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**VOLTAGE MONITORING RELAYS**

- For three-phase systems without neutral, three-phase systems with or without neutral and single-phase systems
- Minimum and maximum AC voltage
- Phase loss and incorrect phase sequence
- Asymmetry
- Minimum and maximum frequency.



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**CURRENT MONITORING RELAYS**

- For single-phase systems
- Maximum AC/DC current
- Minimum or maximum AC/DC current
- Minimum and maximum AC/DC current.



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**PUMP PROTECTION RELAYS**

- For single and three-phase systems
- Minimum  $\cos\phi$  for dry running protection
- Maximum AC current
- Phase loss and incorrect phase sequence.



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**PHASE SHIFT MONITORING RELAYS**

- For single and three-phase systems
- Minimum  $\cos\phi$
- Maximum  $\cos\phi$ .



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**FREQUENCY MONITORING RELAYS**

- For single and three-phase systems
- Minimum frequency
- Maximum frequency.



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**VOLTAGE-FREQUENCY MONITORING RELAY**

- Minimum and maximum voltage
- Minimum and maximum frequency
- ROCOF (Rate Of Change Of Frequency).



- Modular version for switchgear panels, suitable also for rear mounting plate fixing
- Minimum and maximum voltage monitoring relays for single and three-phase systems, with or without neutral
- Voltage asymmetry, phase sequence and phase loss control relays
- Minimum and maximum current monitoring relays
- Frequency monitoring relay
- Voltage and frequency control relay.

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### Voltage monitoring relays for three-phase systems without neutral



	PMV10	PMV20	PMV30	PMV40	PMV50	PMV60	PMV70
Modular version	●(1U)	●(2U)	●(2U)	●(2U)	●(2U)	●(2U)	●(2U)
Minimum AC voltage			●		●	●	●
Maximum AC voltage					●		●
Phase loss	●	●	●	●	●	●	●
Incorrect phase sequence	●	●	●	●	●	●	●
Asymmetry				●		●	●
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### Voltage monitoring relays for three-phase systems with or without neutral



	PMV50N	PMV70N	PMV80N
Modular version	●(3U)	●(3U)	●(3U)
Minimum AC voltage	●	●	●
Maximum AC voltage	●	●	●
Phase loss	●	●	●
Neutral loss	●	●	●
Incorrect phase sequence	●	●	●
Asymmetry		●	
Minimum frequency			●
Maximum frequency			●
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### 17 Voltage monitoring relay for single-phase systems



	PMV55
Modular version	●(2U)
Minimum AC voltage	●
Maximum AC voltage	●
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### Current monitoring relays for single-phase systems



	PMA20	PMA30	PMA40
Modular version	●(2U)	●(2U)	●(3U)
Maximum AC/DC current	●		
Minimum or maximum AC/DC current		●	
Minimum and maximum AC/DC current			●
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### Pump protection relay for single and three-phase systems



	PMA50
Modular version	●(3U)
Minimum $\cos\varphi$ for dry running pump protection	●
Maximum AC current	●
Phase loss	●
Incorrect phase sequence	●
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### Phase shift monitoring relay for single and three-phase systems



	PMA60
Modular version	●(3U)
Minimum $\cos\varphi$	●
Maximum $\cos\varphi$	●
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### Frequency monitoring relay for single and three-phase systems



	PMF20
Modular version	●(2U)
Minimum and maximum frequency	●
Minimum frequency only	●
Maximum frequency only	●
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### Voltage and frequency monitoring relay



	PMVF10
Modular version	●(3U)
Minimum and maximum voltage	●
Minimum and maximum frequency	●
ROCOF	●
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### Voltage monitoring relays



PMV10 A440



PMV20...



PMV30...



PMV40...

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]

Three-phase system, without neutral.  
Phase loss and incorrect phase sequence. Instantaneous trip.

PMV10 A440	208-480VAC	1	0.050
PMV20 A240	100-240VAC	1	0.120
PMV20 A575	208-575VAC	1	0.120
PMV20 A600	380-600VAC	1	0.120

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]

Three-phase system, without neutral.  
Minimum AC voltage. Delayed trip.  
Phase loss and incorrect phase sequence. Instantaneous trip.

PMV30 A240	208-240VAC	1	0.130
PMV30 A575	380-575VAC	1	0.130
PMV30 A600	600VAC	1	0.130

Order code	Rated voltage to control Ue (phase-to-phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]

Three-phase system, without neutral.  
Asymmetry. Delayed trip.  
Phase loss and incorrect phase sequence. Instantaneous trip.

PMV40 A240	208-240VAC	1	0.130
PMV40 A575	380-575VAC	1	0.130
PMV40 A600	600VAC	1	0.130

#### General characteristicz

- Voltage monitoring relay, self powered, for phase loss and incorrect phase sequece
- Phase loss detection if one of the voltages is <70% rated value
- Phase loss tripping time: 60ms
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing: 1-module for PMV10; 2-module for PMV20
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### Certifications and compliance

Certifications obtained: GOST; UL Listed, for USA and Canada (File E93601) as Auxiliary Devices.  
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-15.

#### General characteristics

- Voltage monitoring relay, self powered, for minimum voltage, phase loss and incorrect phase sequence
- Configurable rated voltage (Ue):
  - PMV30 A240: 208-220-230-240VAC
  - PMV30 A575: 380-400-415-440-460-480-525-575VAC
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Control of phase-to-phase voltages
- Phase loss detection if one of the voltages is <70% rated value
- Phase loss tripping time: 60ms
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### ADJUSTMENTS

- "V min" Minimum voltage tripping threshold 80-95% Ue
- "Delay" Tripping time 0.1-20s
- "Reset delay" Resetting time 0.1-20s.

#### Certifications and compliance

Certifications obtained: GOST; UL Listed, for USA and Canada (File E93601), as Auxiliary Devices.  
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-15.

#### General characteristics

- Voltage monitoring relay, self powered, for asymmetry, phase loss and incorrect phase sequence
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Control of phase-to-phase voltages
- Phase loss detection if one of the voltages is <70% rated value
- Phase loss tripping time: 60ms
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### ADJUSTMENTS

- "Asymmetry" High voltage asymmetry tripping threshold 5-15% Ue
- "Delay" Tripping time 0.1-20s
- "Reset delay" Resetting time 0.1-20s

#### Certifications and compliance

Certifications obtained: GOST; UL Listed, for USA and Canada (File E93601), as Auxiliary Devices.  
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-15.

### Voltage monitoring relays



PMV50...

Order code	Rated voltage to control Ue (phase-to-phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]

Three-phase system, without neutral.  
Minimum and maximum AC voltage. Delayed trip.  
Phase loss and incorrect phase sequence. Instantaneous trip.

<b>PMV50 A240</b>	208-240VAC	1	0.130
<b>PMV50 A575</b>	380-575VAC	1	0.130
<b>PMV50 A600</b>	600VAC	1	0.130

#### General characteristics

- Voltage monitoring relay, self powered, for minimum and maximum voltage, phase loss and incorrect phase sequence
- Configurable rated voltage (Ue):
  - PMV50 A240: 208-220-230-240VAC
  - PMV50 A575: 380-400-415-440-460-480-525-575VAC
- High tripping accuracy
- TRMS measurements (True Root Mean Square)
- Control of phase-to-phase voltages
- Phase loss detection if one of the voltages is <70% rated value
- Phase loss tripping time: 60ms
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 on terminals.

#### ADJUSTMENTS

- “V max” Maximum voltage tripping threshold 105-115% Ue
- “V min” Minimum voltage tripping threshold 80-95% Ue
- “Delay” for each Tripping time 0.1-20s
- “Reset delay” Resetting time 0.1-20s.

#### Certifications and compliance

Certifications obtained: GOST; UL Listed, for USA and Compliant to standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-15.



PMV60...

Order code	Rated voltage to control Ue (phase-to-phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]

Three-phase system, without neutral.  
Minimum AC voltage and asymmetry. Delayed trip.  
Phase loss and incorrect phase sequence. Instantaneous trip.

<b>PMV60 A240</b>	208-240VAC	1	0.130
<b>PMV60 A575</b>	380-575VAC	1	0.130
<b>PMV60 A600</b>	600VAC	1	0.130

#### General characteristics

- Voltage monitoring relay, self powered, for minimum voltage, phase loss and incorrect phase sequence
- Configurable rated voltage (Ue):
  - PMV60 A240: 208-220-230-240VAC
  - PMV60 A575: 380-400-415-440-460-480-525-575VAC
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Control of phase-to-phase voltages
- Phase loss detection if one of the voltages is <70% rated value
- Phase loss tripping time: 60ms
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 on terminals.

