water” output become short-circuit. If the water inside the tank contacts with only the common electrode, phase (R) and motor output become open-circuit and motor led turns off. When the water contact with the electrode of the tank, the phase (R) and the motor output become short-out, motor led lights up and the water pump starts to pump water to the tank. Suitable for using together with residual current relays.

-Do not use electrode liquid level relays with flammable and explosive liquids.



User Guide



PHASE (MOTOR) FAILURE AND LIQUID LEVEL CONTROL RELAY



SMK-03F

Operating Voltage (Un)	160V – 260VAC
Operating Frequency	50Hz.
Operating Power	<4VA
Operaint Temperature	-20°C to 55°C
Low Voltage Set	165VAC (Fixed)
High Voltage Set	255VAC (Fixed)
Asymmetry Set	%20 (Fixed)
Liquid Sensivity	<50KΩ
Phase Sequence Feature	Var
Display	4 LEDs
Connection Type	Terminal connection
Contact	5A/250VAC Resistive Load
Cable Dimater	2.5mm ²
Weight	<225gr.
Mounting	Inside of panel vertical or DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	B1



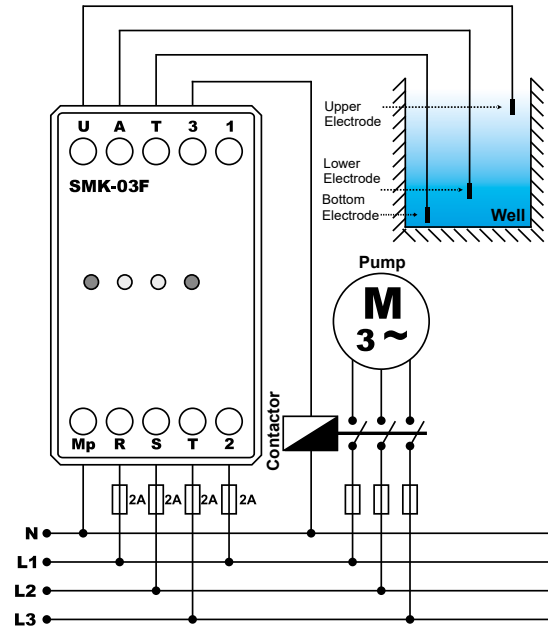
SMK-03F is designed to contgroll three phase motors which are used for emptying tanks having conductor liquid inside or deepholes. It has micro processor makes a longer life for electrode.

Connect (B) pole to the tank trunk of the tank. If the trunk of the tank is not conductor, connect electrode to(B) pole. When liquid in the tank raises to electrode (U) and phases are normal, contact out (NO) 3 pole and relay led will be switches on. When liquid level is under electrode (L) contact out is (NC) 1, relay led switches off and "no liquid"led switches on. If any phase is abnormal (phase disconnect, higher than 250V, lower than 165V or %19 higher than assymetry) phase error led switches on, relay releases and relay led switches off.

SMK-03F types have phase sequencing function. If phase sequence is wrong, relay releases and relay led switches off.

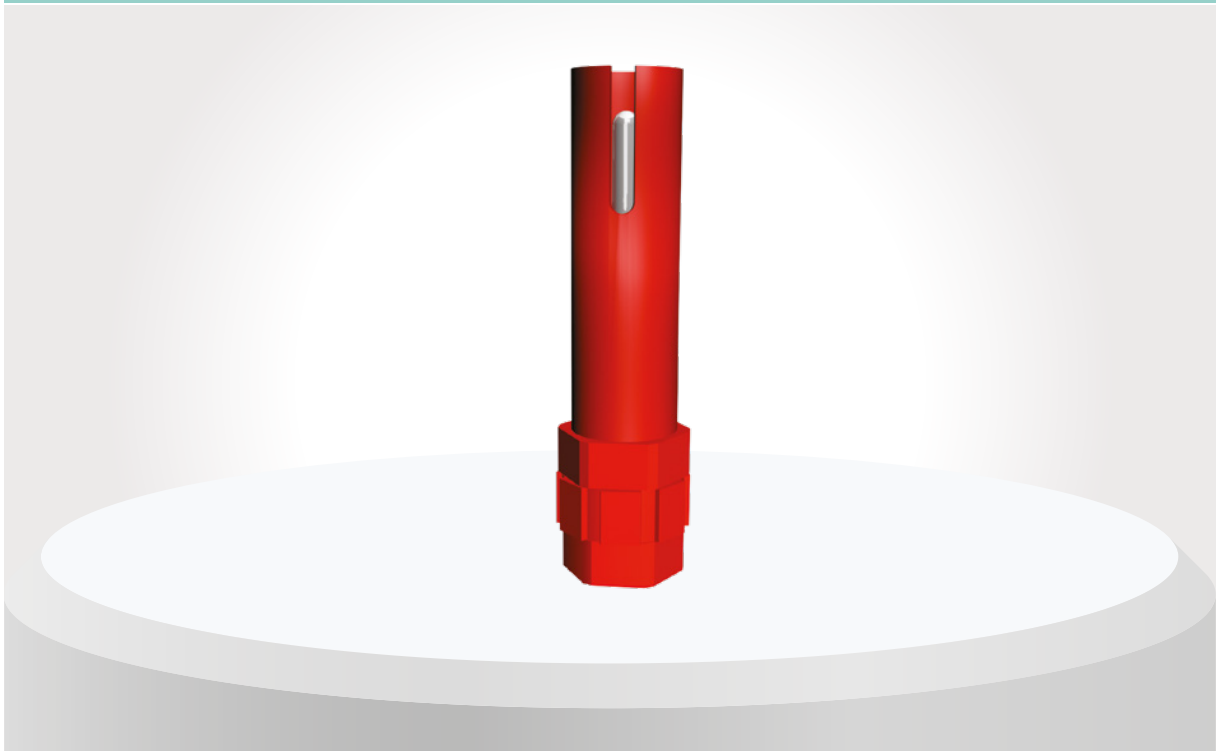
Note: For two electrode usage, make short circuit (U) and (L) and use with bottom electrode.

-Do not use electrode liquid level relays with flammable and explosive liquids.





LIQUID LEVEL ELECTRODE



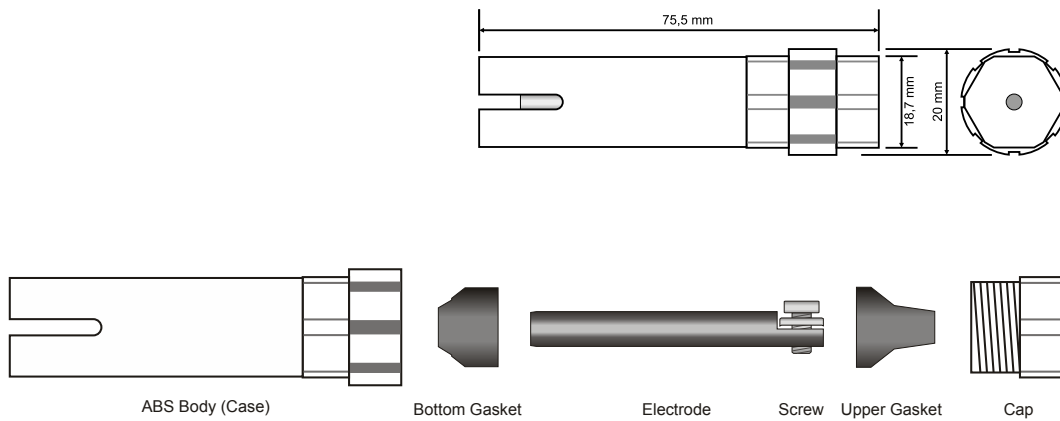
SSE-10

Application Area	Conductive Liquids
Mechanical Connection	Screw
Resistance Temperature	200°C
Electrode Material	Stainless steel
Body Material	ABS
Connection Type	Vertical
Protection Class	IP10
Operating Altitude	<2000 meters



SSE-10 Liquid level electrode based on the conductivity principle of liquid designed as single-electrode or multi-electrode is designed to be used in conjunction with working products.

Because of its simple structure and no electronic parts it is preferred in simple applications at high temperatures. Especially in steam boilers, high temperature conductive liquids provide economical solution. SSE-10 liquid level electrode can be used in our liquid level control products.





DIGITAL PHASE (MOTOR) PROTECTION RELAYS



FDK-01F



DFK-05F

Operating Voltage (Un)	3x380VAC	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Low Voltage	155VAC (Fixed)	180VAC (Fixed)
High Voltage	440VAC (Fixed)	460VAC (Fixed)
Asymmetry	%20 (Fixed)	%5 - 25%
Delay Time	2 Sec. (Fixed)	0.1 Sec. - 10 Sec.
Phase Sequence Feature	Yes	
Display	3 x 3 digits display	
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	2.5mm ²	
Weight	<220gr.	
Mounting	Inside of panel vertical or DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	B2	



Digital phase protection relays are designed to protect the devices having precise operating voltage values against errors likely to arise from mains voltage.

FKD-01/01F and DFK-05F have phase sequence order. If the phase sequence is correct, the relay led lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit. If the phase sequence is wrong, the phase sequence led lights up, the relay led turns off and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit.

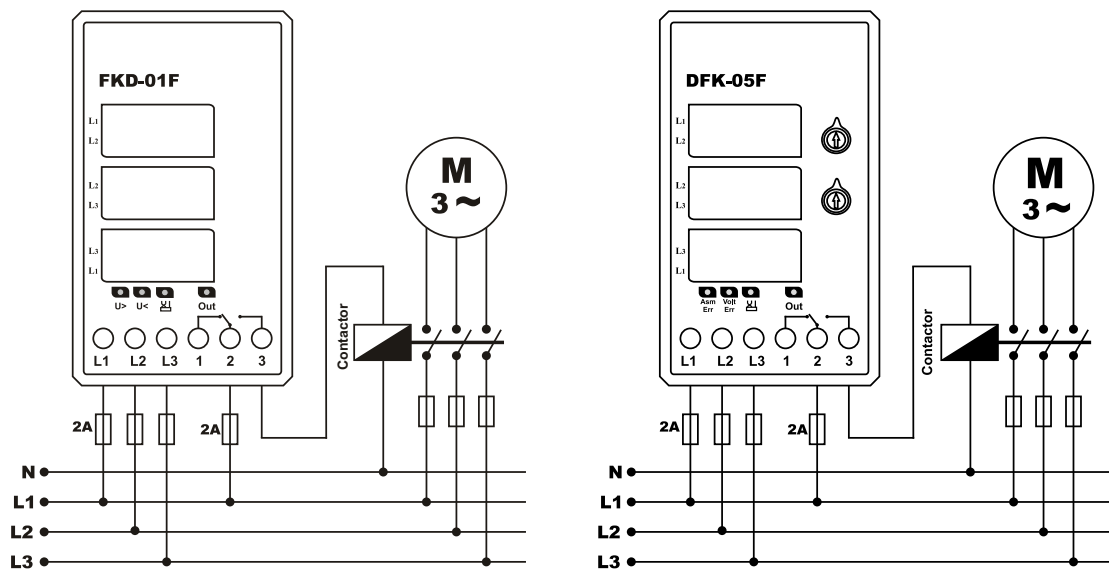
DFK-05F

There is asymmetry set (Asm%) button and error latency time (t) set button on the device.

In formula; asymmetry set = (maximum difference between the voltage values / 380) x 100.

By putting the value of maximum voltage difference suitable for your load in its place on the formula, you can calculate the asymmetry set value.

- True RMS measurement
- 50/60 Hz measurement
- 3 x 9mm 3 digit Display
- It shows three phases at the same time





PHASE (MOTOR) PROTECTION RELAYS



FK-01



FK-02

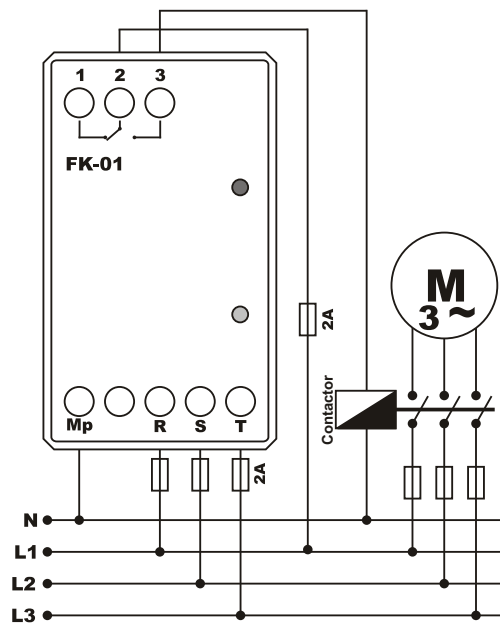
Operating Voltage (Un)	3x380VAC + Neutral	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Asymmetry	~%30	~%40
Display	2 LEDs	
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	2.5mm ²	
Weight	<110gr.	
Mounting	Inside of panel vertical or DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	B1	



Phase protection relays are designed to protect the devices having precise operating voltage values against errors likely to arise from mains voltage and motor temperature. FK-01 has 30%, FK-02 has 40% constant asymmetry. Asymmetry means the difference between the voltage values.

