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Combined Overcurrent & Earth Fault Relay

MK2200
MK1000A

Overcurrent Relay

MK233A
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MK204A

Earth Fault Relay

MK231A
MK232A
MK201A
MK202A

Earth Leakage Relay

MK300A / 300EA
MK330A
MK301A / 302A / 301E
DIN330
DIN310 / 310E
DIN300 / 300E
ZCT40S / 60S / 80S / 120S

Volt & Amp Meter

DVM
DAM

Voltage Relay

MU2300
MU250 / 150

Motor Protection Relay

MPR500

Reverse Power Relay

RPR415

Voltage & Current Control Relay

MX200A / 180A / 160A
MX100 / 50

Power Factor Regulator

PFR140 / 120 / 80 / 60
PFR96 / PFR96P

Annunciator

AN112 / 120

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MK2200

Introduction

The MK2200 combined overcurrent and earth-fault relay is a digital microprocessor based relay. This relay employs extensive advance numerical techniques implemented in real-time, for the computation of measured input quantity. Other advance features include programmable control output, metering and fault data recording.

Application

The MK2200 combined overcurrent and earth-fault relay is used where time graded overcurrent and earth fault protection is required.

Features

- Multifunction numerical relay
- Three-phase, low-set and high-set phase overcurrent
- Two sets of low-set and high-set setting for phase overcurrent
- Low-set and high-set earth fault
- Two sets of low-set and high-set setting for earth fault
- Circuit breaker failure protection
- Four selectable IDMT characteristic curves
- Definite time for low-set and high-set
- Numeric display of phase and earth fault currents
- Display of relay settings
- 9 non-volatile records of previous tripping currents
- Recording of relay start time
- Highly flexible programmable relay outputs
- Multifunction external digital input
- Isolated RS485 Modbus - RTU communication
- Selectable 50 Hz / 60 Hz

Functions

1 Phase Overcurrent Protection

When the phase current exceeds the low-set $I>$ setting value, the overcurrent low-set element starts and delivers a start signal to the display panel and a group of preassigned relay outputs. After a delay time, determined by the inverse time current characteristic curve selected and the measured current or by definite time $t>$, this overcurrent element operates and delivers a trip signal to the display panel and a group of relay outputs that are configured to link to the low-set phase overcurrent tripping.

When the phase current exceeds the high-set $I>>$ setting value, the overcurrent high-set element starts and delivers a start signal to the display panel and a group of preassigned relay outputs. After a preset time, determined by $t>>$, this overcurrent element operates and delivers a trip signal to the display panel and a group of relay outputs that are configured to link to high-set phase overcurrent tripping.

2 Earth-Fault Protection

When the earth-fault current exceeds the low-set $I_{o>}$ setting value, the earth-fault low-set element starts and delivers a start signal to the display panel and a group of preassigned relay outputs. After a delay time, determined by the inverse time current characteristic curve selected and the measured current or by definite time $t_{o>}$, this earth-fault element operates and delivers a trip signal to the display panel and a group of relay outputs that are configured to link to the low-set earth-fault tripping.

When the earth-fault current exceeds the high-set $I_{o>>}$ setting value, the earth-fault high-set element starts and delivers a start signal to the display panel and a group of preassigned relay outputs. After a preset time, determined by $t_{o>>}$, this earth-fault element operates and delivers a trip signal to the display panel and a group of relay outputs that are configured to link to high-set earth-fault tripping.

3 Low-set Characteristic Curves

The inverse definite minimum time (IDMT) characteristic curves in MK2200 comply with BS142-3 and IEC60255-3. The selectable curves and characteristics are:

- Normal inverse
- Very inverse
- Extremely inverse
- Long-time inverse
- Definite time

4 High-set Characteristic

The high-set is selectable between definite time and instantaneous tripping characteristic.

5 External Binary Input

The functions of the external binary input are:

- Blocking the operation of one or more protection stages.
- Remote trip reset.
- Changing of protection group settings.
- Tripping the MK2200 by an external device.

6 Relay Output

There are five relay outputs that can be programmed to respond to the relay start signal, the trip signal, or both the start and trip signals. The sixth relay output functions as internal relay failure indicator.

7 Configuration

The configuration of the relay is accomplished by software switches settable by the user from the front panel.

8 Metering and Fault Record

This function enables the values of the phase current and the earth-fault current to be viewed by the user. In addition, the user can also view the measured values of the phase current and earth-fault current recorded at the moment of fault for the previous 9 fault records stored in non-volatile memory.

Technical Data

INPUTS

Measuring input:

- Rated current I_N : 1 A or 5 A
- Rated frequency : 50 or 60 Hz
- Thermal withstand : $4 \times I_N$ continuous
- $25 \times I_N$ for less than 10 sec
- $100 \times I_N$ for less than 1 sec
- Burden : $< 0.3VA$ at I_N

Rated auxiliary voltage:

- Model MK2200-150D : 24~150 V DC
- Model MK2200-240A : 198~265 V AC
- Model MK2200-240AD : 85~265 V AC
- 110~340 V DC

Power consumption:

- AC auxiliary voltage : 6 ~ 10 VA typical
- DC auxiliary voltage : 5 ~ 9 W typical

Binary Input:

- External binary input : 18 ~ 265 V DC
- 85 ~ 265 V AC

EARTH-FAULT ELEMENT

- Low-set setting $I_{o>}$: $0.05 \sim 1.0 \times I_N$, step 0.01
 - High-set setting $I_{o>>}$: $0.05 \sim 10.0 \times I_N$, step 0.05
 - Time multiplier $k_{t o>}$: $0.02 \sim 1.0$, step 0.01
 - Low set definite time $t_{o>}$: $0 \sim 300$ s
 - High set definite time $t_{o>>}$: $0 \sim 300$ s
- | |
|------------------------------|
| $0 \sim 10.0$ s : step 0.01 |
| $10.0 \sim 100$ s : step 0.1 |
| $100 \sim 300$ s : step 1 |

OVERCURRENT ELEMENT

- Low-set setting $I >$: $0.10 \sim 2.50 \times I_N$, step 0.01
 - High-set setting $I >>$: $0.10 \sim 40 \times I_N$, step 0.05 ($0.1 \sim 10 I_N$), step 0.1 ($10 \sim 40 I_N$)
 - Time multiplier $k_{t >}$: $0.02 \sim 1.0$, step 0.01
 - Low set definite time $t >$: $0 \sim 300$ s
 - High set definite time $t >>$: $0 \sim 300$ s
- | |
|------------------------------|
| $0 \sim 10.0$ s : step 0.01 |
| $10.0 \sim 100$ s : step 0.1 |
| $100 \sim 300$ s : step 1 |

COMMUNICATION

RS485 Modbus - RTU

OUTPUTS

5 programmable contacts + 1 IRF contact:

- Rated voltage : 250 V AC/DC
- Continuous carry : 5 A
- Make and carry for 0.2 s : 30 A

Contact specification:

- Expected electrical life : 100,000 operations
- Expected mechanical life : 5×10^6 operations

ACCURACY

- Protection thresholds : $\pm 3\%$
- Time delay : $\pm 2\%$ with a minimum of 30 ms
- Measurements : $\pm 3\%$
- Reset ratio : 95% typical
- Overshoot time : less than 30 ms typical

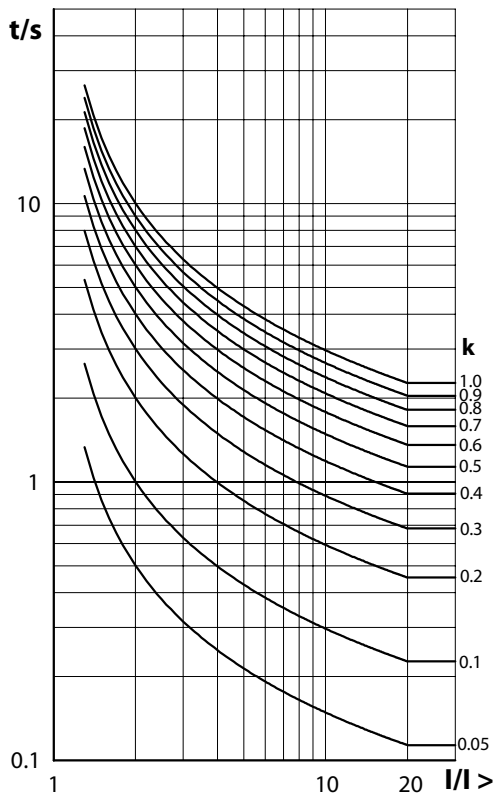
ENVIRONMENTAL CONDITIONS

- Temperature : -5°C to $+55^\circ\text{C}$
- Humidity : 56 days at 93% RH and 40°C non-condensing

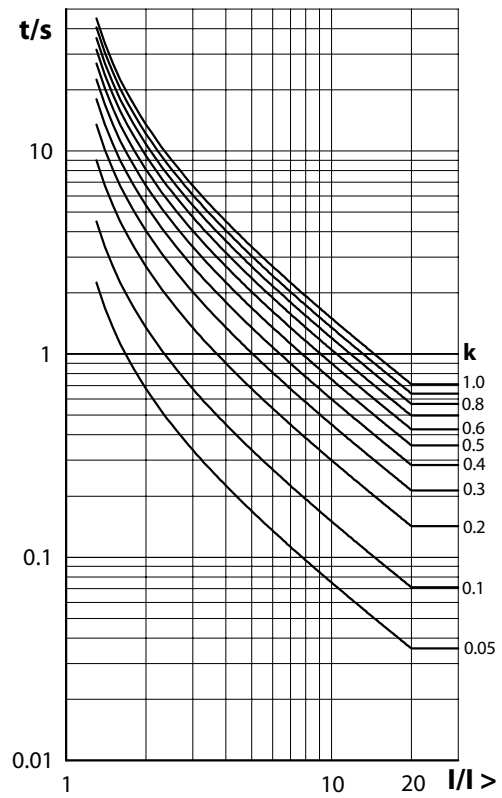
Tests And Standards

- High voltage dielectric withstand test IEC60255-5 2.0 KV rms, 1 min
- High voltage impulse test IEC60255-5 5 KV, 1.2/50 μ s
- Electrical fast transient IEC61000-4-4, Level 4, power supply inputs 4 KV, 5/50ns
- Electrical fast transient IEC61000-4-4, Level 4, other inputs 2 KV, 5/50ns
- Electrostatic discharge IEC61000-4-2, Class III, air discharge 8 KV
- Electrostatic discharge IEC61000-4-2, Class III, contact discharge 6 KV
- 1MHz Burst Disturbance IEC60255-22-1 2 KV Common mode
- 1 KV Differential mode
- Mains conducted disturbance voltage EN 55011 Group 1 Class B
- Radiated EM Field emission CISPR 11 Group 1 Class B
- Enclosure protection when panel mounted IP54

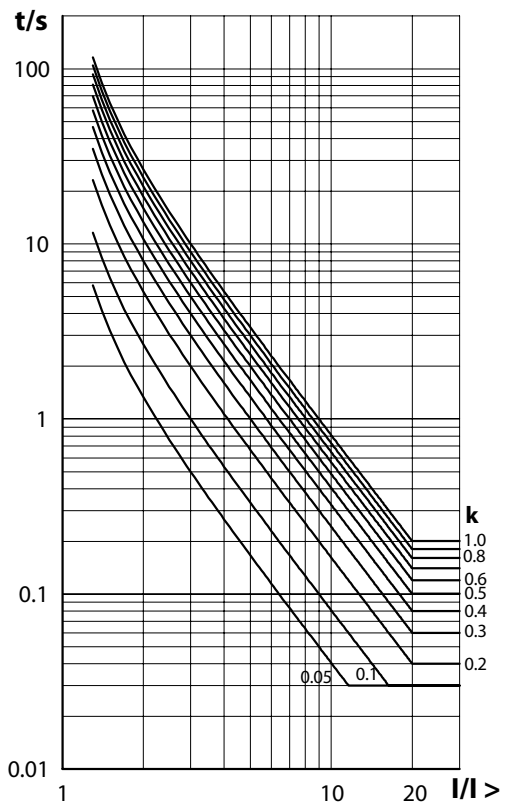
NORMAL INVERSE



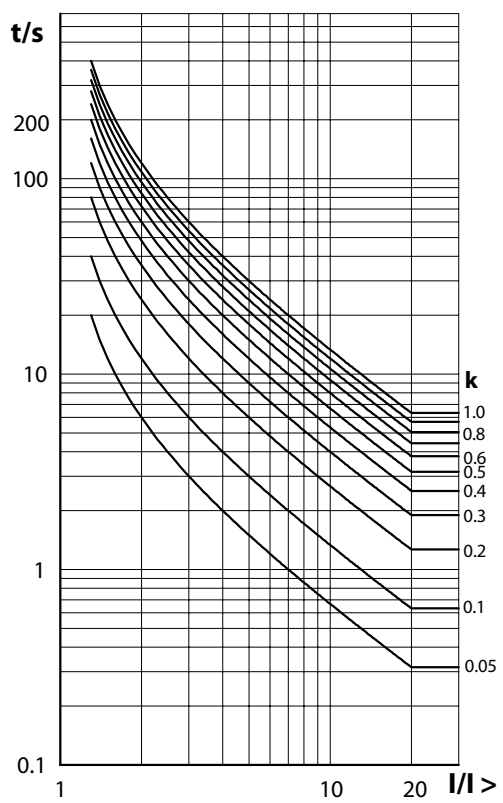
VERY INVERSE



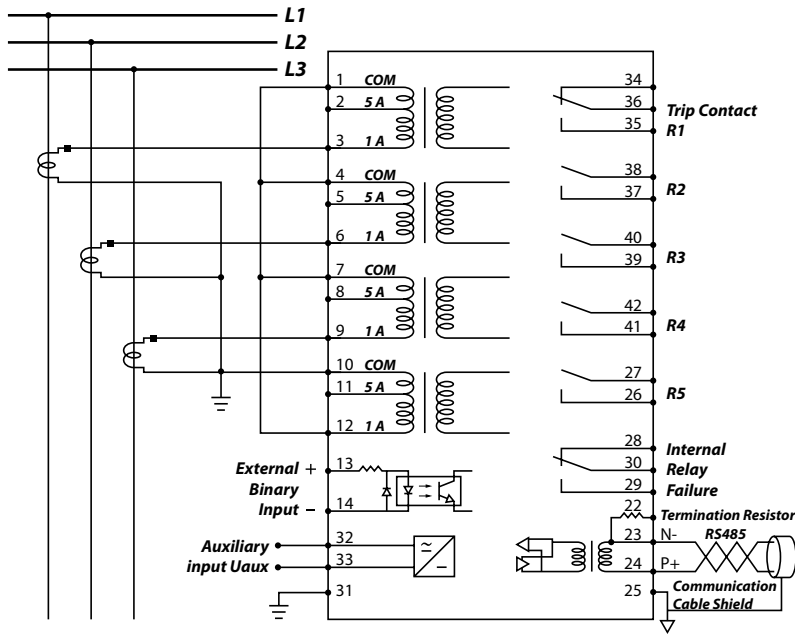
EXTREMELY INVERSE



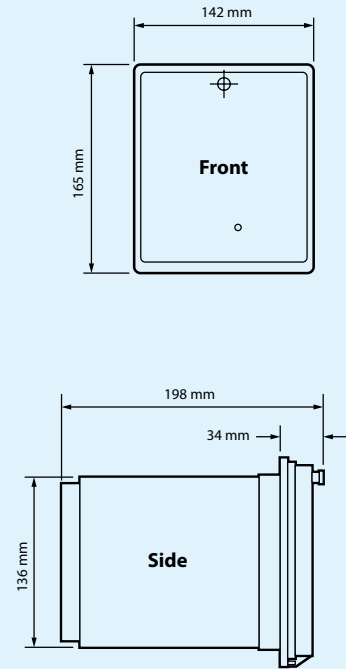
LONG-TIME INVERSE



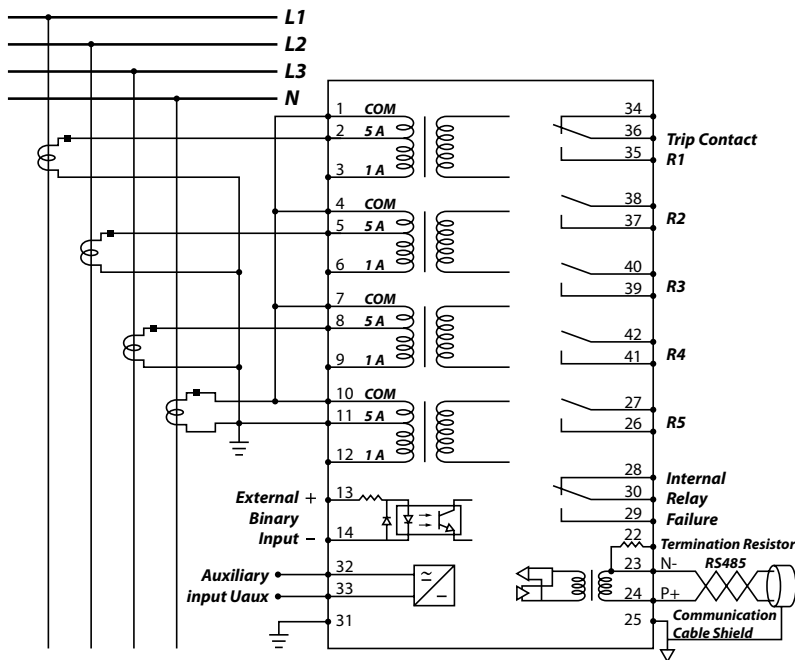
TYPICAL APPLICATION DIAGRAM 1



CASE DIMENSIONS



TYPICAL APPLICATION DIAGRAM 2



Ordering Information

MODEL	DESCRIPTION
MK2200 - 150D	For 50/60 Hz system, auxiliary voltage 24 ~ 150 V DC
MK2200 - 240A	For 50/60 Hz system, auxiliary voltage 198 ~ 265 V AC
MK2200 - 240AD	For 50/60 Hz system, auxiliary voltage 84 ~ 265 V AC or 110 ~ 340 V DC





MK1000A

Features

- Microprocessor based numerical relay
- Current measurement based on fundamental frequency
- Three-phase, low-set overcurrent
- Three-phase, high-set overcurrent
- Low-set earth-fault
- High-set earth-fault
- Definite time for low-set and high-set
- Five selectable IDMT characteristic curves
- Local display of measured and set values
- Programmable relay outputs
- Non-volatile fault values recording
- Complies with IEC 60255-26 standard

SETTING RANGES

i) Overcurrent elements

Low-set ($I >$)	: 0.5 A to 10.0 A, step 0.05 A
	: 10% to 200%, step 1%
Low-set time multiplier ($t >$)	: 0.05 to 1.0, step 0.01
Low-set definite time ($t >$)	: 0.05 to 99s
High-set ($I >>$)	: 0.5 A to 99.9 A, step 0.10 A or disable
	: 10% to 1998%, step 2%
High-set delay time ($t >>$)	: 0.05 sec to 2.5 sec, step 0.01

ii) Earth-fault element

Low-set ($I_0 >$)	: 0.10 A to 5.0 A, step 0.05 A
	: 2% to 100%
Low-set time multiplier($t_0 >$)	: 0.05 to 1.0, step 0.01
Low-set definite time ($t_0 >$)	: 0.05 to 99s
High-set ($I_0 >>$)	: 0.10 A to 50 A, step 0.10 A or disable
	: 2% to 1000%, step 2%
High-set delay time ($t_0 >>$)	: 0.05 sec to 2.5 sec, step 0.01

Technical Data

RATINGS

Rated current (I_N)	: 5 A
Rated frequency	: 50 or 60 Hz
Burden	: < 0.3 VA at I_N
Thermal withstand	: 4 x I_N continuous

AUXILIARY SUPPLY

Model MK1000A-240A(6)	: 198 ~ 265 V AC
Model MK1000A-240AD(6)	: 85 ~ 265 V AC 110 V DC ~ 370 V DC
Model MK1000A-150D(6)	: 24 ~ 150 V DC
Supply frequency	: 50 or 60 Hz
V A rating	: 3 VA typical

ACCURACY

Protection thresholds	: $\pm 5\%$
Time delay	: $\pm 5\%$ with a minimum of 50 ms

CONTACTS

Trip Contacts ($R1$ & $R2$)	
Rated voltage	: 250V AC/DC
Contacts arrangement	: Change-over
Contact rating	: 5 A
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5 x 10 ⁶ operations

INDICATORS

Auxiliary supply	: Green indicator
Pick-up	: Red indicator
Trip	: 7-segment display and red indicators

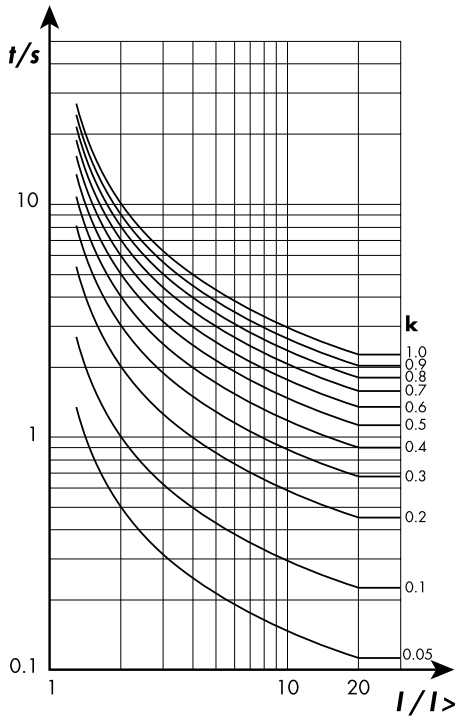
MECHANICAL

Mounting	: Panel mounting
Front panel	: Standard DIN 96 mm x 96 mm
Approximate weight	: 0.75 kg

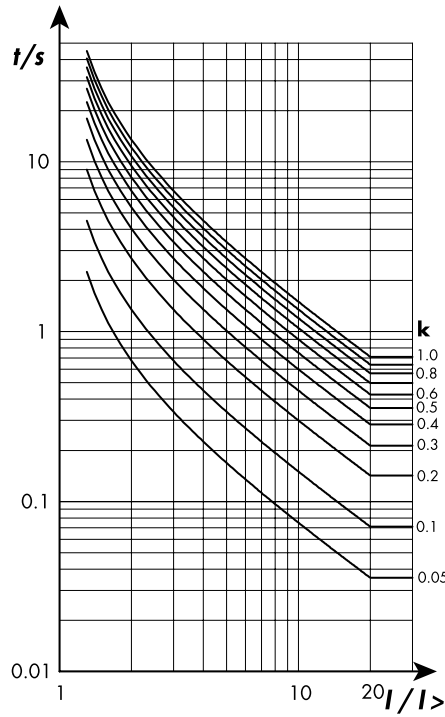
ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to +55°C
Humidity	: 56 days at 93% RH and 40°C non-condensing