#### ADJUSTMENTS

- “V min” Minimum voltage tripping threshold 80-95% Ue
- “Asymmetry” High voltage asymmetry tripping threshold 5-15% Ue
- “Delay” Tripping time 0.1-20s
- “Reset delay” Resetting time 0.1-20s

#### Certifications and compliance

Certifications obtained: GOST; UL Listed for USA and Canada (File E93601), as Auxiliary Devices. Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-15.

# Protection relays

For three-phase systems, without neutral.

For three-phase systems, with or without neutral

## Voltage monitoring relay



PMV70...

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]

Three-phase system, without neutral.  
Minimum and maximum AC voltage and asymmetry.  
Delayed trip.  
Phase loss and incorrect phase sequence. Instantaneous trip.

PMV70 A240	208-240VAC	1	0.130
PMV70 A575	380-575VAC	1	0.130
PMV70 A600	600VAC	1	0.130

### General characteristics

- Voltage monitoring relay, self powered, for minimum and maximum voltage, phase loss, incorrect phase sequence and asymmetry
- Configurable rated voltage (Ue):
  - PMV70 A240: 208-220-230-240VAC
  - PMV70 A575: 380-400-415-440-460-480-525-575VAC
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Control of phase-to-phase voltages
- Phase loss detection if one of the voltages is <70% rated value
- Phase loss tripping time: 60ms
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2-module
- IEC protection degree: IP40 on front( only when placed in IP40 enclosure or control board); IP20 at terminals.

### ADJUSTMENTS

- “V max” Maximum voltage tripping threshold 105-115% Ue
- “V min” Minimum voltage tripping threshold 80-95% Ue
- “Delay” for each Tripping delay 0.1-20s
- “Asymmetry” High voltage asymmetry tripping threshold 5-15% Ue

### Certifications and compliance

Certifications obtained: GOST; UL Listed, for USA and Canada (File E93601), as Auxiliary Devices.  
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

### Operational diagram

See page 17-15.

## Voltage monitoring relay for three-phase systems with or without neutral



PMV50N...

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]

Three-phase system, with or without neutral.  
Minimum and maximum AC voltage. Delayed trip.  
Phase loss, neutral loss and incorrect phase sequence.  
Instantaneous trip.

PMV50N A240	208-240VAC	1	0.150
PMV50N A440	380-440VAC	1	0.150
PMV50N A600	480-600VAC	1	0.150

### General characteristics

- Voltage monitoring relay, self powered, for minimum and maximum voltage, phase loss, neutral loss and incorrect phase sequence
- 4 configurable rated voltage (Ue):
  - PMV50N A240: 208-220-230-240VAC (phase-phase) 120-127-132-138VAC (phase-neutral)
  - PMV50N A440: 380-400-415-440VAC (phase-phase) 220-230-240-254VAC (phase-neutral)
  - PMV50N A600: 480-525-575-600VAC (phase-phase) 277-303-332-347VAC (phase-neutral)
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Phase loss detection when one of the voltages is <70% rated voltage
- Phase or neutral loss tripping time: 60ms
- 2 relay outputs, each with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 3-module
- IEC protection degree: IP40 on front( only when placed in IP40 enclosure or control board); IP20 at terminals.

### ADJUSTMENTS

- “V max” Maximum voltage tripping threshold 105-115% Ue
- “V min” Minimum voltage tripping threshold 80-95% Ue
- “Delay” for each Tripping time 0.1-20s
- “Reset Delay” Resetting time 0.1-20s.

### Certifications and compliance

Certifications obtained: cULus pending completion at time of catalogue printing.  
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

### Operational diagram

See page 17-16.

### Voltage monitoring relays



PMV70N...

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]

Three-phase system, with or without neutral.  
Minimum and maximum AC voltage and asymmetry.  
Delayed trip.  
Phase loss, neutral loss and incorrect phase sequence.  
Instantaneous trip.

<b>PMV70N A240</b>	208-240VAC	1	0.150
<b>PMV70N A440</b>	380-440VAC	1	0.150
<b>PMV70N A600</b>	480-600VAC	1	0.150

#### General characteristics

- Voltage monitoring relay, self powered, for minimum and maximum voltage, phase loss, neutral loss, incorrect phase sequence and asymmetry
- 4 configurable rated voltage (Ue):
  - PMV70N A240: 208-220-230-240VAC (phase-phase) 120-127-132-138VAC (phase-neutral)
  - PMV70N A440: 380-400-415-440VAC (phase-phase) 220-230-240-254VAC (phase-neutral)
  - PMV70N A600: 480-525-575-600VAC (phase-phase) 277-303-332-347VAC (phase-neutral)
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Phase loss detection when one of the voltages is <70% rated value
- Phase or neutral loss tripping time: 60ms
- 2 relay outputs, each with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 3-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### ADJUSTMENTS

- “V max” Maximum voltage tripping threshold 105-115% Ue
- “V min” Minimum voltage tripping threshold 80-95% Ue
- “Delay” for each Tripping time 0.1-20s
- “Asymmetry” High voltage asymmetry tripping threshold 5-15% Ue

#### Certifications and compliance

Certifications obtained: cULus pending completion at time of catalogue printing.  
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-16.



PMV80N...

Order code	Rated voltage to control Ue (phase to phase)	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]

Three-phase system, with or without neutral.  
Minimum and maximum AC voltage, minimum and maximum frequency. Delayed trip.  
Phase loss, neutral loss and incorrect phase sequence.  
Instantaneous trip.

<b>PMV80N A240</b>	208-240VAC	1	0.150
<b>PMV80N A440</b>	380-440VAC	1	0.150
<b>PMV80N A600</b>	480-600VAC	1	0.150

#### General characteristics

- Voltage monitoring relay, self powered, for minimum and maximum voltage, minimum and maximum frequency, phase loss, neutral loss and incorrect phase sequence
- 4 configurable rated voltage (Ue):
  - PMV80N A240: 208-220-230-240VAC (phase-phase) 120-127-132-138VAC (phase-neutral)
  - PMV80N A440: 380-400-415-440VAC (phase-phase) 220-230-240-254VAC (phase-neutral)
  - PMV80N A600: 480-525-575-600VAC (phase-phase) 277-303-332-347VAC (phase-neutral)
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- Phase loss detection if one of the voltages is <70% rated value
- Phase or neutral loss tripping time: 60ms
- 2 relay outputs, each with 1 changeover contact (SPDT)
- Modular DIN 43880, 3-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### ADJUSTMENTS

- “V max” Maximum voltage tripping threshold 105-115% Ue
- “V min” Minimum voltage tripping threshold 80-95% Ue
- “Hz min/max” Minimum/maximum frequency tripping threshold 1-10%
- “V delay” Tripping time 0.1-20s
- “Hz delay” Tripping time 0.1-5s.

#### Certifications and compliance

Certifications obtained: cULus pending completion at time of catalogue printing.  
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-16.



### Voltage monitoring relay



PMV55...

Order code	Rated voltage to control Ue	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]

Single-phase system.  
Minimum and maximum AC voltage. Delayed trip.

<b>PMV55 A240</b>	208-240VAC	1	0.125
<b>PMV55 A440</b>	380-440VAC	1	0.125

#### General characteristics

- Voltage monitoring relay, self powered, for minimum and maximum voltage
- 4 configurable rated voltage (Ue):
  - PMV55 A240: 208-220-230-240VAC
  - PMV55 A440: 380-400-415-440VAC
- Excellent tripping accuracy
- TRMS measurements (True Root Mean Square)
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### ADJUSTMENTS

- "V max" Maximum voltage tripping threshold 105-115% Ue
- "V min" Minimum voltage tripping threshold 80-95% Ue
- "Delay" for each Tripping time 0.1-20s
- "Reset delay" Resetting time 0.1-20s

#### Certifications and compliance

Certifications obtained: GOST; UL Listed, for USA and Canada (File E93601), as Auxiliary Devices.  
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-16.

### Current monitoring relay



PMA20 240

Order code	Rated current Ie	Auxiliary supply voltage	Qty per pkg	Wt
	[A]	[V]	n°	[kg]

Single-phase system.  
AC/DC maximum current control.  
Auxiliary AC/DC power supply.  
Automatic or manual reset.