When the device is energized for the first time, contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. If the voltage values are within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) are open-circuit and contactor terminals no. 2(COM) and 3(NO) are short-circuit.

When the difference between the voltage values exceeds 30%(for FK-01) 40%(for FK-02), the relay led turns off in about 1 seconds and contactor terminals no. 1(NC) and 2(COM) become shortcircuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the difference between voltage values decreases by 5V, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.



User Guide





PHASE (MOTOR) PROTECTION RELAYS



FKV-11



FKV-12

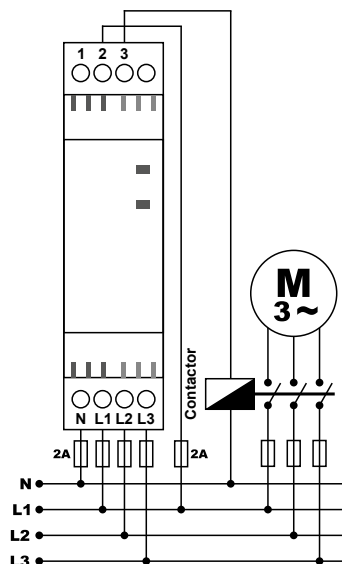
Operating Voltage (Un)	3x380VAC + Neutral	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Asymmetry	~%30	~%40
Display	2 LEDs	
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	2.5mm ²	
Weight	<110gr.	
Mounting	Inside of panel vertical or DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	C2	



Phase protection relays are designed to protect the devices having precise operating voltage values and the feature of phase sequence against errors likely to arise from mains voltage and motor temperature. FKV-11 has 30%, FKV-12 has 40% constant asymmetry. Asymmetry means the difference between the voltage values.

When the device is energized for the first time, contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. If the voltage values are within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) are open-circuit and contactor terminals no. 2(COM) and 3(NO) are short-circuit.

When the difference between the voltage values exceeds 30%(for FKV-11) 40%(for FKV-12), the relay led turns off in about 1 seconds and contactor terminals no. 1(NC) and 2(COM) become shortcircuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the difference between voltage values decreases by 5V, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.





PHASE (MOTOR) PROTECTION RELAYS



FK-04



FS-R

Operating Voltage (Un)	3x380VAC	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Asymmetry	%30(Fixed)	-
Display	3 LEDs	
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	2.5mm ²	
Weight	<110gr.	
Mounting	Inside of panel vertical or DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	B1	

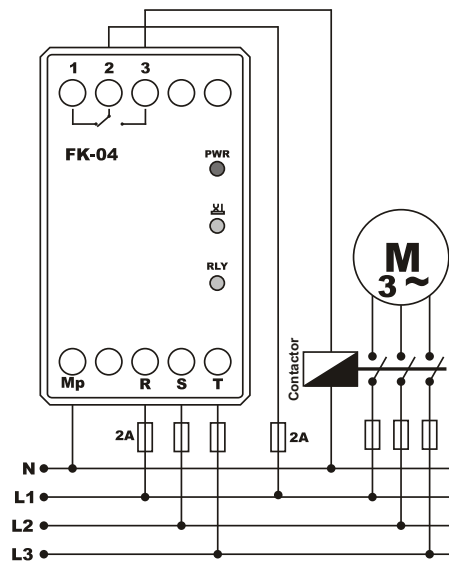


Phase protection relays are designed to protect the devices having precise operating voltage values and the feature of phase sequence against errors likely to arise from mains voltage and motor temperature. The device has 30% constant asymmetry. Asymmetry means the difference between the voltage values.

When the device is energized for the first time, contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. If the voltage values are within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) are open-circuit and contactor terminals no. 2(COM) and 3(NO) are short-circuit.

When the difference between the voltage values exceeds 30%, the relay led turns off in about 1 seconds and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the difference between voltage values decreases by 5V, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

If the phase sequence is correct, the relay led lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit. If the phase sequence is wrong, the phase sequence led lights up, the relay led turns off and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit.





PHASE SEQUENCE PHASE (MOTOR) PROTECTION RELAYS



FK-14



FK-14P

Operating Voltage (Un)	3x380VAC + Neutral	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Asymmetry	~%30(Fixed)	
PTC Feature	-	Yes
Display	2 LEDs	
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	2.5mm ²	
Weight	<110gr.	
Mounting	DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	B4	



Phase protection relays are designed to protect the devices having precise operating voltage values and the feature of phase sequence against errors likely to arise from mains voltage and motor temperature. FK-14 and FK-14P have 30% constant asymmetry.

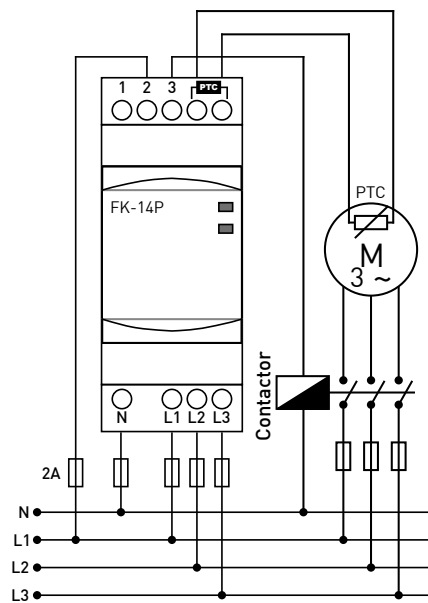
Asymmetry means the difference between the voltage values. Especially on threephase loads such as motors, the high-voltage coil draws high current and the low voltage coil draws low voltage. Therefore, they operate imbalancedly and the coils get damaged by time.

When the device is energized for the first time, contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. If the voltage values are within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) are open-circuit and contactor terminals no. 2(COM) and 3(NO) are short-circuit.

When the difference between the voltage values exceeds 30%, the relay led turns off in about 1 seconds and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the difference between voltage values decreases by 5V, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

If the phase sequence is correct, the relay led lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit. If the phase sequence is wrong, the phase sequence led lights up, the relay led turns off and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit.

If motor temperature value is within the range of normal values ($<1400\Omega$), the relay led lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit. If motor temperature value exceeds the normal value ($<1600\Omega$), ptc error led lights up; contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. If you do not use PTC, short out the ptc terminals.



User Guide





PHASE SEQUENCE PHASE (MOTOR) PROTECTION RELAYS



FKV-14



FKV-14P

Operating Voltage (Un)	3x380VAC + Neutral	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Asymmetry	~%30(Fixed)	
PTC Feature	-	Yes
Display	2 LEDs	
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	1.5mm ²	
Weight	<110gr.	
Mounting	DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	C2	



Phase protection relays are designed to protect the devices having precise operating voltage values and the feature of phase sequence against errors likely to arise from mains voltage and motor temperature. FKV-14 and FKV-14P have 30% constant asymmetry.

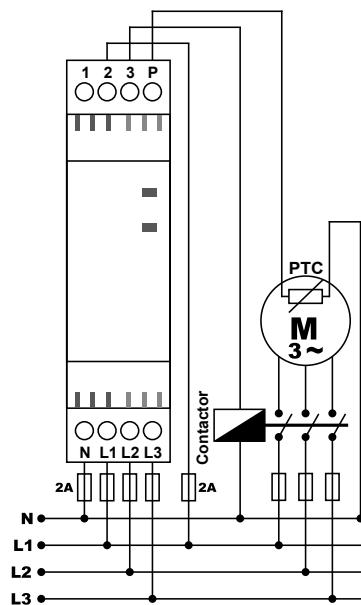
Asymmetry means the difference between the voltage values. Especially on threephase loads such as motors, the high-voltage coil draws high current and the low-voltage coil draws low voltage. Therefore, they operate imbalancedly and the coils get damaged by time.

When the device is energized for the first time, contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. If the voltage values are within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) are open-circuit and contactor terminals no. 2(COM) and 3(NO) are short-circuit.

When the difference between the voltage values exceeds 30%, the relay led turns off in about 1 seconds and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the difference between voltage values decreases by 5V, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

If the phase sequence is correct, the relay led lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit. If the phase sequence is wrong, the phase sequence led lights up, the relay led turns off and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit.

If motor temperature value is within the range of normal values ($<1400\Omega$), the relay led lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit. If motor temperature value exceeds the normal value ($<1600\Omega$), ptc error led lights up; contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. If you do not use PTC, short out the ptc terminals.





PHASE SEQUENCE PROTECTION RELAY WITH FIXED ASYMMETRY



FKV-03



FKV-03N

Operating Voltage (Un)	3x380VAC + Neutral	3x380VAC
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Asymmetry	~%40(Fixed)	
Without Neutral	-	Yes
Display	2 LEDs	
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	1.5mm ²	
Weight	<110gr.	
Mounting	DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	C2	C1

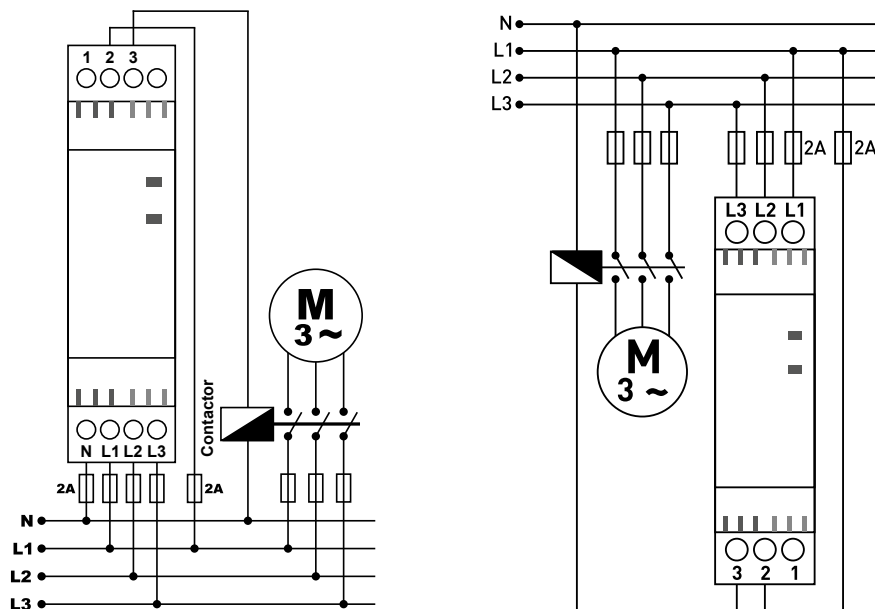


FKV-03 and FKV03-N Phase protection relays are designed to protect the devices having precise operating voltage values and the feature of phase sequence against errors likely to arise from mains voltage. The device has 40% constant asymmetry. Asymmetry means the difference between the voltage values.

When the device is energized for the first time, contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. If the voltage values are within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) are open-circuit and contactor terminals no. 2(COM) and 3(NO) are short-circuit.

When the difference between the voltage values exceeds 30%, the relay led turns off in about 1 seconds and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the difference between voltage values decreases by 5V, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

If the phase sequence is correct, the relay led lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit. If the phase sequence is wrong, the phase sequence led lights up, the relay led turns off and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit.



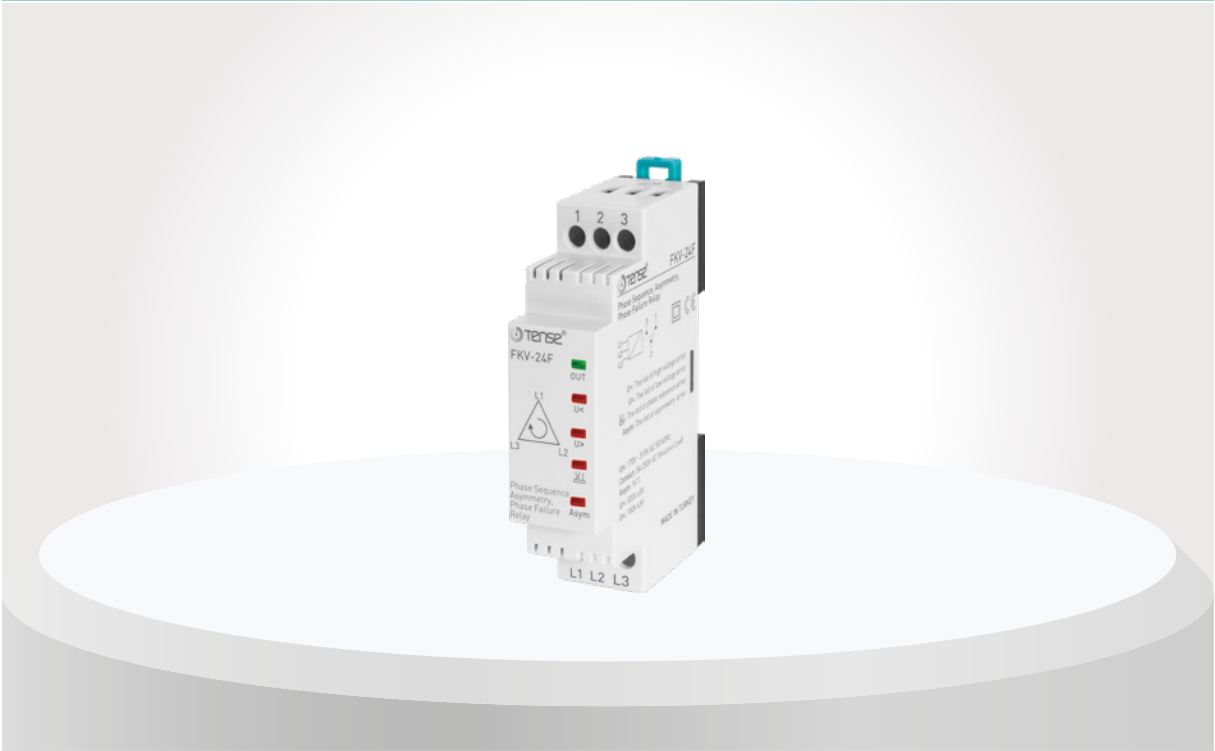
FKV-03



FKV-03N



PHASE (MOTOR) PROTECTION RELAY WITH FIXED ASYMMETRY



FKV-24F

Operating Voltage (Un)	3x380VAC
Operating Frequency	50/60Hz.
Operating Power	<4VA
Operating Temperature	-20°C to 55°C
Low Voltage	180VAC (Fixed)
High Voltage	500VAC (Fixed)
Asymmetry	~%11 (Fixed)
Without Neutral	Yes
Display	5 LEDs
Connection Type	Terminal connection
Contact	5A/250VAC Resistive Load
Cable Diameter	2.5mm ²
Weight	<110gr.
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	C1



Phase protection relays are designed to protect the devices having precise operating voltage values and the feature of phase sequence against errors likely to arise from mains voltage and motor temperature. FKV-24F has 30% constant asymmetry. It can work between 180VAC-500VAC voltage values.