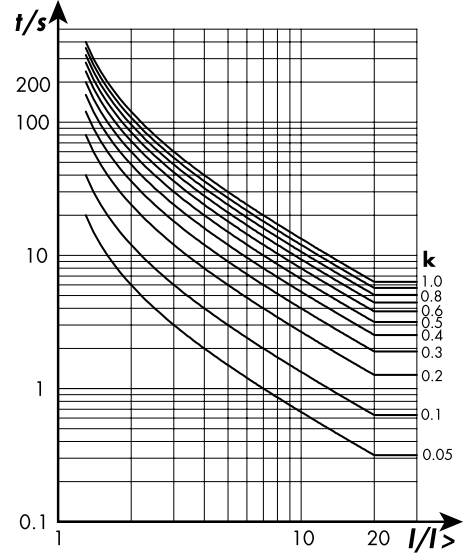
NORMAL INVERSE



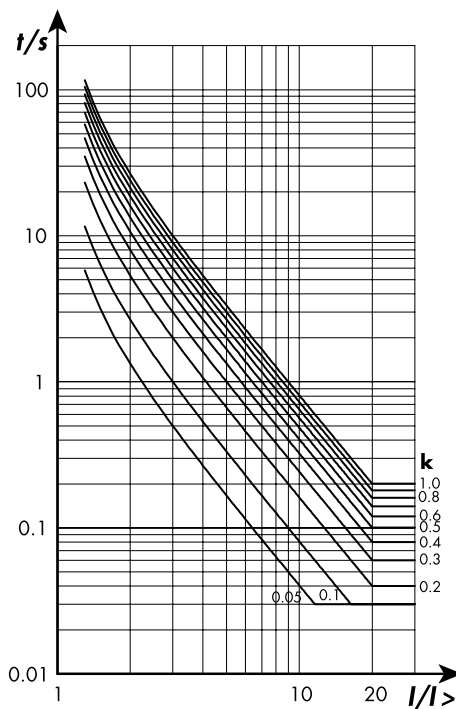
VERY INVERSE



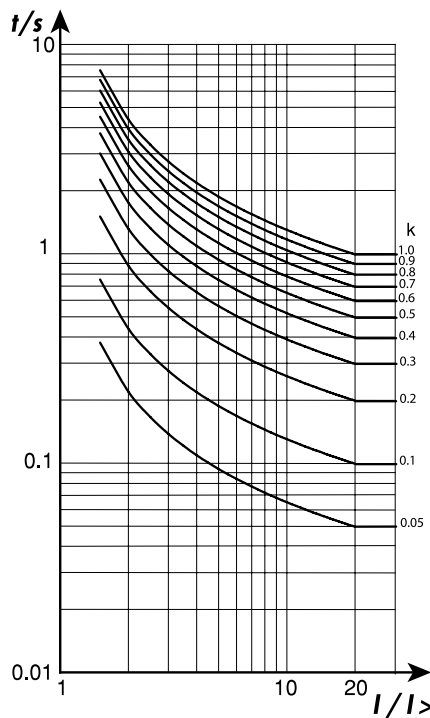
LONG TIME INVERSE



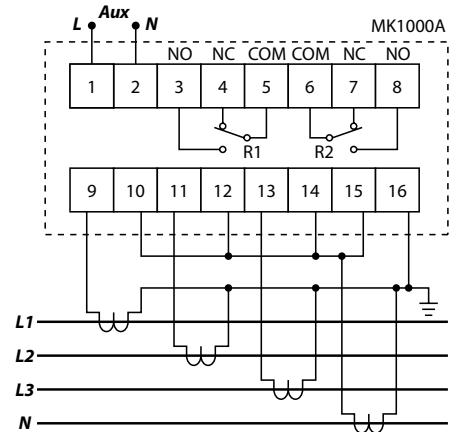
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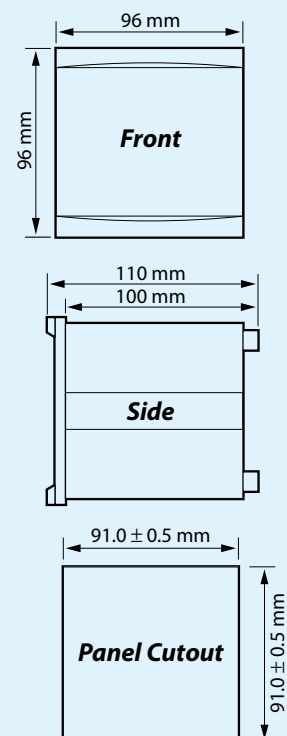
NORMAL INVERSE 1.3/10



TYPICAL APPLICATION DIAGRAM



CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK1000A-240A	For 50Hz system, auxiliary voltage 198 ~ 265 V AC
MK1000A-240AD	For 50Hz system, auxiliary voltage 85 ~ 265 V AC or 110~370 V DC
MK1000A-150D	For 50Hz system, auxiliary voltage 24 ~ 150 V DC
MK1000A-240AD6	For 60Hz system, auxiliary voltage 85 ~ 265 V AC or 110~370 V DC
MK1000A-150D6	For 60Hz system, auxiliary voltage 24 ~ 150 V DC



MK233A

Features

- Microprocessor based numerical relay
- Current measurement based on fundamental frequency
- Three-phase, low-set overcurrent
- Three-phase, high-set overcurrent
- Local display of measured and set values
- Definite time for low-set and high-set
- Non-volatile fault value recording
- Programmable relay outputs
- Five selectable IDMT characteristic curves
- Complies with IEC 60255-26 standard

Technical Data

RATINGS

Rated current (I_n)	: 5 A
Rated frequency	: 50 or 60 Hz
Burden	: < 0.3 VA at I_n
Thermal withstand	: $4 \times I_n$ continuous

AUXILIARY SUPPLY

Model MK233A-240A (6)	: 198 ~ 265 V AC
Model MK233A-110A (6)	: 94 ~ 127 V AC
Supply frequency	: 50 or 60 Hz
VA rating	: 3 VA typical

SETTING RANGES

Low-set ($I >$)	: 0.5 A to 6.0 A, step 0.05 A / 10% to 120%, step 1%
Low-set time multiplier ($kt >$)	: 0.05 to 1.0, step 0.01
Low-set definite time ($t >$)	: 0.05 to 99 sec, step 0.01 (0.05 to 1.0) / 0.1 (1.1 to 99)
High-set ($I >>$)	: 0.5 A to 99.9 A or disable, step 0.10 A / 10% to 1998%, step 2%
High-set delay time ($t >>$)	: 0.05 sec to 2.5 sec, step 0.01

ACCURACY

Protection thresholds	: $\pm 5\%$
Time delay	: $\pm 5\%$ with a minimum of 50 ms

CONTACTS (R1 & R2)

Contact arrangement	: Change-over
Contact rating	: 5 A, 250 V AC ($\cos\phi = 1$)
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5×10^6 operations

INDICATORS

Auxiliary supply	: Green indicator
Pick-up	: Red indicator
Trip	: 7-segment display and red indicators

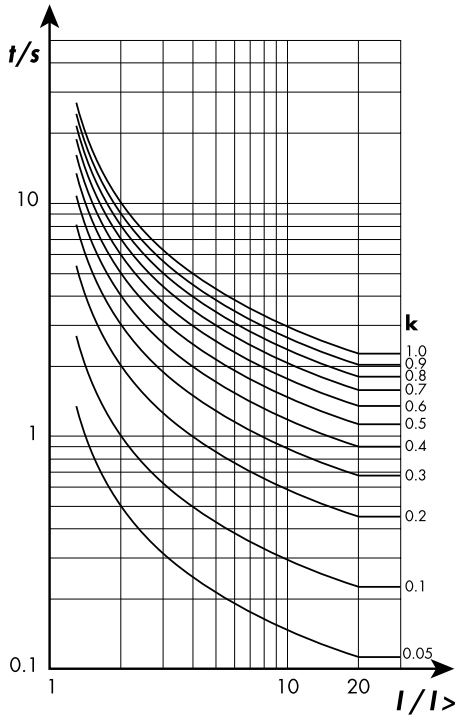
MECHANICAL

Mounting	: Panel mounting
Front panel	: Standard DIN 96 mm x 96 mm
Approximate weight	: 0.7 kg

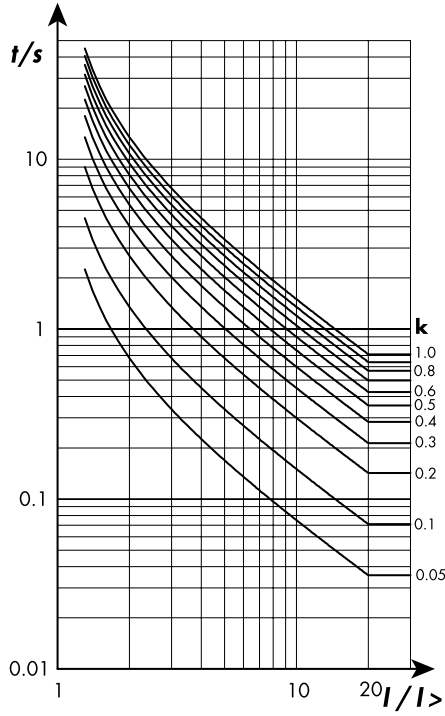
ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to $+55^\circ\text{C}$
Humidity	: 56 days at 93% RH and 40°C non-condensing

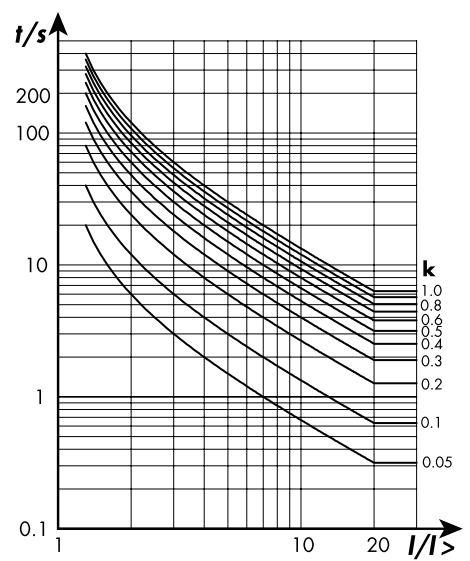
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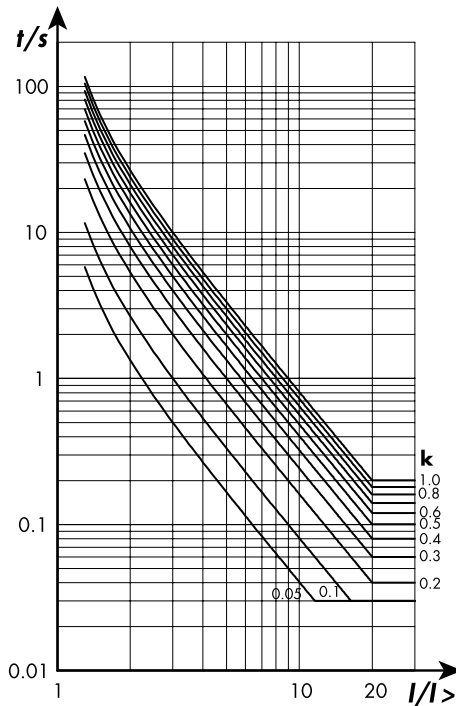
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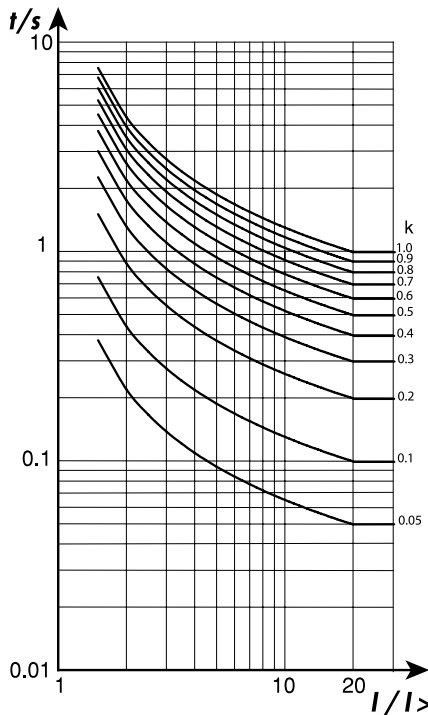
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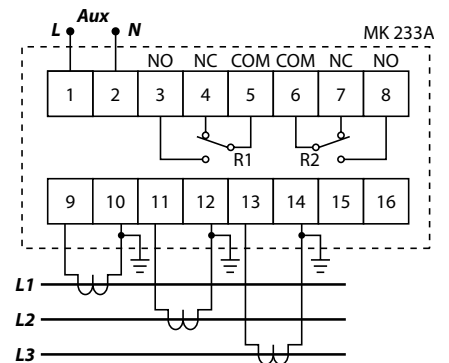
EXTREMELY INVERSE



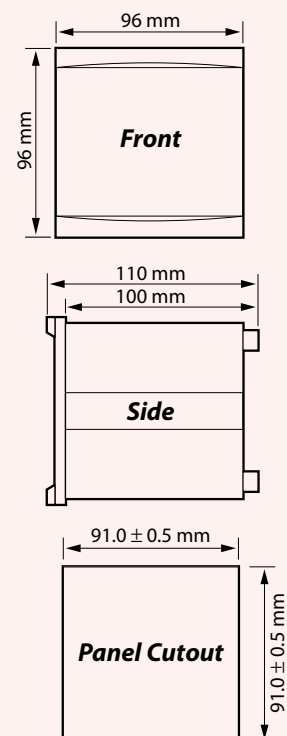
NORMAL INVERSE 1.3/10



TYPICAL APPLICATION DIAGRAM



CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK233A - 240A	For 50 Hz system, auxiliary voltage 198 ~ 265 V AC
MK233A - 110A	For 50 Hz system, auxiliary voltage 94 ~ 127 V AC
MK233A - 240A6	For 60 Hz system, auxiliary voltage 198 ~ 265 V AC
MK233A - 110A6	For 60 Hz system, auxiliary voltage 94 ~ 127 V AC



MK234A

Features

- Microprocessor based numerical relay
- Current measurement based on fundamental frequency
- Three-phase, low-set overcurrent
- Three-phase, high-set overcurrent
- Local display of measured and set values
- Definite time for low-set and high-set
- Non-volatile fault value recording
- Programmable relay outputs
- Complies with IEC 60255-26 standard

Technical Data

RATINGS

Rated current (I_N)	: 5 A
Rated frequency	: 50 or 60 Hz
Burden	: < 0.3 VA at I_N
Thermal withstand	: 4 x I_N continuous

AUXILIARY SUPPLY

Model MK234A-240A(6)	: 198 ~ 265 V AC
Model MK234A-110A(6)	: 94 ~ 127 V AC
Supply frequency	: 50 or 60 Hz
VA rating	: 3 VA typical

SETTING RANGES

Low-set ($I >$)	: 0.5 A to 6.0 A, step 0.05 A / 10% to 120%, step 1%
Low-set definite time ($t >$)	: 0.05 to 99 sec, step 0.01 (0.05 to 1.0) / 0.1 (1.1 to 99)
High-set ($I >>$)	: 0.5 A to 99.9 A or disable, step 0.10 A / 10% to 1998%, step 2%
High-set delay time ($t >>$)	: 0.05 sec to 2.5 sec, step 0.01

ACCURACY

Protection thresholds	: $\pm 5\%$
Time delay	: $\pm 5\%$ with a minimum of 50 ms

CONTACTS (R1 & R2)

Contact arrangement	: Change-over
Contact rating	: 5 A, 250 V AC ($\cos\phi = 1$)
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5×10^6 operations

INDICATORS

Auxiliary supply	: Green indicator
Pick-up	: Red indicator
Trip	: 7-segment display and red indicators

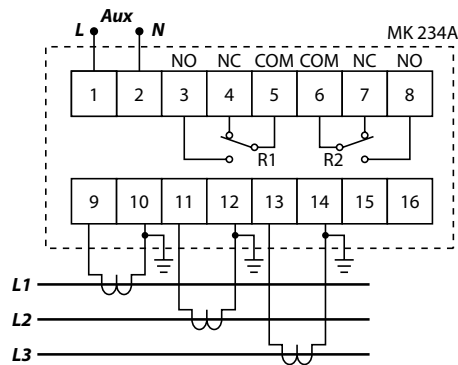
MECHANICAL

Mounting	: Panel mounting
Front panel	: Standard DIN 96 mm x 96 mm
Approximate weight	: 0.7 kg

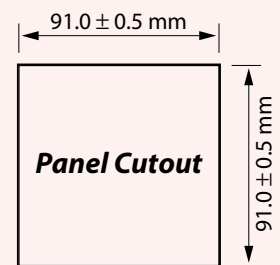
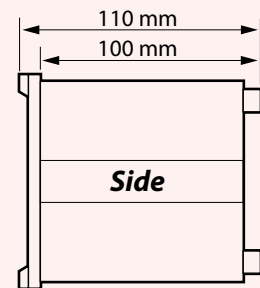
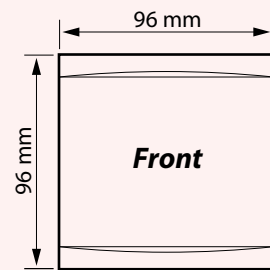
ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to $+55^\circ\text{C}$
Humidity	: 56 days at 93% RH and 40°C non-condensing

TYPICAL APPLICATION DIAGRAM



CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK234A - 240A	For 50 Hz system, auxiliary supply 198 ~ 265 V AC
MK234A - 110A	For 50 Hz system, auxiliary supply 94 ~ 127 V AC
MK234A - 240A6	For 60 Hz system, auxiliary supply 198 ~ 265 V AC
MK234A - 110A6	For 60 Hz system, auxiliary supply 94 ~ 127 V AC



MK203A

Features

- Microprocessor based numerical relay
- Current measurement based on fundamental frequency
- Low-set inverse definite minimum time (IDMT) relay
- High-set instantaneous relay
- Separate low-set and high-set trip indicators
- Option to disable high-set relay
- Front panel access to test function
- Complies with IEC 60255-26 standard

Technical Data

RATINGS

Rated current (I_n)	: 5 A
Rated frequency	: 50 Hz
Burden	: < 0.3 VA at I_n
Thermal withstand	: 4 x I_n continuous

AUXILIARY SUPPLY

Model MK203A-240A	: 198 ~ 265 V AC
Model MK203A-110A	: 94 ~ 127 V AC
Supply frequency	: 50 Hz
VA rating	: 3 VA typical

SETTING RANGES

Low-set ($I >$)	: 2.0 A to 6.0 A
	: 40% to 120%
Time multiplier (TM)	: 0.05 to 1.0
High-set ($I >>$)	: $I >$ to $10 \times I >$ or disable
High-set delay time ($t >>$)	: Instantaneous

TIME CURRENT CHARACTERISTIC CURVE

- Normal Inverse

CONTACTS

Trip contact (R1)	: Manual reset type
Contact Arrangement	: Change-over
Contact rating	: 5 A, 250 V AC ($\cos\phi = 1$)
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5×10^6 operations

INDICATORS

Auxiliary supply	: Green indicator
Pick-up	: Red indicator
Trip	: Red indicator

PERFORMANCE

Adjustable accuracy	: Less than $\pm 5\%$.
Repeatability	: Less than 0.5% of full scale.

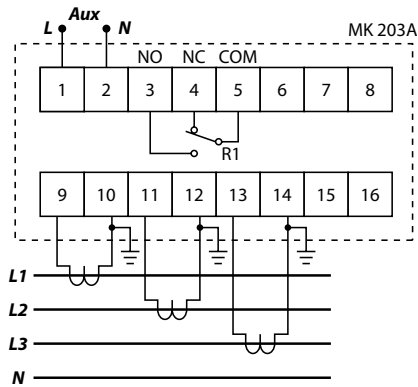
MECHANICAL

Mounting	: Panel mounting
Front panel	: Standard DIN 96 mm x 96 mm
Approximate weight	: 0.7 kg

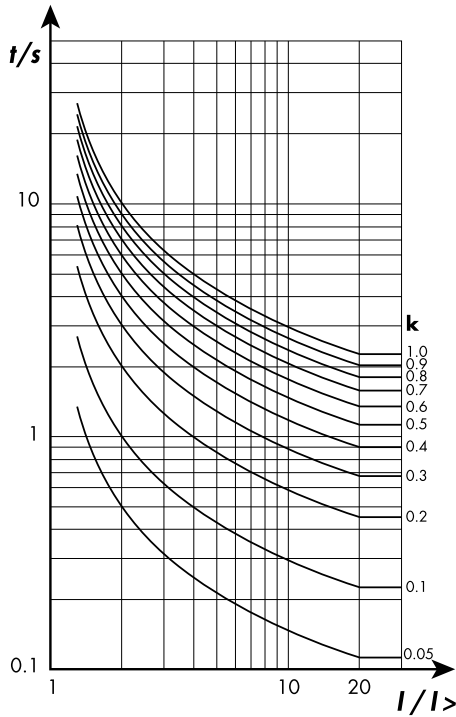
ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to $+55^\circ\text{C}$
Humidity	: 56 days at 93% RH and 40°C non-condensing

TYPICAL APPLICATION DIAGRAM

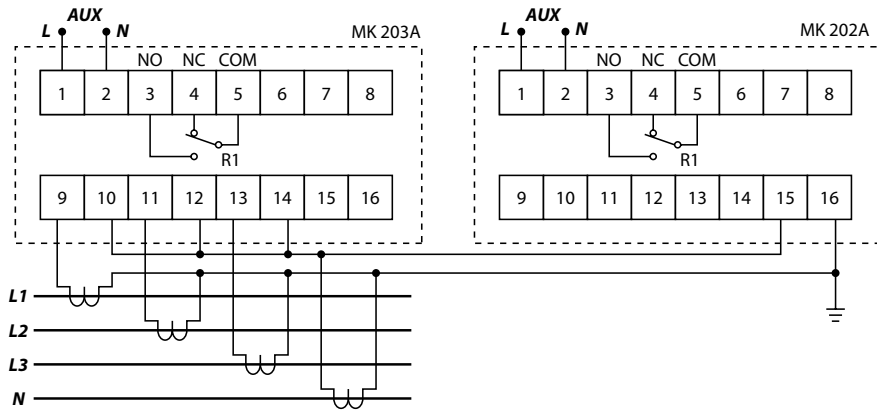


NORMAL INVERSE

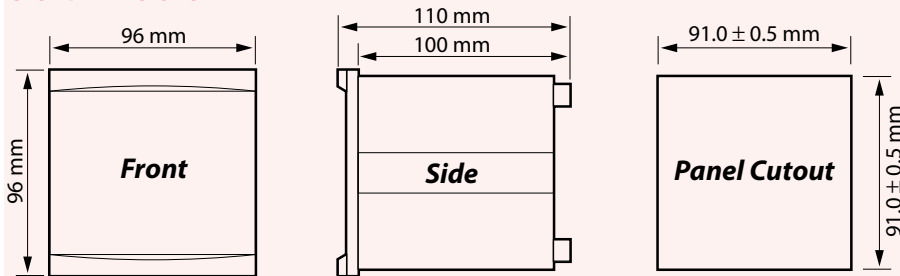


MK203A Overcurrent Relay

COMBINED IDMT OVERCURRENT & EARTH FAULT RELAYS



CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK203A - 240A	For 50 Hz system, auxiliary voltage 198 ~ 265 V AC
MK203A - 110A	For 50 Hz system, auxiliary voltage 94 ~ 127 V AC





MK204A

Features

- Microprocessor based numerical relay
- Current measurement based on fundamental frequency
- Low-set inverse definite time relay (IDT)
- High-set instantaneous relay
- Separate low-set and high-set trip indicators
- Option to disable high-set relay
- Front panel access to test function
- Complies with IEC 60255-26 standard

Technical Data

RATINGS

Rated current (I_n)	: 5 A
Rated frequency	: 50 Hz
Burden	: < 0.3 VA at I_n
Thermal withstand	: 4 x I_n continuous

AUXILIARY SUPPLY

Model MK204A-240A	: 198 ~ 265 V AC
Model MK204A-110A	: 94 ~ 127 V AC
Supply frequency	: 50 Hz
VA rating	: 3 VA typical

SETTING RANGES

Low-set ($I >$)	: 2.0 A to 6.0 A
	: 40% to 120%
Time multiplier (TM)	: 0.05 to 1.0
High-set ($I >>$)	: $I >$ to 10 x $I >$ or disable
High-set delay time ($t >>$)	: Instantaneous

CONTACTS

Trip contact (R1)	: Manual reset type
Contact Arrangement	: Change-over
Contact rating	: 5 A, 250 V AC ($\cos\phi = 1$)
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5 x 10 ⁶ operations

INDICATORS

Auxiliary supply	: Green indicator
Pick-up	: Red indicator
Trip	: Red indicator

PERFORMANCE

Adjustable accuracy	: Less than $\pm 5\%$.
Repeatability	: Less than 0.5% of full scale.