<b>PMA20 240</b>	5 or 16A	24-240V AC/DC	1	0.121
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#### General characteristics

- Current monitoring relay for AC/DC maximum current control, AC/DC multivoltage auxiliary power supply
- Direct connection up to 16A max, or by current transformer (CT)
- Excellent tripping accuracy
- TRMS current measurements (True Root Mean Square)
- Resetting and inhibition input
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### ADJUSTMENTS

- "Imax" Maximum current tripping threshold 5-100% Ie
- "Hysteresis" Maximum hysteresis threshold 1-50%
- "Trip delay" Tripping time 0.1-30s
- "Inhibition time" Tripping delay for external input or at power up 1-60s
- "Aut. reset delay" Automatic resetting time 0.1-30s
- "Mode"
  - Rated current 5A or 16A,
  - Relay output normally energised or de-energised
  - Tripping memory (Latch) On or Off.

#### Certifications and compliance

Certifications obtained: GOST; UL Listed, for USA and Canada (File E93601), as Auxiliary Devices - Modular ampere monitoring relays.  
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-17.

### Current monitoring relays



PMA30 240

Order code	Rated current I <sub>e</sub>	Auxiliary supply voltage	Qty per pkg	Wt
	[A]	[V]	n°	[kg]

Single-phase system.  
AC/DC minimum or maximum current control. Delayed trip.  
Auxiliary AC/DC power supply.  
Automatic or manual reset.

<b>PMA30 240</b>	5 or 16A	24-240V AC/DC	1	0.121
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#### General characteristics

- Current monitoring relay for AC/DC minimum or maximum current control; AC/DC multivoltage auxiliary power supply
- Direct connection up to 16A max, or by current transformer (CT)
- Excellent tripping accuracy
- TRMS current measurements (True Root Mean Square)
- Resetting and inhibition input
- 1 relay output with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### ADJUSTMENTS

- "Set point" Minimum or maximum current tripping threshold 5-100% I<sub>e</sub>
- "Hysteresis" Minimum or maximum hysteresis threshold 1-50%
- "Trip delay" Tripping time 0.1-30s
- "Inhibition time" Tripping delay for external input or at power up 1-60s
- "I<sub>e</sub>" Current scale selection: 5A or 16A
- "Mode"
- Min or max function
  - Relay output normally energised or de-energised
  - Tripping memory (Latch) On or Off.

#### Certifications and compliance

Certifications obtained: GOST; UL Listed, for USA and Canada (File E93601), as Auxiliary Devices - Modular ampere monitoring relays.  
Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See pages 17-18 and 19.



PMA40 240

Order code	Rated current I <sub>e</sub>	Auxiliary supply voltage	Qty per pkg	Wt
	[A]	[V]	n°	[kg]

Single-phase system.  
AC/DC minimum and maximum current control. Delayed trip.  
Auxiliary AC/DC power supply.  
Automatic or manual reset.

<b>PMA40 240</b>	0.02-0.05-0.25-1-5-16A	24-240V AC/DC	1	0.166
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#### General characteristics

- Current monitoring relay for AC/DC minimum and maximum current control, AC/DC multivoltage auxiliary power supply
- Direct connection up to 16A max, or by current transformer (CT)
- Excellent tripping accuracy
- TRMS current measurements (True Root Mean Square)
- Automatic or manual resetting (manual resetting by power removal)
- 2 relay outputs (Min and Max), configurable, each with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 3-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### ADJUSTMENTS

- "I<sub>max</sub>" Maximum current tripping threshold 5-100% I<sub>e</sub>
- "I<sub>min</sub>" Minimum current tripping threshold 5-100% I<sub>e</sub>
- "Trip delay" Minimum and maximum current tripping time 0.1-30s
- "Inhibition time" Tripping time at power up 1-60s
- "I<sub>e</sub>" Current scale selection: 20mA, 50mA, 250mA, 1A, 5A or 16A
- "Mode"
- Separate or common relay outputs
  - Relay output normally energised or de-energised
  - Tripping memory (Latch) On or Off.

#### Certifications and compliance

Certifications obtained: GOST; UL Listed, for USA and Canada (File E93601), as Auxiliary Devices - Modular ampere monitoring relays.  
Compliant with standards IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-20.

### Pump protection relay



PMA50...

Order code	Rated current I <sub>e</sub>	Auxiliary supply voltage	Qty per pkg	Wt
	[A]	[V]	n°	[kg]

Single and three-phase systems.  
Maximum AC current and minimum cosφ. Delayed trip.  
Phase loss and incorrect phase sequence. Instantaneous trip.  
Auxiliary AC power supply.  
Automatic or manual reset.

<b>PMA50 A240</b>	5 or 16A	220-240VAC	1	0.251
<b>PMA50 A415</b>		380-415VAC	1	0.251
<b>PMA50 A480</b>		440-480VAC	1	0.251

#### General characteristics

- Pump protection relay against dry running, auxiliary AC power supply
- Motor under-load and over-current control
- Direct connection up to 16A max, or by current transformer (CT)
- Excellent tripping accuracy
- Voltage control range 80-660VAC
- Current control range 0.1-16A
- Resetting and enabling consent input
- 1 relay output relay with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 3-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### ADJUSTMENTS

"Cosφ min"	Minimum cosφ threshold 0.1-0.99 (under-load/dry running)
"I <sub>max</sub> "	Maximum (over) current threshold 10-100%I <sub>e</sub>
"Trip delay"	Tripping time for minimum cosφ and maximum current 0.1-10s
"Inhibition time"	Tripping delay for external input or at power up 1-60s
"Aut. reset delay"	Automatic reset time OFF-100min
"Mode"	<ul style="list-style-type: none"> <li>• Rated current 5A or 16A</li> <li>• Single or three phase</li> <li>• External reset On or Off.</li> </ul>

#### Certifications and compliance

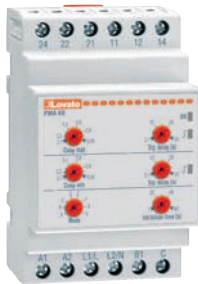
Certifications obtained: GOST; UL Listed, for USA and Canada (File E93601), as Auxiliary Devices - Modular ampere monitoring relays.

Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-21.

### Phase shift monitoring relay



PMA60...

Order code	Rated current $I_e$	Auxiliary supply voltage	Qty per pkg	Wt
	[A]	[V]	n°	[kg]
PMA60 A240	16A	220-240VAC	1	0.254
PMA60 A415		380-415VAC	1	0.254
PMA60 A480		440-480VAC	1	0.254

Single and three-phase systems.  
Minimum and maximum  $\cos\varphi$  control. Delayed trip.  
AC auxiliary power supply.  
Automatic or manual reset.

#### General characteristics

- Minimum and maximum phase shift monitoring relay, AC auxiliary power supply
- Direct connection up to 16A max, or by current transformer (CT)
- Excellent tripping accuracy
- Voltage control range 80-660VAC
- Current control range 0.1-16A
- Automatic or manual resetting (manual resetting by power removal)
- 2 relay outputs (Min and Max), configurable, each with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 3-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### ADJUSTMENTS

- " $\cos\varphi$  min" Minimum  $\cos\varphi$  threshold  
0.1-0.99 inductive
- "Trip delay" Tripping time for minimum  $\cos\varphi$   
0.1-30s
- " $\cos\varphi$  max" Maximum inductive  $\cos\varphi$  threshold  
0.1-0.99
- "Trip delay" Tripping time for maximum  $\cos\varphi$   
0.1-30s
- "Inhibition time" Tripping delay at power up 1-60s
- "Mode"
  - Single or three phase
  - Relay outputs normally energised or de-energised
  - Tripping memory (Latch) On or Off.

#### Certifications and compliance

Certifications obtained: GOST; UL Listed, for USA and Canada (File E93601), as Auxiliary Devices - Modular ampere monitoring relays.

Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, CSA C22.2 n° 14.

#### Operational diagram

See page 17-22.

## Frequency monitoring relay



PMF20...

Order code	Rated voltage Ue	Qty per pkg	Wt
	[V] 50/60Hz	n°	[kg]

Single and three-phase systems.  
Minimum and maximum frequency. Delayed trip.  
Automatic reset.

<b>PMF20 A240</b>	220-240VAC	1	0.125
<b>PMF20 A415</b>	380-415VAC	1	0.125

### General characteristics

- Frequency monitoring relay, self powered, for minimum and maximum control
- Rated frequency selection: 50 or 60Hz
- Tripping threshold for minimum and maximum frequency
- Excellent tripping accuracy
- 1 relay output, configurable, with 1 changeover contact (SPDT)
- Modular DIN 43880 housing, 2-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

### ADJUSTMENTS

- "Hz max" Maximum frequency tripping threshold +1 to +10%
- "Delay" Tripping time 0.1-20s
- "Hz min" Minimum frequency tripping threshold -1 to -10%
- "Delay" Tripping time 0.1-20s
- "Reset delay" Resetting time 0.1-20s
- "Mode"
  - Minimum and maximum frequency
  - Output relay energised at maximum frequency
  - Output relay energised at minimum frequency
  - Output relay de-energised at maximum frequency.