Asymmetry means the difference between the voltage values. Especially on threephase loads such as motors, the high-voltage coil draws high current and the low-voltage coil draws low voltage. Therefore, they operate imbalancedly and the coils get damaged by time.

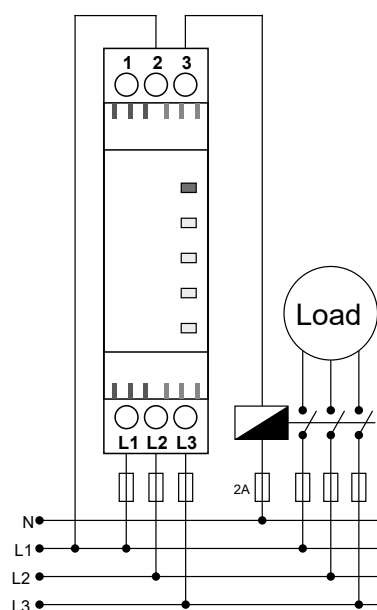
When the device is energized for the first time, contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. If the voltage values are within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) are open-circuit and contactor terminals no. 2(COM) and 3(NO) are short-circuit.

When the difference between the voltage values exceeds 11%, the relay led turns off in about 1 seconds and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the difference between voltage values decreases by 5V, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

If the phase sequence is correct, the relay led lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit. If the phase sequence is wrong, the phase sequence led lights up, the relay led turns off and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit.

If the voltage value exceeds the high voltage set value, the high voltage ($U>$) error led lights up and if the voltage value does not drop below the normal value in 2 seconds, high voltage error occurs on the device. In this position, the relay led turns off, contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the voltage value drops below the high voltage set value by 5V, the high voltage error led turns off and the device starts to count the error latency (t) time. When the error latency time is up, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

If the voltage values drop below the low voltage set value, the low voltage ($U<$) error led lights up and if the voltage values do not increase to the normal value within the error latency time, low voltage error occurs on the device. In this position, the relay led turns off, contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the voltage value exceeds the low voltage set value by 5V, the low voltage error led turns off and the device starts to count the error latency (t) time. When the error latency time is up, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.





PHASE (MOTOR) PROTECTION RELAY WITH ADJUSTABLE ASYMMETRY



FK-05



FK-05F

Operating Voltage (Un)	3x380VAC	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Low Voltage	150VAC (Fixed)	
High Voltage	460VAC (Fixed)	
Asymmetry	%5 - %25	
Delay	0.1sec. - 10sec.	
Phase Sequence Feature	-	Yes
Without Neutral	Yes	
Display	3 LEDs	4 LEDs
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	2.5mm ²	
Weight	<210gr.	
Mounting	DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	B1	



Phase protection relays with adjustable asymmetry are designed to protect the devices having precise operating voltage values against errors likely to arise from mains voltage. There is asymmetry set (Asm%) button and error latency time (t) set button on the device.

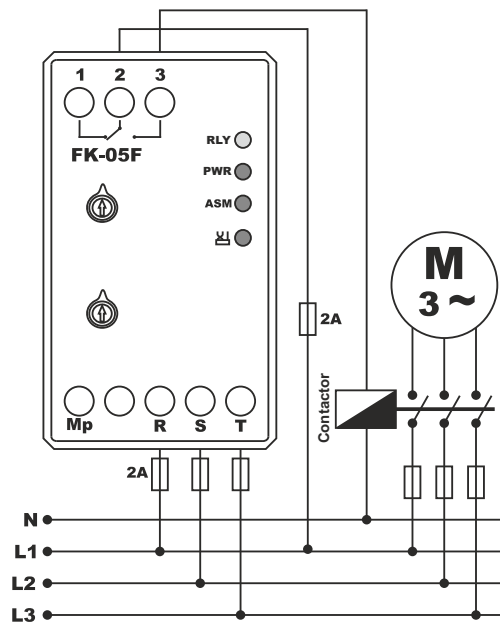
Asymmetry means the difference between the voltage values. Especially on three-phase loads such as motors, the high-voltage coil draws high current and the low-voltage coil draws low voltage. Therefore, they operate imbalancedly and the coils get damaged by time.

In formula; asymmetry set = (maximum difference between the voltage values / 380) x 100

By putting the value of maximum voltage difference suitable for your load in its place on the formula, you can calculate the asymmetry set value.

FK-05F

If the phase sequence is correct, the relay led lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become shortcircuit. If the phase sequence is wrong, the phase sequence led lights up, the relay led turns off and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit.





GKM-11

Operating Voltage (Un)	140V - 310VAC
Operating Frequency	50/60Hz.
Operating Power	<6VA
Operating Temperature	-20°C to 55°C
Low Voltage	150V - 210VAC + Off (Can be disabled)
High Voltage	230V - 300VAC + Off (Can be disabled)
Delay	0.5sec. - 20sec.
Reset	0.5sec. - 20sec.
Display	3 LEDs
Connection Type	Terminal connection
Contact	5A/250VAC Resistive Load
Cable Diameter	2.5mm ²
Weight	<100gr.
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	B4



Voltage control relays are designed to protect the devices having precise operating voltage values against errors likely to arise from mains voltage.

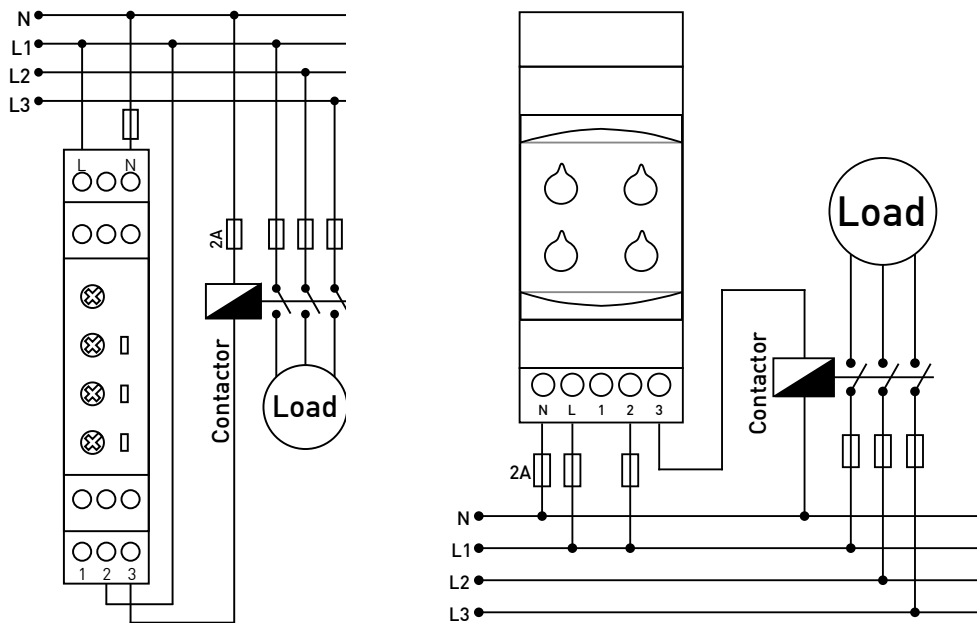
Please make the connection of the device according to the diagram. Adjust the high voltage ($U>$), low voltage ($U<$) and error latency time (t) values depending on the load you will use. When the device is energized, the power led lights up. Contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. If the voltage value is within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

High Voltage Protection – Enter Error : If the voltage value exceeds the high voltage set value, HV led lights up and the device waits up to latency time(DT). When the time is up, relay contacts switch on and relay led lights off.

High Voltage Protection – Exit Error: If the voltage value drops below the high voltage set value by 5V, the device waits up to set reset time(RT). When the time is up, HV led turns off, relay contacts switch off and relay led lights off.

Low Voltage Protection – Enter Error : If the voltage value drops below the low voltage set value, LV led lights up and the device waits up to latency time(DT), when the time is up, relay contacts switch on and relay led lights off.

Low Voltage Protection – Exit Error : If the voltage value exceeds up the high voltage set value by 5V, the device waits up to set reset time(RT). When the time is up, LV led turns off, relay contacts switch off and relay led lights on.





UNDER VOLTAGE PROTECTION RELAY



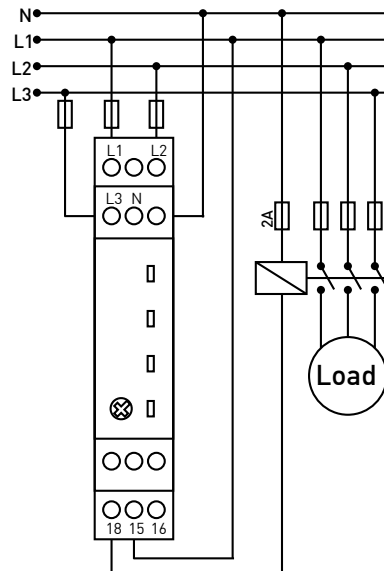
UVR-21

Operating Voltage (Un)	415V AC and neutral
Operating Frequency	50/60Hz.
Operating Power	<6VA
Operating Temperature	-20°C to 55°C
Low Voltage	~170VAC (Fixed)
Delay Time (t)	1 min. - 10 min.
Display	2 LEDs
Connection Type	Terminal connection
Contact	5A/250VAC Resistive Load
Cable Diameter	2.5mm ²
Weight	<110gr.
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	C3



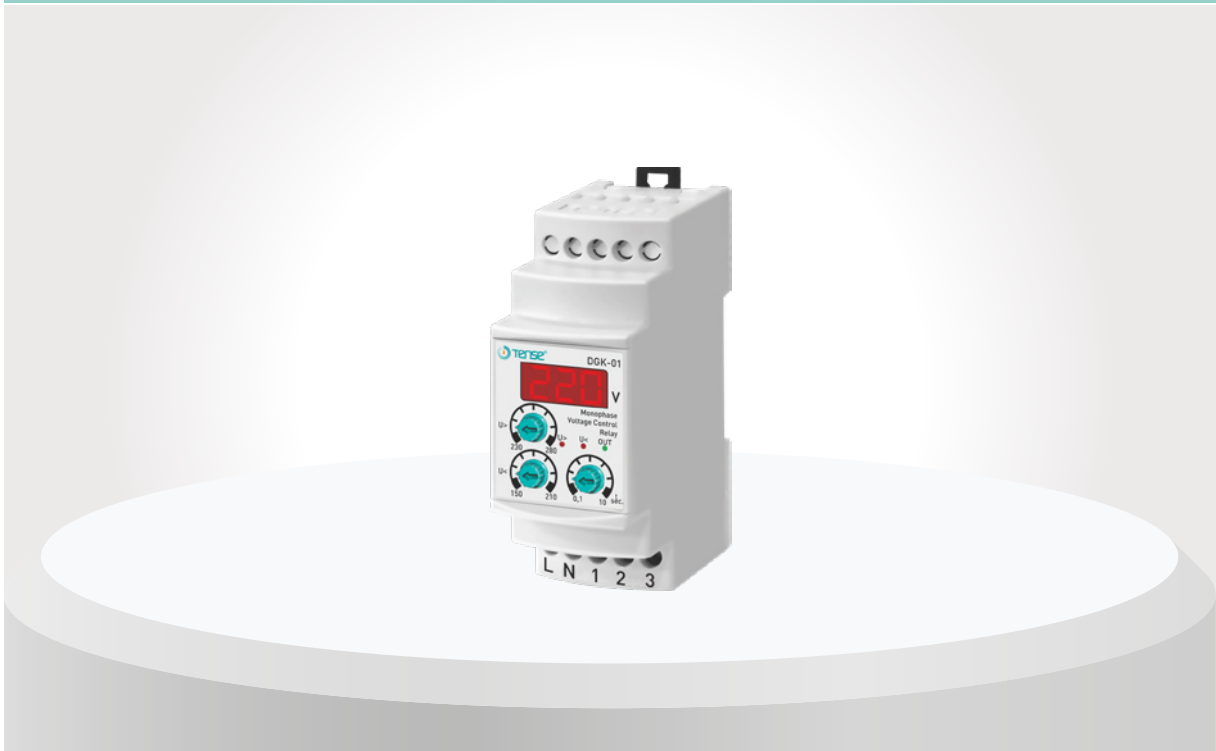
UVR-21 Under Voltage Relay is designed for preventing three phase devices to get harmed from long-term voltage fluctuations.