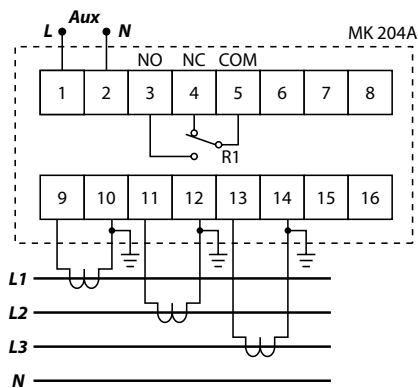
MECHANICAL

Mounting	: Panel mounting
Front panel	: Standard DIN
	: 96 mm x 96 mm
Approximate weight	: 0.7 kg

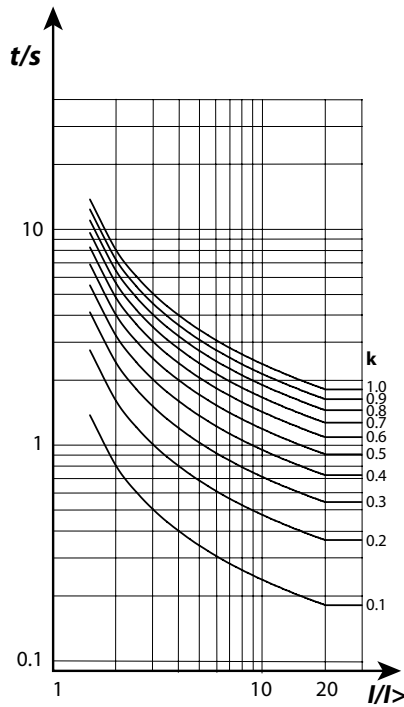
ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to +55°C
Humidity	: 56 days at 93% RH and 40°C non-condensing

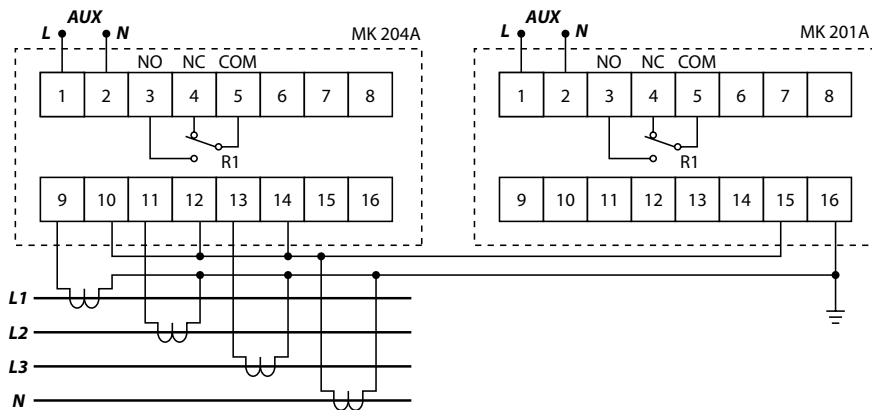
TYPICAL APPLICATION DIAGRAM



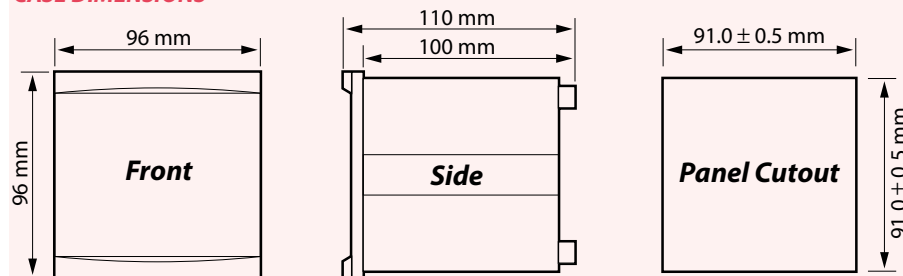
IDT INVERSE



COMBINED OVERCURRENT & EARTH FAULT RELAYS



CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK204A - 240A	For 50 Hz system, auxiliary voltage 198 ~ 265 V AC
MK204A - 110A	For 50 Hz system, auxiliary voltage 94 ~ 127 V AC





MK231A

Features

- Microprocessor based numerical relay
- Current measurement based on fundamental frequency
- Low-set earth-fault
- High-set earth-fault
- Local display of measured and set values
- Definite time for low-set and high-set
- Non-volatile fault value recording
- Programmable relay outputs
- Complies with IEC 60255-26 standard

Technical Data

RATINGS

Rated current (I_n)	: 5 A
Rated frequency	: 50 or 60 Hz
Burden	: < 0.3 VA at I_n
Thermal withstand	: 4 x I_n continuous

AUXILIARY SUPPLY

Model MK231A-240A (6)	: 198 ~ 265 V AC
Model MK231A-110A (6)	: 94 ~ 127 V AC
Supply frequency	: 50 or 60 Hz
VA rating	: 3 VA typical

SETTING RANGES

Low-set ($I >$)	: 0.1 A to 5.0 A, step 0.05 A / 2% to 100%, step 1%
Low-set definite time ($t >$)	: 0.05 to 99 sec, step 0.01 (0.05 to 1.0) / 0.1 (1.1 to 99)
High-set ($I >>$)	: 0.1 A to 50 A or disable, step 0.1 A / 2% to 1000%, step 2%
High-set delay time ($t >>$)	: 0.05 sec to 2.5 sec, step 0.01

ACCURACY

Protection thresholds	: $\pm 5\%$
Time delay	: $\pm 5\%$ with a minimum of 50 ms

CONTACTS (R1 & R2)

Contact arrangement	: Change-over
Contact rating	: 5 A, 250 V AC ($\cos\phi = 1$)
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5×10^6 operations

INDICATORS

Auxiliary supply	: Green indicator
Pick-up	: Red indicator
Trip	: 7-segment display and red indicators

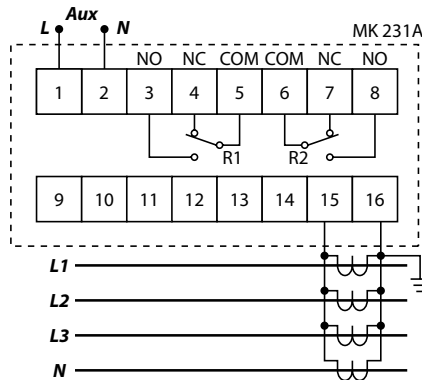
MECHANICAL

Mounting	: Panel mounting
Front panel	: Standard DIN 96 mm x 96 mm
Approximate weight	: 0.6 kg

ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to $+55^\circ\text{C}$
Humidity	: 56 days at 93% RH and 40°C non-condensing

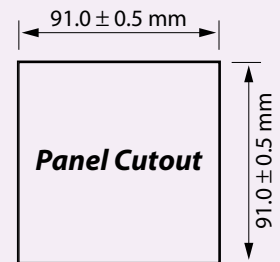
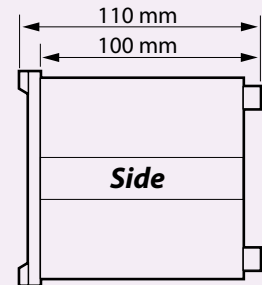
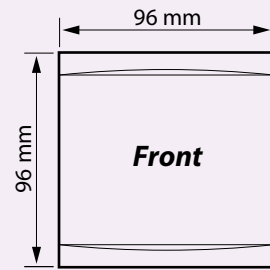
TYPICAL APPLICATION DIAGRAM



MK231A Earth Fault Relay



CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK231A - 240A	For 50 Hz system, auxiliary voltage 198 ~ 265 V AC
MK231A - 110A	For 50 Hz system, auxiliary voltage 94 ~ 127 V AC
MK231A - 240A6	For 60 Hz system, auxiliary voltage 198 ~ 265 V AC
MK231A - 110A6	For 60 Hz system, auxiliary voltage 94 ~ 127 V AC



MK232A

Features

- Microprocessor based numerical relay
- Current measurement based on fundamental frequency
- Low-set earth-fault
- High-set earth-fault
- Local display of measured and set values
- Definite time for low-set and high-set
- Non-volatile fault value recording
- Programmable relay outputs
- Five selectable IDMT characteristic curves
- Complies with IEC 60255-26 standard

Technical Data

RATINGS

Rated current (I_n)	: 5 A
Rated frequency	: 50 or 60 Hz
Burden	: < 0.3 VA at I_n
Thermal withstand	: $4 \times I_n$ continuous

AUXILIARY SUPPLY

Model MK232A-240A (6)	: 198 ~ 265 V AC
Model MK232A-110A (6)	: 94 ~ 127 V AC
Supply frequency	: 50 or 60 Hz
VA rating	: 3 VA typical

SETTING RANGES

Low-set ($I >$)	: 0.1 A to 5.0 A, step 0.05 A / 2% to 100%, step 1%
Low-set time multiplier ($kt >$)	: 0.05 to 1.0, step 0.01
Low-set definite time ($t >$)	: 0.05 to 99 sec, step 0.01 (0.05 to 1.0) / 0.1 (1.1 to 99)
High-set ($I >>$)	: 0.1 A to 50 A or disable, step 0.1 A / 2% to 1000%, step 2%
High-set delay time ($t >>$)	: 0.05 sec to 2.5 sec, step 0.01

ACCURACY

Protection thresholds	: $\pm 5\%$
Time delay	: $\pm 5\%$ with a minimum of 50 ms

CONTACTS (R1 & R2)

Contact arrangement	: Change-over
Contact rating	: 5 A, 250 V AC ($\cos\phi = 1$)
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5×10^6 operations

INDICATORS

Auxiliary supply	: Green indicator
Pick-up	: Red indicator
Trip	: 7-segment display and red indicators

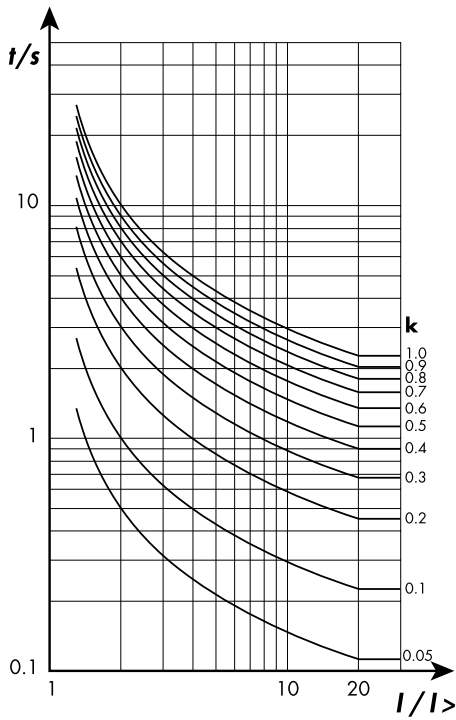
MECHANICAL

Mounting	: Panel mounting
Front panel	: Standard DIN 96 mm x 96 mm
Approximate weight	: 0.6 kg

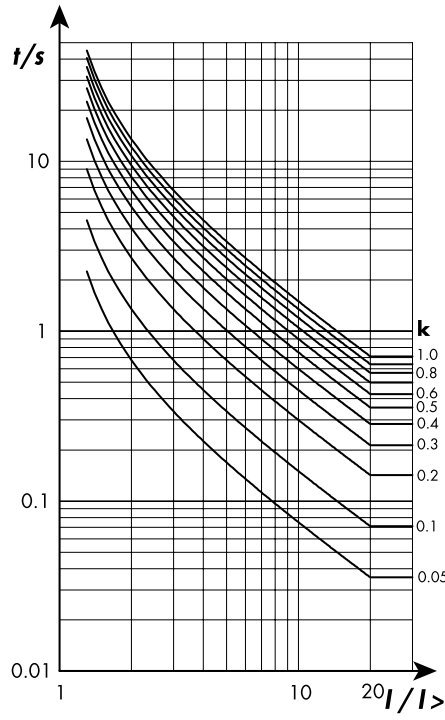
ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to $+55^\circ\text{C}$
Humidity	: 56 days at 93% RH and 40°C non-condensing

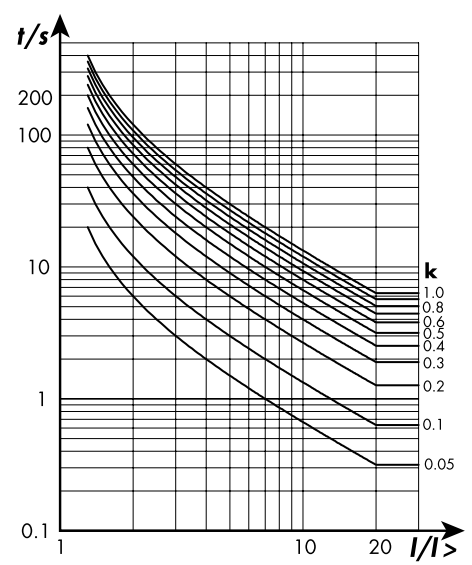
NORMAL INVERSE 3/10



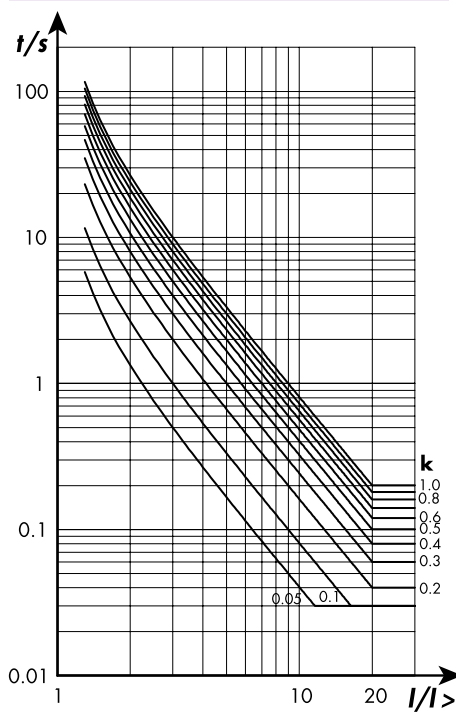
VERY INVERSE



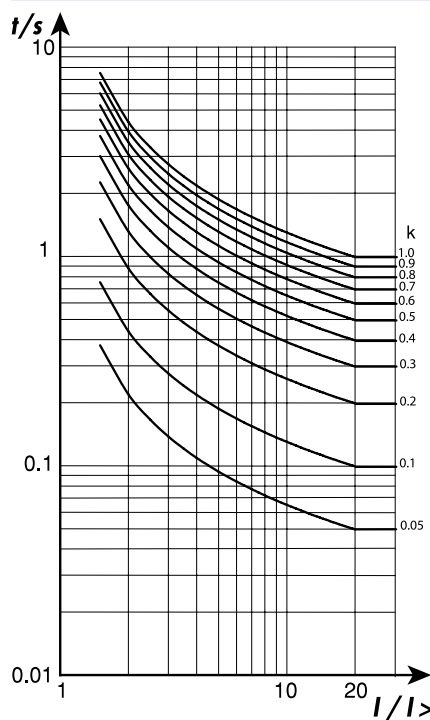
LONG TIME INVERSE



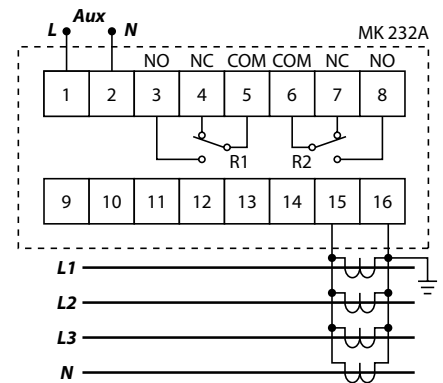
EXTREMELY INVERSE



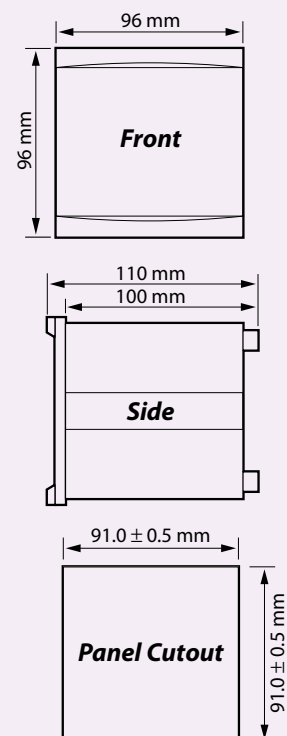
NORMAL INVERSE 1.3/10



TYPICAL APPLICATION DIAGRAM



CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK232A - 240A	For 50 Hz system, auxiliary voltage 198 ~ 265 V AC
MK232A - 110A	For 50 Hz system, auxiliary voltage 94 ~ 127 V AC
MK232A - 240A6	For 60 Hz system, auxiliary voltage 198 ~ 265 V AC
MK232A - 110A6	For 60 Hz system, auxiliary voltage 94 ~ 127 V AC



MK201A

Features

- Microprocessor based numerical relay
- Current measurement based on fundamental frequency
- Low-set definite time relay
- High-set instantaneous relay
- Separate low-set and high-set indicators
- Option to disable the high-set relay
- Front panel access to the test function
- Complies with IEC 60255-26 standard

PERFORMANCE

Adjustable accuracy : Less than $\pm 5\%$
 Repeatability : Less than 0.5% of full scale

MECHANICAL

Mounting : Panel mounting
 Front panel : Standard DIN
 96 mm x 96 mm
 Approximate weight : 0.6 kg

ENVIRONMENTAL CONDITIONS

Temperature : -5°C to $+55^{\circ}\text{C}$
 Humidity : 56 days at 93% RH and 40°C non-condensing

Technical Data

RATINGS

Rated current (I_n) : 5 A
 Rated frequency : 50 Hz
 Burden : $< 0.3 \text{ VA}$ at I_n
 Thermal withstand : $4 \times I_n$ continuous

AUXILIARY SUPPLY

Model MK201A-240A : 198 ~ 265 V AC
 Model MK201A-110A : 94 ~ 127 V AC
 Supply frequency : 50 Hz
 VA rating : 3 VA typical

SETTING RANGES

Low-set ($I >$) : 0.1 A to 2.0 A
 : 2% to 40%
 Low-set delay time (DELAY): 0.05 sec to 1.0 sec
 High-set ($I >>$) : $I >$ to $10 \times I$ or disable
 High-set delay time ($t >>$): Instantaneous

CONTACTS

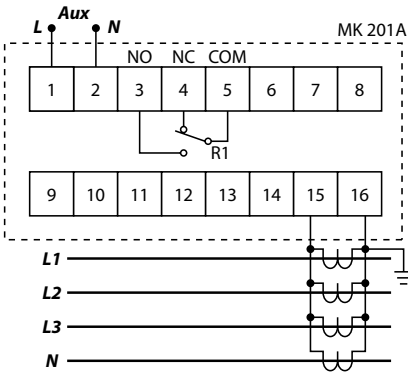
Trip contact (R1) : Manual reset type
 Contact Arrangement : Change-over
 Contact rating : 5 A, 250 V AC ($\cos\phi = 1$)
 Contact material : Silver alloy
 Expected electrical life: 100,000 operations at rated current
 Expected mechanical life: 5×10^6 operations

INDICATORS

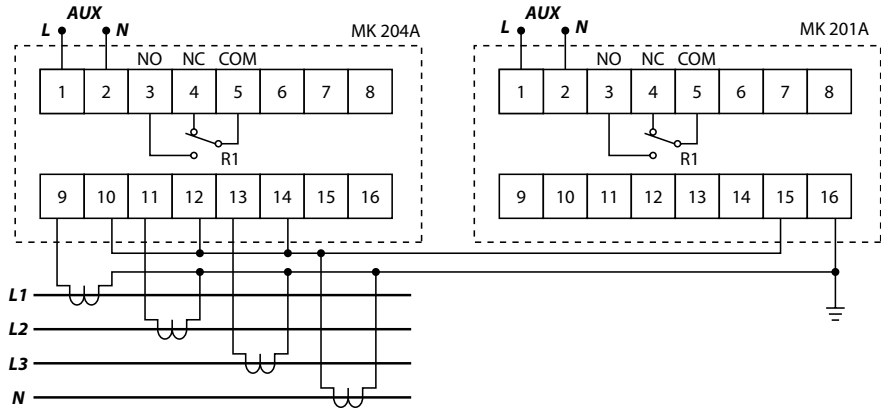
Auxiliary supply : Green indicator
 Pick-up : Red indicator
 Trip : Red indicator



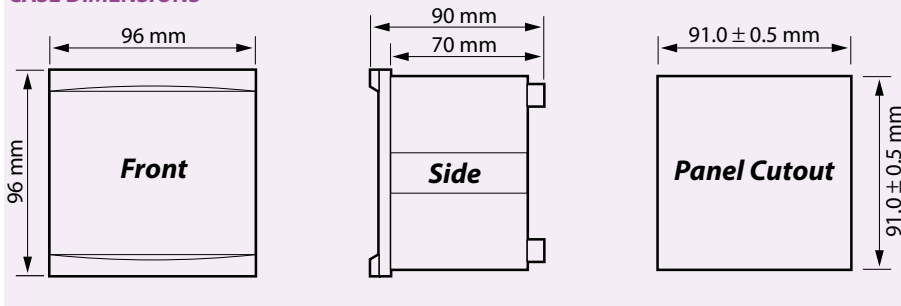
TYPICAL APPLICATION DIAGRAM



COMBINED OVERCURRENT & EARTH FAULT RELAYS



CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK201A - 240A	For 50 Hz system, auxiliary voltage 198 ~ 265 V AC
MK201A - 110A	For 50 Hz system, auxiliary voltage 94 ~ 127 V AC



MK202A

Features

- Microprocessor based numerical relay
- Current measurement based on fundamental frequency
- Low-set inverse definite minimum time (IDMT) relay
- High-set instantaneous relay
- Separate low-set and high-set trip indicators
- Option to disable high-set element
- Front panel access to test function
- Complies with IEC 60255-26 standard

Technical Data

RATINGS

Rated current (I_N)	: 5 A
Rated frequency	: 50 Hz
Burden	: < 0.3 VA at I_N
Thermal withstand	: 4 x I_N continuous

AUXILIARY SUPPLY

Model MK202A-240A	: 198 ~ 265 V AC
Model MK202A-110A	: 94 ~ 127V AC
Supply frequency	: 50 Hz
VA rating	: 3 VA typical

SETTING RANGES

Low-set ($I >$)	: 0.1A to 2.0 A
	: 2% to 40%
Time multiplier (TM)	: 0.05 to 1.0
High-set ($I >>$)	: $I >$ to $10 \times I >$ or disable
High-set delay time ($t >>$)	: Instantaneous

TIME CURRENT CHARACTERISTIC CURVE

- Normal Inverse

CONTACTS

Trip contact (R1)	: Manual reset type
Contact Arrangement	: Change-over
Contact rating	: 5 A, 250 V AC ($\cos\phi = 1$)
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5×10^6 operations

INDICATOR

Auxiliary indicator	: Green indicator
Pick-up	: Red indicator
Trip	: Red indicator

PERFORMANCE

Adjustable accuracy	: Less than $\pm 5\%$.
Repeatability	: Less than 0.5% of full scale.