### Certifications and compliance

Certifications obtained: GOST; UL Listed, for USA and Canada (File E93601), as Auxiliary Devices.

Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL 508, BCSA C22.2 n° 14.

### Operational diagram

See page 17-23.

### Voltage and frequency monitoring relay



PMVF10



Order code di ordinazione	Rated voltage to control Ue	Qty per pkg	Wt
	[V]	n°	[kg]

Three-phase low-voltage system, with or without neutral. Compatible for single-phase low-voltage system. Minimum and maximum AC voltage and frequency control and ROCOF.

<b>PMVF10</b>	230VAC 50Hz 400VAC 50Hz	1	0.254
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#### Status indication table

Anomaly	Green LED "ON"	Red LED "Vmin"	Red LED "Vmax"	Red LED "Hz"	Relay output 1 and 2
None	Constantly lighted	Switched off	Switched off	Switched off	Energised
Min/max frequency or ROCOF	Flashing	Switched off	Switched off	Constantly lighted	De-energised
Voltage <Vmin	Flashing	Constantly lighted	Switched off	Switched off	De-energised
Voltage >Vmax	Flashing	Switched off	Constantly lighted	Switched off	De-energised

#### General characteristics

The monitoring relay PMVF10 is designed and developed to satisfy requirements of the local power authority (ENEL guide edition 2.1 of 12/2010). The authority imposes that the following automatic controls be done whenever an independent power source (e.g. wind turbine or photovoltaic system, diesel generating set, etc.) is connected in parallel with the electric grid (local low-voltage utility):

- Limits of minimum and maximum voltage values
- Limits of minimum and maximum frequency values
- Limit of the Rate Of Change Of Frequency (ROCOF).

When at least one of these limits are not respected, abnormal conditions need to be signalled using a contact.

Typically, the contact is used to isolate the independent power source from the electric grid.

The following are the relay protections available:

- Maximum voltage
- Minimum voltage
- Maximum frequency
- Minimum frequency
- ROCOF.

TRMS measurements of this relay can obtain a correct operation even in presence of harmonic voltages. It has fixed tripping thresholds for minimum and maximum voltage while those for frequency can be selected between two predefined values, using a rotary switch. A reset delay is adjustable by potentiometer.

#### Operational characteristics

- Self powered by the system controlled
- Compatible for:
  - Three-phase systems (400VAC 50Hz, with or without neutral)
  - Single-phase systems (230VAC 50 Hz)
- TRMS measurements (True Root Mean Square)
- 2 relay outputs, each with 1 changeover contact (SPDT), rated 8A 250VAC (AC1)
- Modular DIN 43880 housing, 3-module
- IEC protection degree: IP40 on front (only when placed in IP40 enclosure or control board); IP20 at terminals.

#### PROTECTIONS

Maximum voltage protection:

- Fixed threshold  $\geq 1.13U_e$
- Fixed tripping time  $\leq 0.1s$ .

Minimum voltage protection:

- Fixed threshold  $\leq 0.825U_e$
- Fixed tripping time  $\leq 0.2s$ .

#### ADJUSTMENTS

- "Mode" Multifunction rotary switch:
- Control of phase or phase-to-phase voltage values
  - Frequency threshold  $\pm 0.3$  or  $\pm 1Hz$
  - ROCOF ( $> 0.5Hz/s$ ) On or Off
- "Reset delay" Resetting time 0.1-30s.

#### STATUS INDICATIONS

- 1 green LED for system with limits (flashing when out of limits)
- 3 red LEDs for minimum and maximum voltage, minimum and maximum frequency and ROCOF.

#### Certifications and compliance

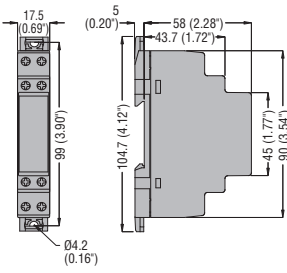
Certifications obtained: Local Power Authority (ENEL guide, edition 2.1 December 2010).

Compliant with standards: IEC/EN 60255-5, IEC/EN 61000-6-2, IEC/EN 610006-3.

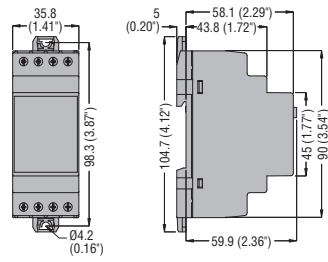
#### Operational diagram

See page 17-23.

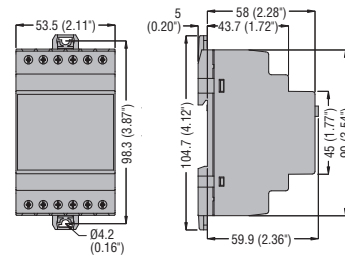
### Protection relays PMV10...



### PMV... - PMF20 PMA20... - PMA30...

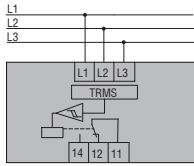


### PMV...N - PMA40... - PMA50... - PMA60... - PMVF10

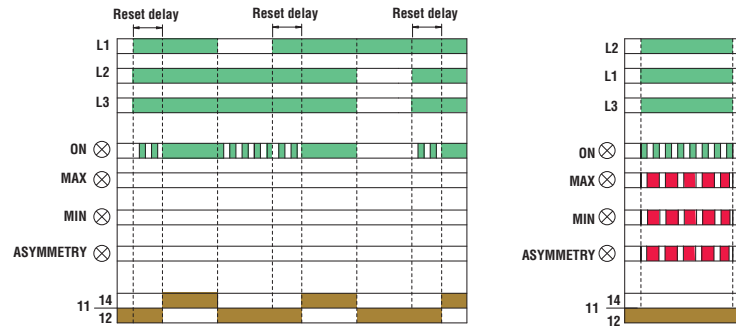


Voltage monitoring relays for 3-phase systems without neutral

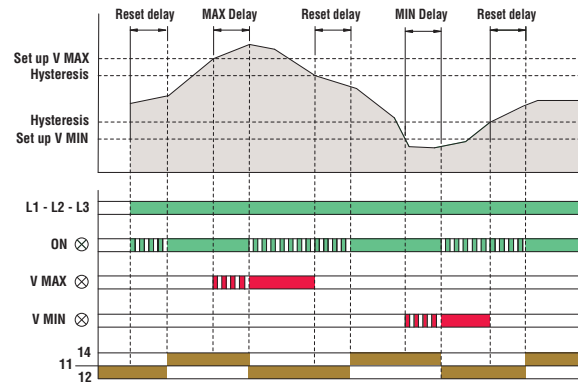
PMV10 - PMV20 - PMV30 - PMV40  
PMV50 - PMV60 - PMV70



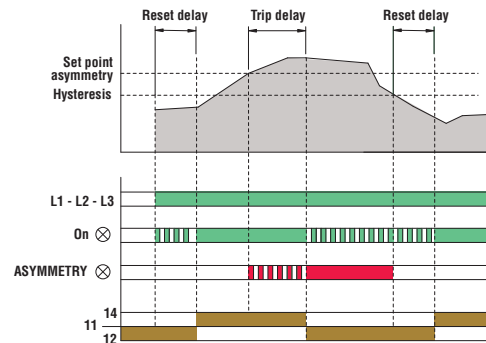
Phase loss and incorrect phase sequence (PMV10-PMV20-PMV30-PMV40-PMV50-PMV60- MV70)



Maximum and minimum voltage (PMV30 - PMV50 - PMV60 - PMV70)

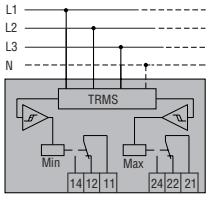


Asymmetry (PMV40 - PMV60 - PMV70)

