Monitoring Relay and Timers Technical Manual

IMO

PANEL

Monitoring Relays MR Series

- 3-Phase current/voltage monitoring
- Multifunction
- Fault latch
- Supply voltage selectable via power modules
- 2 Change-over contacts
- Width 22.5mm
- Industrial design

Options and ordering codes

Monitoring Relays	MR - PFR400

Voltage monitoring 3-phase 400volts	PFR400
Voltage monitoring 3-phase 230volts	PFR230
Voltage monitoring 3-phase, multifunction, modular supply	PFRAT
Voltage monitoring 1-phase, multifunction, modular supply	1PVM
Current monitoring 1-phase, multifunction, modular supply	1PIM

Power Supply	MR - PS 12

Power Supply	PS

12 Volts AC Power supply	12
24 Volts AC Power supply	24
230 Volts AC Power supply	230
400 Volts AC Power supply	400

Dimensions

MR-PFRAT

1. Functions
Voltage monitoring in 3-phase mains with adjustable thresholds, adjustable tripping delay, monitoring of phase sequence and phase failure monitoring of asymmetry with adjustable threshold and the following functions (selectable by means of rotary switch)

UNDER	Undervoltage monitoring
UNDER+SEQ	Undervoltage monitoring and monitoring of phase sequence
WIN	Monitoring of window between Min and Max
WIN+SEQ	Monitoring the window between Min and Max and monitoring of phase sequence

2. Time ranges

	Adjustment range	
Start-up suppression time:	-	
Tripping delay:	0.1s	10s

3. Mechanical design
Self-extinguishing plastic housing, IP rating IP40
Mounted on DIN-Rail TS 35 according to EN 50022
Mounting position: any
Shockproof terminal connection according to VBG 4 (PZ1 required), IP rating IP20
Tightening torque: max. 1Nm
Terminal capacity:
1 x 0.5 to 2.5mm² with/without multicore cable end
1 x 4mm² without multicore cable end
2 x 0.5 to 1.5mm² with/without multicore cable end
2 x 2.5mm² flexible without multicore cable end

4. Indicators
Red LED ON/OFF: indication of failure of the corresponding threshold
Red LED flashing: indication of tripping delay of the corresponding threshold
Yellow LED ON/OFF: indication of relay output

5. Output circuit
2 potential free change-over contacts
Rated voltage: 250V AC
Switching capacity (distance 750VA (3A / 250V AC)
Switching capacity (distance 1250VA (5A / 250V AC)
Fusing: 5A fast acting
Mechanical life: 20 x 106 operations
Electrical life: 2 x 105 operations at 1000VA resistive load
Switching frequency: max. 60/min at 100VA resistive load
max. 6/min at 1000VA resistive load (according to IEC 947-5-1)
Overvoltage category: III (according to IEC 60664-1)
Rated surge voltage: 4kV

6. Input circuit

Supply voltage:	12 to 400V AC	terminals A1-A2 (galvanically separated) selectable via power modules TR2	
Tolerance:	according to specification	of power module	
Rated frequency:	according to specification	of power module	
Rated consumption:	2VA (1.5W)		
Duration of operation:	100%		
Reset time:	500ms		
Residual ripple for DC:	-		
Drop-out voltage:	>30% of the supply voltage		
Overvoltage category:	III (according to IEC 60664-1)		
Rated surge voltage:	4kV		

7. Accuracy
Base accuracy: ±5% (of maximum scale value)
Frequency response: -
Adjustment accuracy: Ω5% (of maximum scale value)
Repetition accuracy: Ω2%
Voltage influence: Ω0.5%
Temperature influence: Ω0.1% / °C

8. Measuring circuit
Fusing: max. 20A (according to UL 508)
Measured variable: AC Sinus (48 to 63Hz)
Input:

3(N)~ 115/66V	terminals (N)-L1-L2-L3	(MR-PFRAT)
3(N)~ 230/132V	terminals (N)-L1-L2-L3	(MR-PFRAT)
3(N)~ 400/230V	terminals (N)-L1-L2-L3	(MR-PFRAT)

Overload capacity:

3(N)~ 115/66V	3(N)~173/100V	(MR-PFRAT)
3(N)~ 230/132V	3(N)~345/199V	(MR-PFRAT)
3(N)~ 400/230V	3(N)~600/346V	(MR-PFRAT)

Input resistance:

3(N)~ 115/66V	220kT	(MR-PFRAT)
3(N)~ 230/132V	470kT	(MR-PFRAT)
3(N)~ 400/230V	1MT	(MR-PFRAT)

Switching threshold

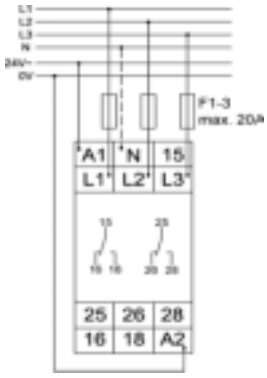
Max:	-20% to +30% of UN
Min:	-30% to +20% of UN

Asymmetry: 5% to 25%
Overvoltage category: III (according to IEC 60664-1)
Rated surge voltage: 4kV

9. Ambient conditions
Ambient temperature: -25 to +55°C (according to IEC 68-1)
-25 to +40°C (according to UL 508)
Storage temperature: -25 to +70°C
Transport temperature: -25 to +70°C
Relative humidity: 15% to 85% (according to IEC 721-3-3 class 3K3)
Pollution degree: 3 (according to IEC 60664-1)
Vibration resistance: 10 to 55Hz 0.35mm (according to IEC 68-2-6)
Shock resistance: 15g 11ms (according to IEC 68-2-27)