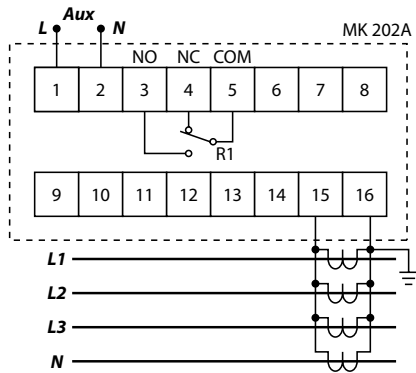
MECHANICAL

Mounting	: Panel mounting
Front panel	: Standard DIN
	96 mm x 96 mm
Approximate weight	: 0.6 kg

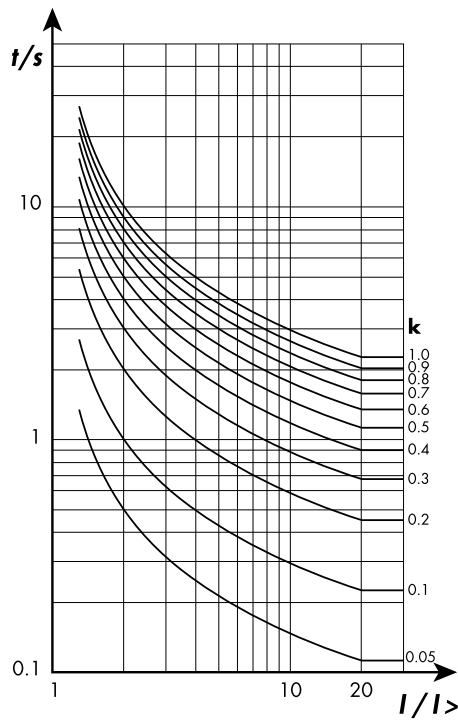
ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to $+55^\circ\text{C}$
Humidity	: 56 days at 93% RH and 40°C non-condensing

TYPICAL APPLICATION DIAGRAM

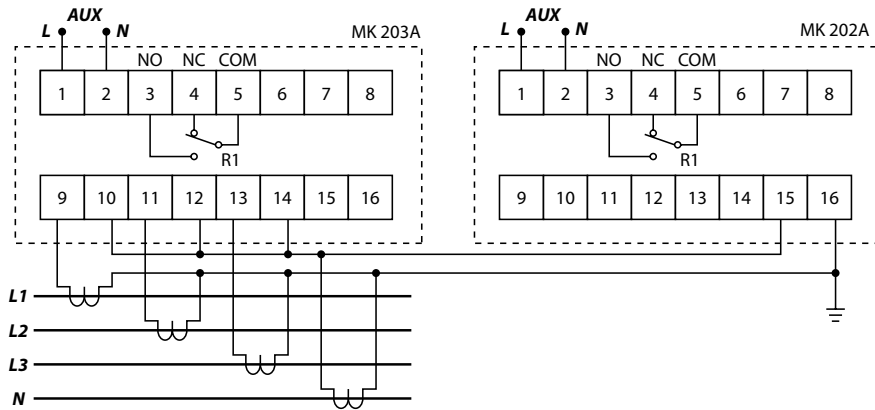


IDMT NORMAL INVERSE

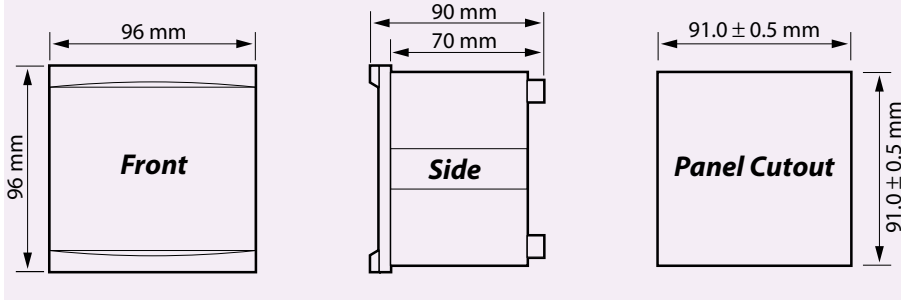


MK202A Earth Fault Relay

COMBINED IDMT OVERCURRENT & EARTH FAULT RELAYS

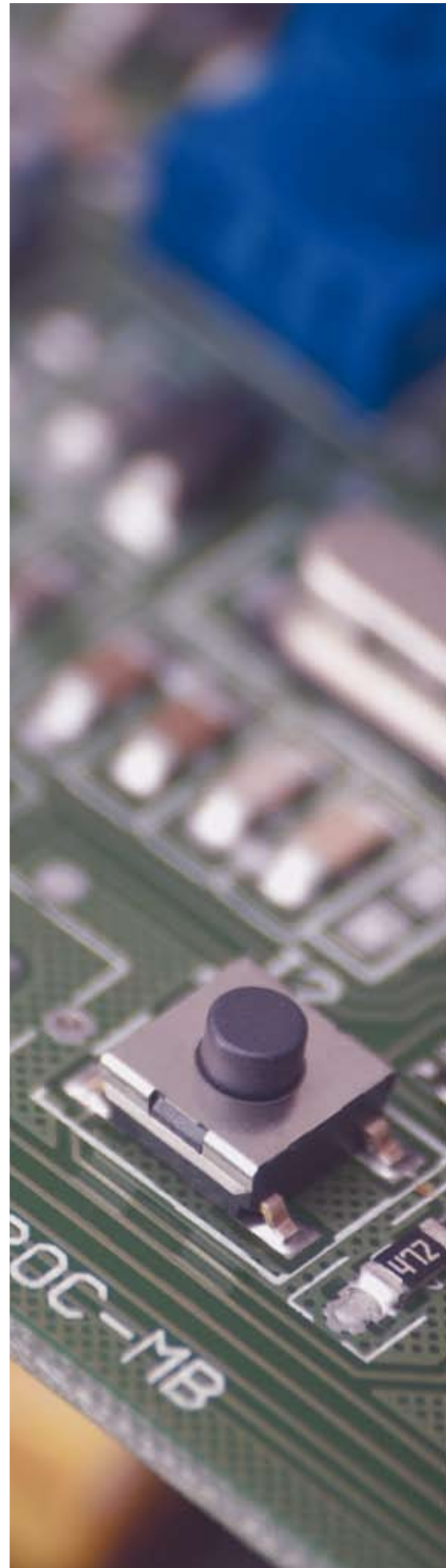


CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK202A - 240A	For 50 Hz system, auxiliary voltage 198 ~ 265 V AC
MK202A - 110A	For 50 Hz system, auxiliary voltage 94 ~ 127 V AC



MK300A / 300EA



MK300A



MK300EA

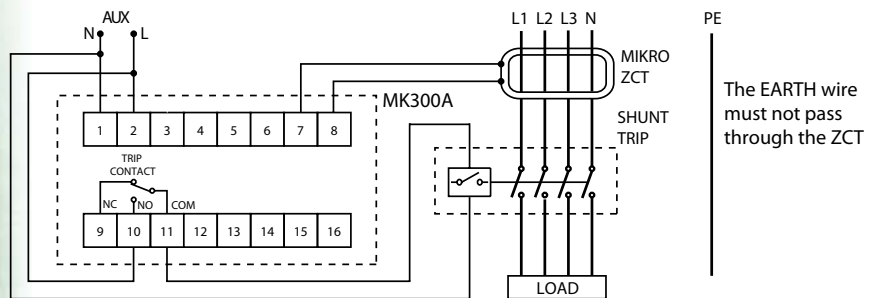
Features for MK300A / 300EA

- Numerical earth leakage relay
- Programmable current sensitivity and time delay
- Detection of no connection to ZCT
- Relay trip indicator
- Relay alarm indicator
- Real-time leakage current display
- 50% pre-fault indicator
- Leakage fault current recording
- Standard DIN 96x96mm panel mounting
- Protected against nuisance tripping

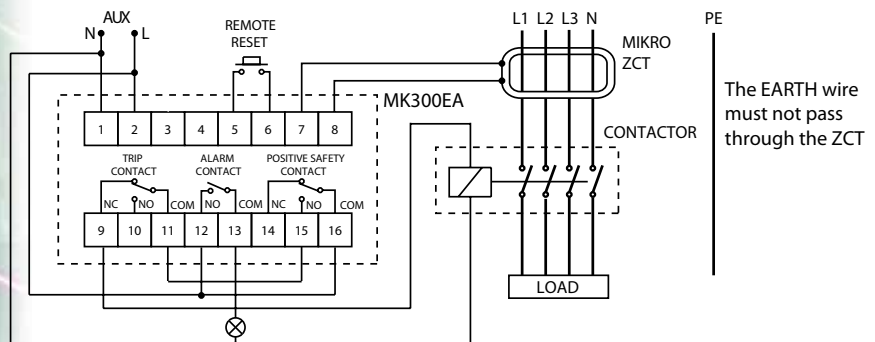
Features for MK300EA only

- Positive safety output contact
- Pre-fault alarm contact
- Remote reset function

TYPICAL APPLICATION DIAGRAM For MK300A



TYPICAL APPLICATION DIAGRAM For MK300EA



Technical Data

AUXILIARY SUPPLY

Model MK300A / 300EA -230A : 184 ~ 276 V AC
 Model MK300A / 300EA -110A : 94 ~ 127 V AC
 Rated frequency : 50 Hz
 VA rating : 3 VA typical

SETTING

Sensitivity adjustment : 30mA, 50mA,
 0.10~1.00A (Step=50mA)
 1.00~10.0A (Step=1.00A)
 Time delay adjustment : Instantaneous, 0.1~3.0sec (Step=0.1s)

RECORD

Fault record : 3 latest tripped fault currents or "tSt" for manual test trip
 Storage : Non-volatile memory

INPUT

Remote Test / Reset Inputs : N.O. dry contact *

OUTPUTS

Trip contact : Activated during leakage trip, manual test trip or ZCT connection error
 Positive safety contact* : Activated when power-up and relay function correctly
 Alarm contact* : Activated when measured leakage current exceeded 50% of $I_{\Delta n}$.

CONTACTS

Contact arrangement : Change-over
 Contact rating : 5A(NO) / 3A(NC) / 250V AC1
 Expected electrical life : 10,000 operations at rated current
 Expected mechanical life : 5×10^6 operations

INDICATORS

Pre-fault alarm : Red indicator (Normal blink)
 Time delay : Red indicator (Fast blink)
 Leakage trip : 7-segment display and red indicator
 ZCT connection error : 7-segment display and red indicator
 Real-time leakage current : 7-segment display

ZERO - PHASE CURRENT TRANSFORMER

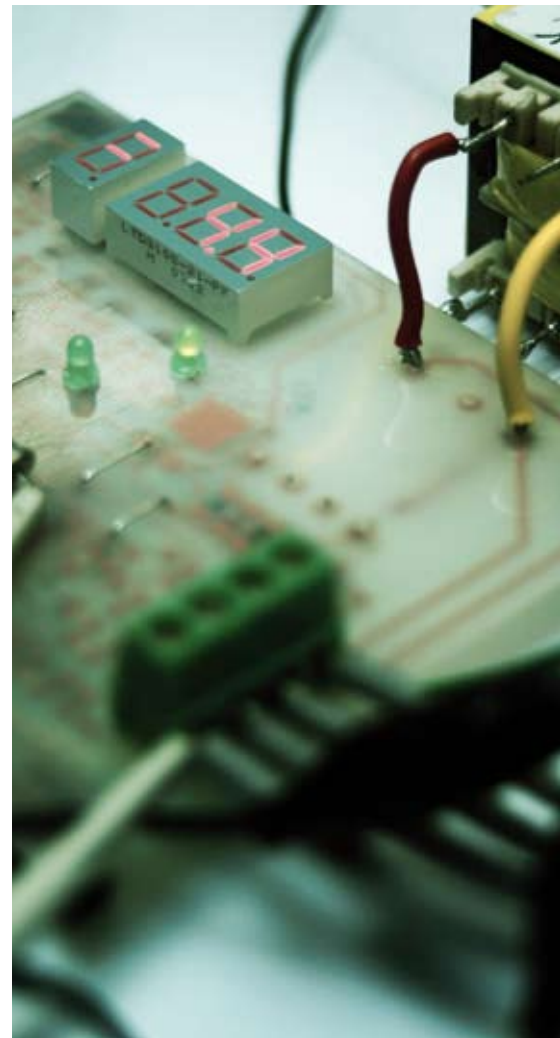
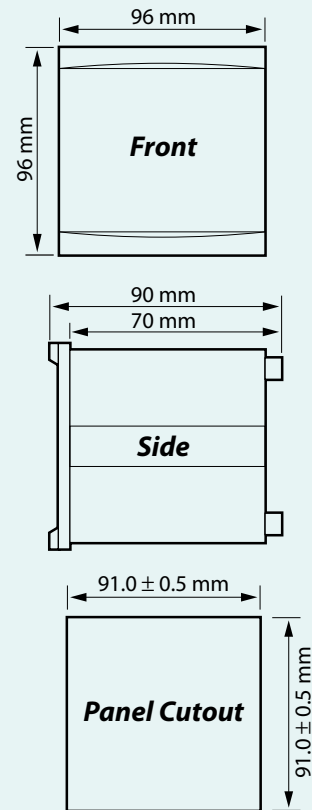
To operate with Mikro's ZCT series of current transformer

MECHANICAL

Mounting method : Panel mounting
 Front panel : Standard DIN 96mm x 96mm
 Approximate weight : 0.58kg (excluding ZCT)

* Applicable to MK 300EA series only

CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK300A - 230A	For 50Hz system, auxiliary voltage 184~276VAC
MK300EA - 230A	For 50Hz system, auxiliary voltage 184~276VAC
MK300A - 110A	For 50Hz system, auxiliary voltage 94~127VAC
MK300EA - 110A	For 50Hz system, auxiliary voltage 94~127VAC

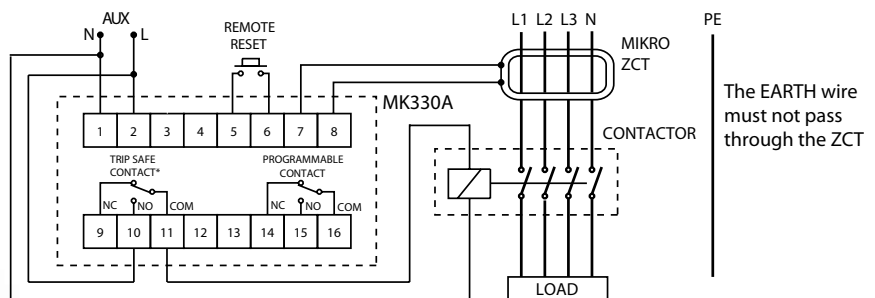


MK330A

Features

- Numerical auto-reclosing earth leakage relay
- Programmable current sensitivity and time delay
- Programmable dead time and number of shots
- Programmable persistent fault time and reclaim time
- Programmable lockout auto reset time
- Incorporated positive safety feature into trip contact
- One programmable contact for flexibility
- Detection of no connection to ZCT
- Relay trip indicator
- Relay alarm indicator
- Real-time leakage current display
- Leakage fault current recording
- Remote reset function
- Standard DIN 96x96mm panel mounting
- Protected against nuisance tripping

TYPICAL APPLICATION DIAGRAM



* The trip safe contact is activated (terminal 10-11 closed) when the relay is in normal power-up condition with the measured leakage current less than $0.85 I\Delta n$.

Technical Data

AUXILIARY SUPPLY

Model MK330A-230A	: 184~276VAC
Model MK330A-110A	: 94~127VAC
Rated frequency	: 50Hz
VA rating	: 3VA typical

SETTING

Sensitivity adjustment	: 30mA, 50mA, 0.10~1.00A (Step=50mA) 1.00~10.0A (Step=1.00A)
Time delay adjustment	: Instantaneous, 0.1~3.0sec (Step=0.1s)
Number of shots	: 0~30 (Step=1, 0=Disable auto re-close function)
Dead time	: 1~500sec (Step=1sec)
Persistent fault time	: 0~500sec (Step=1sec, 0=Disable function)
Reclaim time	: 0~500min (Step=1min, 0=Disable function)
Lockout auto reset time	: 0~200hour (Step=1Hr, 0=Disable function)
Programmable contact	: Option 0 = Disable Option 1 = All (Option 2 to 6) Option 2 = ZCT error Option 3 = Leakage trip, test trip, re-close lockout Option 4 = Re-close lockout Option 5 = Pre-fault alarm, leakage trip, test trip, re-close lockout Option 6 = Re-close lockout, ZCT error

RECORD

Fault record	: 3 latest tripped fault currents or "tSt" for manual test trip
Storage	: Non-volatile memory

INPUT

Remote reset	: N.O. dry contact
--------------	--------------------

OUTPUTS

Trip safe contact	: Activated when the relay is in normal power-up condition with the measured leakage current less than 0.85 I _{Δn} .
Programmable contact	: Activated according to user setting

CONTACTS

Contact arrangement	: Change-over
Contact rating	: 5A (NO) / 3A (NC) / 250V AC1
Expected electrical life	: 10,000 at rated current
Expected mechanical life	: 5 x 10 ⁶ operations

INDICATORS

Pre-fault alarm	: Red indicator (Normal blink)
Time delay	: Red indicator (Fast blink)
Leakage trip	: 7-segment display and red indicator
Re-close lockout	: 7-segment display and red indicator
ZCT connection error	: 7-segment display and red indicator
Real-time leakage current	: 7-segment display

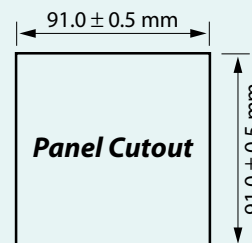
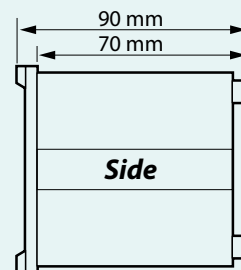
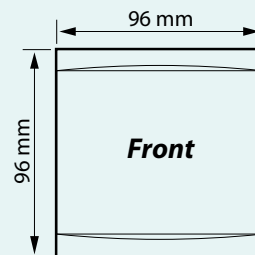
ZERO-PHASE CURRENT TRANSFORMER

To operate with Mikro's ZCT series of current transformers

MECHANICAL

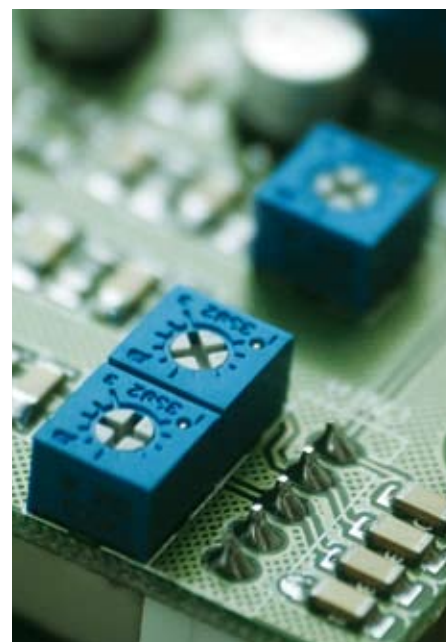
Mounting method	: Panel mount
Front panel	: Standard DIN 96x96mm
Approximate weight	: 0.58kg (excluding ZCT)

CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK330A-230A	For 50Hz system, auxiliary voltage 184~276VAC
MK330A-110A	For 50Hz system, auxiliary voltage 94~127VAC