When the device is energized, phases count up to set delay time when they are in normal values, and after the time is up relay gets activated and out led lights up. In this position contact output terminals no. 15 and 18 become short-circuit. When any of phases drop below about 170V, relay gets de-activated and out led turns off. In this position contact output terminals no. 16 and 15 become short-circuit. When any of phases exceed above about 180V, it counts up to set time, relay gets activated and out led lights up.





DIGITAL MONO-PHASE VOLTAGE CONTROL RELAYS



DGK-01

Operating Voltage (Un)	140V - 290VAC
Operating Frequency	50/60Hz.
Operating Power	<6VA
Operating Temperature	-20°C to 55°C
Low Voltage	150V - 210VAC
High Voltage	230V - 280VAC
Delay	0.1sec. - 10sec.
Display	1 x 3 digits display and 3 LEDs
Connection Type	Terminal connection
Contact	5A/250VAC Resistive Load
Cable Diameter	2.5mm ²
Weight	<220gr.
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters
Case	B4

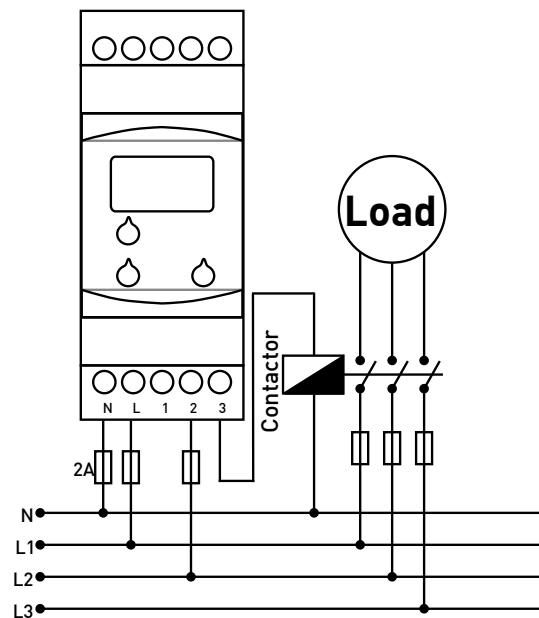


DGK-01 is designed to protect the devices having precise operating voltage values against errors likely to arise from mains voltage. There are high ($U>$) voltage set button, low ($U<$) voltage set button and error latency (t) time set button on the device.

Please make the connection of the device according to the diagram. Energize the device. When the device is energized for the first time, contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. Adjust the high voltage, low voltage and error latency time values depending on the load you will use. While adjusting the values via the set button, the value being adjusted is shown on the display. If the voltage value is within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

If the voltage value exceeds the high voltage set value, the high voltage ($U>$) error led lights up and if the voltage value does not drop below the normal value in 2 seconds, high voltage error occurs on the device. In this position, the relay led turns off, contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the voltage value drops below the high voltage set value by 5V, the high voltage error led turns off and the device starts to count the error latency (t) time. When the error latency time is up, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

If the voltage values drop below the low voltage set value, the low voltage ($U<$) error led lights up and if the voltage values do not increase to the normal value within the error latency time, low voltage error occurs on the device. In this position, the relay led turns off, contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the voltage value exceeds the low voltage set value by 5V, the low voltage error led turns off and the device starts to count the error latency (t) time. When the error latency time is up, the relay led lights up and contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.





DIGITAL OVER & UNDER VOLTAGE CONTROL RELAYS



DGK-03



DGK-04



DGK-04F



DGK-04PF

Operating Voltage (Un)	3x380VAC			
Operating Frequency	50/60Hz.			
Operating Power	<6VA			
Operating Temperature	-20°C to 55°C			
Low Voltage	95VAC (Fixed)	260V - 360VAC		
High Voltage	400V - 460VAC			
Delay	0.1sec. - 10sec.			
Phase Sequence Feature	-	Yes		
PTC Feature	-			Yes
Display	2 LEDs	3 LEDs	4 LEDs	5 LEDs
Connection Type	Terminal connection			
Contact	5A/250VAC Resistive Load			
Cable Diameter	2.5mm ²			
Weight	<210gr.			
Mounting	DIN rail mounting			
Protection Class	IP20			
Operating Altitude	<2000 meters			
Case	B2			



Digital voltage control relays are designed to protect the devices having precise operating voltage values against errors likely to arise from mains voltage. There are high (U $>$) voltage set button, low (U $<$) voltage set button and error latency (t) time set button on the device.

Please make the connection of the device according to the diagram. Energize the device. When the device is energized for the first time, contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. Adjust the high voltage, low voltage and error latency time values depending on the load you will use. While adjusting the values via the set button, the value being adjusted is shown on the display. If the voltage values are within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) are open-circuit and contactor terminals no. 2(COM) and 3(NO) are short-circuit.

If the voltage values exceed the high voltage set value, the high voltage (U $>$) error led lights up and if the voltage values do not drop below the normal value in 2 seconds, high voltage error occurs on the device. In this situation, the relay led turns off; the relevant display blinks depending on which phase to phase value causes error; contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the voltage value drops below the high voltage set value by 5V, the high voltage error led turns off and the device starts to count the error latency (t) time. When the error latency time is up, the relay led lights up, the display remains open and contactor terminals no. 1(NC) and 2(COM) are open-circuit and contactor terminals no. 2(COM) and 3(NO) are short-circuit.

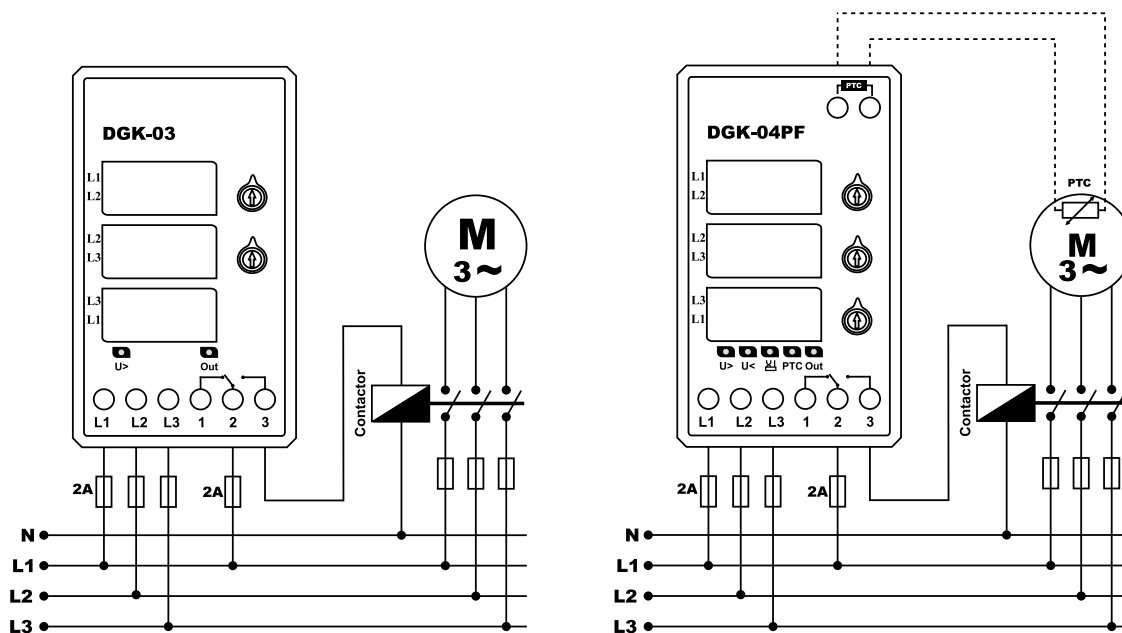
If the voltage values drop below the low voltage set value, the low voltage (U $<$) error led lights up and if the voltage values do not increase to the normal value within the error latency time, low voltage error occurs on the device. In this situation, the relay led turns off; the relevant display blinks depending on which phase to phase value causes error; contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit. When the voltage values exceed the low voltage set value by 5V, the low voltage error led turns off and the device starts to count the error latency (t) time. When the error latency time is up, the relay led lights up, the display remains open and contactor terminals no. 1(NC) and 2(COM) are open-circuit and contactor terminals no. 2(COM) and 3(NO) are short-circuit.

DGK-04F/04PF

If the phase sequence is correct, the relay led lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit. If the phase sequence is wrong, the phase sequence led lights up, the relay led turns off and contactor terminals no. 1(NC) and 2(COM) become short-circuit and contactor terminals no. 2(COM) and 3(NO) become open-circuit.

DGK-04PF

If motor temperature value is within the range of normal values (<1400 Ω), the relay led lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit. When the motor heats up and the temperature value exceed the normal value (>1600 Ω), the ptc error led lights up (this model has PTC feature). If you do not use PTC, short out the ptc terminals.



User Guide



THREE-PHASE VOLTAGE CONTROL RELAYS (MONO-PHASE DIAL)



GKM-02



GKM-02F

Operating Voltage (Un)	140V - 300VAC	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Low Voltage	140V - 210VAC + Off (Can be disabled)	
High Voltage	230V - 300VAC + Off (Can be disabled)	
Delay Time	0.1sec. - 20sec.	
Reset Time	0.1sec. - 20sec.	
Phase Sequence Feature	-	Yes
Display	4 LEDs	
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	2.5mm ²	
Weight	<210gr.	
Mounting	DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	B4	



Voltage control relays are designed to protect the devices having precise operating voltage values against errors likely to arise from mains voltage.

Please make the connection of the device according to the diagram. Adjust the high voltage ($U>$), low voltage ($U<$) and error latency time (t) values depending on the load you will use. When the device is energized, the power led lights up. Contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. If the voltage value is within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

High Voltage Protection : If one or more of the phases voltage values exceed the high voltage set value, HV led lights up and the device waits up to latency time(DT). When the time is up, relay contacts switch on and relay led lights off.

High Voltage Fuse Protection : If one or more of the phases voltage values exceed more than 1.5 times of the nominal operating voltage, HV led flashes and after 100 ms., relay contacts switch on and relay led lights off.

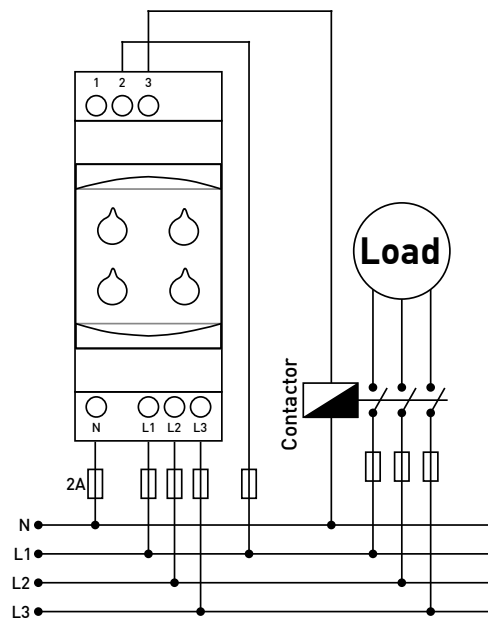
Low Voltage Protection : If one or more of the phase voltage values drop the low voltage set value, LV led lights up and the device waits up to latency time(DT). When the time is up, relay contacts switch on and relay led lights off.

Low Voltage Fuse Protection : If one or more of the phases voltage values drop more than 0.5 times of the nominal operating voltage, LV led flashes and after 100 ms., relay contacts switch on and relay led lights off.

Low Supply Voltage Protection – Enter Error State : for GKM-02, if voltage value of N-L1 drops more than 0.4 times of the nominal operating voltage, LV and HV leds light up and after 100 ms., relay contacts switch on and relay led lights off.

Phase Sequence Protection : If the phase sequence is reversed, Phase Sequence error led lights up and relay doesn't switch on. Lack of phase is phase sequence error too.

Neutral Lack Protection : If neutral can't move to the device, phase sequence error led flashes for GKM-02F, neutral lack led flashes for GKM-02.