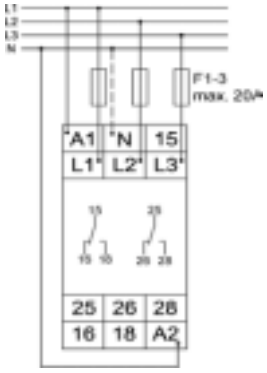
MR-PFRAT-cont

24volts



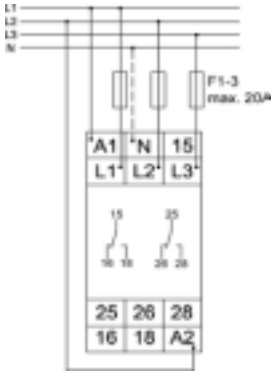
Connection Diagram

230volts



Connection Diagram

400volts

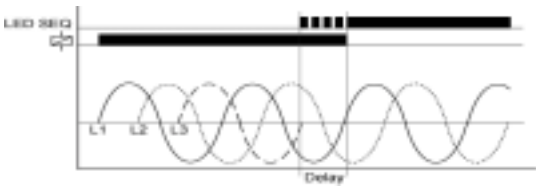


Connection Diagram

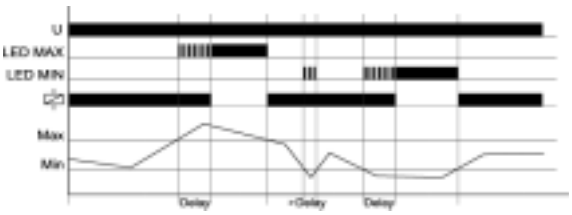
For all the functions the LEDs MIN and MAX are flashing alternating, when the minimum value for the measured voltage was chosen to be greater than the maximum value.
If a failure already exists when the device is activated, the output relays remain in off-position and the LED for the corresponding threshold is illuminated.

Under voltage monitoring (UNDER, UNDER+SEQ)
When the measured voltage (mean value of phase-to-phase voltages) falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (DELAY) begins (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relays switch into off-position (yellow LED not illuminated). The output relays again switch into on-position (yellow LED illuminated), when the measured voltage exceeds the value adjusted at the MAX-regulator.
Window function (WIN, WIN+SEQ)
The output relays switch into on-position (yellow LED illuminated) when the measured voltage (mean value of phase-to-phase voltages) exceeds the value adjusted at the MIN-regulator. When the measured voltage exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (DELAY) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relays switch into off-position (yellow LED not illuminated). The output relays again switch into on-position (yellow LED illuminated) when the measured voltage falls below the value adjusted at the MAX-regulator (red LED MAX not illuminated). When the measured voltage falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (DELAY) begins again (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relays switch into off-position (yellow LED not illuminated).
Phase sequence monitoring (SEQ)
Phase sequence monitoring is selectable for all functions.
If a change in phase sequence is detected (red LED SEQ illuminated), the output relays switch into off-position immediately (yellow LED not illuminated).
Phase failure monitoring (SEQ)
If one of the phase voltages fails, the set interval of the tripping delay (DELAY) begins (red LED SEQ flashes). After the interval has expired (red LED SEQ illuminated), the output relays switch into off-position (yellow LED not illuminated).
Reverse voltages of a consumer (e.g. a motor which continues to run on two phases only) do not effect the disconnection but can be monitored by using a proper value for the asymmetry.
Asymmetry monitoring
If the asymmetry of the phase-to-phase voltages exceeds the value set at the ASYM-regulator, the set interval of the tripping delay (DELAY) begins (red LED ASYM flashes). After the interval has expired (red LED ASYM illuminated), the output relays switch into off-position (yellow LED not illuminated).
If the neutral wire is connected to the device, the asymmetry of the phase voltages referred to the neutral wire (Y-voltage) is monitored also. In that case both values of the asymmetry are evaluated and if one of the values exceeds the value set at the ASYM-regulator, the set interval of the tripping delay (DELAY) begins (red LED ASYM flashes). After the interval has expired (red LED ASYM illuminated), the output relays switch into off-position (yellow LED not illuminated).
Loss of neutral wire by means of evaluation of asymmetry
A break of the neutral wire between power line and machinery is detected as soon as asymmetry between phase-to-phase voltage and neutral wire occurs. If the asymmetry exceeds the value set at the ASYM-regulator, the set interval of the tripping delay (DELAY) begins (red LED ASYM flashes). After the interval has expired (red LED ASYM illuminated), the output relays switch

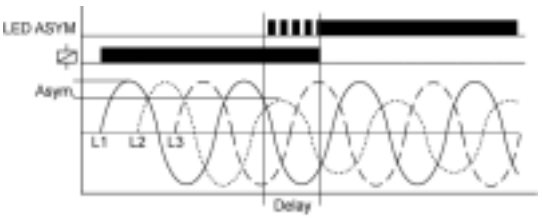
MR-PFRAT Phase Loss



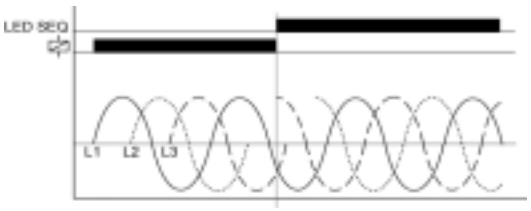
MR-PFRAT Window



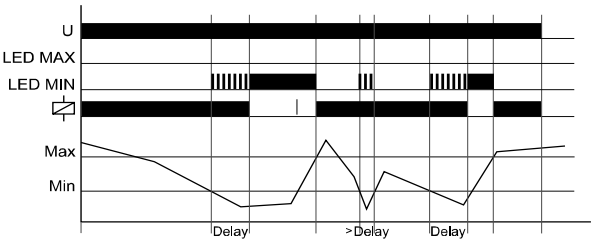
MR-PFRAT Asymmetrical



MR-PFRAT Sequence



MR-PFRAT Undervoltage



MR-PFR

1. Functions
Monitoring of phase sequence, phase failure and detection of return voltage
(by means of evaluating the asymmetry)

2. Time ranges

	Adjustment range
Start-up suppression time:	fixed, max. 500ms
Tripping delay:	fixed, max. 350ms

3. Indicators

Green LED ON:	indication of supply voltage
Yellow LED ON/OFF:	indication of relay output