MK301A / 302A / 301E



MK301A



MK302A



MK301E

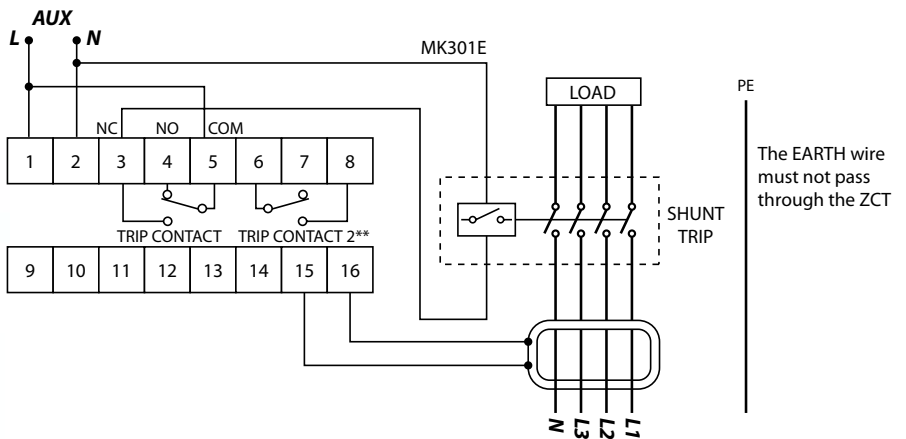
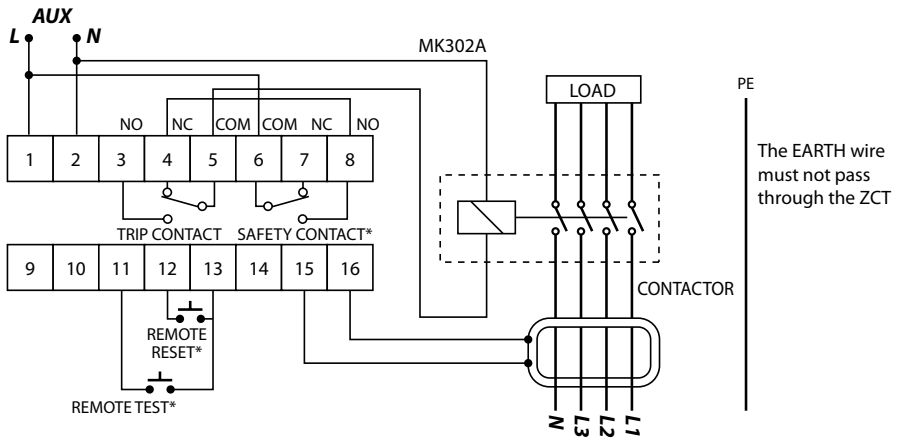
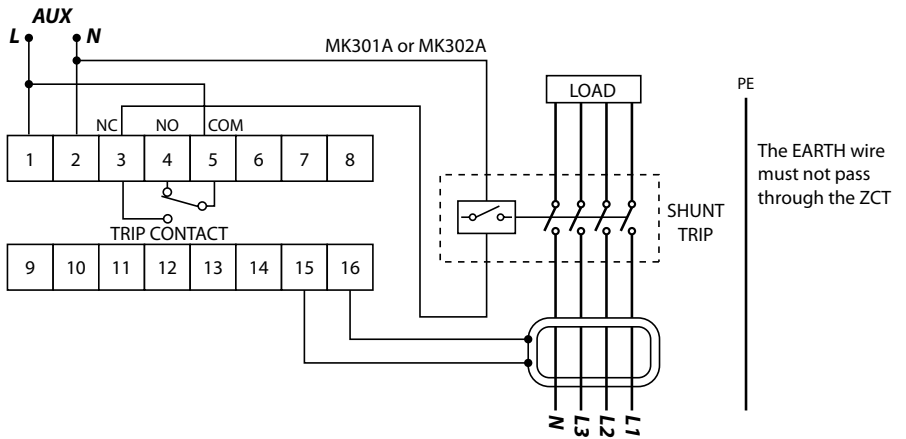
Features

- Trip starting indicator
- Detection of no connection to current transformer for extra safety
- Relay tripped indicator
- High immunity to electrical interference

Features for MK302A only

- Safety output contact
- Earth leakage level indicators
- Remote reset and remote test functions

TYPICAL APPLICATION DIAGRAMS



* Applicable to MK302A series only

** Applicable to MK301E series only

Technical Data

AUXILIARY SUPPLY

Model MK301A / 302A -240A	: 198 ~ 265 V AC
Model MK301A / 302A -110A	: 94 ~ 127 V AC
Rated frequency	: 50 / 60 Hz
VA rating	: 3 VA typical

SETTING RANGES

Sensitivity adjustment	: 0.03 A to 30 A
Delay time adjustment	: 0 sec to 3.0 sec

PERFORMANCE

Setting accuracy	: -15% to +0%
Timing accuracy	: ±5%

CONTACTS

Contact arrangement	: 1 x manual reset type : 1 x safety contact* : NC and NO contacts available
Contacts rating	: 5 A, 250 V AC (cosφ = 1) contact rating
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5 x 10 ⁶ operations

INPUTS

Remote Test* / Reset Inputs*	: N.O. dry contact
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INDICATORS

Auxiliary supply	: Green indicator
Time delay	: Red indicator
Trip	: Red indicator
Real-time leakage current	: Red indicator

ZERO - PHASE CURRENT TRANSFORMER

To operate with Mikro's ZCT series of current transformer

MECHANICAL

Mounting method	: Panel mounting
Front panel	: Standard DIN 96mm x 96mm
Approximate weight	: 0.6 kg (excluding ZCT)

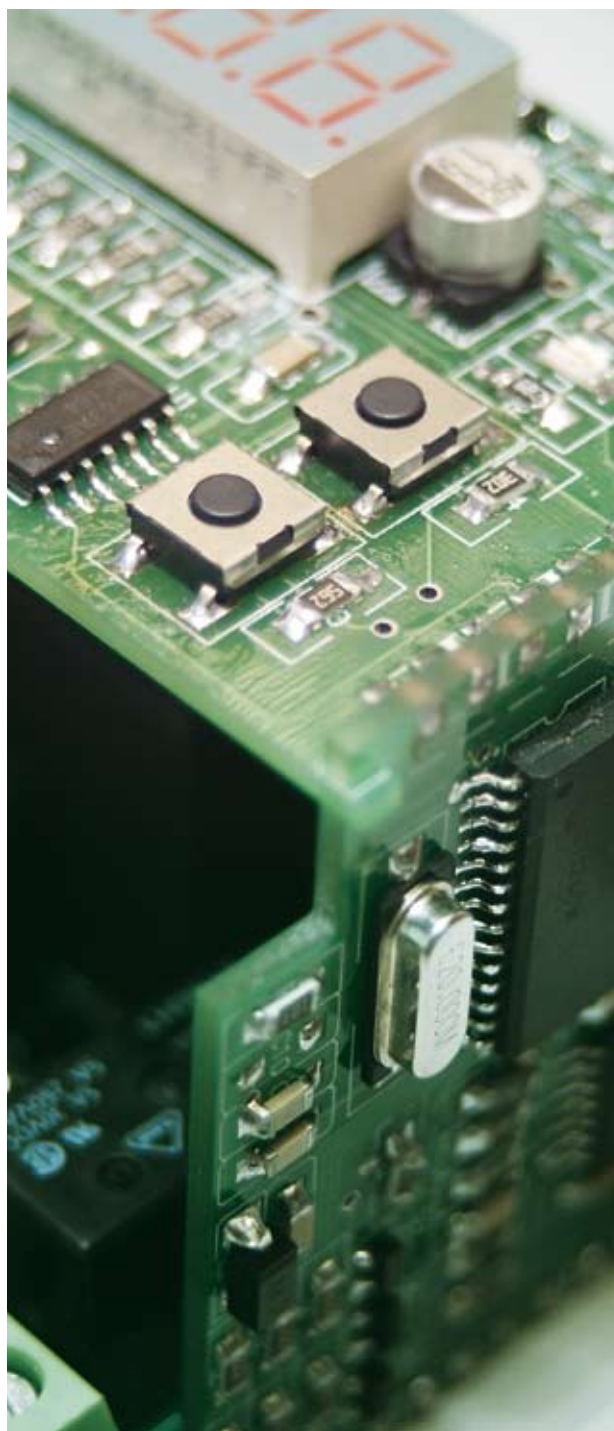
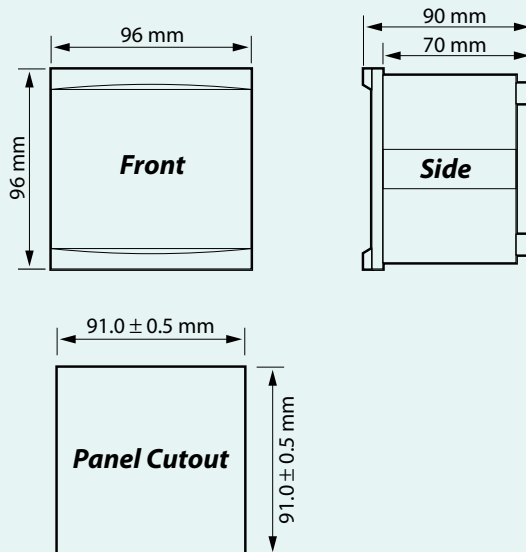
ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to +55°C
Humidity	: 56 days at 93% RH and 40°C non-condensing

* Applicable to MK302A series only

** Applicable to MK301E series only

CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MK301A - 240A	For 50 / 60 Hz system, auxiliary voltage 198 ~ 265 V AC
MK301A - 110A	For 50 / 60 Hz system, auxiliary voltage 94 ~ 127 V AC
MK302A - 240A	For 50 / 60 Hz system, auxiliary voltage 198 ~ 265 V AC
MK302A - 110A	For 50 / 60 Hz system, auxiliary voltage 94 ~ 127 V AC
MK301E - 240A	For 50 / 60 Hz system, auxiliary voltage 198 ~ 265 V AC
MK301E - 110A	For 50 / 60 Hz system, auxiliary voltage 94 ~ 127 V AC

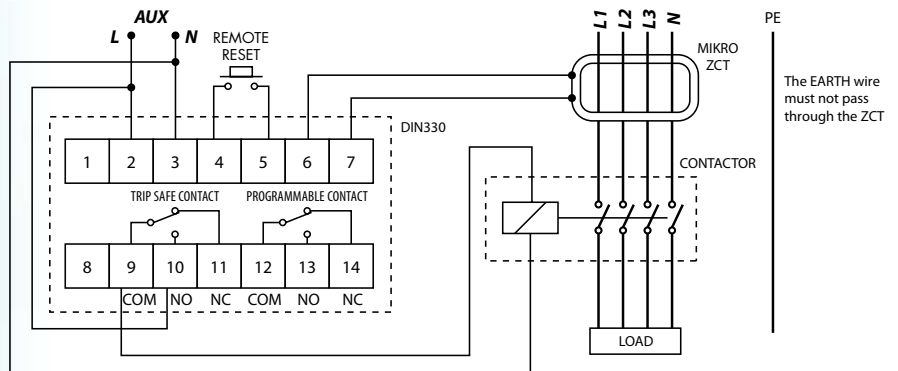


DIN330

Features

- Numerical self reclosing earth leakage relay
- Programmable current sensitivity and time delay
- Programmable dead time and number of shots
- Programmable persistent fault time and reclaim time
- Programmable lockout auto reset time
- Incorporated positive safety feature into trip contact
- One programmable contact for flexibility
- Detection of no connection to ZCT
- Relay trip indicator
- Relay alarm indicator
- Real-time leakage current display
- Leakage fault current recording
- Remote reset function
- Standard DIN rail mounting
- Protection against nuisance tripping
- Standard 35mm DIN rail mounting

TYPICAL APPLICATION DIAGRAM



* The trip safe contact is activated (terminal 9-10 closed) when the relay is in normal power-up condition with the measured leakage current less than $0.85 I\Delta n$.

Technical Data

AUXILIARY SUPPLY

Model DIN330-240 A(6)	: 198 ~ 265 V AC
Rated frequency	: 50 or 60 Hz
VA rating	: 3 VA typical

SETTINGS

Sensitivity adjustment	: 30 mA, 50 mA, 0.10 A – 1.00 A (Step = 50 mA), 1.00 A – 10.0 A (Step = 1.00 A)
Time delay adjustment	: Instantaneous, 0.1s – 3.0s. Step = 0.10 sec.
Number of shots	: 0 - 30. Step = 1. 0 = Disable auto reclose function
Dead time	: 1 - 500 sec. Step = 1 sec.
Permanent fault time	: 0 - 500 sec. Step = 1 sec. 0 = Disable function
Reclaim time	: 0 - 500 minute. Step = 1 min. 0 = Disable function
Lockout auto reset time	: 0 - 200 hour. Step = 1 Hrs. 0 = Disable function
Programmable contact	: Option 0 = Disable Option 1 = All (Option 2 to 4) Option 2 = ZCT error Option 3 = Leakage trip, test trip, re-close lockout Option 4 = Re-close lockout Option 5 = Pre-fault alarm, leakage trip, test trip, reclose lockout Option 6 = Re-close lockout, ZCT error

CONTACTS

Contact arrangement	: Change-over
Contact rating	: 5A (NO) / 3A (NC) / 250 V AC1
Expected electrical life	: 10,000 operations at rated current
Expected mechanical life	: 5 x 10 ⁶ operations

RECORD

Fault record	: 3 latest tripped fault currents or "tSt" for manual test trip
Storage	: Non-volatile memory

INPUTS

Remote reset	: N.O. dry contact
--------------	--------------------

OUTPUTS

Trip safe contact	: Activated when the relay is in normal power-up condition with the measured leakage current less than 0.85 I _{Δn} .
Programmable contact	: Activated according to user setting

INDICATORS

50% pre-fault alarm	: Red indicator (Normal blink)
Time delay	: Red indicator (Fast blink)
Leakage trip	: 7-segment display and red indicator
Reclose lockout	: 7-segment display and red indicator
ZCT fault	: 7-segment display and red indicator
Real time leakage current	: 7-segment display

ZERO-PHASE CURRENT TRANSFORMER

To operate with Mikro's ZCT series of current transformer

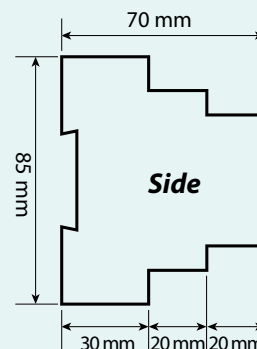
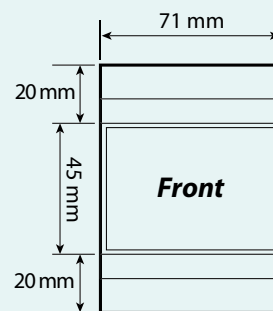
MECHANICAL

Mounting method	: Standard 35 mm din rail mounting
Approximate weight	: 0.38 kg (Excluding ZCT)

ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to +55°C
Humidity	: 56 days at 93% RH and 40°C non-condensing

CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
DIN330 - 240 A	For 50 Hz system, auxiliary voltage 240 V AC
DIN330 - 240 A6	For 60 Hz system, auxiliary voltage 240 V AC





DIN310 / 310E

Features

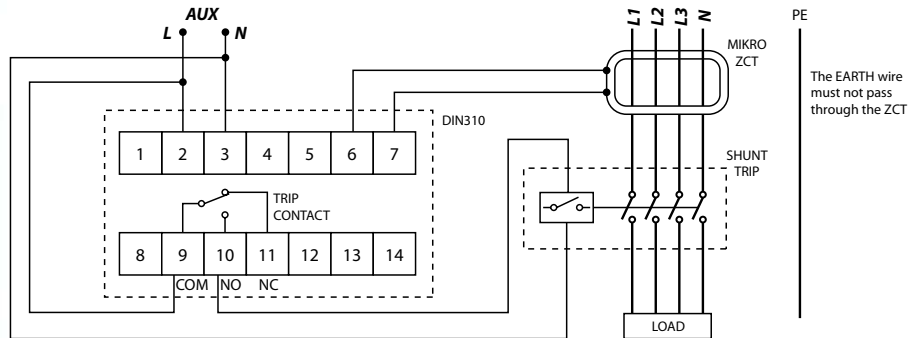
- Numerical earth leakage relay
- Programmable current sensitivity and time delay
- Detection of no connection to ZCT
- Relay trip indicator
- Relay alarm indicator
- Real-time leakage current display
- Leakage fault current recording
- 50% pre-fault indicator
- Standard DIN rail mounting
- Protection against nuisance tripping

Features For DIN310E only

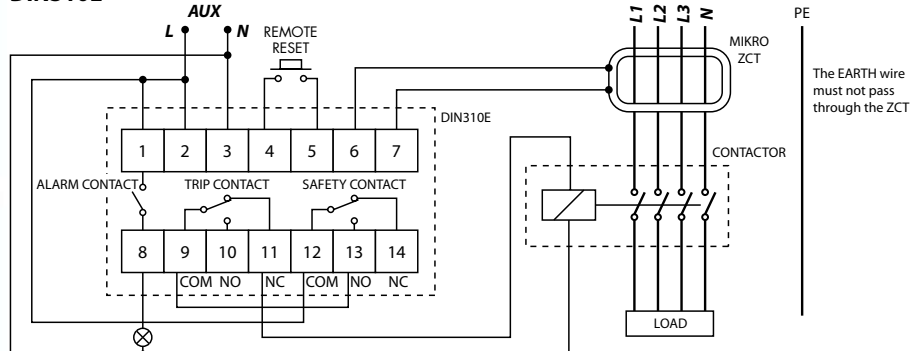
- Positive safety output contact
- 50% pre-fault output contact
- Remote reset function

TYPICAL APPLICATION DIAGRAMS

DIN310



DIN310E



Technical Data

AUXILIARY SUPPLY

DIN310-240 A(6)	: 198 ~ 265 V AC
DIN310E-240 A(6)	: 198 ~ 265 V AC
Rated frequency	: 50 or 60 Hz
VA rating	: 3 VA typical

SETTING RANGES

Sensitivity adjustment	: 30 mA, 50 mA, 0.10 A – 1.00 A (Step = 50 mA), 1.00 A – 10.0 A (Step = 1.00 A)
Time delay adjustment	: Instantaneous, 0.1s – 3.0s. Step = 0.10 sec.

CONTACTS

Contact arrangement	: Change-over
Contact rating	: 5A (NO) / 3A (NC) / 250 V AC1
Expected electrical life	: 10,000 operations at rated current
Expected mechanical life	: 5 x 10 ⁶ operations

RECORD

Fault record	: 3 latest tripped fault currents or "tSt" for manual test trip
Storage	: Non-volatile memory

INPUT

Remote reset*	: N.O. dry contact
---------------	--------------------

OUTPUTS

Trip Contact	: Activated if relay tripped or ZCT fault
Positive safety contact*	: Activated when ZCT is connected properly to the relay
Pre-fault alarm contact*	: Activated when leakage current exceeded 50% of sensitivity setting

INDICATORS

50% pre-fault alarm	: Red indicator
Time delay	: Red indicator
Leakage trip	: 7-segment display and red indicator
ZCT fault	: 7-segment display and red indicator
Real time leakage current	: 7-segment display

ZERO-PHASE CURRENT TRANSFORMER

To operate with Mikro's ZCT series of current transformer

MECHANICAL

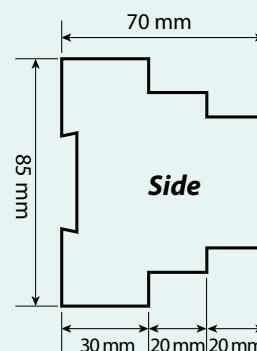
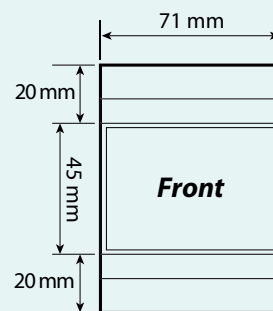
Mounting method	: Standard 35 mm DIN rail mounting
Approximate weight	: 0.38 kg (Excluding ZCT)

ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to +55°C
Humidity	: 56 days at 93% RH and 40°C non-condensing

* Applicable to DIN310E series only

CASE DIMENSIONS



Ordering Information


MODEL	DESCRIPTION
DIN310 - 240 A	For 50 Hz system, auxiliary voltage 240 V AC
DIN310E - 240 A	For 50 Hz system, auxiliary voltage 240 V AC
DIN310 - 240 A6	For 60 Hz system, auxiliary voltage 240 V AC
DIN310E - 240 A6	For 60 Hz system, auxiliary voltage 240 V AC





DIN300 / 300E

Features

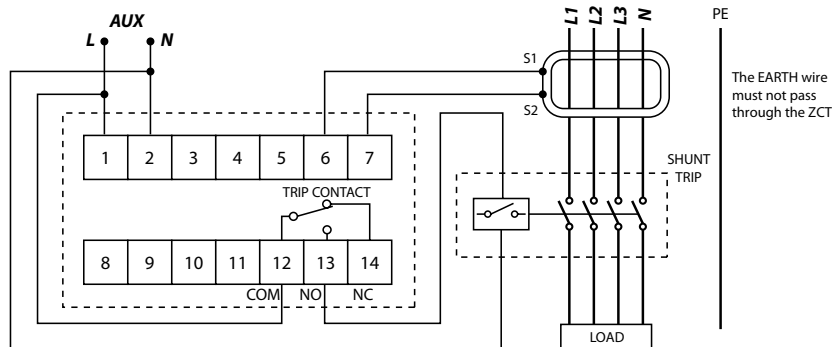
- 25 selectable sensitivity settings: 30 mA to 30 A
- 9 selectable time delays: 0ms to 3s
- Earth leakage level indicators
- Detection of no connection to ZCT
- Relay tripped indicator
- Trip starting indicator
- Protected against nuisance tripping 

Features For DIN300E only

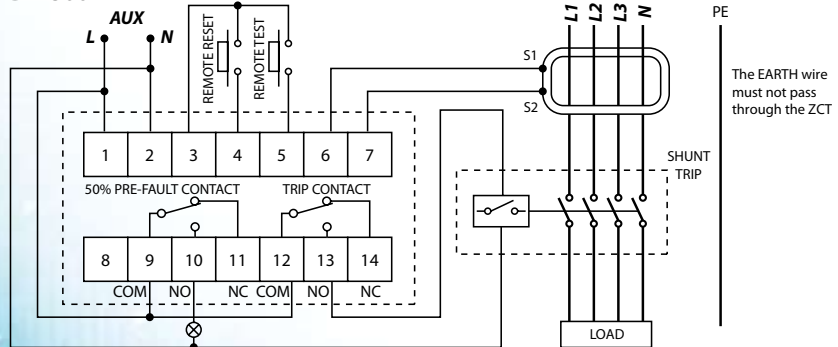
- 50% pre-fault output contact
- Remote test and remote reset functions

TYPICAL APPLICATION DIAGRAMS

DIN300



DIN300E



Technical Data

AUXILIARY SUPPLY

Model DIN300 / 300E -240A	: 198 ~ 265 V AC
Model DIN300 / 300E -110A	: 94 ~ 127 V AC
Rated frequency	: 50 / 60 Hz
VA rating	: 3 VA typical

SETTINGS RANGES

Sensitivity setting	: 30 mA, 50 mA, 75 mA, 100 mA, 125 mA, 150 mA, 200 mA, 250 mA, 300 mA, 500 mA, 750 mA, 1 A, 1.25 A, 1.5 A, 2 A, 2.5 A, 3 A, 5 A, 7.5 A, 10 A, 12.5 A, 15 A, 20 A, 25 A, 30 A.
Time delay setting	: Instantaneous, 50 ms, 100 ms, 150 ms, 250 ms, 350 ms, 500 ms, 1 s, 3 s.