THREE-PHASE VOLTAGE CONTROL RELAYS (THREE-PHASE DIAL)



GKT-03



GKT-03F

Operating Voltage (Un)	260V - 510VAC	
Operating Frequency	50/60Hz.	
Operating Power	<6VA	
Operating Temperature	-20°C to 55°C	
Low Voltage	260V - 370VAC + Off (Deactivated)	
High Voltage	400V - 510VAC + Off (Deactivated)	
Delay Time	0.1sec. - 20sec.	
Reset Time	0.1sec. - 20sec.	
Phase Sequence Feature	-	Yes
None Neutral	Yes	
Display	3 LEDs	4 LEDs
Connection Type	Terminal connection	
Contact	5A/250VAC Resistive Load	
Cable Diameter	2.5mm ²	
Weight	<210gr.	
Mounting	DIN rail mounting	
Protection Class	IP20	
Operating Altitude	<2000 meters	
Case	B4	



Voltage control relays are designed to protect the devices having precise operating voltage values against errors likely to arise from mains voltage.

Please make the connection of the device according to the diagram. Adjust the high voltage($U>$), low voltage ($U<$) and error latency time (t) values depending on the load you will use. When the device is energized, the power led lights up. Contactor terminals no. 1(NC) and 2(COM) are short-circuit and contactor terminals no. 2(COM) and 3(NO) are open-circuit. If the voltage value is within the range of normal values, the relay led (OUT) lights up; contactor terminals no. 1(NC) and 2(COM) become open-circuit and contactor terminals no. 2(COM) and 3(NO) become short-circuit.

High Voltage Protection : If one or more of the phases voltage values exceed the high voltage set value, HV led lights up and the device waits until the set delay time (DT). When the time is up, relay gets de-activated and relay led lights off.

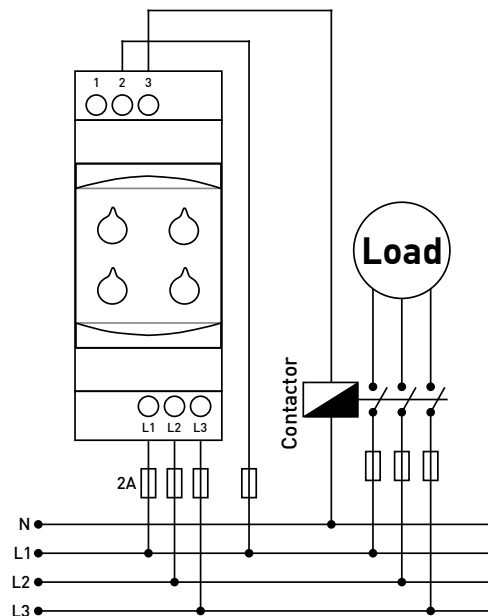
High Voltage Fuse Protection : If one or more of the phases voltage values exceed more than 1.5 times of the nominal operating voltage, HV led flashes and after 100 ms., relay gets de-activated and relay led lights off.

Low Voltage Protection : If one or more of the phase voltage values drop the low voltage set value, LV led lights up and the device waits until the set delay time (DT)). When the time is up, relay gets de-activated and relay led lights off.

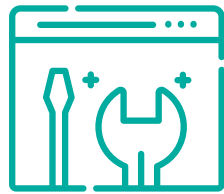
Low Voltage Fuse Protection : If one or more of the phases voltage values drop below than 0.5 times of the nominal operating voltage, LV led flashes and after 100 ms., relay gets de-activated and relay led lights off.

Low Supply Voltage Protection – To Enter the error State : for GKM-03/03F, if voltage value of L1-L2 drops to 0.4 times of the nominal operating voltage, LV and HV leds light up and after 100 ms., relay gets de-activated and relay led lights off.

Phase Sequence Protection : If the phase sequence is reversed, Phase Sequence error led lights up and relay doesn't switch on. Lack of phase is phase sequence error too.



User Guide







LOW VOLTAGE X5 CURRENT TRANSFORMER

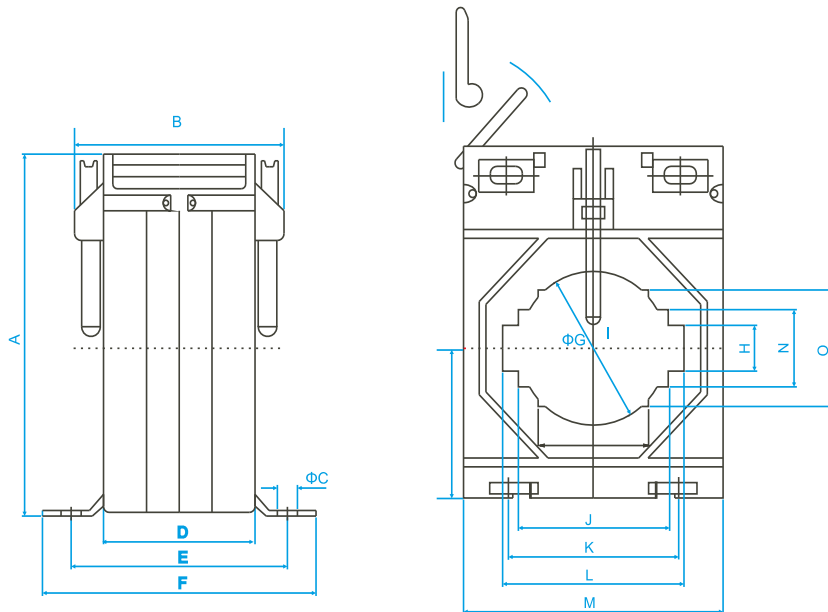


AT

Doğruluk (Class)	0.5
Operating Temperature	-25°C to 55°C
Voltage Test	720VAC
Operating Frequency	50 / 60 Hz
High Voltage Test	4KV 50Hz./min.
Standart	IEC44-1, BS3938 ve DIN 42600
Cable Diameter	2.5mm ²
Connection Type	Cable or bar inside the panel must be inside
Mounting	DIN rail mounting
Protection Class	IP20
Operating Altitude	<2000 meters



Product Code	Body	Input/Output Current	Output Power
AT-30	SF 62/20	30/5A	2.5
AT-40	SF 62/20	40/5A	2.5
AT-50	SF 62/20	50/5A	2.5
AT-60	SF 62/20	60/5A	2.5
AT-75	SF 62/20	75/5A	2.5
AT-100	SF 62/30	100/5A	5
AT-125	SF 62/30	125/5A	5
AT-150	SF 62/30	150/5A	5
AT-200	SF 62/40	200/5A	10
AT-250	SF 62/40	250/5A	10
AT-300	SF 62/40	300/5A	10
AT-400	SF 62/40	400/5A	10
AT-500	SF 62/40	500/5A	10
AT-600	SF 62/50	600/5A	10
AT-750	SF 74/50	750/5A	10
AT-800	SF 74/50	800/5A	10
AT-1000	SF 74/50	1000/5A	15
AT-1250	SF 86/60	1250/5A	15
AT-1500	SF 140/100	1500/5A	15
AT-2000	SF 140/100	2000/5A	20
AT-2500	SF 140/100	2500/5A	20
AT-3000	SF 140/100	3000/5A	30
AT-4000	SF 140/100	4000/5A	35
AT-5000	SF 140/100	5000/5A	45



Product Code	(mm)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
AT-30, AT-40, AT-50, AT-60, AT-75		78	36	6.6	36	55	71	30.1	30.1	11	23	44	21	62	21	26
AT-100, AT-125, AT-150		78	47	6.6	35	55	71	31	31	16	31	44	31	62	21	26
AT-200, AT-250, AT-300, AT-400, AT-500		78	47	6.6	35	55	71	33	33	11	31	47	41	74	21	31
AT-750, AT-800, AT-1000		98	61	6.6	45	67	81	51	51	21	51	68	51	86	31	44
AT-1250		110	56	6.6	40	62	76	65	65	31	61	86	61	104	31	56

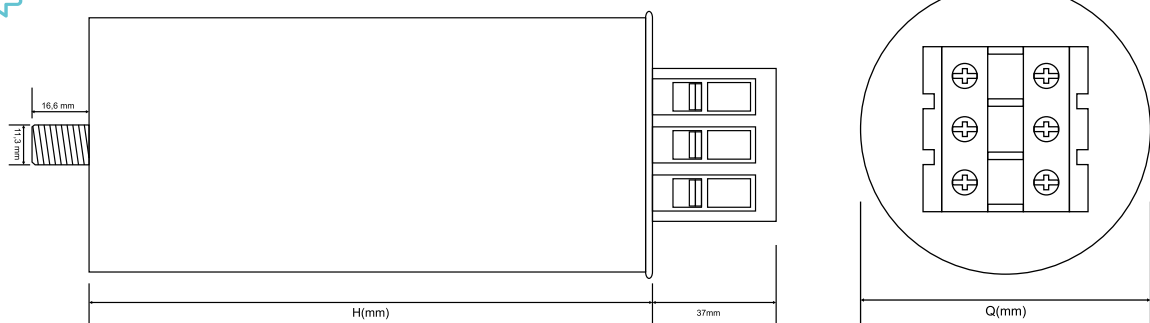




LOW VOLTAGE COMPENSATION CAPACITORS



Operating Voltage (Un)	230VAC (Monophase), 400VAC (Three-phase),
Maximum Operating Voltage	Un x 1.1
Maximum Operating Current	In x 1.3
Operating Frequency	50Hz. / 60Hz.
Operating Temperature	-40°C to 55°C
Operating Humidity	≤95%
Capacity Tolerance	(-5%) or (+10%)
Terminal Test Voltage	Un x 2.15 5sec.
Insulation Voltage	3000VAC 2sec.
PCB	No
Lifetime	180.000 hours
Standart	IEC 60831-1, IEC 60831-2
Connection Type	Terminal connection
Protection Class	IP20
Operating Altitude	<4000 meters





230 VOLT AC	50 Hz (230VAC)		60 Hz (230VAC)		Capacity (µf)	Dimensions (ØmmxHmm)
	Capacitive Power (kVAr)	Current (A)	Capacitive Power (kVAr)	Current (A)		
0.25 kVAr	0.25	1	0.4	0.75	15.1	40 x 95
0.5 kVAr	0.5	1.1	0.75	1	35	50 x 95
1 kVAr	1	1.3	1.5	1.5	50.8	63 x 125
1.5 kVAr	1.5	1.8	1.9	2.5	90.3	63 x 125
2.5 kVAr	2.5	3.3	3	4	127.4	75 x 160
5 kVAr	5	20	6	24	254.8	76 x 175
7.5 kVAr	7.5	30	9	36	382.2	76 x 240
10 kVAr	10	40	12	48	509.6	86 x 240

400 VOLT AC	50 Hz (400VAC)		60 Hz (400VAC)		Capacity (µf)	Dimensions (ØmmxHmm)
	Capacitive Power (kVAr)	Current (A)	Capacitive Power (kVAr)	Current (A)		
0.5 kVAr	0.5	1.3	0.75	1.8	3x12,1	40 x 145
1 kVAr	1	1.6	1.3	2.4	3x15,1	40 x 145
1.5 kVAr	1.5	2.8	1.8	3.9	3x16,6	40 x 145
2,5 kVAr	2.5	3.6	3	4.3	3x33,2	50 x 145
5 kVAr	5	7.2	6	8.6	3x49,7	75 x 160
7.5 kVAr	7.5	10.8	9	13	3x66,3	75 x 160
10 kVAr	10	14.4	12	17.3	3x79,6	75 x 203
12.5 kVAr	12.5	17.3	14.4	20.8	3x99,5	75 x 203
15 kVAr	15	21.7	18	26	3x132,6	75 x 238
20 kVAr	20	28.9	24	34.7	3x165,8	90 x 278
25 kVAr	25	32	30	43.3	3x198,9	100 x 278
30 kVAr	30	36.1	36	52	3x232,2	100 x 278
40 kVAr	40	57.7	42	60.6	3x256,6	135 x 285
50 kVAr	50	62.5	48	69.3	3x274	135 x 345





Production Standards	EN 61558-1, EN 61558 2-20, EN 60289 and EN60076-6 with CE CERTIFICATE
Nominal Forces	Monophase 0,10 - 10 kVAR or three-phase 0,5 - 100 kVAR production.
Nominal Voltage	230 VAC 1000 VAC
Nominal Frequency	50 Hz (60 Hz Optional)
Reactor Factor	$\rho = \% 100$
Inductivity Tolerance	$\% 5$
Magnetic Circuit	0.35 mm silicified lamination with high magnetic permeability.
Windings	Electrolytic copper or aluminum coil wire - foil.
Design	Air-spaced design.
Connection	Transformer terminal block, Rail terminal block, SKP shoe, copper busbar.
Protection (Electric)	Thermal protection against overheating.
Protection Class	IP 00 (Connection into the cabin according to the desired protection class upon request.)
Isolation Class	1. class, optionally F 155 °C or H 180 °C
Emprenye	Varnish under f or h grade according to demand
Relative Humidity	$\%90$ condensing (DIN 40040)
Operating Altitude	0 - 2000 m
Operating Environment Temperature	-10 °C +40 °C
Storage Temperature	-10 °C +70 °C
Appropriate Production	Design according to the voltage and power rating of your energy system.