4. Mechanical design
Self-extinguishing plastic housing, IP rating IP40
Mounted on DIN-Rail TS 35 according to EN 50022
Mounting position: any
Shockproof terminal connection according to VBG 4 (PZ1 required),
IP rating IP20
Tightening torque: max. 1Nm
Terminal capacity:
1 x 0.5 to 2.5mm² with/without multicore cable end
1 x 4mm² without multicore cable end
2 x 0.5 to 1.5mm² with/without multicore cable end
2 x 2.5mm² flexible without multicore cable end

5. Input circuit

Supply voltage:		
3(N)~ 115/66V	terminals (N)-L1-L2-L3 (= measuring voltage)	(MR-PFR115VS02)
3(N)~ 230/132V	terminals (N)-L1-L2-L3 (= measuring voltage)	(MR-PFR230VS02)
3(N)~ 400/230V	terminals (N)-L1-L2-L3 (= measuring voltage)	(MR-PFR400VS02)
Tolerance:		
3(N)~ 115/66V	3(N)~ 99 to 132V	(MR-PFR115VS02)
3(N)~ 230/132V	3(N)~ 198 to 264V	(MR-PFR230VS02)
3(N)~ 400/230V	3(N)~ 342 to 457V	(MR-PFR400VS02)
Rated frequency:	48 to 63Hz	
Rated consumption:		
3(N)~ 115/66V	3VA	(MR-PFR115VS02)
3(N)~ 230/132V	6VA	(MR-PFR230VS02)
3(N)~ 400/230V	9VA	(MR-PFR400VS02)
Duration of operation:	100%	
Reset time:	<100ms	
Residual ripple for DC:	-	
Drop-out voltage:	>20% of the supply voltage	
Overvoltage category:	III (according to IEC 60664-1)	
Rated surge voltage:	4kV	

6. Output circuit
2 potential free change-over contacts

Rated voltage:	250V AC
Switching capacity (distance <5mm):	750VA (3A / 250V AC)
Switching capacity (distance >5mm):	1250VA (5A / 250V AC)
Fusing:	5A fast acting
Mechanical life:	20 x 106 operations
Electrical life:	2 x 105 operations at 1000VA resistive load
Switching frequency:	max. 60/min at 100VA resistive load max. 6/min at 1000VA resistive load (according to IEC 947-5-1)
Overvoltage category:	III (according to IEC 60664-1)
Rated surge voltage:	4kV

7. Measuring circuit

Measured variable:	AC Sinus, 48 to 63Hz		
Input:			
	3(N)~ 115/66V	terminals (N)-L1-L2-L3	(MR-PFR115VS02) (= supply voltage)
	3(N)~ 230/132V	terminals (N)-L1-L2-L3	(MR-PFR230VS02) (= supply voltage)
	3(N)~ 400/230V	terminals (N)-L1-L2-L3	(MR-PFR400VS02) (= supply voltage)
Overload capacity:			
	3(N)~ 115/66V	3(N)~ 132/76V	(MR-PFR115VS02)
	3(N)~ 230/132V	3(N)~ 264/152V	(MR-PFR230VS02)
	3(N)~ 400/230V	3(N)~ 457/264V	(MR-PFR400VS02)
Input resistance:			
	3(N)~ 115/66V	5kW	(MR-PFR115VS02)
	3(N)~ 230/132V	10kW	(MR-PFR230VS02)
	3(N)~ 400/230V	15kW	(MR-PFR400VS02)
Asymmetry:	fixed, typ. 30%		
Overvoltage category:	III (according to IEC 60664-1)		
Rated surge voltage:	4kV		

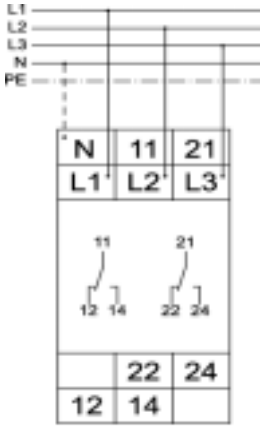
8. Accuracy

Base accuracy:	-
Frequency response:	-
Adjustment accuracy:	-
Repetition accuracy:	-
Voltage influence:	-
Temperature influence:	-

9. Ambient conditions

Ambient temperature:	-25 to +55°C (according to IEC 68-1) -25 to +40°C (according to UL 508)
Storage temperature:	-25 to +70°C
Transport temperature:	-25 to +70°C
Relative humidity:	15% to 85% (according to IEC 721-3-3 class 3K3)
Pollution degree:	3 (according to IEC 60664-1)
Vibration resistance:	0 to 55Hz 0.35mm (according to IEC 68-2-6)
Shock resistance:	15g 11ms (according to IEC 68-2-27)

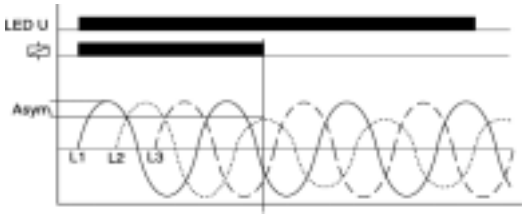
MR-PFR-Cont



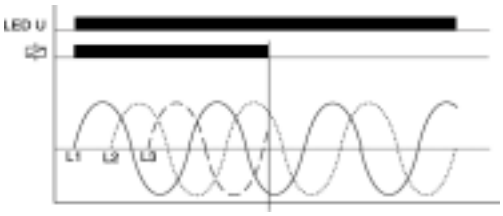
Connection Diagram

Phase sequence monitoring
When all the phases are connected in the correct sequence and the measured asymmetry is less than the fixed value, the output relays switch into on-position (yellow LED illuminated). When the phase sequence changes, the output relays switch into off-position (yellow LED not illuminated).
Phase failure monitoring
When one of the three phases fails, the output relays switch into
off-position (yellow LED not illuminated).
Detection of reverse voltage (by means of evaluation of asymmetry)
The output relays switch into off-position (yellow LED not illuminated) when the asymmetry between the phase voltages exceeds the fixed value of the asymmetry.
An asymmetry caused by the reverse voltage of a consumer (e.g. a motor which continues to run on two phases only) does not effect the disconnection

Detection of reverse voltage



Phase failure monitoring



MR-1PVM

1. Functions

AC/DC voltage monitoring in 1-phase mains with adjustable thresholds, timing for start-up suppression and tripping delay separately adjustable and the following functions (selectable by means of rotary switch)