PERFORMANCE

Setting accuracy	: -15% to +0%
Timing accuracy	: ±5%

CONTACTS

Contacts (Trip / 50% pre-fault*)	
Contact arrangement	: Change over
Contact rating	: 5 A, 250 V AC (cosφ = 1)
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5 x 10 ⁶ operations

INPUTS

Remote test* / Reset inputs*	: N.O. dry contacts
------------------------------	---------------------

ZERO - PHASE CURRENT TRANSFORMER

To operate with Mikro's ZCT series of current transformer

INDICATORS

Auxiliary supply	: Green indicator
Time delay	: Red indicator
Trip	: Red indicator
Leakage current*	: 5 red indicators for leakage levels

MECHANICAL

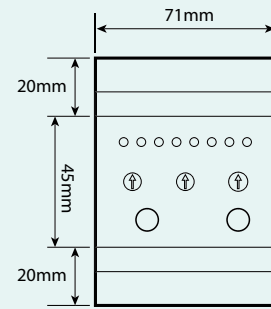
Mounting method	: Din rail mounted
Approximate weight	: 0.3 kg

ENVIRONMENTAL CONDITIONS

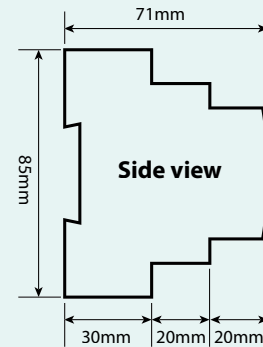
Temperature	: -5°C to +55°C
Humidity	: 56 days at 93% RH and 40°C non-condensing

* Applicable to DIN300E model only

CASE DIMENSIONS



Front view



Side view

Ordering Information

MODEL	DESCRIPTION
DIN300 - 240 A	For 50 / 60 Hz system, auxiliary voltage 240 V AC
DIN300 - 110 A	For 50 / 60 Hz system, auxiliary voltage 110 V AC
DIN300E - 240 A	For 50 / 60 Hz system, auxiliary voltage 240 V AC
DIN300E - 110 A	For 50 / 60 Hz system, auxiliary voltage 110 V AC



ZCT40S/60S/80S/120S



40S



60S

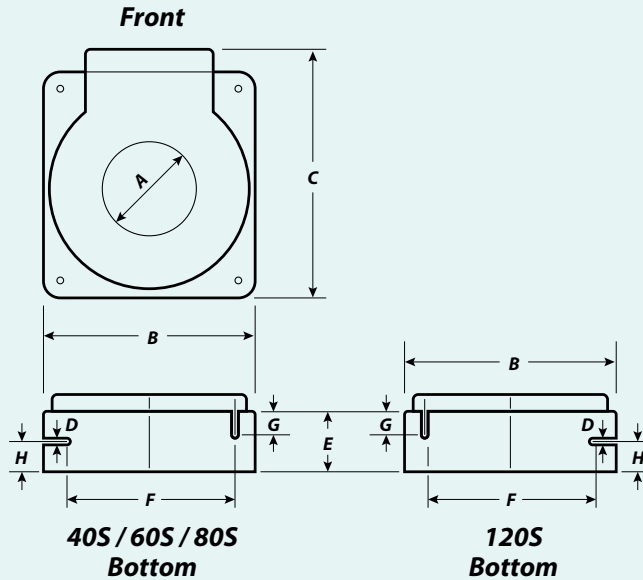


80S



120S

CASE DIMENSIONS



DIMENSION (mm)

DIMENSION (mm)	Model			
	ZCT40S	ZCT60S	ZCT80S	ZCT120S
A	40	60	80	120
B	78	95	120	180.5
C	97	110	135	179.5
D	3.5	6	3.5	6
E	36	31.5	36	37
F	52	62	94	147
G	16	20.5	16	20.5
H	17.5	11	17.5	16

Ordering Information

MODEL	DESCRIPTION
ZCT40S	40mm inner diameter
ZCT60S	60mm inner diameter
ZCT80S	80mm inner diameter
ZCT120S	120mm inner diameter



DVM

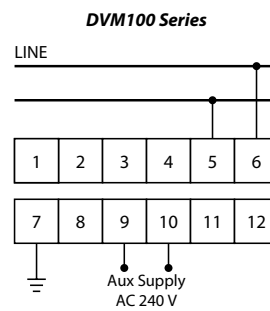
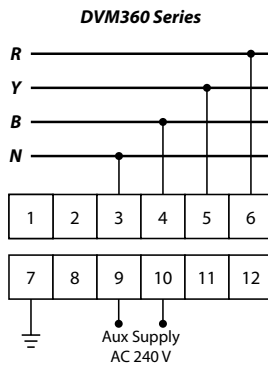
Features

- Built-in selector switch
- Easy-to-read, 14.2mm digit display
- DIN size casing

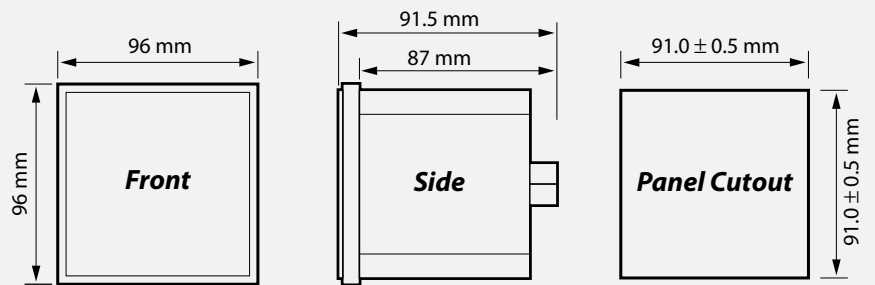
Technical Data

Auxiliary supply	: 198 ~ 265 V AC
	: 94 ~ 127 V AC
VA rating	: 3 VA
Input frequency	: 47 ~ 66 Hz
Maximum input voltage	: 500 Vrms

TYPICAL APPLICATION DIAGRAM



CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
DVM360 - 240A	Auxiliary voltage 240 V AC
DVM100 - 240A	Auxiliary voltage 240 V AC
DVM360 - 110A	Auxiliary voltage 110 V AC
DVM100 - 110A	Auxiliary voltage 110 V AC



DAM

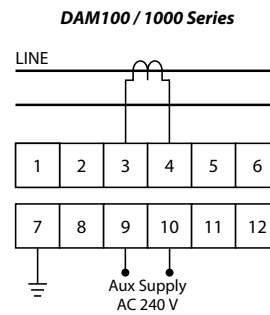
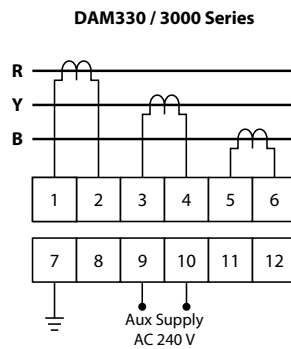
Features

- Built-in selector switch
- Easy-to-read, 14.2mm digit display
- DIN size casing
- Wide selection of current transformer (CT) ratio

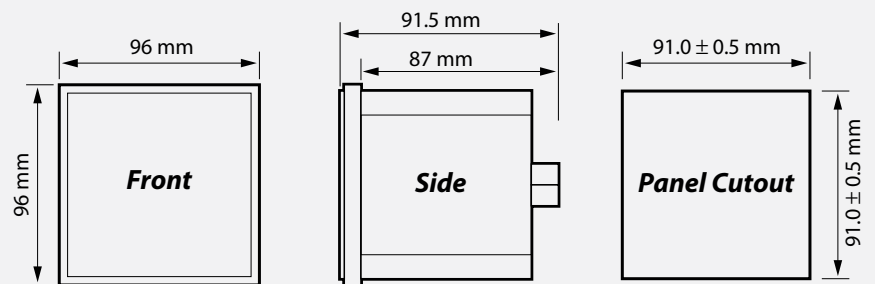
Technical Data

Auxiliary supply	: 198 ~ 265 V AC
	: 94 ~ 127 V AC
VA rating	: 3 VA
Input frequency	: 47 ~ 66 Hz
Maximum input	: 6 A continuous
Ammeter CT ratio	: .../5 A
Class	: 1.0

TYPICAL APPLICATION DIAGRAM



CASE DIMENSIONS



Ordering Information

MODEL /SERIES	WITH SELECTOR	WITHOUT SELECTOR	DISPLAY FORMAT	UNIT
DAM330	✓		000	A
DAM3000	✓		0000	A
DAM100		✓	000	A
DAM1000		✓	0000	A

For primary current from 60A to 500A

DAM 330 - XXXX

DAM 100 - XXXX

Order number

For primary current from 600 A to 5000 A

DAM 3000 - XXXX

DAM 1000 - XXXX

Order number



Model DAM 330 & DAM 100	
ORDER NUMBER	*CT RATIO
0060	60 / 5 A
0100	100 / 5 A
0150	150 / 5 A
0200	200 / 5 A
0250	250 / 5 A
0300	300 / 5 A
0400	400 / 5 A
0500	500 / 5 A

Model DAM3000 & DAM1000	
ORDER NUMBER	*CT RATIO
600	600 / 5 A
800	800 / 5 A
1000	1000 / 5 A
1200	1200 / 5 A
1500	1500 / 5 A
1600	1600 / 5 A
2000	2000 / 5 A
2400	2400 / 5 A
2500	2500 / 5 A
3000	3000 / 5 A
3200	3200 / 5 A
3500	3500 / 5 A
4000	4000 / 5 A
4500	4500 / 5 A
5000	5000 / 5 A

Example: Model DAM 330 - 0060 for digital ammeter with CT ratio 60 / 5 A.

*CT : Current Transformer
For other CT ratio, please contact the manufacturer.

MODEL	DESCRIPTION
DAM330 - xxxx - 240A	Auxiliary voltage 240 V AC
DAM100 - xxxx - 240A	Auxiliary voltage 240 V AC
DAM330 - xxxx - 110A	Auxiliary voltage 110 V AC
DAM100 - xxxx - 110A	Auxiliary voltage 110 V AC
DAM3000 - xxxx - 240A	Auxiliary voltage 240 V AC
DAM1000 - xxxx - 240A	Auxiliary voltage 240 V AC
DAM3000 - xxxx - 110A	Auxiliary voltage 110 V AC
DAM1000 - xxxx - 110A	Auxiliary voltage 110 V AC

MU250 / 150



MU250 3-phase



MU150 Single-phase

Product Description

MU150 and MU250 are voltage relays that combine various protections and starting delay. MU150 is used for single-phase monitoring while MU250 is used for 3-phase monitoring.

Features

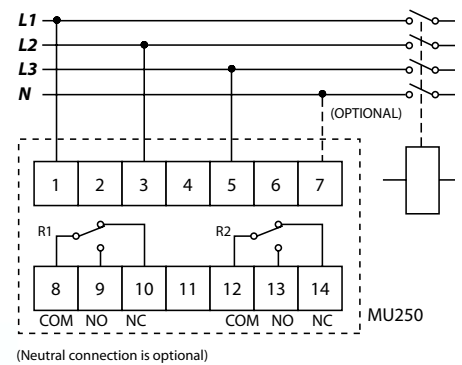
- Microprocessor based numerical relay
- Undervoltage
- Overvoltage
- Delay-on
- 2 voltage-free output contacts
- Voltage and frequency display

Features For MU250 only

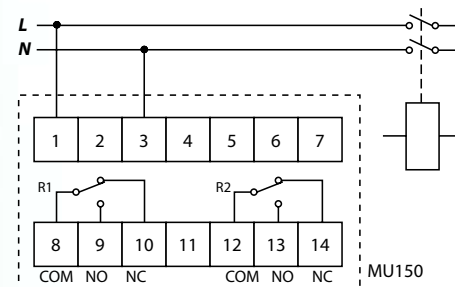
- 3-Phase
- Unbalance
- Phase loss
- Phase sequence
- With or without neutral connection
- Phase to phase or phase to neutral monitoring

TYPICAL APPLICATION DIAGRAMS

MU250



MU150



Technical Data

SETTING RANGES

Undervoltage	: 1% to 25%
Time delay for undervoltage	: 0.1s to 30s
Overvoltage	: 1% to 20%
Time delay for overvoltage	: 0.1s to 30s
Start time delay	: 0s to 999s

For MU250 only:

Unbalance	: 3% to 20%
Time delay for unbalance	: 0.1s to 30s
Phase loss	: Fixed time <0.1s
Phase sequence	: Fixed time <0.1s

POWER SUPPLY INPUT

Input voltage	: MU150: 220V(-25%) to 240V(+20%) AC (Phase-Neutral)
	: MU250: 380V(-25%) to 415V(+20%) AC (Phase-Phase)
Supply frequency	: 45Hz to 65Hz
Maximum power consumption	: MU250: 3VA
	: MU150: 2.5VA

CONTACTS

Contact arrangement	: Change-over
Contact rating	: 5A, 250V AC (cos φ=1)
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5 X 10 ⁶ operations

INDICATORS

Auxiliary supply	: Green LED indicator
Pickup indicator	: Red LED indicator
Trip	: 7-segment display and red LED indicators

MECHANICAL

Mounting	: Din rail mounted
Approximate weight	: MU150: 0.27kg
	: MU250: 0.31kg

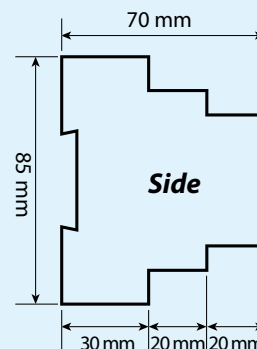
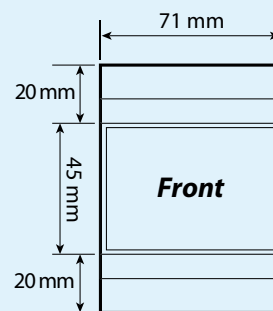
ACCURACY

Protection thresholds	: ± 3%
Time delay	: 0 to 0.5s, ± 15% with minimum 40ms
	: 0.6s and above, < ± 3%
Measurements	: ± 3%

ENVIRONMENTAL CONDITIONS

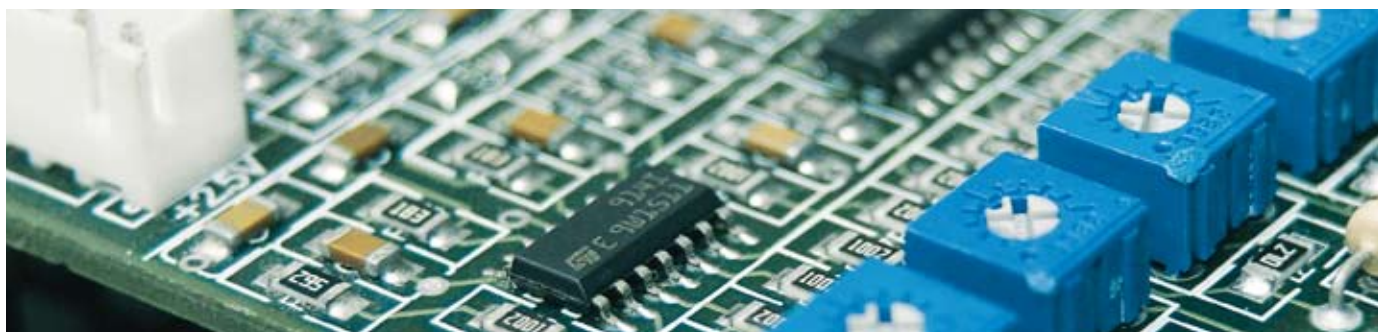
Temperature	: -5 C to +55 C
Humidity	: 56 days at 93% RH and 40 C non-condensing

CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MU150-240V	Single-Phase, 220/230/240 V AC, 45-65 Hz power supply
MU250-415V	3-Phase, 380/400/415 V AC, 45-65 Hz power supply





MU2300

Introduction

The MU2300 is a microprocessor based numerical relay for voltage protection functions in electrical distribution network.

Features

- Multifunction numerical voltage protection relay
- Low-set undervoltage stage ($U<$) with definite-time or inverse-time characteristic
- High-set undervoltage stage ($U<<$) with definite-time
- Low-set overvoltage stage ($U>$) with definite-time or inverse-time characteristic
- High-set overvoltage stage ($U>>$) with definite-time
- Negative sequence overvoltage protection ($U_{2>}$) with definite-time or inverse-time characteristic
- Neutral displacement / residual overvoltage protection ($U_{0>}$) with definite-time or inverse-time characteristic
- Can be used in single-phase or three-phase operation
- Multi-function isolated digital input with wide input voltage range
- Fault record and event code recording
- Five programmable voltage-free output contacts
- Isolated RS485 Modbus - RTU communication

NEGATIVE SEQUENCE OVER-VOLTAGE ELEMENT

Negative sequence over-voltage setting, $U_{2>}$: 5 - 200 V
Time multiplier, TMS	: 0.5 - 100
Negative sequence over-voltage definite time $tU_{2>}$: 0 - 600 s

RESIDUAL OVER-VOLTAGE ELEMENT

Residual over-voltage setting, $U_{0>}$: 0.5 - 130 V
Time multiplier, TMS	: 0.5 - 100
Residual over-voltage definite time $tU_{0>}$: 0 - 600 s

Technical Data

INPUTS

Measuring input:

Rated voltage input	: 57-130 V
Rated frequency	: 50 / 60 Hz

Rated auxiliary voltage:

Model MU2300-150D	: 24~150 V DC
Model MU2300-240AD	: 85~265 V AC 110~340 V DC

Power consumption:

AC auxiliary voltage	: 6 ~ 10 VA typical
DC auxiliary voltage	: 5 ~ 9 W typical

Binary Input:

External binary input	: 85~265 V AC/DC
-----------------------	------------------

OUTPUTS

5 programmable contacts + 1 IRF contact:

Rated voltage	: 250 V AC/DC
Continuous carry	: 5 A
Make and carry for 0.2 s	: 30 A

Contact specification:

Expected electrical life	: 10^5 operations
Expected mechanical life	: 5×10^6 operations

UNDER-VOLTAGE ELEMENT

Low set setting $U<$: 5 - 130 V
High set setting $U<<$: 5 - 130 V
Time multiplier, TMS	: 0.5 - 100
Low set Definite time $tU<$: 0 - 600 s
High set Definite time $tU<<$: 0 - 600 s

OVER-VOLTAGE ELEMENT

Low set setting $U>$: 5 - 200 V
High set setting $U>>$: 5 - 260 V
Time multiplier, TMS	: 0.5 - 100
Low set definite time $tU>$: 0 - 600 s
High set definite time $tU>>$: 0 - 600 s

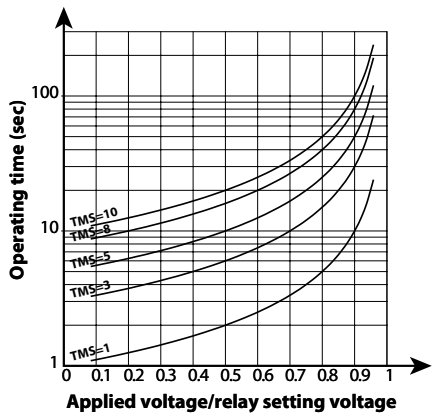
COMMUNICATION

RS485 Modbus - RTU

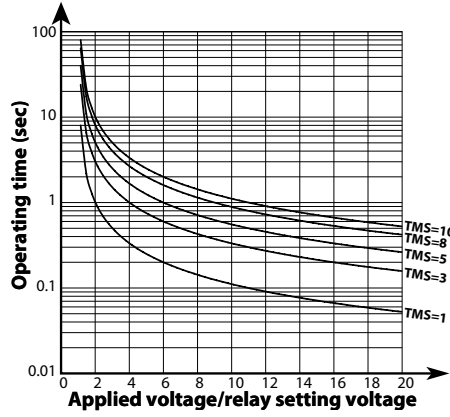
ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to +55°C
Humidity	: 56 days at 93% RH and 40°C non-condensing

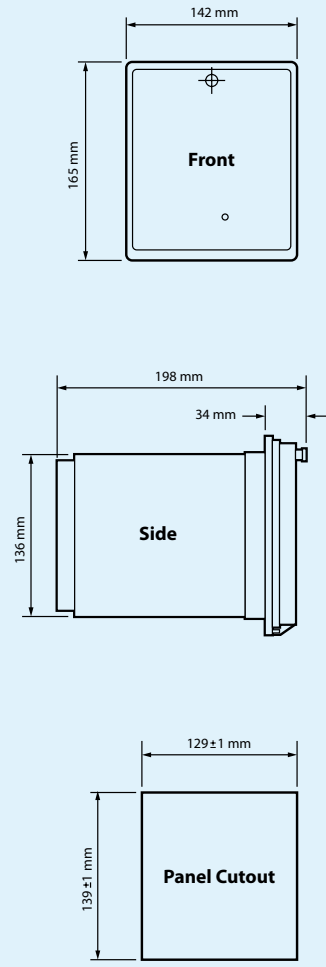
UNDervOLTAGE CHARACTERISTIC



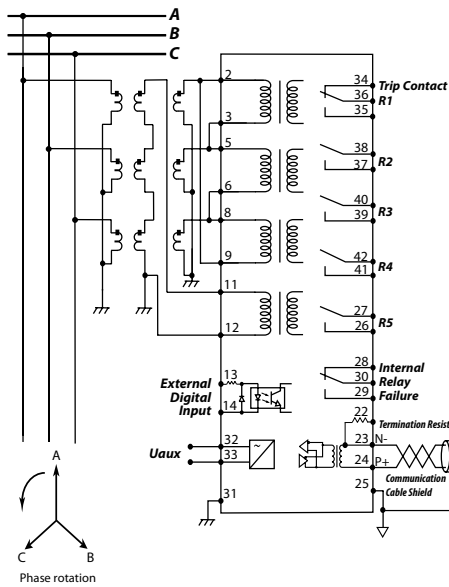
OVERVOLTAGE CHARACTERISTIC



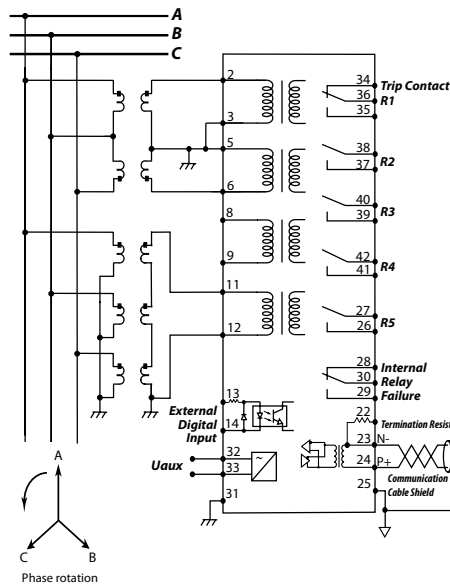
CASE DIMENSIONS



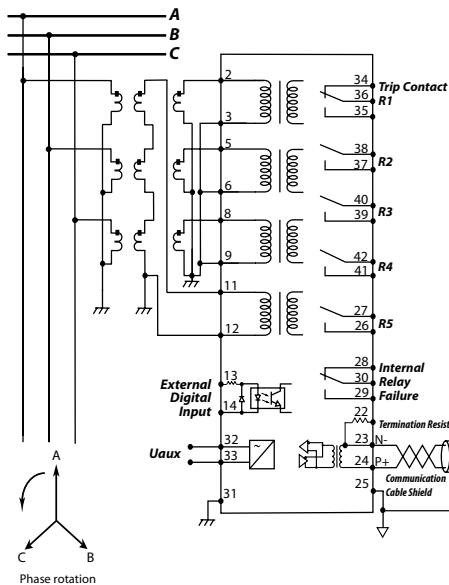
TYPICAL APPLICATION DIAGRAMS



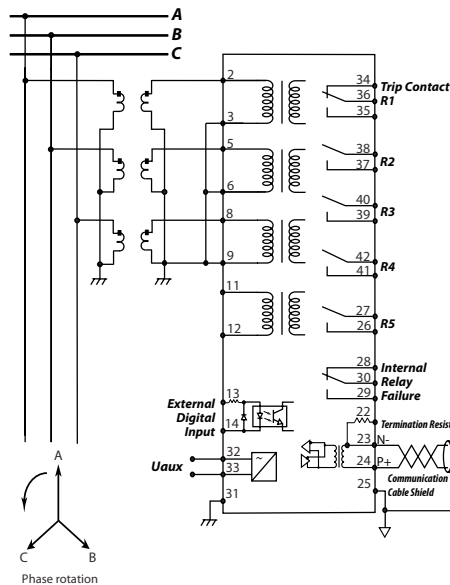
3V_{p-p} + V_{residual} connection



2V_{p-p} + V_{residual} connection



3V_{p-n} + V_{residual} connection



3V_{p-n} connection

Ordering Information

MODEL	DESCRIPTION
MU2300-150D	For 50 / 60 Hz system, auxiliary voltage 24 ~ 150 V DC
MU2300-240AD	For 50 / 60 Hz system, auxiliary voltage 85 ~ 265 V AC or 110~340 V DC