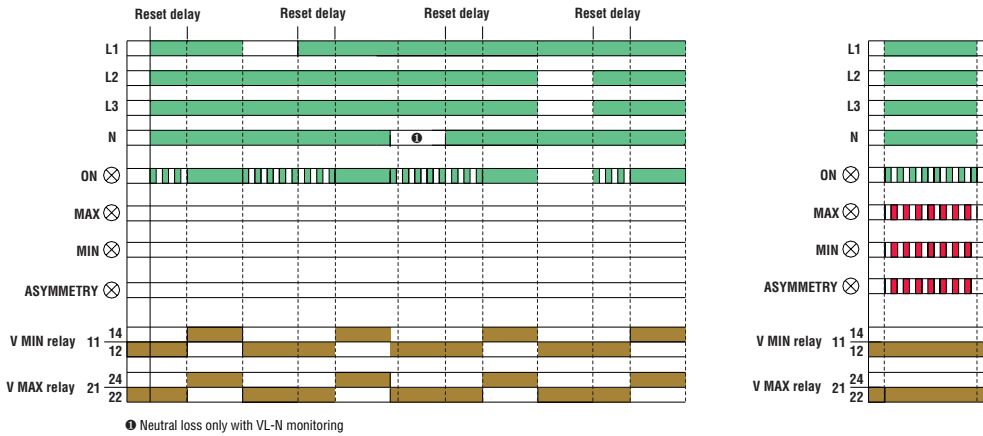




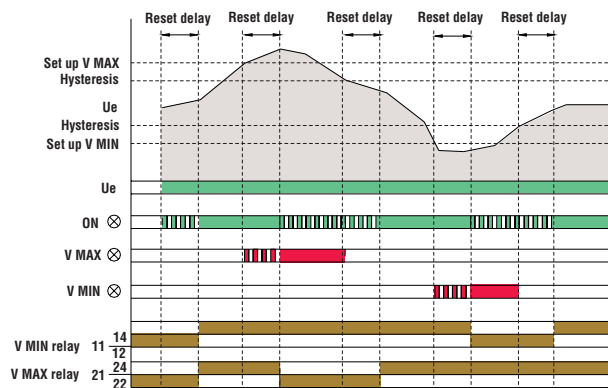
### Voltage monitoring relays for 3-phase systems c/w or w/o neutral PMV50N - PMV60N - PMV70N



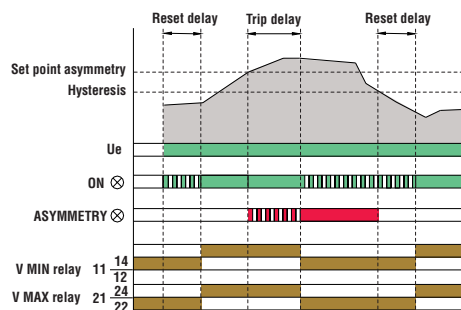
### Phase loss and incorrect phase sequence (PMV50N - PMV60N - PMV70N)



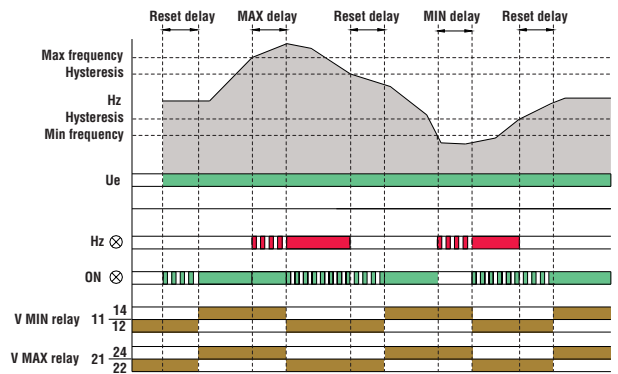
### Maximum and minimum voltage (PMV50N - PMV60N - PMV70N)



### Asymmetry (PMV70N)

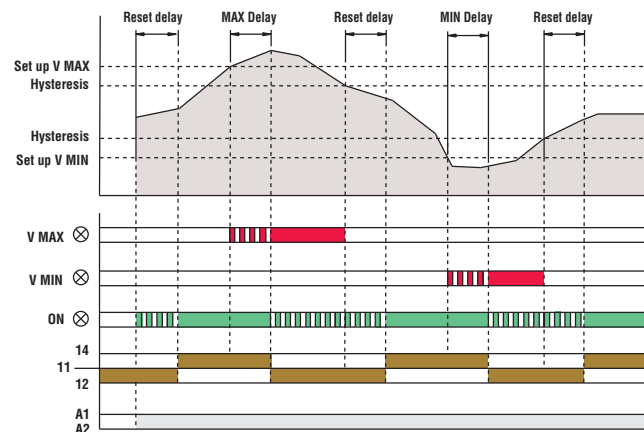
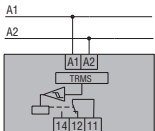


### Maximum and minimum frequency (PMV80N)



### Voltage monitoring relay for 1-phase systems

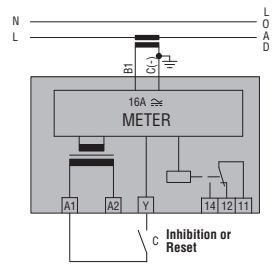
#### PMV55



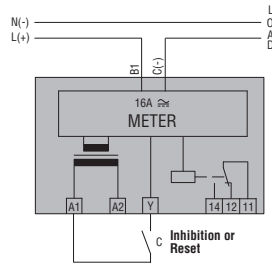
### Current monitoring relay for 1-phase systems

#### PMA20

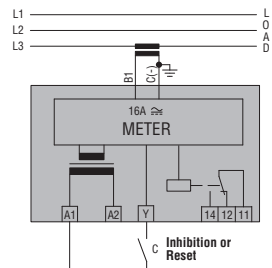
##### Single-phase connection with CT



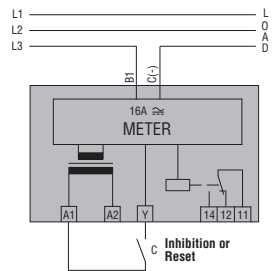
##### Single-phase direct connection



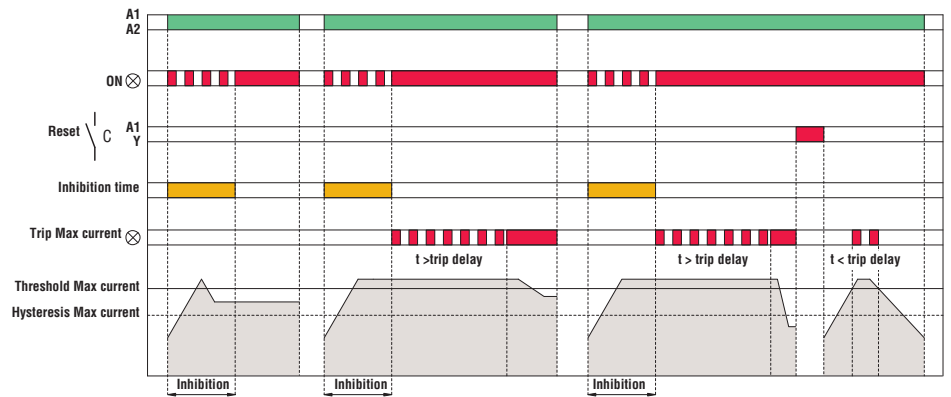
##### Three-phase connection with CT (1 phase control)



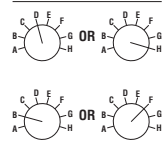
##### Three-phase direct connection (1 phase control)



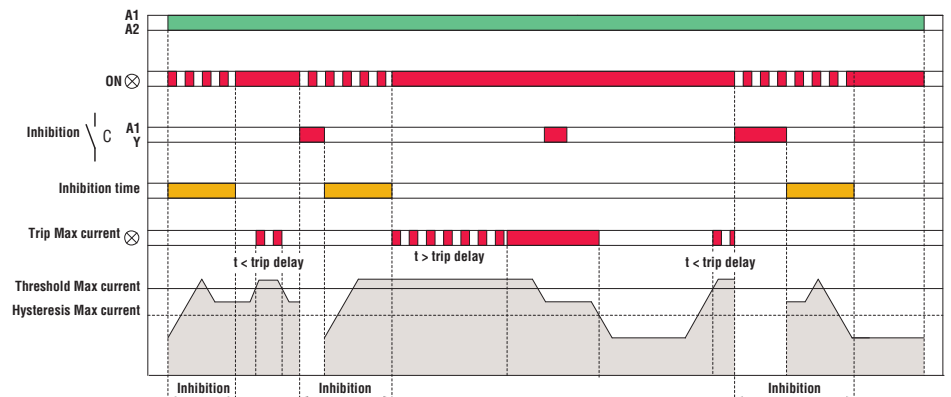
#### Operation with tripping latch (Latch ON)