OVER	Overvoltage monitoring
OVER+LATCH	Overvoltage monitoring with fault latch
UNDER	Undervoltage monitoring
UNDER+LATCH	Undervoltage monitoring with fault latch
WIN	Monitoring the window between Min and Max
WIN+LATCH	Monitoring the window between Min and Max with fault latch

2. Time ranges

	Adjustment range	
Start-up suppression time:	0s	10s
Tripping delay:	0.1s	10s

3. Indicators

Green LED ON:	indication of supply voltage
Green LED flashing:	indication of start-up suppression time
Yellow LED ON/OFF:	indication of relay output
Red LED ON/OFF:	indication of failure of the corresponding threshold
Red LED flashing:	indication of tripping delay of the corresponding threshold

4. Mechanical design

Self-extinguishing plastic housing, IP rating IP40
Mounted on DIN-Rail TS 35 according to EN 50022
Mounting position: any
Shockproof terminal connection according to VBG 4 (PZ1 required), IP rating IP20
Tightening torque: max. 1Nm
Terminal capacity:
1 x 0.5 to 2.5mm² with/without multicore cable end
1 x 4mm² without multicore cable end
2 x 0.5 to 1.5mm² with/without multicore cable end
2 x 2.5mm² flexible without multicore cable end

5. Input circuit

Supply voltage:

12 to 400V AC	terminals A1-A2 (galvanically separated)

selectable via power supplies MR-PS

Tolerance:	according to specification of power module
Rated frequency:	according to specification of power module
Rated consumption:	2VA (1.5W)
Duration of operation:	100%
Reset time:	500ms
Residual ripple for DC:	-
Drop-out voltage:	>30% of the supply voltage
Overvoltage category:	III (according to IEC 60664-1)
Rated surge voltage:	4kV

6. Output circuit

2 potential free change-over contacts

Rated voltage:	250V AC
Switching capacity (distance	750VA (3A / 250V AC)
Switching capacity (distance	1250VA (5A / 250V AC)
Fusing:	5A fast acting
Mechanical life:	20 x 106 operations
Electrical life:	2 x 105 operations at 1000VA resistive load
Switching frequency:	max. 60/min at 100VA resistive load max. 6/min at 1000VA resistive load (according to IEC 947-5-1)
Overvoltage category:	III (according to IEC 60664-1)
Rated surge voltage:	4kV

7. Measuring circuit

Fusing:	max. 20A (according to UL 508)	
Measured variable:	DC or AC Sinus (16.6 to 400Hz)	
Input:		
	30V AC/DC	terminals E-F1(+)
	60V AC/DC	terminals E-F2(+)
	300V AC/DC	terminals E-F3(+)
Overload capacity:		
	30V AC/DC	100Veff
	60V AC/DC	150Veff
	300V AC/DC	440Veff
Input resistance:		
	30V AC/DC	47kT
	60V AC/DC	100kT
	300V AC/DC	470kT
Switching threshold		
	Max:	10% to 100% of UN
	Min:	5% to 95% of UN
Overvoltage category:	III (according to IEC 60664-1)	
Rated surge voltage:	4kV	

8. Accuracy

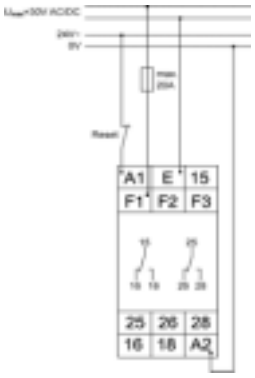
Base accuracy:	±5% (of maximum scale value)
Frequency response:	-10% to +5% (at 16.6 to 400Hz)
Adjustment accuracy:	Ω5% (of maximum scale value)
Repetition accuracy:	Ω2%
Voltage influence:	Ω0.5%
Temperature influence:	Ω0.1% / °C

9. Ambient conditions

Ambient temperature:	-25 to +55°C (according to IEC 68-1) -25 to +40°C (according to UL 508)
Storage temperature:	-25 to +70°C
Transport temperature:	-25 to +70°C
Relative humidity:	15% to 85% (according to IEC 721-3-3 class 3K3)
Pollution degree:	3 (according to IEC 60664-1)
Vibration resistance:	10 to 55Hz 0.35mm (according to IEC 68-2-6)
Shock resistance:	15g 11ms (according to IEC 68-2-27)

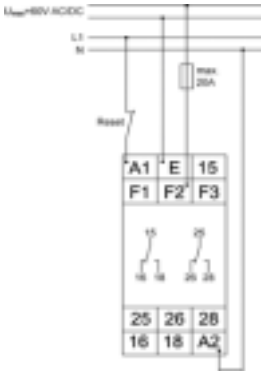
MR-1PVM-cont

30 volts



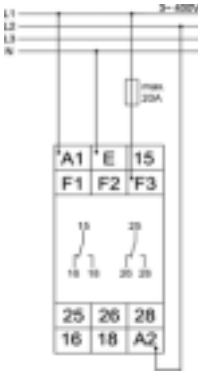
Connection Diagram

60 volts



Connection Diagram

300 volts

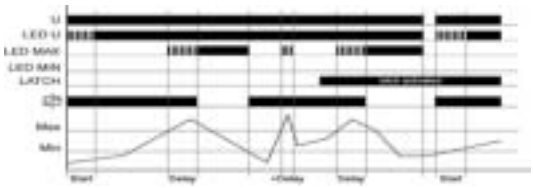


Connection Diagram

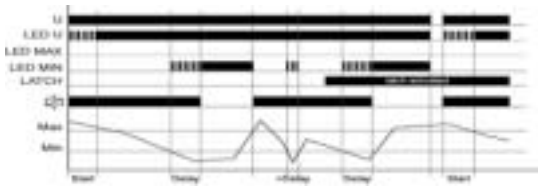
When the supply voltage U is applied, the output relays switch into on-position (yellow LED illuminated) and the set interval of the start-up suppression (START) begins (green LED U flashes). Changes of the measured voltage during this period do not affect the state of the output relay. After the interval has expired the green LED is illuminated steadily.
For all the functions the LEDs MIN and MAX are flashing alternating, when the minimum value for the measured voltage was chosen to be greater than the maximum value.