MPR500

Features

- Microprocessor based numerical relay
- Thermal overload
- Overcurrent
- Undercurrent
- Unbalance
- Phase loss
- Phase sequence
- Earth fault
- Prolonged starting/stall rotor
- 2 voltage-free output contacts

AUXILIARY SUPPLY

Model MPR 500-240A : 198 ~ 265 V AC
 Model MPR 500-240AD : 85 ~ 265 V AC
 110 ~ 370 V DC
 Model MPR 500-150D : 24 ~ 150 V DC
 Supply frequency : 50 or 60 Hz
 Maximum power consumption : 3 VA typical

CONTACTS

Contact arrangement : Change-over
 Contact rating : 5 A, 250 V AC ($\cos\phi = 1$)
 Contact material : Silver alloy
 Operating time : 15 ms max
 Expected electrical life : 100,000 operation at
 rated current
 Expected mechanical life : 5×10^6 operations

INDICATORS

Run : Green indicator
 Trip/Pickup : 7-segment display and
 red indicator
 Thermal : Yellow indicator

MECHANICAL

Mounting : Panel mounting
 Front panel : Standard DIN
 96mm x 96 mm
 Approximate weight : 0.75kg

ENVIRONMENTAL CONDITIONS

Temperature : -5°C to +55°C
 Humidity : 56 days at 93% RH and
 40°C non-condensing

Technical Data

CT RATINGS

Rated current : 5 A
 Rated frequency : 50 or 60 Hz
 Burden : <0.3 VA at rated current
 Thermal withstand : 4 x rated continuous

BINARY INPUT

Rated input voltage : 12 V (Supplied internally)

SETTING RANGES

THERMAL OVERLOAD

time constant, t_{6X} : 1 – 40s.
 Step 0.1s for 1 - 10s,
 step 1s for 10 - 40s.

Short circuit, $I_{>>}$: off, 2 - 12 x I_B
 Step 1 x I_B

Short circuit
 delay time, $t_{>>}$: 0 - 25s
 Step 0.1s for 1 - 10s,
 step 1s for 10 - 25s.

Undercurrent, $I_{<<}$: off, 20 - 90% I_B .
 Step 1%

Undercurrent
 delay time, $t_{<<}$: 0 - 60s.
 Step 0.1s for 1 - 10s,
 step 1s for 10 - 60s.

Unbalance : off, 10 - 50%
 Step 1%

Unbalance delay time, t_{Δ} : 0 - 25s.
 Step 0.1s for 1 - 10s,
 Step 1s for 10 - 25s.

Earth fault, I_0 : off, 10 - 60% I_B .
 Step 1%

Earth fault delay time, t_0 : 0 - 25s.
 Step 0.1s for 1 - 10s,
 step 1s for 10 - 25s.

Phase loss : <120ms

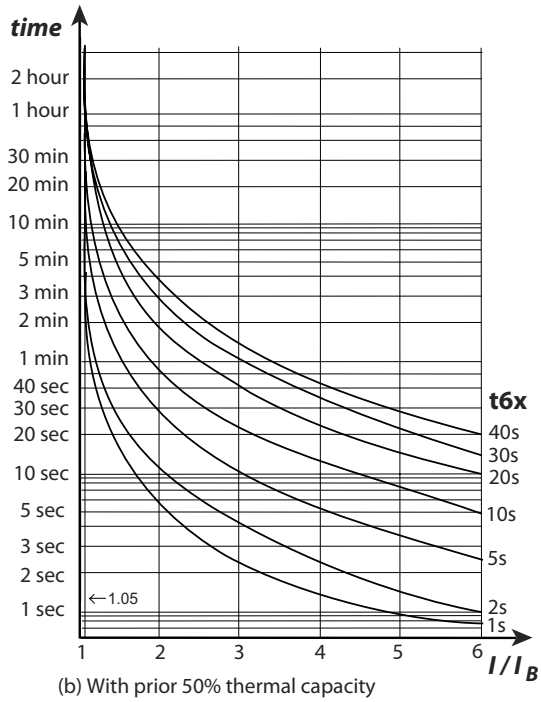
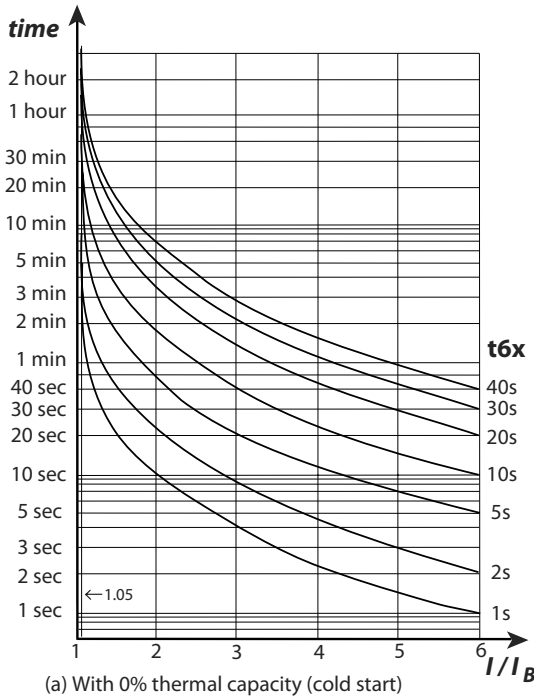
Phase sequence : <120ms

Prolonged starting/
 stalled rotor, I_S : off, 2 - 12 x I_B .
 Step 0.1 x I_B

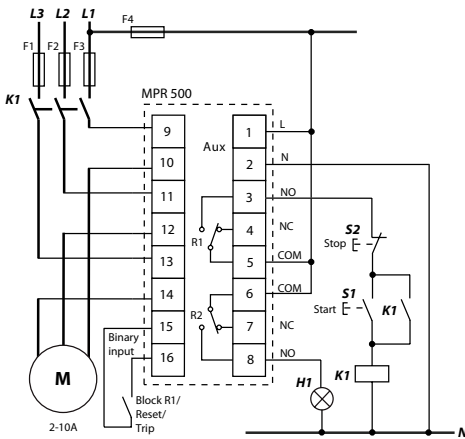
Prolonged starting
 delay time, t_{Sstart} : 0 - 60s.
 Step 0.1s for 1 - 10s,
 step 1s for 10 - 60s.

Stalled rotor
 delay time, t_{Sstall} : 0 - 60s.
 Step 0.1s for 1 - 10s,
 step 1s for 10 - 60s.

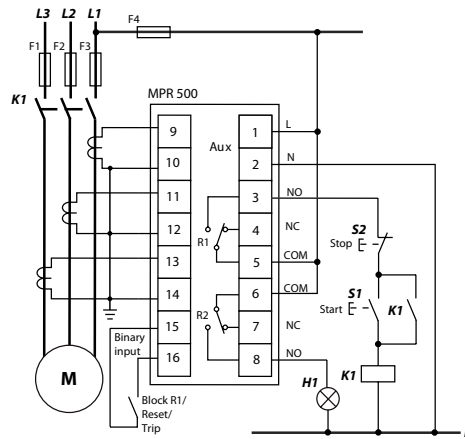
THERMAL TRIPPING CURVE



TYPICAL APPLICATION DIAGRAMS

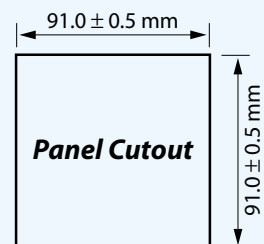
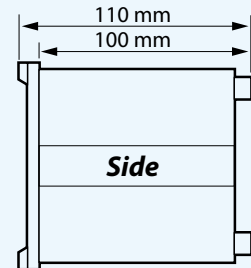
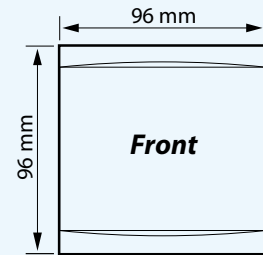


Motor with full load current of 2A to 10A



Motor with higher full load current using external CT

CASE DIMENSIONS



Ordering Information

MODEL

DESCRIPTION

MPR500-240A

For 50Hz system, auxiliary voltage 198 ~ 265 V AC

MPR500-240AD

For 50Hz system, auxiliary voltage 85 ~ 265 V AC or 110 ~ 370 V DC

MPR500-150D

For 50Hz system, auxiliary voltage 24 ~ 150 VDC

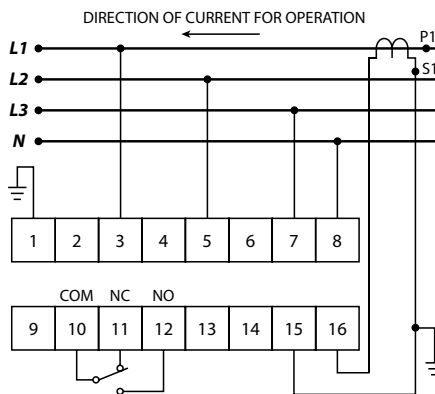


RPR415

Features

- Reverse power monitoring
- 3-phase-4-wire system
- Adjustable reverse power setting
- Adjustable tripping time delay
- Indicators for auxiliary power, trip delay and trip status
- Test button

TYPICAL APPLICATION DIAGRAM



Product Description

The RPR 415 relay is a directionally controlled timing relay used to protect AC generators from motoring. When such a condition occurs and the reverse current exceeded the customer adjustable preset limit and the current persists for a predetermined delay time, the trip relay operates to disconnect the circuit.

Technical Data

INPUT

Rated voltage (U_n) : 380/440 V AC

Rated current (I_n) : 5 A

Rated frequency : 50 Hz / 60 Hz

Overload : $1.2 \times U_n, 2 \times I_n$ continuous
 $1.2 \times U_n, 10 \times I_n$ for 3 sec

OUTPUT

Contact Arrangement : Change-over

Contact rating : 5 A, 250 V AC ($\cos \phi = 1$)

Contact material : Silver alloy

Expected electrical life: 100,000 operations at rated current

Expected mechanical life: 5×10^6 operations

SETPOINT

Range : 2% to 20% reverse current

Time delay : Adjustable 0 sec to 20 sec

Hysteresis : 1%

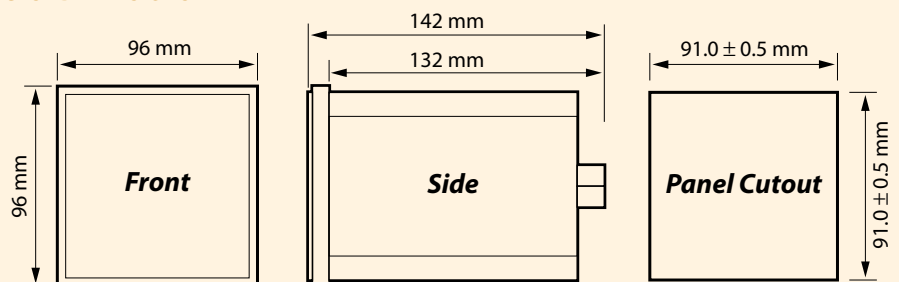
Repeatability : 0.5%

ENVIRONMENTAL CONDITIONS

Temperature : -5°C to $+55^\circ\text{C}$

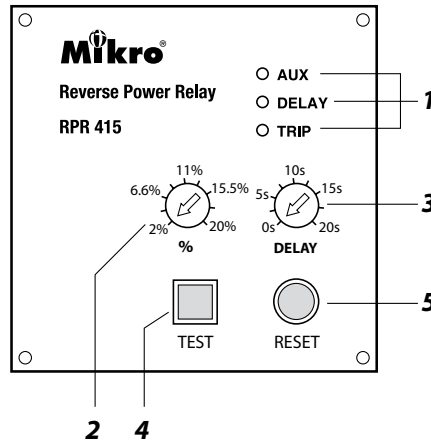
Humidity : 56 days at 93% RH and 40°C non-condensing

CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
RPR415	Auxiliary voltage 415 V AC



Front Panel Description

1. Light Indicators

Indicator AUX	Indicator DELAY	Indicator TRIP	Status
OFF	OFF	OFF	No auxiliary power supply.
ON	OFF	OFF	System normal mode. No tripping.
ON	ON	OFF	Reverse current exceeded pre-set limit. Time delay countdown started.
ON	OFF	ON	System tripped.

2. Reverse Current Adjustment Knob

- For setting the minimum reverse current before tripping
- Setting range from 2% to 20%

3. Delay Timing Adjustment Knob

- Trip time delay setting
- Setting range from 0 to 20 sec

4. Test Button

- Press the test button to simulate a trip condition.

5. Reset Button

- The reset button is for resetting the light indicator after tripping.
- To reset, press the reset button once
- The tripping contact will be released once the reverse current fall below the pre-set limit. However, the TRIP light indicator is latched. Press the reset button to reset the light indicator to normal state.

MX200A / 180A / 160A



MX200A
Under & Over Voltage Relay



MX180A
Over Voltage Relay



MX160A
Under Voltage Relay

Features

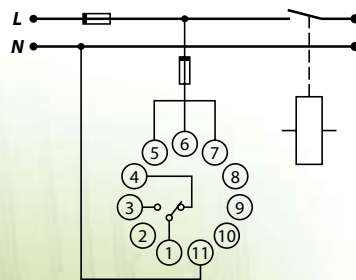
- Electronic monitoring relay
- Voltage monitoring for single 3-phase system
- Phase failure monitoring
- Adjustable voltage limit
- Adjustable delay time
- Indicators for voltage fault
- Indicators for power and output ON

Product Description

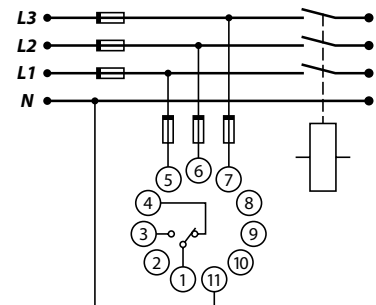
MX160A, MX180A & MX200A are single or 3-phase monitoring relays. The relays are designed for application where it required to maintain the voltage within set limits. A built-in adjustable time delay prevents nuisance tripping.

WIRING DIAGRAM

Single-Phase System

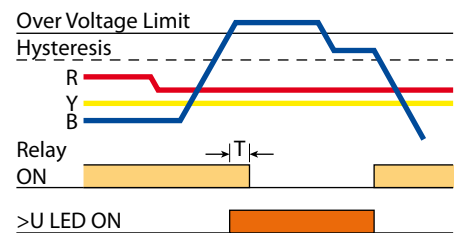


3-Phase System

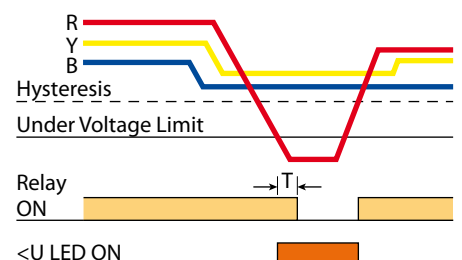


OPERATIONS DIAGRAM

i) Over Voltage Function**



ii) Under Voltage Function*



Technical Data

POWER SUPPLY INPUT

3-PHASE SYSTEM

Phase-to-phase voltage : 380 V AC \pm 20%
 400 V AC \pm 20%
 415 V AC \pm 20%

SINGLE PHASE

Phase-to-neutral voltage : 220 V AC \pm 20%
 230 V AC \pm 20%
 240 V AC \pm 20%

Frequency range : 45 to 65 Hz

Max. power consumption : 3 VA

Input connections

For 3-phase model : Phase L1, L2, L3 to pin 5, 6, & 7
 Neutral to pin 11

For single-phase model : Phase L to pin 5, 6 & 7***
 Neutral to pin 11

SETTING RANGES

Lower voltage limit * : 78% - 98%

Upper voltage limit ** : 102% - 122%

Delay time, T : 0.1 - 10s

HYSTERESIS

\leq 1% of rms - value

CONTACT OUTPUT

Contact arrangement : SPDT change-over contacts.

Contact rating : 5A, 250 V AC ($\cos\phi=1$)

Contact material : Silver alloy

Expected electrical life : 100,000 operations at rated current

Expected mechanical life : 5×10^6 operations

INDICATORS

Power supply ON : Green indicator

Output ON : Red indicator

Under voltage limit (U<) * : Red indicator

Over voltage limit (U>) ** : Red indicator

MECHANICAL

Mounting : Circular 11-pin plug-in socket

Approximate weight : 0.25kg

ENVIRONMENTAL CONDITIONS

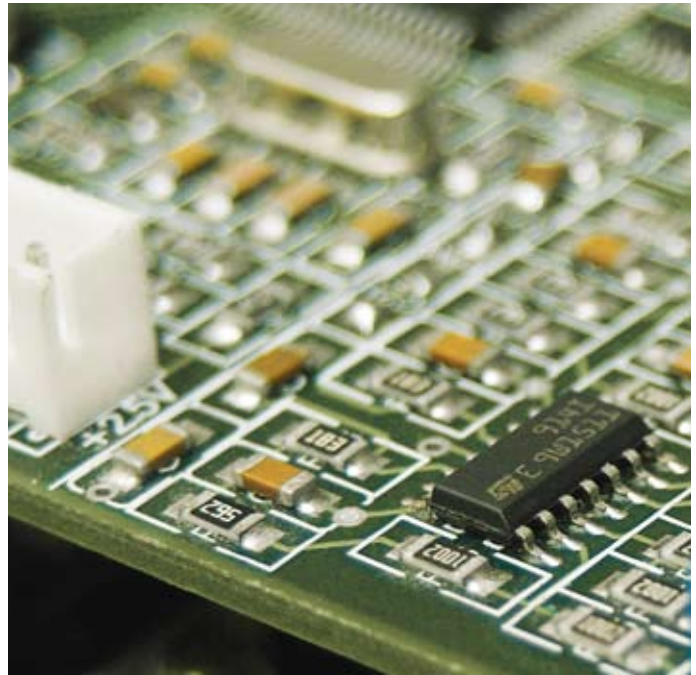
Temperature : -5°C to $+55^{\circ}\text{C}$

Humidity : 56 days at 93% RH and 40°C
 non-condensing

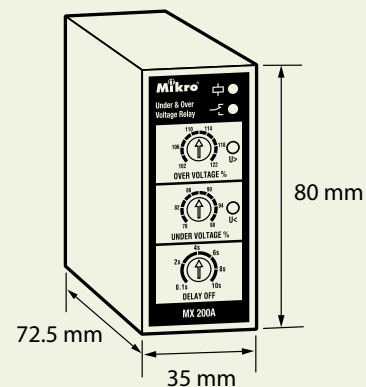
* Applicable to MX160A and MX200A only

** Applicable to MX180A and MX200A only

*** For single phase connection, short pin 5,6 & 7



CASE DIMENSIONS



Ordering Information

MODEL	FUNCTION		Supply Voltage V AC
	Under Voltage Monitoring	Over Voltage Monitoring	
MX160A - 380	YES	NO	380
MX160A - 400	YES	NO	400
MX160A - 415	YES	NO	415
MX180A - 380	NO	YES	380
MX180A - 400	NO	YES	400
MX180A - 415	NO	YES	415
MX200A - 380	YES	YES	380
MX200A - 400	YES	YES	400
MX200A - 415	YES	YES	415

MX100/50



MX100
Phase Sequence &
Phase Failure monitoring



MX50
Phase Failure monitoring

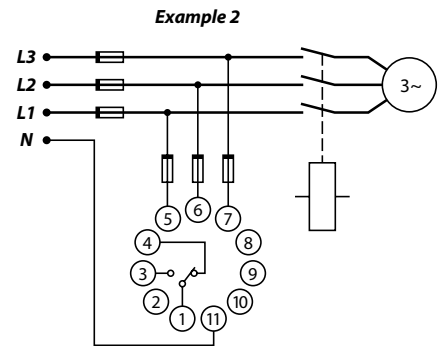
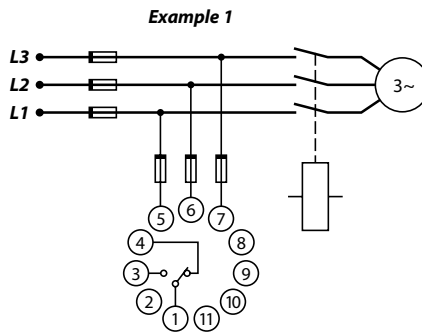
Features

- Electronic monitoring relay
- Phase sequence monitoring*
- Phase failure monitoring
- Plug-in type module
- Indicators for power and alarm status

Introduction

This phase sequence and phase failure relay is designed for application where the 3-phase supply needs to be continuously monitored for proper sequencing and phase loss. Commonly used to protect a 3-phase motor.