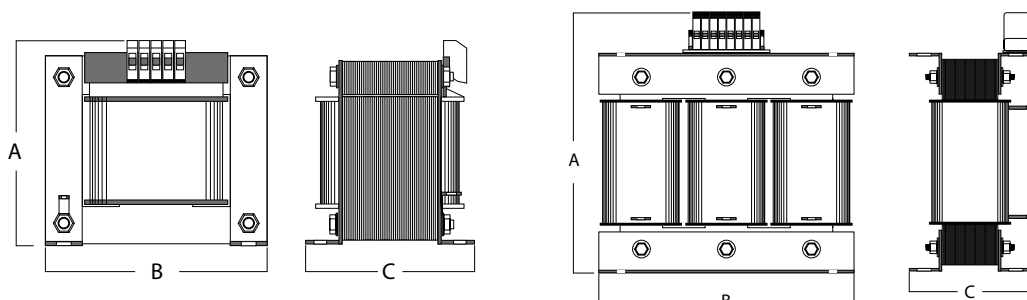


MONOPHASE SHUNT REACTORS (INDUCTIVE LOAD REACTORS)

Production Code	Product Name	Power (kVAr) 230V AC	Thermal Protection	Sheet Metal Type	A (mm)	B (mm)	C (mm)	INDUCTANCE (mH)	Current (A)	Weight (kg)
TNS-0,5	Shunt reactor	0,5	●	E-I	120	120	77	338	2,17	3,1
TNS-1	Shunt reactor	1,0	●	E-I	145	150	100	169	4,35	6,3
TNS-1K	Shunt reactor (Adjustable)	0,25-0,5-0,75-1,0	●	E-I	145	120	100			7
TNS-1,5	Shunt reactor	1,5	●	E-I	145	150	120	113	6,52	9,2
TNS-1,66S	Shunt reactor	1,66	●	E-I	145	150	120	103	6,82	10
TNS-2,5	Shunt reactor	2,5	●	E-I	185	192	120	67,6	10,87	12,5
TNS-3	Shunt reactor	3	●	E-I	185	192	145	56,3	13,04	17,5
TNS-3,33S	Shunt reactor	3,33	●	E-I	185	192	145	50,5	14,40	22,5
TNS-5	Shunt reactor	5,0	●	E-I	185	192	210	33,8	21,74	30,5
TNS-6,67S	Shunt reactor	6,67	●	U-I	240	180	300	28,5	30,0	26,0
TNS-10S	Shunt reactor	10	●	U-I	240	180	360	16,9	43,48	37,6

THREE-PHASE SHUNT REACTORS (INDUCTIVE LOAD REACTORS)

Production Code	Product Name	Power (kVAr) 400V AC	Thermal Protection	Sheet Metal Type	A (mm)	B (mm)	C (mm)	INDUCTANCE (mH)	Current (A)	Weight (kg)
TNS-0,5/400V	Shunt reactor	0,5	●	TYPE1	145	150	84	1020	0,72	3
TNS-1/400V	Shunt reactor	1	●	TYPE1	152	180	80	505	1,44	7,8
TNS-1,5/400V	Shunt reactor	1,5	●	TYPE1	152	180	100	336	2,17	9,5
TNS-2,5/400V	Shunt reactor	2,5	●	TYPE1	225	240	100	202	3,61	11,9
TNS-3 /400V	Shunt reactor	3	●	TYPE1	225	240	110	170	4,33	16,7
TNS-5/400V	Shunt reactor	5	●	TYPE1	275	300	146	101	7,22	30,5
TNS-7,5/400V	Shunt reactor	7,5	●	TYPE1	315	300	156	68	10,83	32
TNS-10/400V	Shunt reactor	10	●	TYPE1	360	360	166	51	14,43	44
TNS-15/400V	Shunt reactor	15	●	TYPE2	350	420	176	34	21,65	63
TNS-20/400V	Shunt reactor	20	●	TYPE2	350	420	196	25,5	28,87	81
TNS-25/400V	Shunt reactor	25	●	TYPE2	405	480	216	20,4	36,09	102
TNS-30/400V	Shunt reactor	30	●	TYPE2	405	480	236	16,8	43,30	125
TNS-40/400V	Shunt reactor	40	●	TYPE2	405	480	256	12,63	57,80	141
TNS-50/400V	Shunt reactor	50	●	TYPE2	510	600	270	10,2	72,20	180





Production Standards	EN 61558-1, EN 61558 2-20, EN 60289, EN 60076-6, CE certified.
Nominal Forces	Single-phase 0,10 - 10 kVAR or three-phase 0,5 - 100 kVAR production.
Nominal Voltage	230 VAC 1000 VAC
Nominal Frekans	50 Hz (60 Hz optional)
Standard Resonance Frequencies	134 Hz p= %14 189 Hz p= % 7 210 Hz p=%5,67
Inductivity Tolerance	± % 3
Magnetic Circuit	0.35 mm silicate lamination with high magnetic permeability.
Wraps	Electrolytic copper or aluminum coil wire - foil.
Design	Air-spaced design
Connection	Transformer terminal block, Rail terminal block, SKP shoe, Copper busbar.
Protection (Electrical)	90 °C 1 NC Contact thermistor
Protection Class	IP 00
Insulation Class	1st class, optionally F 155 ° C or H 180 ° C
Impregnated	Varnish on request F or H grade under vacuum.
Relative humidity	90% Non-condensing (DIN 40040)
Operating Altitude	0 - 2000 m
Operating Environment Temperature	-10 °C+ 40 °C
Storage Temperature	-10 °C+ 70 °C



MONOPHASE HARMONIC FILTER REACTORS

MONOPHASE HARMONIC REACTOR RESONANCE FR 189Hz P: 7% RATED VOLTAGE 230V

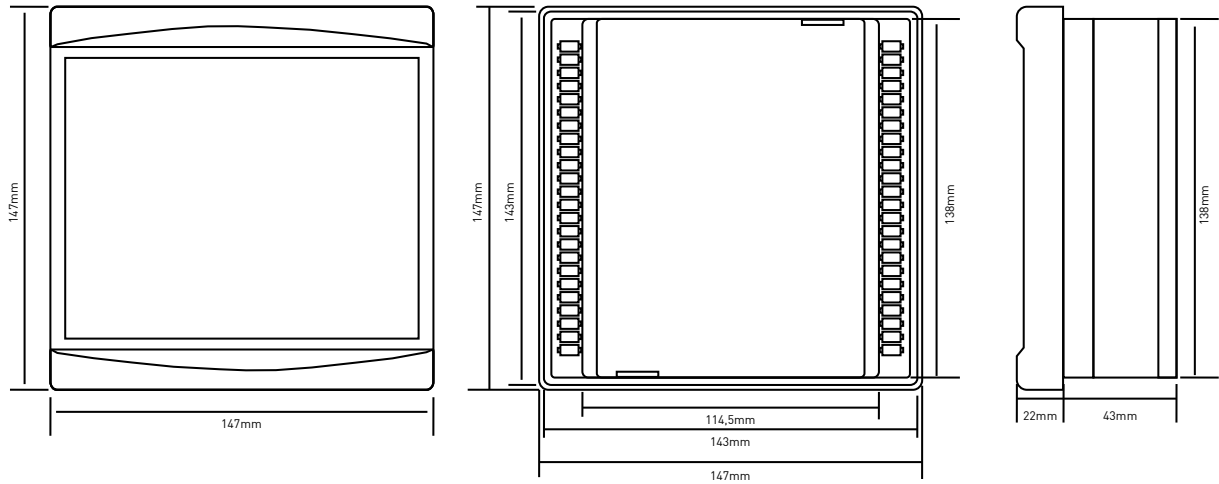
Product Code	Power	A (mm)	B (mm)	C (mm)	INDUCTANCE (mH)	I _{rms} (A)	I _{lin} (A)	Weight (kg)
HRM-0.40-07	0.40 kVAr	89	75	57	34,8	1,91	3,33	0,90
HRM-0.55-07	0.55 kVAr	89	75	66	25,3	2,63	4,59	1,20
HRM-0.83-07	0.83 kVAr	87	85	64	17,4	3,83	6,67	1,30
HRM-1-07	1 kVAr	87	85	64	13,9	4,78	8,32	1,35
HRM-1.50-07	1.50 kVAr	87	85	78	9,28	7,17	12,50	1,85
HRM-2-07	2 kVAr	87	85	89	6,96	9,57	16,70	2,00
HRM-2.50-07	2.50 kVAr	88	95	82	5,57	12,00	20,90	2,50
HRM-3-07	3 kVAr	88	95	86	4,64	14,30	25,00	2,70
HRM-4-07	4 kVAr	109	110	100	3,48	19,10	33,30	3,85
HRM-5-07	5 kVAr	120	120	100	2,78	23,90	41,60	4,60
HRM-7.50-07	7.50 kVAr	145	150	120	1,85	35,90	62,50	8,00
HRM-10-07	10 kVAr	145	150	130	1,39	47,80	83,20	9,30

THREE-PHASE HARMONIC FILTER REACTORS

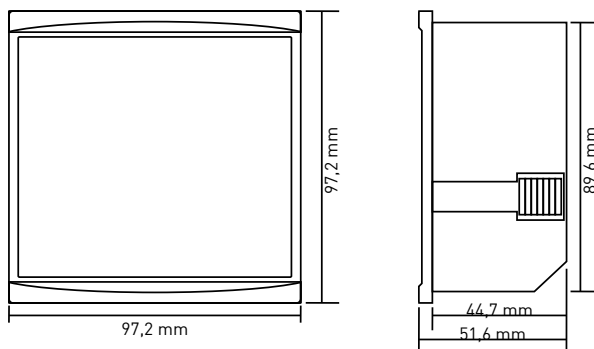
THREE-PHASE HARMONIC REACTORS RESONANCE FR 189Hz P: 7% RATED VOLTAGE 400V

Product Code	Power	Sheet Metal Type	A	B	C	INDUCTANCE (mH)	I _{rms} (A)	I _{lin} (A)	Weight (kg)
HRT-0.50-07	0.50 kVAr	TYPE1	120	120	63	76,80	0,79	1,03	1,4
HRT-1-07	1 kVAr	TYPE1	120	120	63	38,40	1,59	2,07	1,45
HRT-1.50-07	1.50 kVAr	TYPE1	120	120	63	25,60	2,38	3,09	1,52
HRT-2.50-07	2.50 kVAr	TYPE1	120	120	74	15,36	3,97	5,16	2,2
HRT-5-07	5 kVAr	TYPE1	145	150	74	7,68	7,94	10,32	3,52
HRT-6.25-07	6.25 kVAr	TYPE1	145	150	84	6,14	9,92	12,90	4,4
HRT-7.50-07	7.50 kVAr	TYPE1	145	150	84	5,12	11,91	15,48	4,54
HRT-10-07	10 kVAr	TYPE1	175	180	84	3,84	15,88	20,64	5,7
HRT-12.50-07	12.50 kVAr	TYPE1	175	180	84	3,07	19,85	25,81	5,8
HRT-15-07	15 kVAr	TYPE1	175	180	104	2,56	23,82	30,97	6,3
HRT-20-07	20 kVAr	TYPE2	200	240	100	1,92	31,76	41,29	11,25
HRT-25-07	25 kVAr	TYPE2	200	240	100	1,54	39,69	51,60	11,5
HRT-30-07	30 kVAr	TYPE2	200	240	110	1,28	47,63	61,92	14,25
HRT-40-07	40 kVAr	TYPE2	200	240	120	0,96	65,51	85,16	17,1
HRT-50-07	50 kVAr	TYPE2	250	300	126	0,77	79,39	103,21	23
HRT-60-07	60 kVAr	TYPE2	250	300	146	0,64	95,27	123,85	31,5
HRT-75-07	75 kVAr	TYPE2	250	300	146	0,51	119,08	154,80	33,5
HRT-80-07	80 kVAr	TYPE2	300	360	156	0,48	127,02	165,13	40,5
HRT-100-07	100 kVAr	TYPE2	300	360	156	0,38	158,78	206,41	45