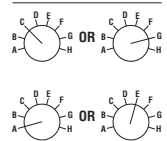
#### Positions



#### Operation with no tripping latch (Latch OFF)



#### Positions

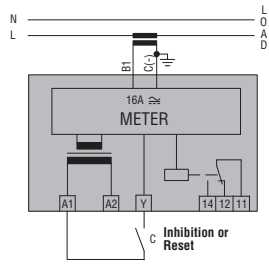


Operation			
Position	Ie	Relay output	Latch
A	5A	OFF	OFF
B		ON	ON
C		ON	OFF
D	16A	OFF	ON
E		OFF	OFF
F		ON	ON
G		ON	OFF
H		ON	ON

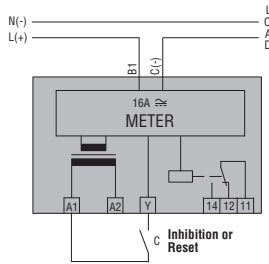
Current monitoring relay for 1-phase systems

PMA30

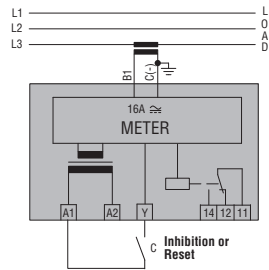
Single-phase connection by CT



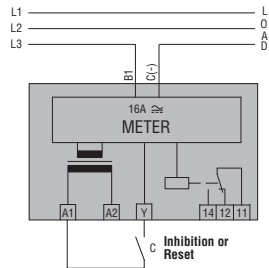
Single-phase direct connection



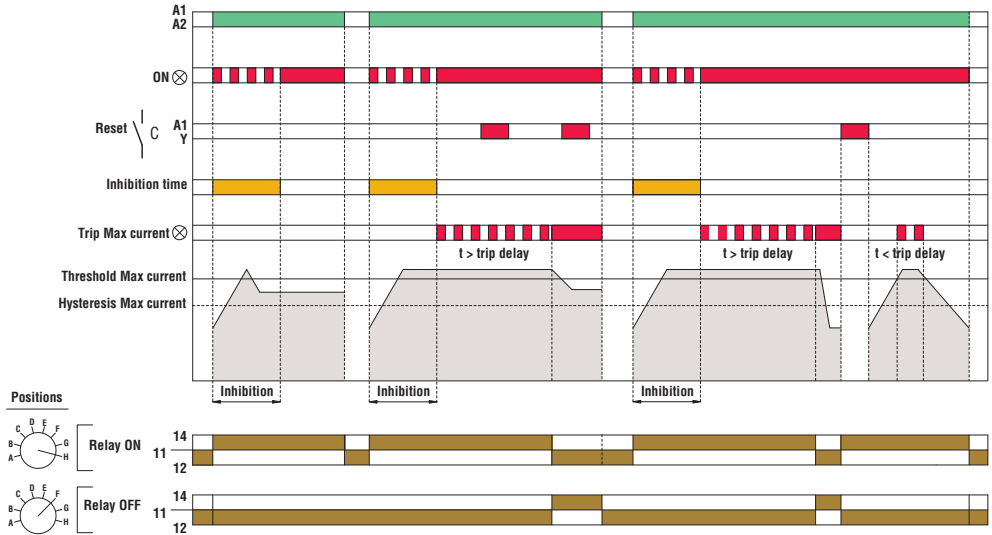
Three-phase connection by CT (1 phase control)



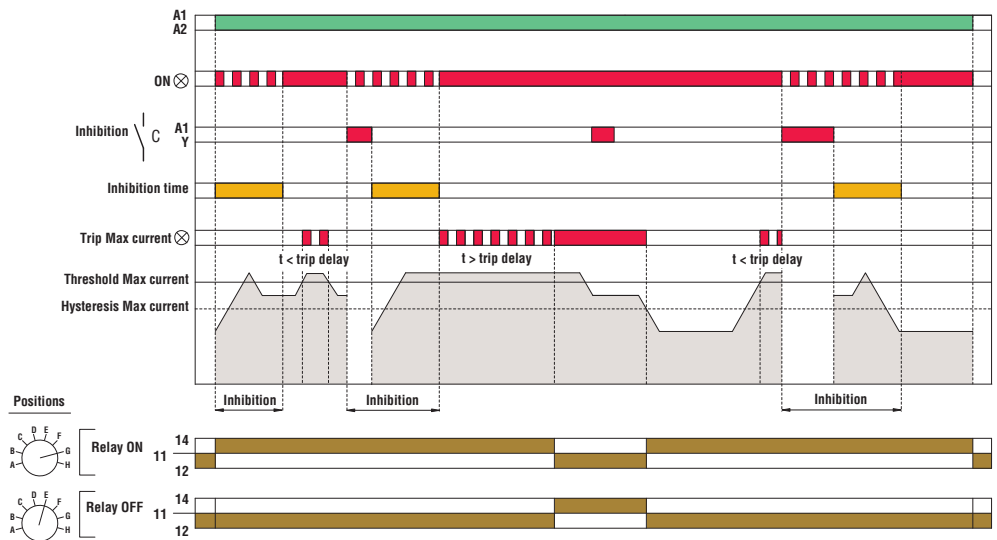
Three-phase direct connection (1 phase control)



Maximum current control operation with tripping latch (Latch ON)

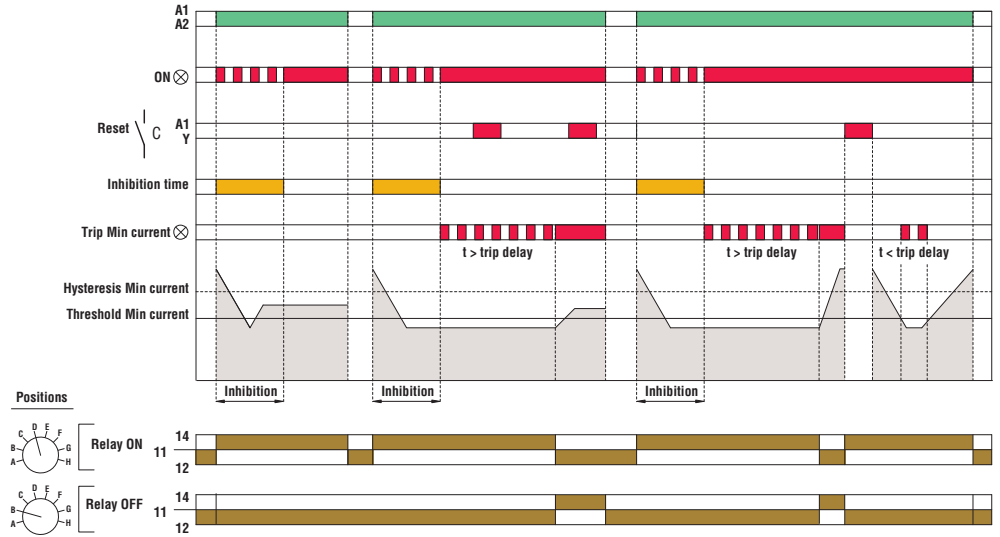


Maximum current control operation with no tripping latch (Latch OFF)

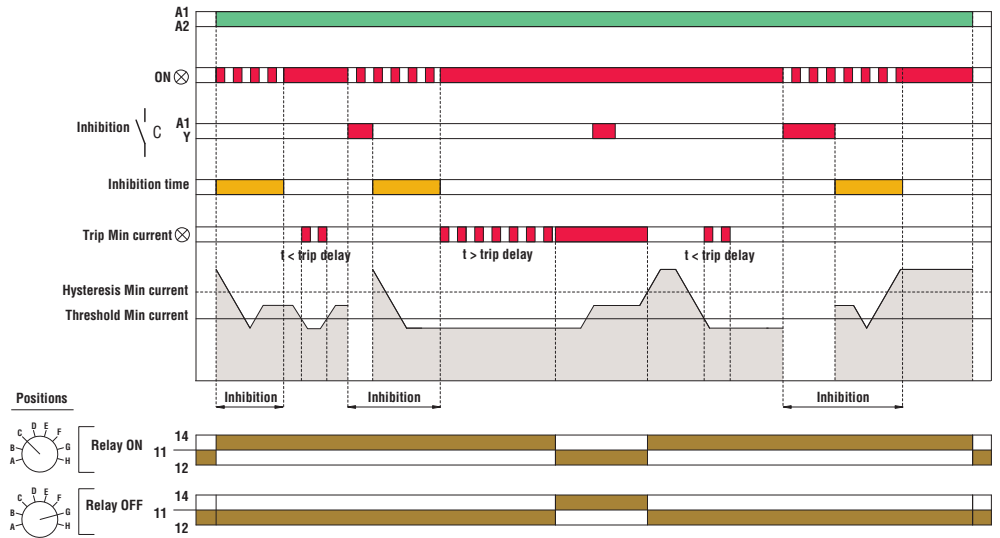


Operation			
Position	Function	Relay output	Latch
A	Minimum current	OFF	OFF
B		ON	ON
C		ON	OFF
D		ON	ON
E	Maximum current	OFF	OFF
F		ON	ON
G		ON	OFF
H		ON	ON