Overvoltage monitoring (OVER, OVER+LATCH)
When the measured voltage exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (DELAY) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relays switch into off-position (yellow LED not illuminated). The output relays again switch into on-position (yellow LED illuminated), when the measured voltage falls below the value adjusted at the MIN-regulator (red LED MAX not illuminated).
If the fault latch is activated (OVER+LATCH) and the measured voltage remains above the MAX-value longer than the set interval of the tripping delay, the output relays remain in the off-position even if the measured voltage falls below the value adjusted at the MIN-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relays switch into on-position and a new measuring cycle begins with the set interval of the start-up suppression (START).
Undervoltage monitoring (UNDER, UNDER+LATCH)
When the measured voltage falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (DELAY) begins (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relays switch into off-position (yellow LED not illuminated). The output relays again switch into on-position (yellow LED illuminated), when the measured voltage exceeds the value adjusted at the MAX-regulator.
If the fault latch is activated (UNDER+LATCH) and the measured voltage remains below the MIN-value longer than the set interval of the tripping delay, the output relays remain in the off-position even if the measured voltage exceeds the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relays switch into on-position and a new measuring cycle begins with the set interval of the start-up suppression (START).
Window function (WIN, WIN+LATCH)
The output relays switch into on-position (yellow LED illuminated) when the measured voltage exceeds the value adjusted at the MIN-regulator. When the measured voltage exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (DELAY) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relays switch into off-position (yellow LED not illuminated). The output relays again switch into on-position (yellow LED illuminated) when the measured voltage falls below the value adjusted at the MAX-regulator (red LED MAX not illuminated). When the measured voltage falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (DELAY) begins again (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relays switch into off-position (yellow LED not illuminated).
If the fault latch is activated (WIN+LATCH) and the measured voltage remains below the MIN-value longer than the set interval of the tripping delay, the output relays remain in the off-position even if the measured voltage exceeds the value adjusted at the MIN-regulator. If the measured voltage remains above the MAX-value longer than the set interval of the tripping delay, the output relays remain in the off-position even if the measured voltage falls below the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relays switch into on-position and a new measuring cycle begins with the set interval of the start-up suppression (START).

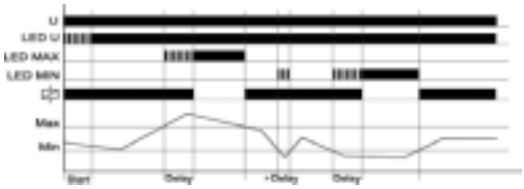
MR-1PVM Over Voltage



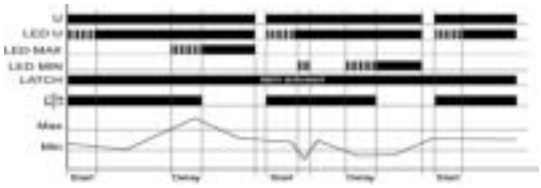
MR-1PVM Under Voltage



MR-1PVM Window



MR-1PVM Window + Latch



MR-1PIM

1. Functions

AC/DC current monitoring in 1-phase mains with adjustable thresholds, timing for start-up suppression and tripping delay separately adjustable and the following functions (selectable by means of rotary switch)

OVER	Overcurrent monitoring
OVER+LATCH	Overcurrent monitoring with fault latch
UNDER	Undercurrent monitoring
UNDER+LATCH	Undercurrent monitoring with fault latch
WIN	Monitoring the window between Min and Max
WIN+LATCH	Monitoring the window between Min and Max with fault latch

2. Time ranges

	Adjustment range	
Start-up suppression time:	0s	10s
Tripping delay:	0.1s	10s

3. Indicators

Green LED ON:	indication of supply voltage
Green LED flashing:	indication of start-up suppression time
Yellow LED ON/OFF:	indication of relay output
Red LED ON/OFF:	indication of failure of the corresponding threshold
Red LED flashing:	indication of tripping delay of the corresponding threshold

4. Mechanical design

Self-extinguishing plastic housing, IP rating IP40
Mounted on DIN-Rail TS 35 according to EN 50022

Mounting position:	any

Shockproof terminal connection according to VBG 4 (PZ1 required), IP rating IP20

Tightening torque:	max. 1Nm

Terminal capacity:
1 x 0.5 to 2.5mm² with/without multicore cable end
1 x 4mm² without multicore cable end
2 x 0.5 to 1.5mm² with/without multicore cable end
2 x 2.5mm² flexible without multicore cable end

5. Input circuit

Supply voltage:		
	12 to 400V AC	terminals A1-A2 (galvanically separated)
	selectable via power supply MR-PS	
Tolerance:	according to specification of power module	
Rated frequency:	according to specification of power module	
Rated consumption:	2VA (1.5W)	
Duration of operation:	100%	
Reset time:	500ms	
Residual ripple for DC:	-	
Drop-out voltage:	>30% of the supply voltage	
Overvoltage category:	III (according to IEC 60664-1)	
Rated surge voltage:	4kV	

6. Output circuit

2 potential free change-over contacts

Rated voltage:	250V AC
Switching capacity (distance <5mm):	750VA (3A / 250V AC)
Switching capacity (distance >5mm):	1250VA (5A / 250V AC)
Fusing:	5A fast acting
Mechanical life:	20 x 106 operations
Electrical life:	2 x 105 operations at 1000VA resistive load
Switching frequency:	max. 60/min at 100VA resistive load max. 6/min at 1000VA resistive load (according to IEC 947-5-1)
Overvoltage category:	III (according to IEC 60664-1)
Rated surge voltage:	4kV