WIRING DIAGRAMS



FUNCTION TABLE

Condition	Pin 5	Pin 6	Pin 7	Relay	Remark
1	L1	L2	L3	ON	System healthy
2	Loss	L2	L3	OFF	Phase failure
3	L1	Loss	L3	OFF	Phase failure
4	L1	L2	Loss	OFF	Phase failure
5	L2	L1	L3	OFF	Sequence fault*
6	L3	L2	L1	OFF	Sequence fault*

* Applicable to MX100 model only

Technical Data

POWER SUPPLY INPUT

- Phase-to-phase voltage : 220 V AC \pm 15%
- : 380 V AC \pm 15%
- : 400 V AC \pm 15%
- : 415 V AC \pm 15%
- Frequency range : 45 to 65 Hz
- Max power consumption : 3 VA
- Input connections : Phase L1 to pin 5
- : Phase L2 to pin 6
- : Phase L3 to pin 7
- : Neutral (optional) to pin 11

CONTACT OUTPUT

- Contact arrangement : SPDT change-over contacts
- Contact rating : 5 A, 250 V AC ($\cos\phi = 1$)
- Contact material : Silver alloy
- Expected electrical life : 100,000 operations at rated current
- Expected mechanical life : 5×10^6 operations

INDICATORS

- Power supply ON : Green indicator
- Output ON : Red indicator

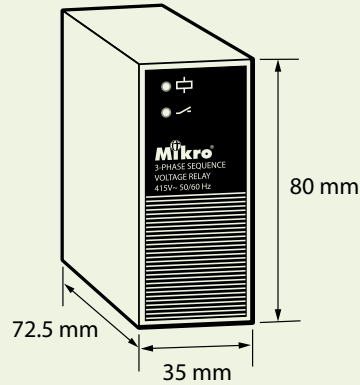
MECHANICAL

- Mounting : Circular plug-in socket
- Approximate weight : 0.25 kg

ENVIRONMENTAL CONDITIONS

- Temperature : -5°C to +55°C
- Humidity : 56 days at 93% RH and 40°C non-condensing

CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
MX100 - 220	Auxiliary voltage 220 V AC
MX100 - 380	Auxiliary voltage 380 V AC
MX100 - 400	Auxiliary voltage 400 V AC
MX100 - 415	Auxiliary voltage 415 V AC
MX50 - 220	Auxiliary voltage 220 V AC
MX50 - 380	Auxiliary voltage 380 V AC
MX50 - 400	Auxiliary voltage 400 V AC
MX50 - 415	Auxiliary voltage 415 V AC



PFR140/120/80/60



Features

- Microprocessor based intelligent auto switching control
- Automatic C/K and rated step adjustment
- Automatic CT polarity correction
- Display of power factor, current & total harmonic distortion of current
- Programmable sensitivity
- Last step can be used as alarm/fan output
- Under/over voltage alarm, under/over compensate alarm & high harmonic distortion alarm
- User-friendly setting
- Complies with IEC 61000-6-2 standard

Technical Data

RATINGS AUXILIARY POWER SUPPLY

Current Supply voltage	: 220~240 V AC / 380~415 V AC
Operating Limits	: -15% + 10%
Consumption	: 10 VA max
Rated frequency	: 50 Hz or 60 Hz

CURRENT INPUT

Rated current (I_n)	: 5 A
Operating Limits	: 0.15 A to 6.5 A
Rated Frequency	: 50 Hz or 60 Hz

RELAY OUTPUT

Numbers of outputs	: 6 / 8 / 12 / 14 (PFR60 / PFR80 / PFR120 / PFR140)
Contact arrangement	: NO contacts type
Contact rating	: 5 A, 250 V AC ($\cos\phi = 1$)
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5×10^6 operations
Max current for the common terminals	: 12 A continuous

CONTROL RANGE

Power factor setting	: 0.8 inductive - 0.8 capacitive
C/K setting	: 0.03 - 1.20 / Automatic
Switching sensitivity	: 5 - 600 s/step
Reconnection time for same step	: 5 - 240 s
THD threshold	: 0.20 - 3.00 (20% - 300%) / OFF
Switching Program	: Automatic / Automatic Rotate / 4-quadrant / Manual
Rated step coefficient	: 0 / 1 / 2 / 3 / 4 / 5 / 6 / 8 / 12 / 16 (Automatic if C/K set to Auto)

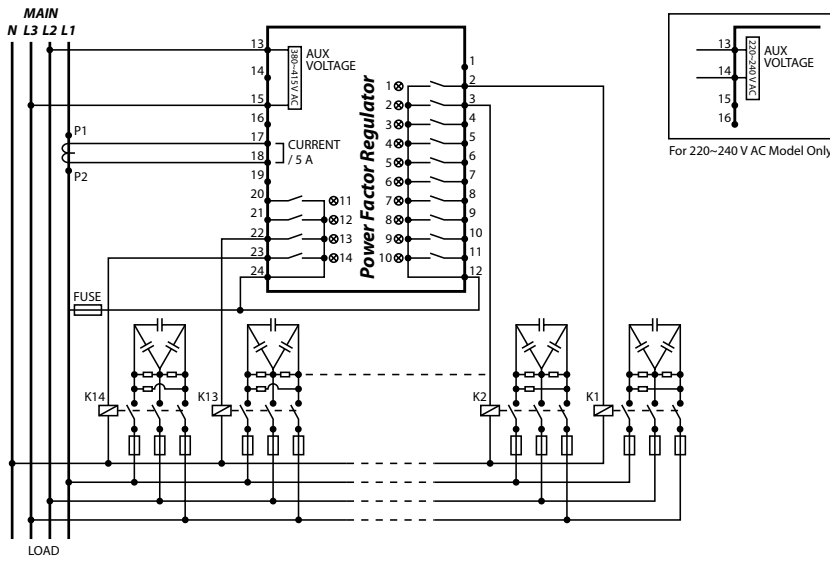
MECHANICAL

Mounting	: Panel mounting
Dimension (h x w x d)	: 144mm x 144mm x 90mm
Approximate weight	: 1 kg

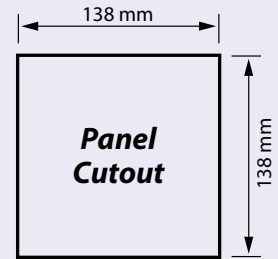
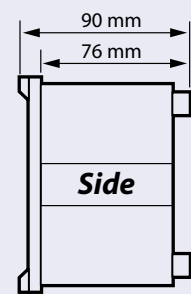
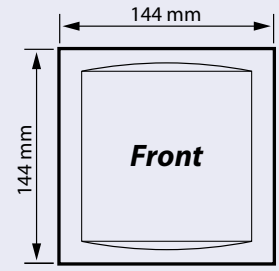
ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to +55°C
Humidity	: 56 days at 93% RH and 40°C non-condensing

TYPICAL APPLICATION DIAGRAM



CASE DIMENSIONS



Ordering Information

MODEL	DESCRIPTION
PFR60 - 415 - 50	6 Steps, 50 Hz system, auxiliary voltage 380~415 V AC
PFR80 - 415 - 50	8 Steps, 50 Hz system, auxiliary voltage 380~415 V AC
PFR120 - 415 - 50	12 Steps, 50 Hz system, auxiliary voltage 380~415 V AC
PFR140 - 415 - 50	14 Steps, 50 Hz system, auxiliary voltage 380~415 V AC
PFR60 - 220 - 50	6 Steps, 50 Hz system, auxiliary voltage 220~240 V AC
PFR80 - 220 - 50	8 Steps, 50 Hz system, auxiliary voltage 220~240 V AC
PFR120 - 220 - 50	12 Steps, 50 Hz system, auxiliary voltage 220~240 V AC
PFR140 - 220 - 50	14 Steps, 50 Hz system, auxiliary voltage 220~240 V AC
PFR60 - 415 - 60	6 Steps, 60 Hz system, auxiliary voltage 380~415 V AC
PFR80 - 415 - 60	8 Steps, 60 Hz system, auxiliary voltage 380~415 V AC
PFR120 - 415 - 60	12 Steps, 60 Hz system, auxiliary voltage 380~415 V AC
PFR140 - 415 - 60	14 Steps, 60 Hz system, auxiliary voltage 380~415 V AC
PFR60 - 220 - 60	6 Steps, 60 Hz system, auxiliary voltage 220~240 V AC
PFR80 - 220 - 60	8 Steps, 60 Hz system, auxiliary voltage 220~240 V AC
PFR120 - 220 - 60	12 Steps, 60 Hz system, auxiliary voltage 220~240 V AC
PFR140 - 220 - 60	14 Steps, 60 Hz system, auxiliary voltage 220~240 V AC



PFR96 / PFR96P

Features

- Microprocessor based intelligent auto switching control
- Automatic C/K and rated step adjustment
- Automatic CT polarity correction
- Display of power factor & current
- Programmable sensitivity
- Last step can be used as alarm/fan output
- Under/over voltage alarm, under/over compensate alarm
- User-friendly setting
- Complies with IEC 61000-6-2 standard

For PFR96

- For single-phase system

For PFR96P

- For 3-phase system

Technical Data

RATINGS AUXILIARY POWER SUPPLY

Model PFR96	: 110 ~ 120 V AC / 220 ~ 240 V AC
Model PFR96P	: 380 ~ 415 V AC
Operating Limits	: -15% + 10%
Consumption	: 10 VA max
Rated frequency	: 50 Hz or 60 Hz

CURRENT INPUT

Rated current (I_n)	: 5 A
Operating Limits	: 0.15 A to 6.5 A
Rated frequency	: 50 Hz or 60 Hz

RELAY OUTPUT

Numbers of outputs	: 6
Contact arrangement	: NO contacts type
Contact rating	: 5 A, 250 V AC ($\cos\phi = 1$)
Contact material	: Silver alloy
Expected electrical life	: 100,000 operations at rated current
Expected mechanical life	: 5×10^6 operations
Max current for the common terminals	: 12 A continuous

CONTROL RANGE

Power factor setting	: 0.8 inductive - 0.8 capacitive
C/K setting	: 0.03 - 1.20 / Automatic
Switching sensitivity	: 5 - 600 s/step
Reconnection time for same step	: 5 - 240 s
Switching Program	: Automatic / Automatic Rotate / 4-quadrant / Manual
Rated step coefficient	: 0 / 1 / 2 / 3 / 4 / 5 / 6 / 8 / 12 / 16 (Automatic if C/K set to Auto)

MECHANICAL

Mounting	: Panel mounting
Dimension (h x w x d)	: 96mm x 96mm x 70mm
Approximate weight	: 0.6 kg

ENVIRONMENTAL CONDITIONS

Temperature	: -5°C to +55°C
Humidity	: 56 days at 93% RH and 40°C non-condensing

TYPICAL APPLICATION DIAGRAM

Diagram 1 - For model PFR96

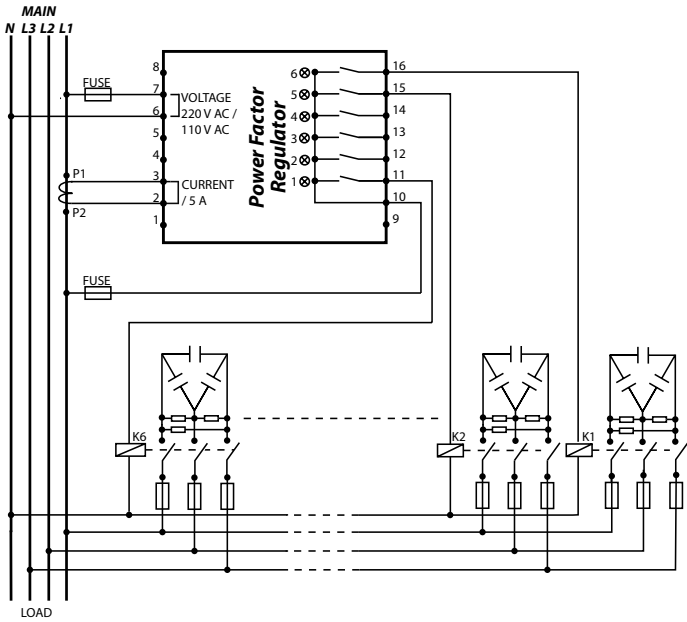
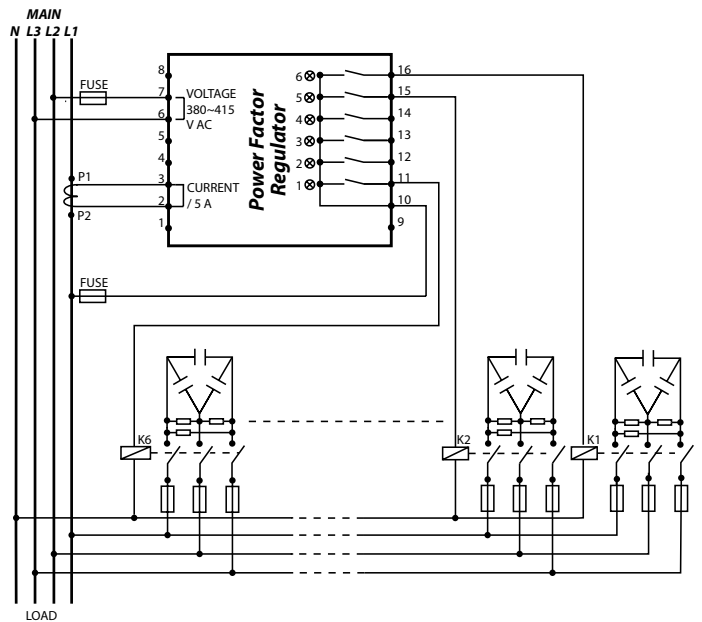


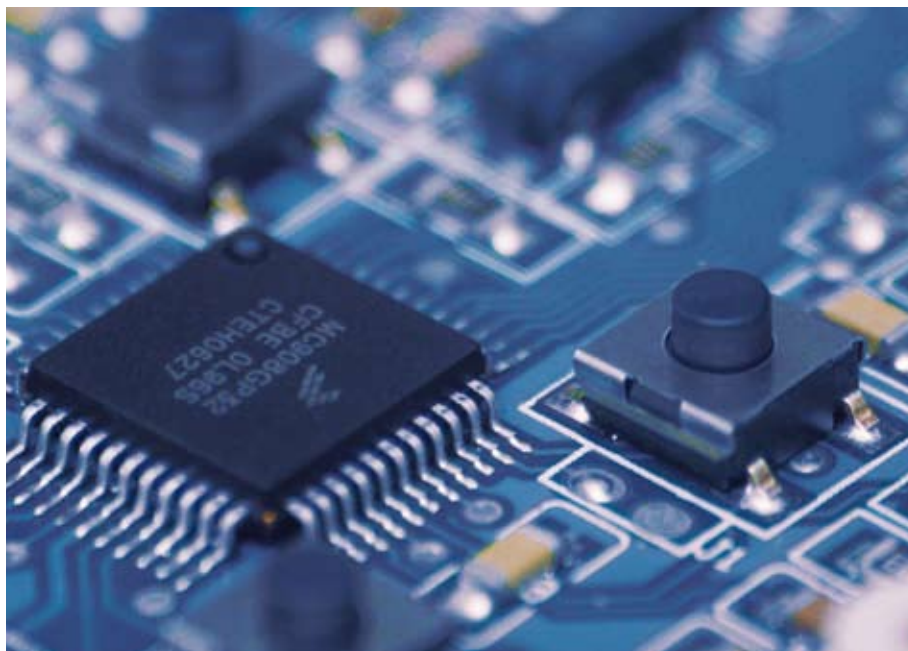
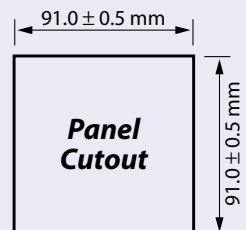
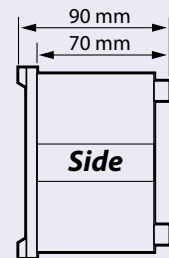
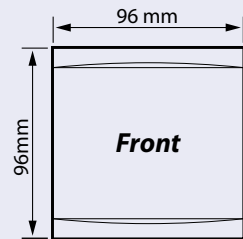
Diagram 2 - For model PFR96P



Ordering Information

MODEL	DESCRIPTION
PFR96 - 220 - 50	6 Steps, for 50 Hz system, auxiliary voltage 220~240 V AC
PFR96 - 220 - 60	6 Steps, for 60 Hz system, auxiliary voltage 220~240 V AC
PFR96 - 110 - 50	6 Steps, for 50 Hz system, auxiliary voltage 110~120 V AC
PFR96 - 110 - 60	6 Steps, for 60 Hz system, auxiliary voltage 110~120 V AC
PFR96P - 415 - 50	6 Steps, for 50 Hz system, auxiliary voltage 380~415 V AC
PFR96P - 415 - 60	6 Steps, for 60 Hz system, auxiliary voltage 380~415 V AC

CASE DIMENSIONS





AN112/120

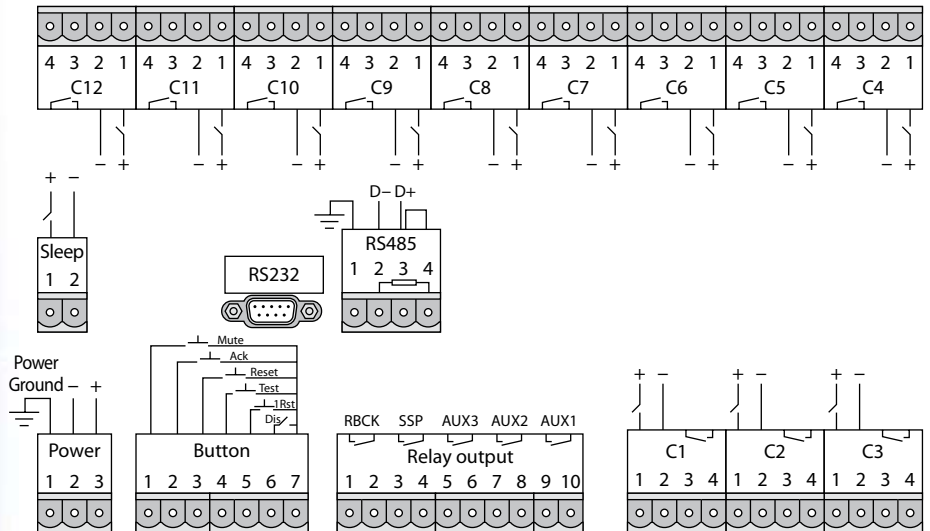
Programmable Alarm Annunciator

The AN112/120 series Alarm Annunciator provides ideal solution for all your alarm system management and requirement. It comes with either 12 or 20 windows, and due to the use of microprocessor-based design, the alarm annunciator is highly flexible in terms of functionality and programmability, suitable for all application and industries.

Features

- 12 or 20 windows. Replaceable super-bright LED modules, with choice of amber or red illumination
- 11 Alarm Sequences as per ISA-18.1 standard
- Each channel/window fully field programmable, either from front panel built-in pushbutton or using PC
- Option of either RS232 or RS485 MODBUS-RTU communication. Comes with user-friendly configuration software.
- Repeat relay for each window as well as numerous configurable multifunction output relays for connection to external equipment to form alarm management system
- Sleep or unattended mode feature is available, for stations not permanently manned
- Auto-silence and auto-acknowledge features, with delay settable from 1 – 255 s

TYPICAL CONNECTION DIAGRAM



Tests And Standards

- Electrostatic discharge IEC61000-4-2, Class III, air discharge 8 KV
- Electrostatic discharge IEC61000-4-2, Class III, contact discharge 6 KV
- Electrical fast transient IEC61000-4-4 4 KV, 5/50ns
- Surge immunity IEC61000-4-5 4 KV, L to E
- Enclosure protection when panel mounted Front: IP41
..... Enclosure: IP30

Technical Data

WINDOW

Window Dimension: 50 x 30 mm.
 Type: White translucent lens.
 Colours: Red, Amber. Coloured by field replaceable LED module.
 Windows Flash
 Fast: 1.4 Hz (0.4s on, 0.4s off),
 Slow: 0.45 Hz (1.1s on, 1.1s off),
 Intermittent: (0.4s on, 1.8s off)

ALARM SEQUENCES M, A, R, R-12, F1A, F1M, F2A, F2M, F3A, F3M, Follower

TYPE OF MOUNTING Panel Mounting

AUXILIARY POWER INPUT

Fuse protected.
 AN1xx-30 24-36 V DC or 18-27 V AC.
 AN1xx-110 88-132 V DC or 64-95 V AC.
 Power consumption AN112: 6 W, AN120: 8 W

ALARM CONTACT INPUTS

Opto-isolated inputs
 AN1xx-30 24-36 V DC or 18-27 V AC.
 AN1xx-110 88-132 V DC or 64-95 V AC.
 Input current 3 mA typical

RELAY OUTPUTS

Repeat relays Potential free for each alarm point.
 5 A at 250 V AC, 3 A at 30 V DC. Resistive load.
 AUX1-AUX3, RBACK, SSP 5 A at 250 V AC, 5 A at 30 V DC. Resistive load.

TERMINALS

Wire size 28-14 AWG. (0.08mm² to 2.5mm²)
 Removable screw type terminal block (removable)

ENVIRONMENT

Operation temperature -20 to 60°C
 Storage temperature -20 to 80°C
 Humidity 0 - 95% RH, non condensing

COMMUNICATION

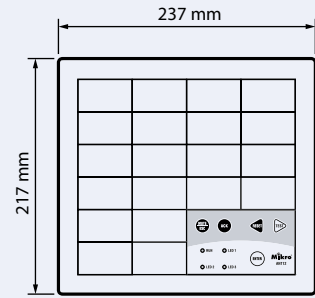
Hardware interface AN1xx - xx - x - A: RS232
 AN1xx - xx - x - B: Isolated RS485

Protocol Modbus - RTU
 Baud rate 300 to 57600

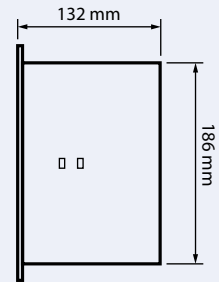
ENVIRONMENTAL CONDITIONS

Temperature : -5°C to +55°C
 Humidity : 56 days at 93% RH and 40°C non-condensing

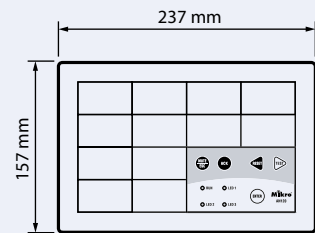
CASE DIMENSIONS



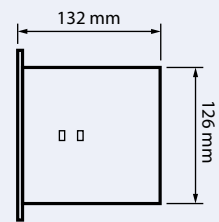
AN120 Front



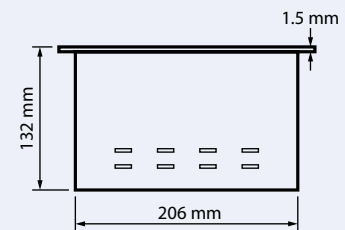
AN120 Side



AN112 Front



AN112 Side



Bottom

Ordering Information

Order code:
AN1 [] - [] - [] - [] **A:** RS 232 communication
 **B:** RS 485 communication
 **0:** without repeat relays
 **1:** with repeat relays
 Power Supply: **30, 110** V DC
 Number of Windows: **12, 20**

For example: 12 windows, 30 V DC, with repeat relays, RS232 communication:
AN112-30-1-A