Minimum current control operation with tripping latch (Latch ON)



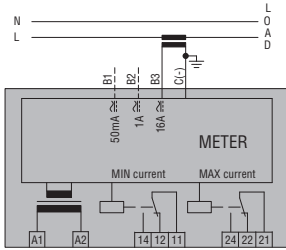
Minimum current control operation with no tripping latch (Latch OFF)



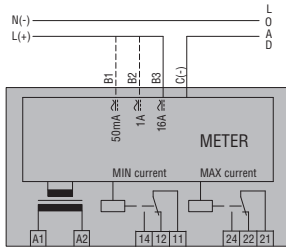
### Current monitoring relay for 1-phase systems

#### PMA40

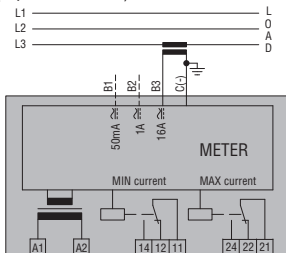
#### Single-phase connection by CT



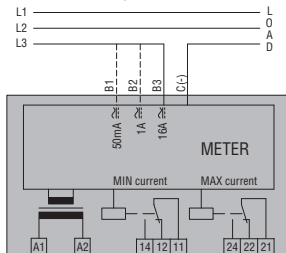
#### Single-phase direct connection



#### Three-phase connection by CT (1 phase control)

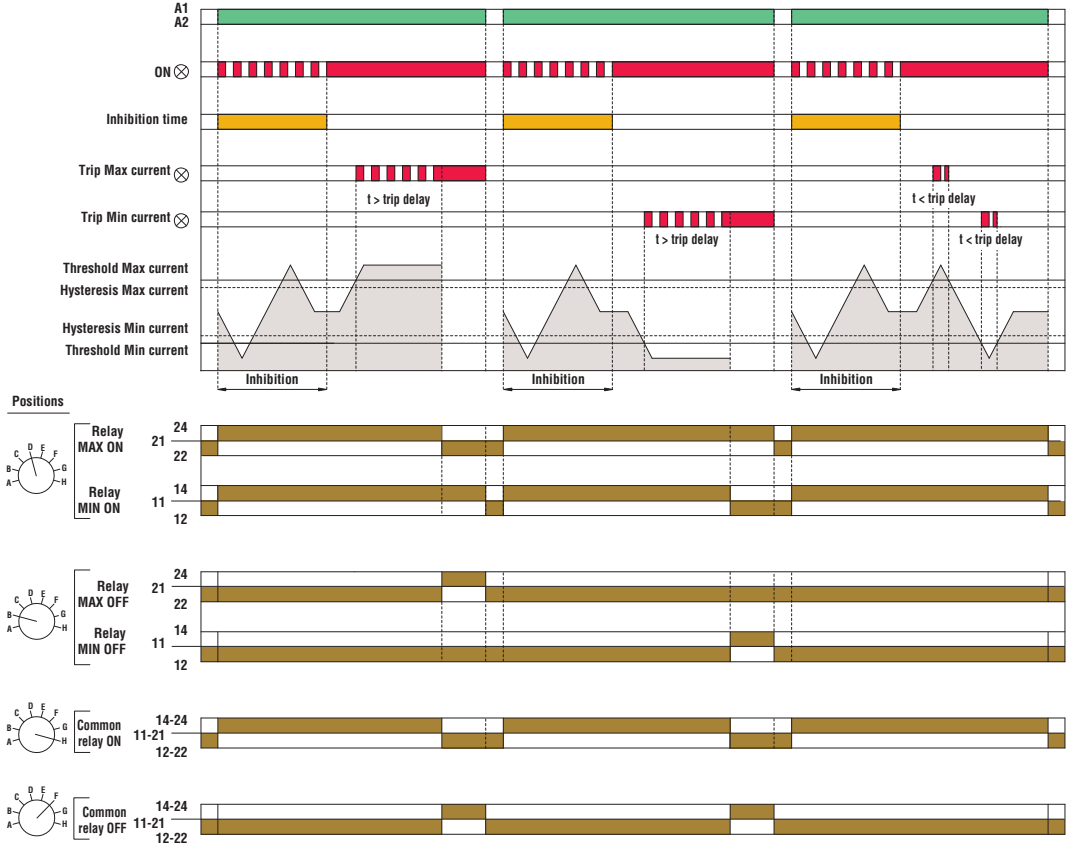


#### Three-phase direct connection (1 phase control)

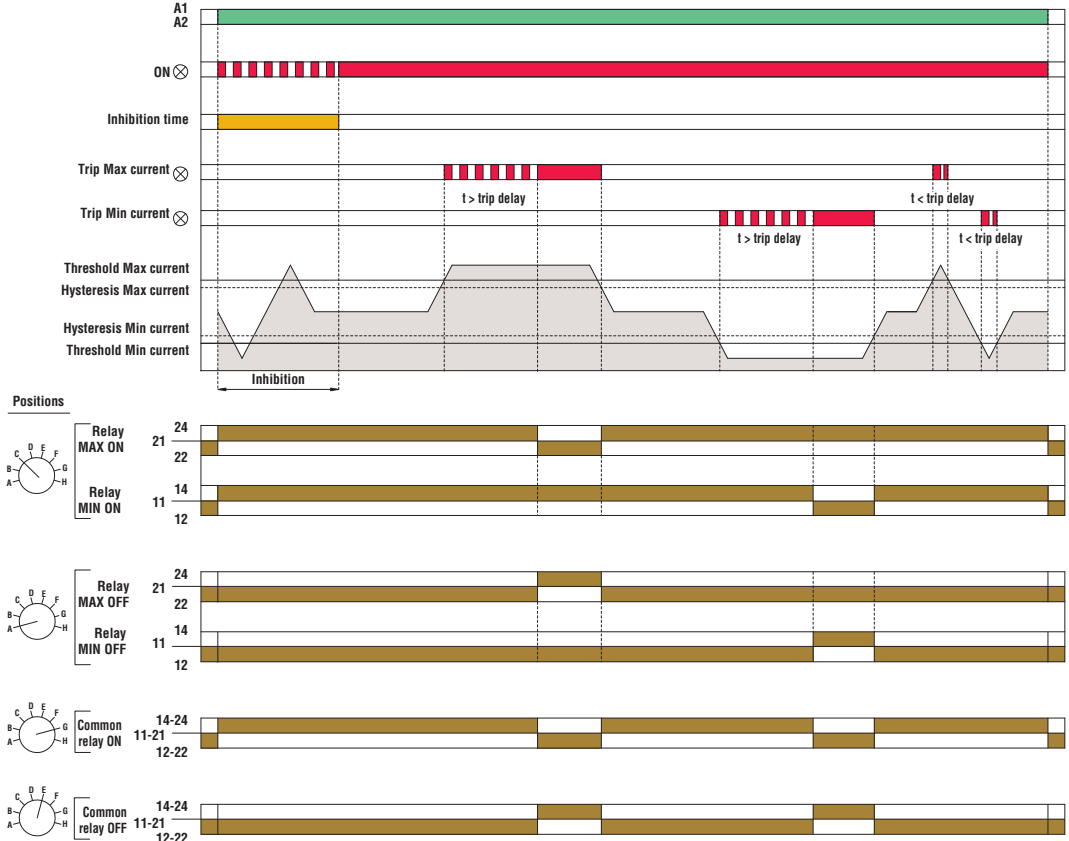


Operation			
Position	Operation	Relay output	Latch
A	Separate relays	OFF	OFF
B		ON	OFF
C		ON	ON
D		ON	ON
E	Common relays	OFF	OFF
F		ON	ON
G		ON	OFF
H		ON	ON

### Operation with tripping latch (Latch ON)



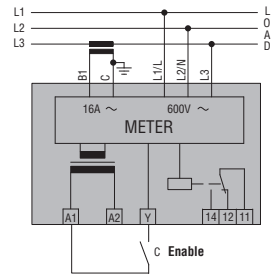
### Operation with no tripping latch (Latch OFF)



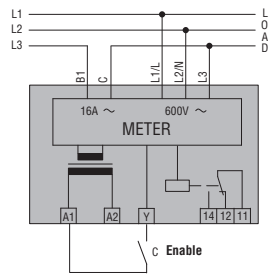
### Pump protection - motor under-load/over-current monitoring