7. Measuring circuit

Measured variable:	DC or AC Sinus (16.6 to 400Hz)	
Input:		
	100mA AC/DC	terminals K-I1(+)
	1A AC/DC	terminals K-I2(+)
	10A AC/DC	terminals K-I3(+) (distance >5mm)
Overload capacity:		
	100mA AC/DC	800mA
	1A AC/DC	3A
	10A AC/DC	12A
Input resistance:		
	100mA AC/DC	470mΩ
	1A AC/DC	47mΩ
	10A AC/DC	5mΩ
Switching threshold		
	Max:	10% to 100% of IN
	Min:	5% to 95% of IN
Overvoltage category:	III (according to IEC 60664-1)	
Rated surge voltage:	4kV	

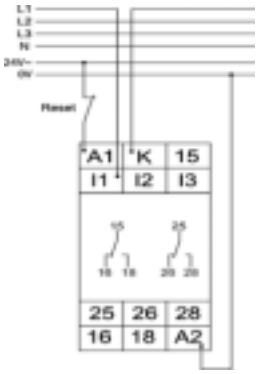
8. Accuracy

Base accuracy:	±5% (of maximum scale value)
Frequency response:	-10% to +5% (16.6 to 400Hz)
Adjustment accuracy:	±5% (of maximum scale value)
Repetition accuracy:	±2%
Voltage influence:	-
Temperature influence:	±0.1% / °C

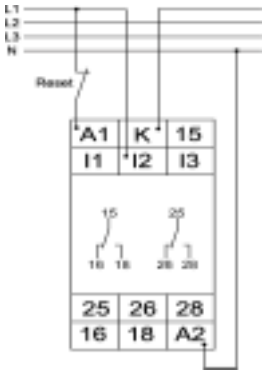
9. Ambient conditions

Ambient temperature:	-25 to +55°C (according to IEC 68-1) -25 to +40°C (according to UL 508)
Storage temperature:	-25 to +70°C
Transport temperature:	-25 to +70°C
Relative humidity:	15% to 85% (according to IEC 721-3-3 class 3K3)
Pollution degree:	3 (according to IEC 60664-1)
Vibration resistance:	10 to 55Hz 0.35mm (according to IEC 68-2-6)
Shock resistance:	15g 11ms (according to IEC 68-2-27)

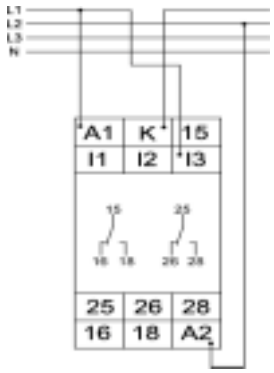
MR-1PIM-cont



Connection Diagram



Connection Diagram

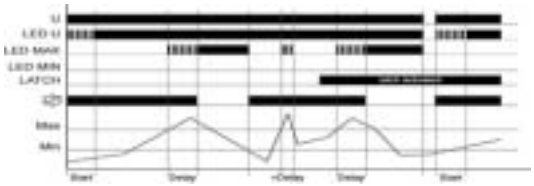


Connection Diagram

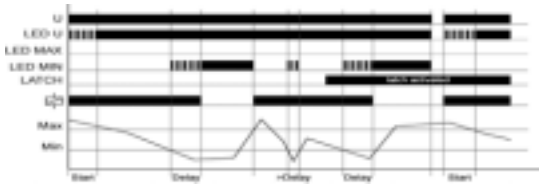
When the supply voltage U is applied, the output relays switch into on-position (yellow LED illuminated) and the set interval of the start-up suppression (START) begins (green LED U flashes). Changes of the measured current during this period do not affect the state of the output relay. After the interval has expired the green LED is illuminated steadily.
For all the functions the LEDs MIN and MAX are flashing alternating, when the minimum value for the measured current was chosen to be greater than the maximum value.

Overcurrent monitoring (OVER, OVER+LATCH)
When the measured current exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (DELAY) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relays switch into off-position (yellow LED not illuminated). The output relays again switch into on-position (yellow LED illuminated), when the measured current falls below the value adjusted at the MIN-regulator (red LED MAX not illuminated).
If the fault latch is activated (OVER+LATCH) and the measured current remains above the MAX-value longer than the set interval of the tripping delay, the output relays remain in the off-position even if the measured current falls below the value adjusted at the MIN-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relays switch into on-position and a new measuring cycle begins with the set interval of the start-up suppression (START).
Undercurrent monitoring (UNDER, UNDER+LATCH)
When the measured current falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (DELAY) begins (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relays switch into off-position (yellow LED not illuminated). The output relays again switch into on-position (yellow LED illuminated), when the measured current exceeds the value adjusted at the MAX-regulator.
If the fault latch is activated (UNDER+LATCH) and the measured current remains below the MIN-value longer than the set interval of the tripping delay, the output relays remain in the off-position even if the measured current exceeds the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relays switch into on-position and a new measuring cycle begins with the set interval of the start-up suppression (START).
Window function (WIN, WIN+LATCH)
The output relays switch into on-position (yellow LED illuminated) when the measured current exceeds the value adjusted at the MIN-regulator. When the measured current exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (DELAY) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relays switch into off-position (yellow LED not illuminated). The output relays again switch into on-position (yellow LED illuminated) when the measured current falls below the value adjusted at the MAX-regulator (red LED MAX not illuminated). When the measured current falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (DELAY) begins again (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relays switch into off-position (yellow LED not illuminated).
If the fault latch is activated (WIN+LATCH) and the measured current remains below the MIN-value longer than the set interval of the tripping delay, the output relays remain in the off-position even if the measured current exceeds the value adjusted at the MIN-regulator. If the measured current remains above the MAX-value longer than the set interval of the tripping delay, the output relays remain in the off-position even if the measured current falls below the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relays switch into on-position and a new measuring cycle begins with the set interval of the start-up suppression (START).