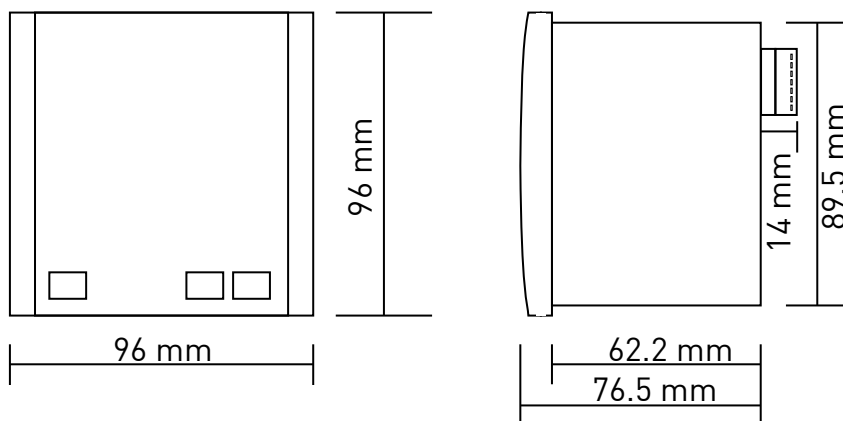
A1 CASE



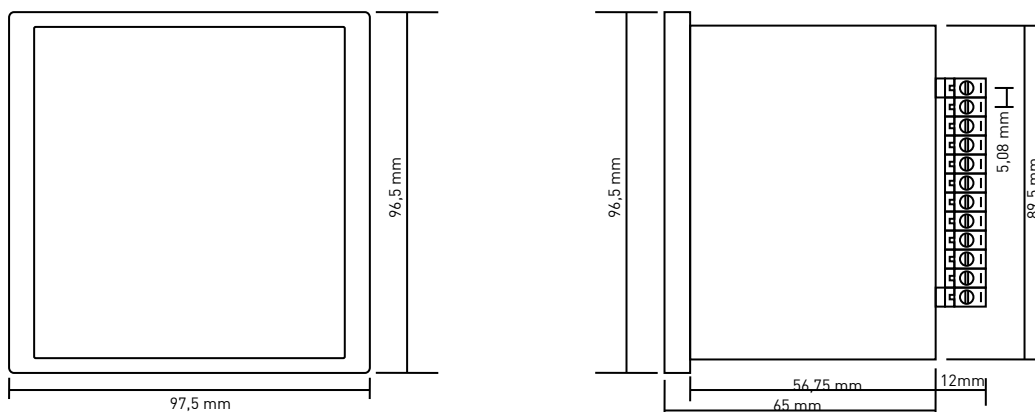
A2 CASE



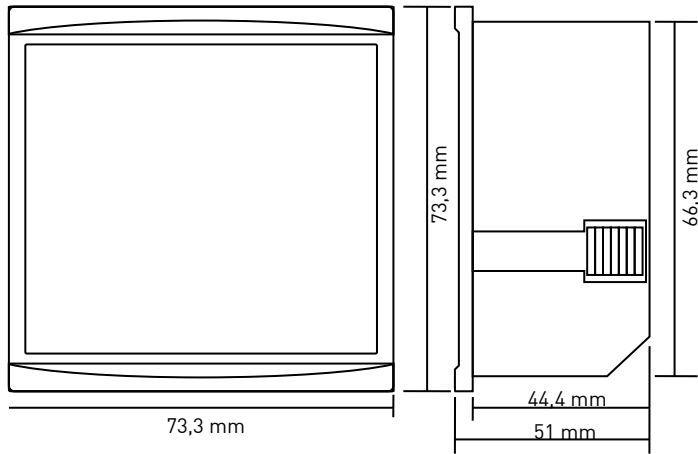
A3 CASE



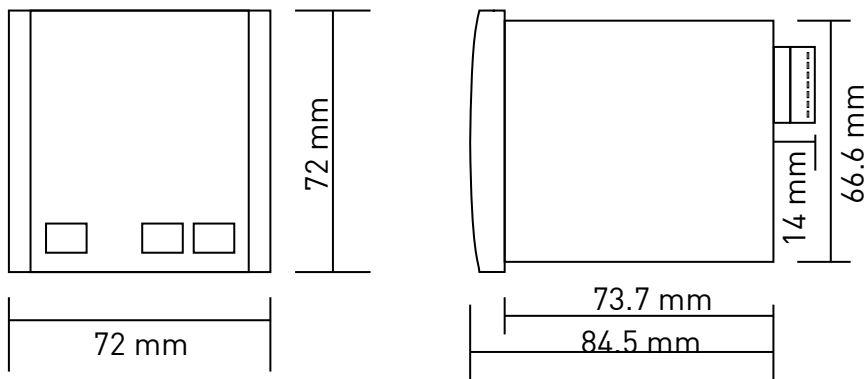
A4 CASE



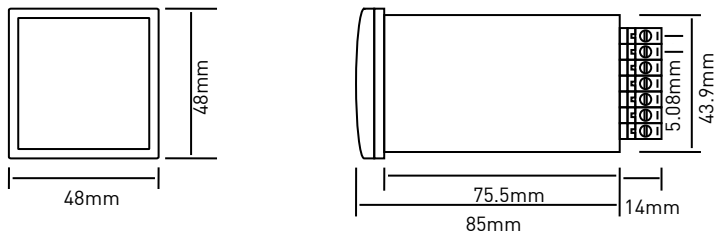
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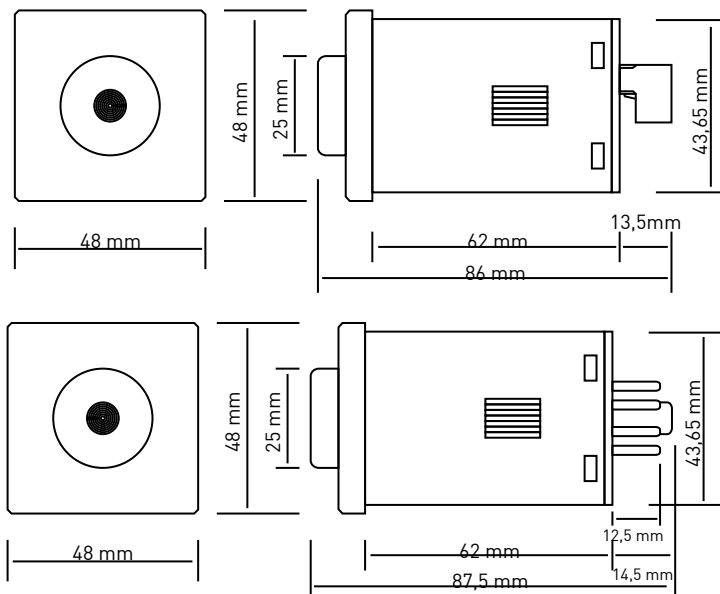
A6 CASE



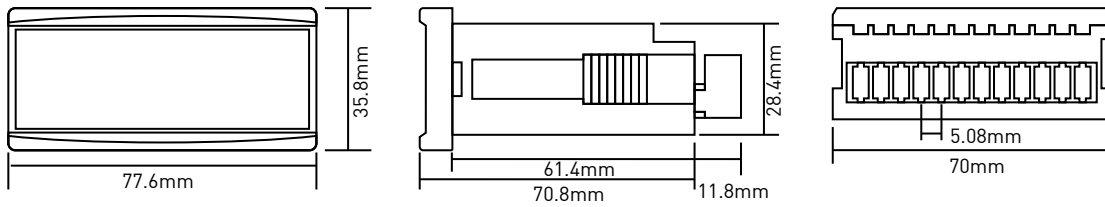
A7 CASE



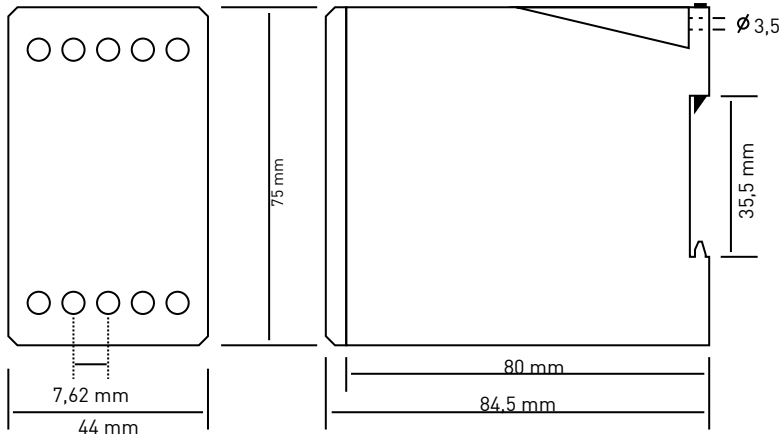
A8 CASE



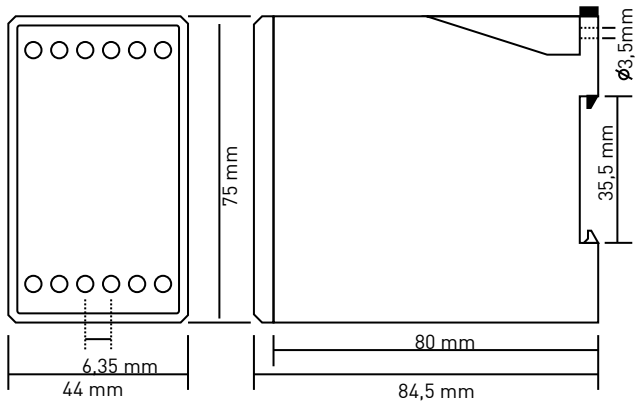
A9 CASE



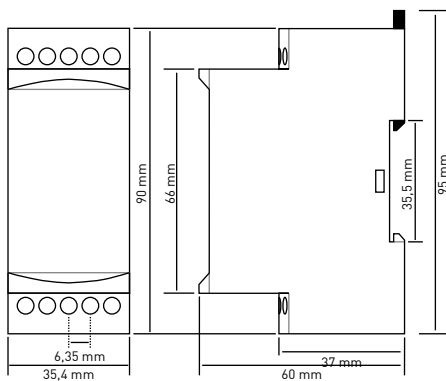
B1 CASE



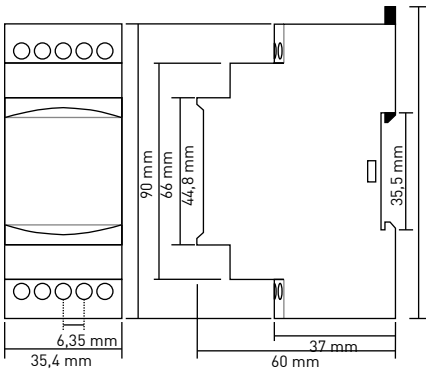
B2 CASE



B3 CASE

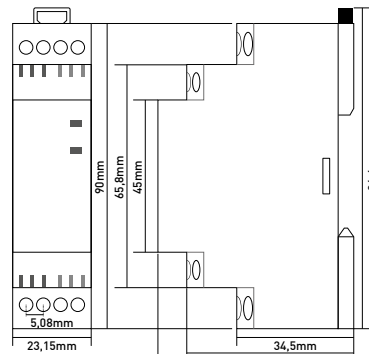
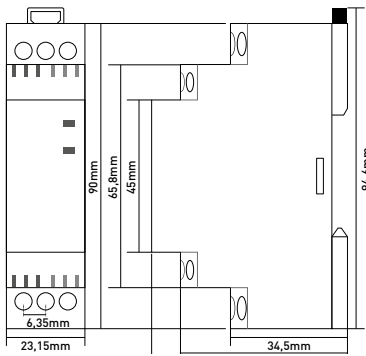


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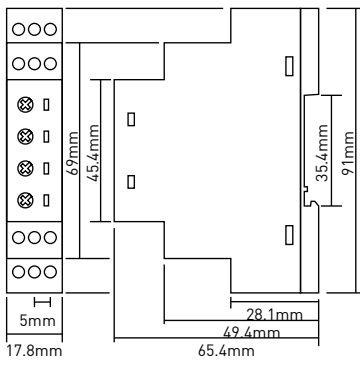


C1 CASE

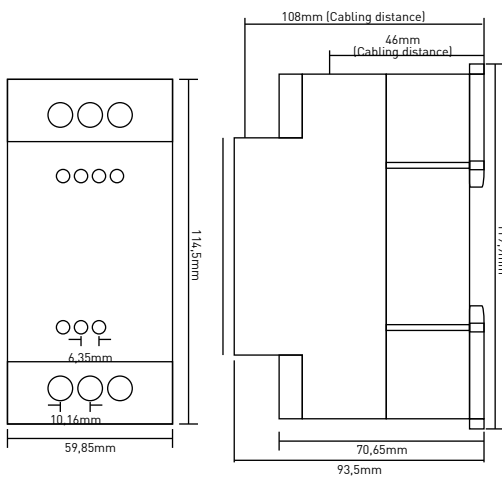
C2 CASE



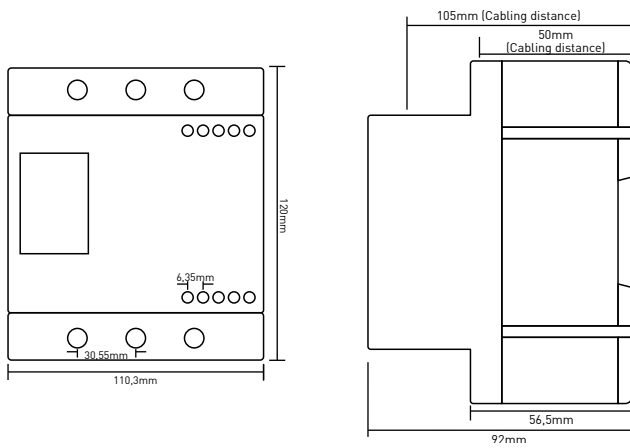
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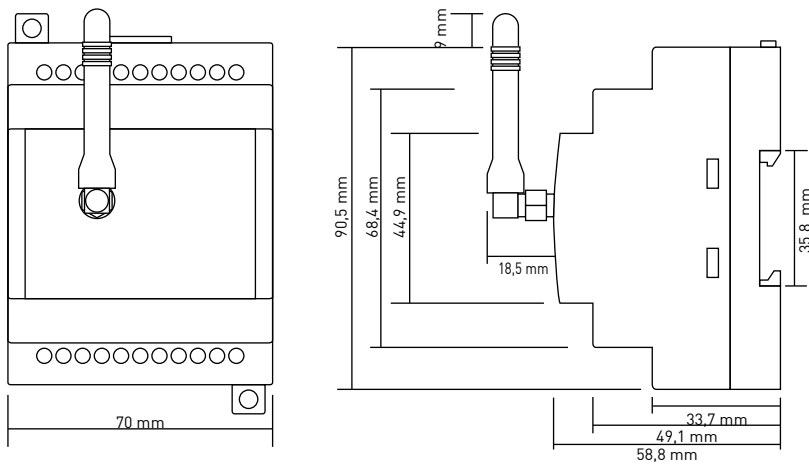
D1 CASE