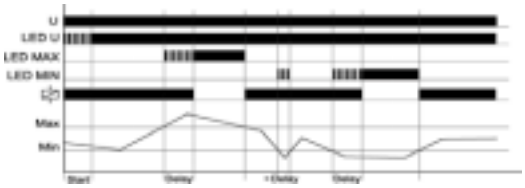
MR-1PVM Over Voltage



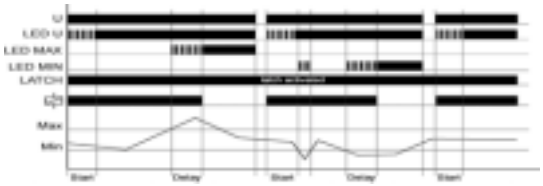
MR-1PVM Under Voltage



MR-1PVM Window



MR-1PVM Window + Latch



DIN Timers TD

22.5mm DIN rail mounting Electronic Timers

- AC/DC coil operation
- Multi-time range
- Multi-function, On-delay, Off-delay and Star/Delta versions
- Voltage range selectable
- Marking plate cover

Options and ordering codes

TD	MA	Multi Voltage Options

DIN rail mount timers	TD

Multi-function	MA
4 function	MC
Multi-function 2 C/O	MB
On-delay	EA
Off-delay	RA
Asymmetrical recycling	IA
True off-delay 3 minutes	AA
True off-delay 10 minutes	AB
Star/Delta	SD

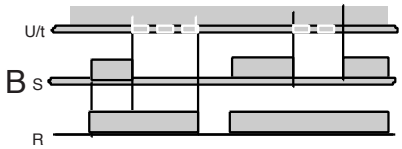
	Multi Voltage Options
All timers are Multi-voltage I/P 24VAC/DC and 100-230VAC selectable on unit. Except EA+RA models	
EA + RA models only	110VAC + 24VAC/DC
EA + RA models only	230VAC + 24VAC/DC

Specification

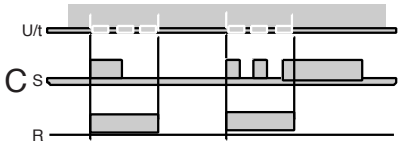
		TDMA	TDMC	TDMB	TDEA	TDRA	TDIA	TDAA	TDAB	TDSD
Operation modes		A,B,C,D E,F,G,H	A,B,F,G	A,B,C,D E,F,G,H	A	B	Rp,Ri	T	T	S
Time range		0.05sec- - 10 days	0.05sec- 10 days	0.05sec- - 10 days	0.05sec- - 10 days	0.05sec- - 10 days	0.05sec- - 10 days	0.1sec- - 3 min	0.1sec- - 10 min	0.5sec-3minY 40-100ms Y△
Accuracy		±0.5% FS								
Supply voltage		24VDC ±10%, 24VAC-15% +10%, 110-230VAC-15% +10%								
Nominal power consumption		24V 1.5VA/ 1W-110V 2VA 230V 8VA	24V 1.5VA/ 1W-110V 2VA 230V 8VA	24V 1.5VA/ 1W-110V 2VA 230V 11VA	24V 1.5VA/ 1W-110V 2VA 230V 8VA	24V 1.5VA/ 1W-110V 2VA 230V 11VA	24V 1.5VA/ 1W-110V 2VA 230V 8VA	24V 1.5VA/ 1W-110V 4VA 230V 15VA	24V 1.5VA/ 1W-110V 4VA 230V 15VA	24V 1.5VA/ 1W-110V 2VA 230V 11VA
Input signal Control contact must be 90% of A1-A2		Power on control contact	Power on control contact	Power on control contact	Power on	Power on control contact	Power on	Power on	Power on	Power on
Contact configuration		1 C/O	1 C/O	2 C/O programmable	1 C/O	1 C/O	1 C/O	1 C/O	1 C/O	1 C/O with rest position
Control output		8A@250VAC	8A@250VAC	8A@250VAC	5A@250VAC	5A@250VAC	5A@250VAC	5A@250VAC	5A@250VAC	8A@250VAC
Life expectancy	Electrical	400,000	400,000	400,000	100,000	100,000	400,000	100,000	100,000	400,000
	Mechanical	30 x 10^6	30 x 10^6	30 x 10^6	10 x 10^6	10 x 10^6	30 x 10^6	30 x 10^6	30 x 10^6	30 x 10^6
Allowable ambient temperature		-25 ˚C upto +55˚C								
IP rating	Enclosures	IP40								
	Terminals	IP20								
Terminals		Box clamp screw terminal upto 4mm²								

Mode functions

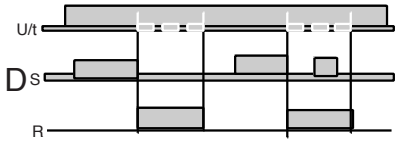
A On Delay
On application of supply voltage the time period starts to run. On completion of time the relay energises. Power off reset.



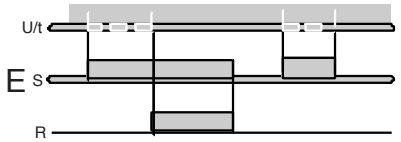
B Off delay
Supply to the unit must be continuous. On closure of the control contact (S) the relay energises immediately. On re-opening of S the time period starts to run and (R) de-energises If the control contact (S) is reclosed before “the actual time period is completed, this period will be deleted” and a new one starts on re-opening of (S).



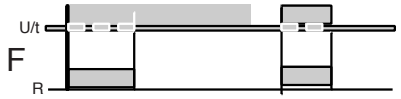
C Single shot leading edge pulse started
Supply to the unit must be continuous. On closure of the control contact (S) the relay energises immediately and the time starts to run. On completion of the time the relay will de-energise. Activation of (S) during the time out period has no effect.



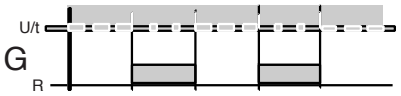
D Single shot trailing edge
Supply to the unit must be continuous. The first closure of (S) has no effect. On opening of (S) the time period starts to run and (R) energises immediately. On completion of time the relay de-energises. Activation of the control contact (S) during the time out period has no effect.



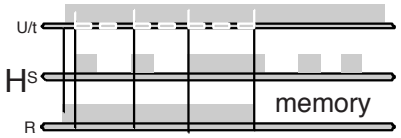
E On delay with control contact
Supply to the unit must be continuous. On closure of (S) the time period starts to run. On completion of time the relay energises and stays energised as long as (S) is closed. Opening the control contact before the time out is complete will reset the time period.



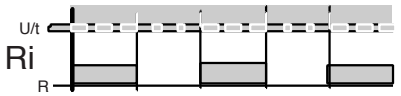
F Single shot leading edge
On application of supply voltage the time starts and (R) energises immediately. Following time out the relay will de-energise. For a new start of function the supply voltage must be interrupted.



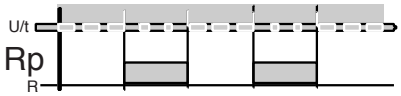
G Flasher pause first
On application of supply voltage the time period starts to “run. The relay switches on and off for the periods, beginning” with a pause. The time period for pause and pulse is equal.



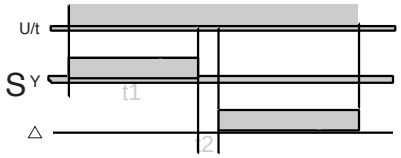
H Pulse detection
On application of supply voltage the relay energises. The first pulse of (S) starts the time period. Receiving pulses during the time period extends it and (R) stays energised. Receiving no pulses during the time period completes it and (R) de-energises. (R) stays latched until supply voltage has been interrupted.



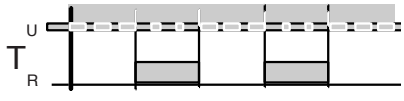
Ri Cyclic timer pulse started
On application of supply voltage the time period starts to run. “The relay switches on and off for the periods, beginning with a” pulse. The time period for t1 and t2 can be different. The function continues as long as voltage is applied.



Rp Cyclic timer pause started
On application of supply voltage the time period starts to run. “The relay switches on and off for the periods, beginning with a” pause. The time period for t1 and t2 can be different. The function continues as long as voltage is applied.



S Star Delta
On application of supply voltage the contact 17 - 18 of the star relay is closed and the star time t1 begins to run. On completion of the t1 the star relay de-energises and the dwell time t2 starts. On completion of t2 the contact 17 - 28 of the delta relay is closed and remains in operation as long as the supply voltage is applied.



T True Off Delay
When supply voltage U is engaged the relay energises (contacts 15-18). When the supply voltage is removed the set time t begins to run. On completion of time t the output falls back to the off position (contacts 15-16). If the supply voltage U is re-engaged to “the unit before t has elapsed, the time already elapsed is cancelled” and starts again next time the supply voltage is interrupted.

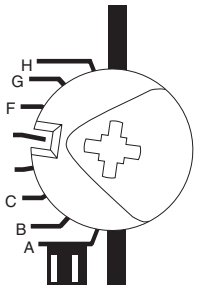
DIN Timers TD continued

Function switches

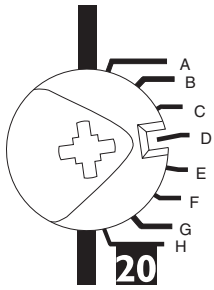
H pulse detection
G flashing pause first
F single shot
E ON-delay controlled by trigger input
D single shot trailing edge
C single shot pulse operated
B Off-delay
A On-delay

TDMB

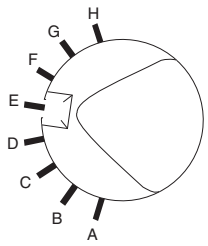
Positions of function switch with one contact as instantaneous c.t.



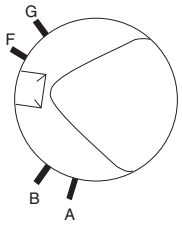
Both contacts delayed



TDMA



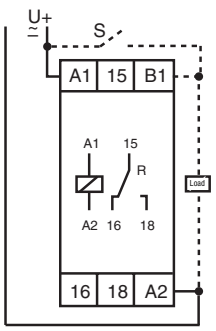
TDMC



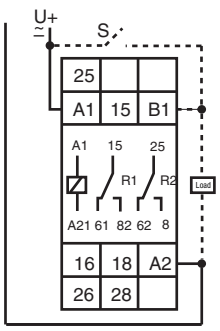
Start function B, C, D, E and H by control contact A1-B1

Connection diagrams

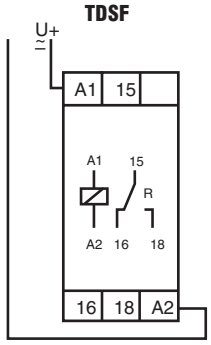
TDMA; TDRA



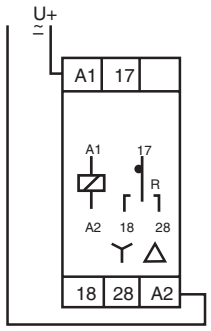
TDMB



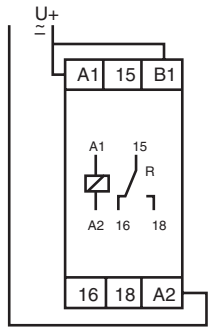
TDEA, TDAA, TDAB, TDSF



TDSD



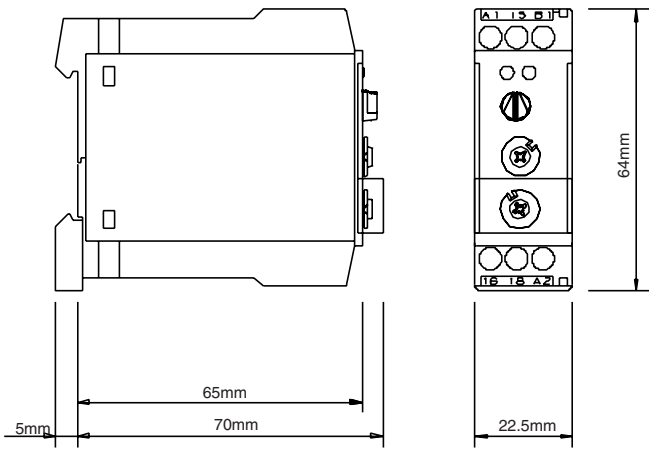
TDIA



Control Function Function Rp: without link Function Ri: link A1-B1

Dimensions

TDMA, TDEA, TDRA, TDIA, TDAA, TDAA, TDAB, TDSD, TDSF



TDMB