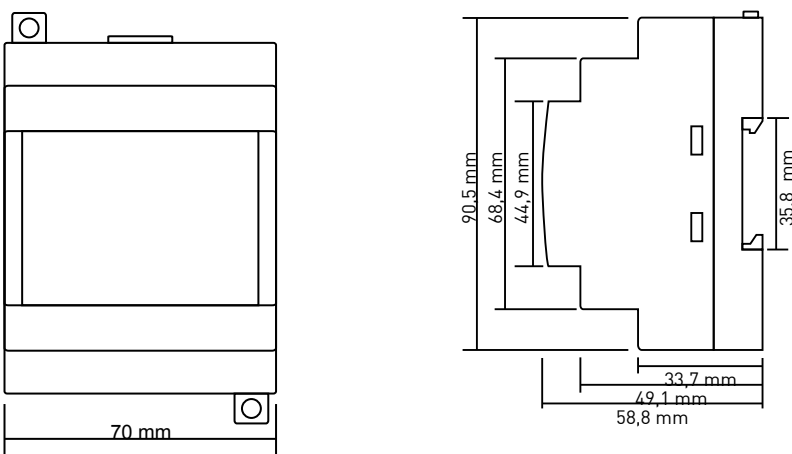
D2 CASE



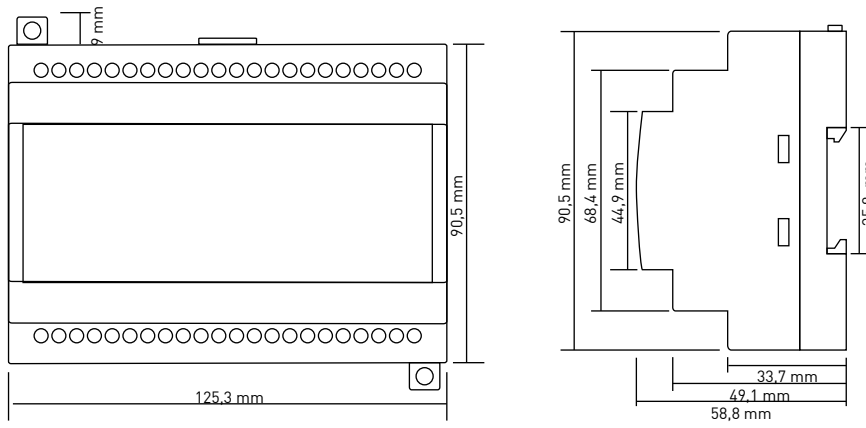
E1 CASE



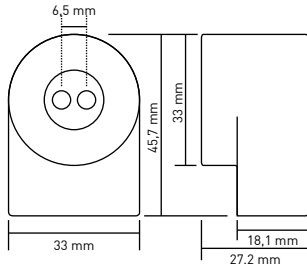
E2 CASE



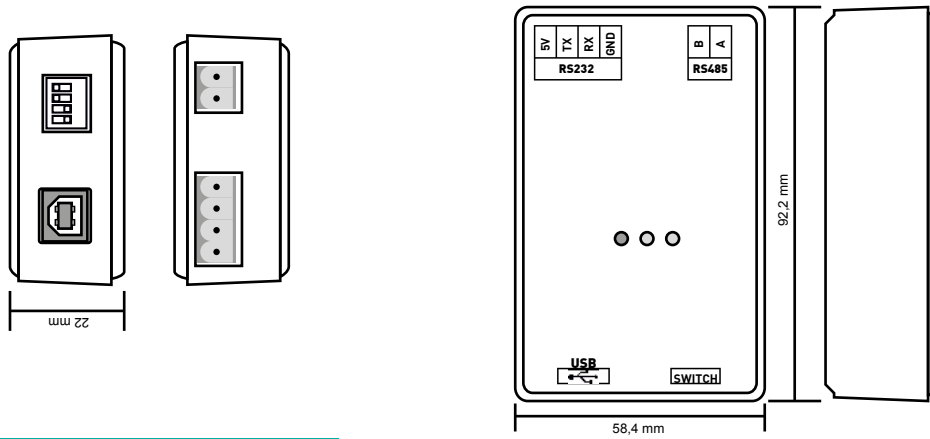
E3 CASE



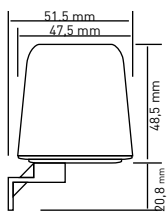
F1 CASE



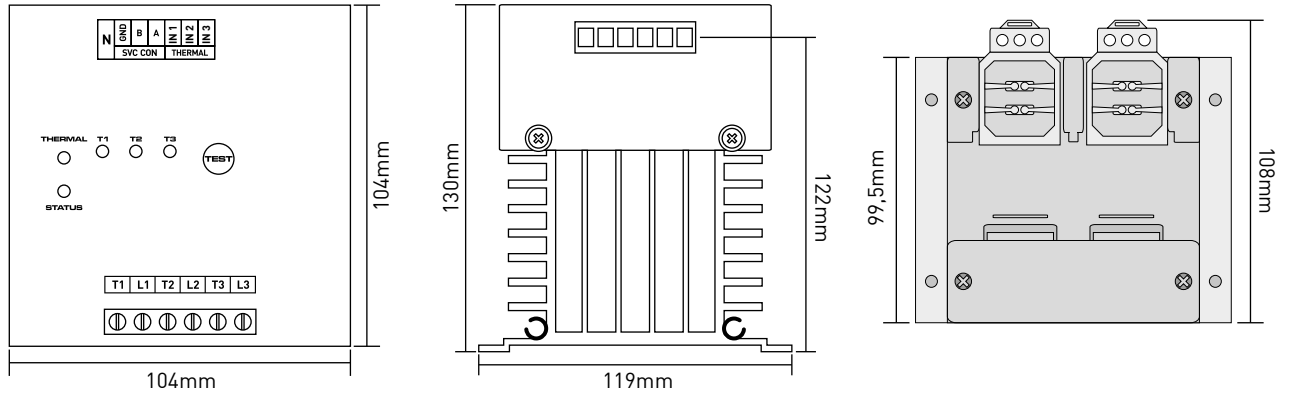
F2 CASE



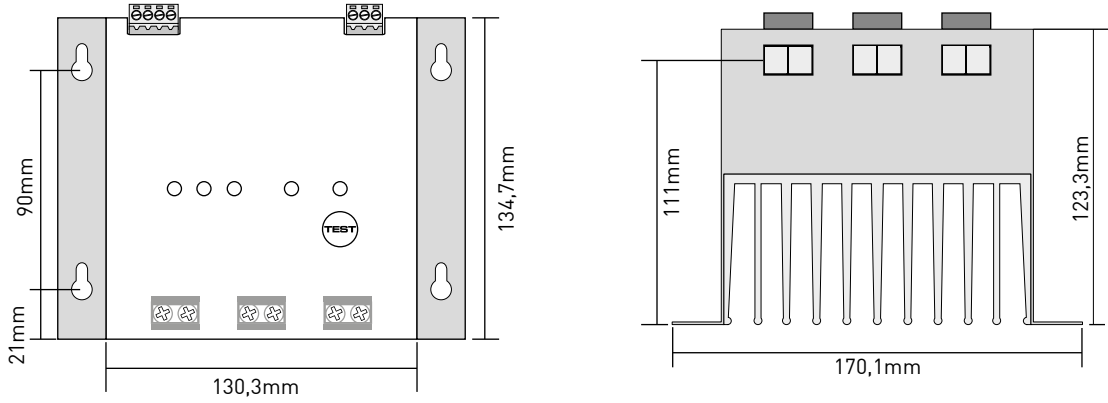
F3 CASE



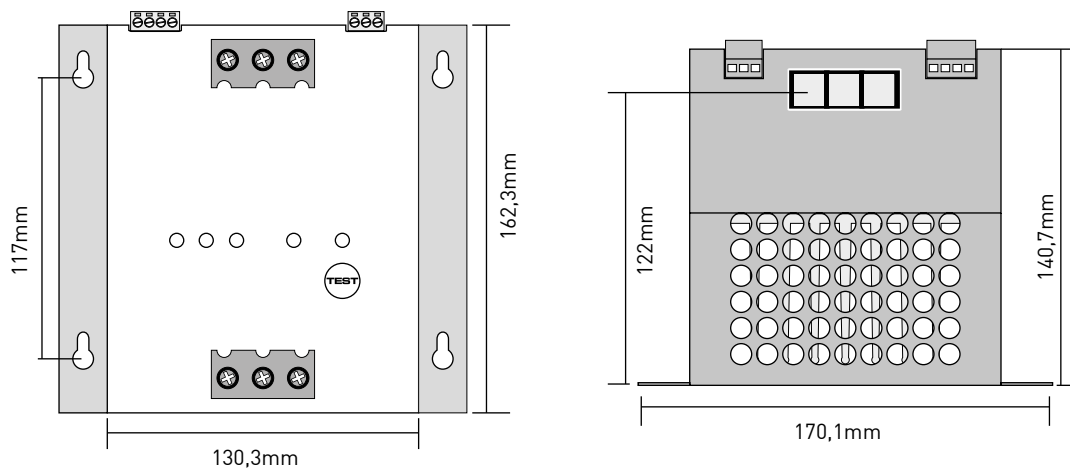
G1 CASE



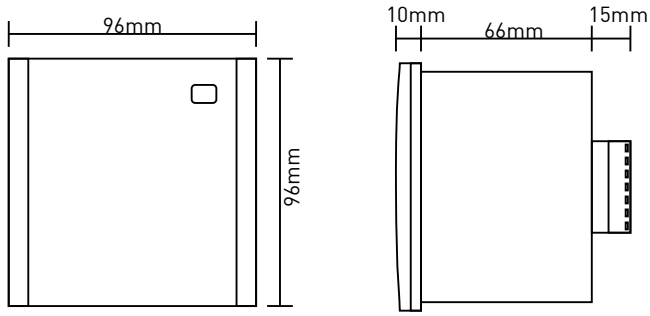
G2 CASE



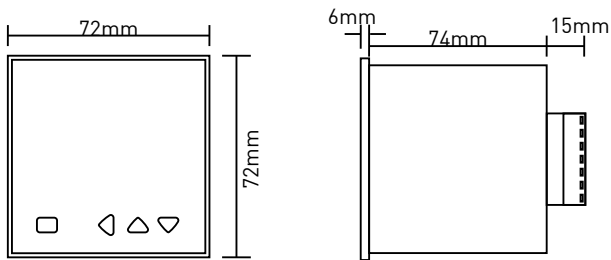
G3 CASE



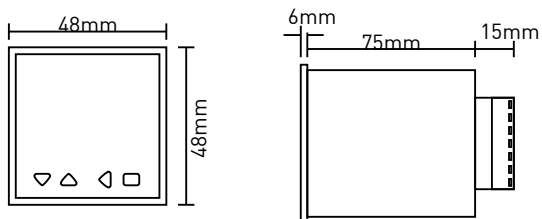
H1 CASE



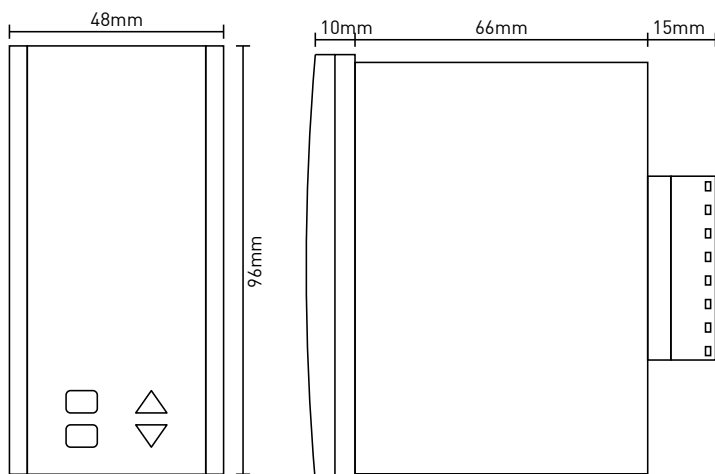
H2 CASE



H3 CASE



H4 CASE





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