#### PMA50

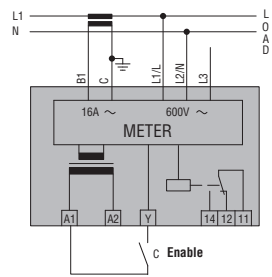
##### Three-phase connection by CT



##### Three-phase direct connection

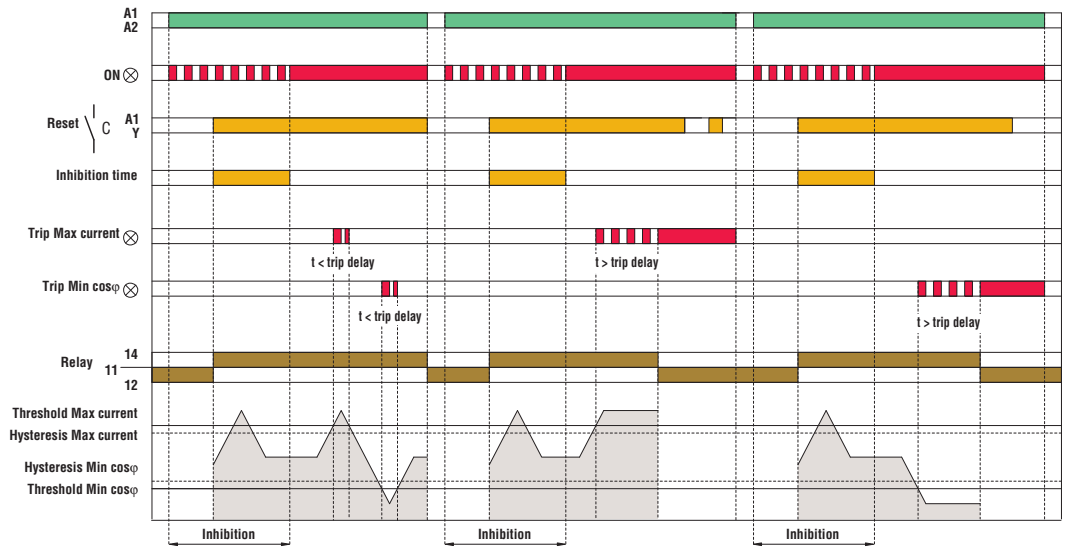


##### Single-phase connection by CT

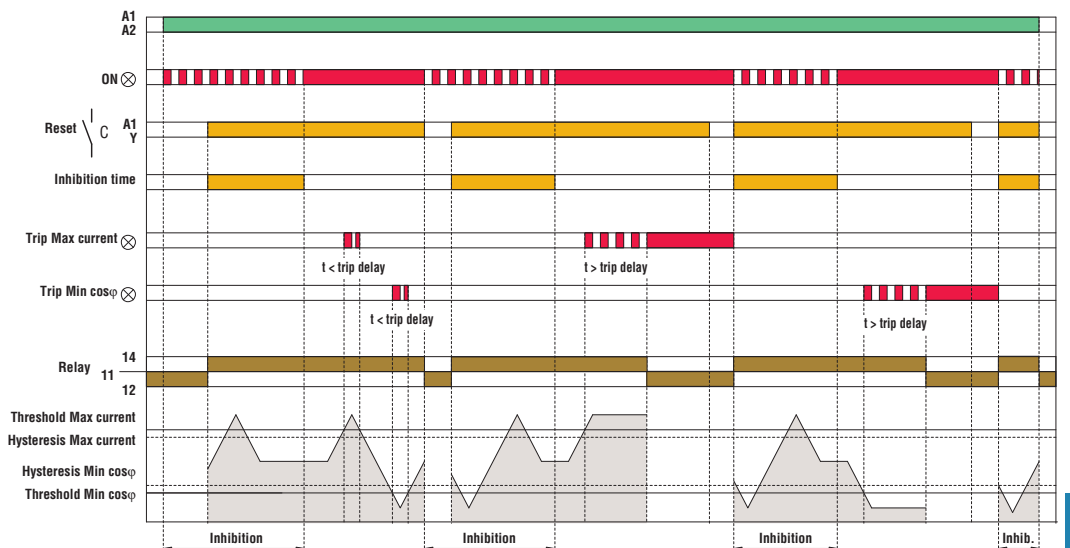


Operation			
Position	Ie	Connection	External reset
A	5A	1 phase	OFF
B		3 phase	ON
C		3 phase	OFF
D			ON
E	16A	1 phase	OFF
F		3 phase	ON
G		3 phase	OFF
H		3 phase	ON

#### External reset disabled (OFF)

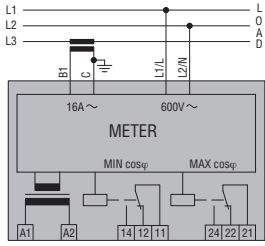


#### External reset enabled (ON)

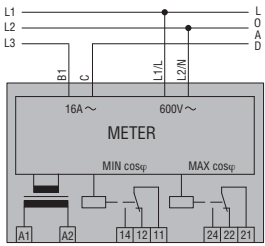


### Phase shift monitoring relay PMA60

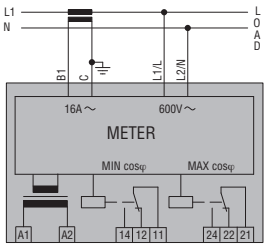
#### Three-phase connection by CT



#### Three-phase direct connection

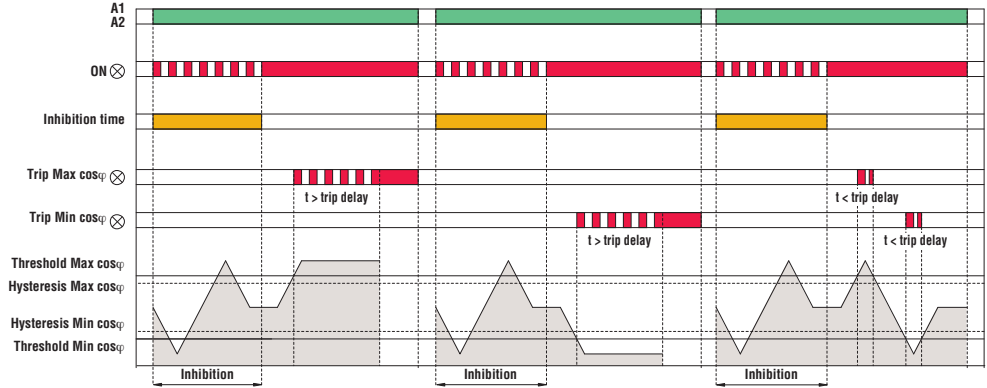


#### Single-phase connection by CT

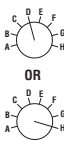


Operation			
Position	Connection	Relay output	Latch
A	1 phase	OFF	OFF
B		ON	ON
C		ON	OFF
D		ON	ON
E	3 phase	OFF	OFF
F		ON	ON
G		ON	OFF
H		ON	ON

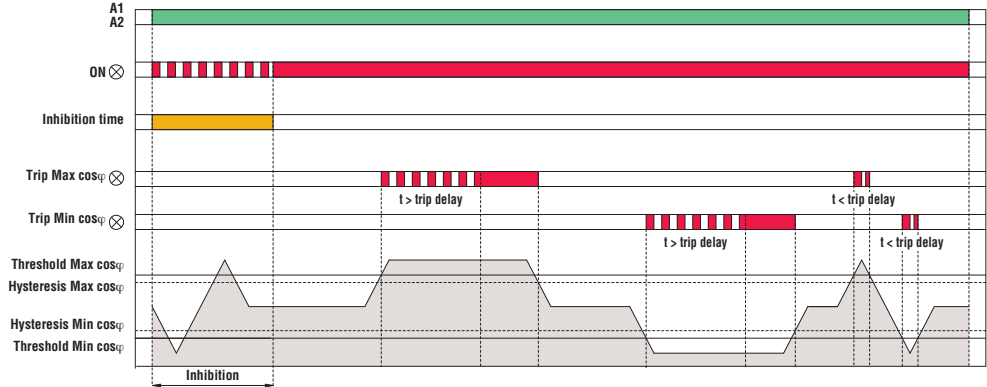
#### Operation with tripping latch (Latch ON)



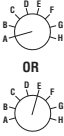
#### Positions



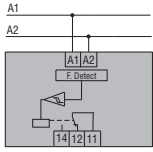
#### Operation with no tripping latch (Latch OFF)



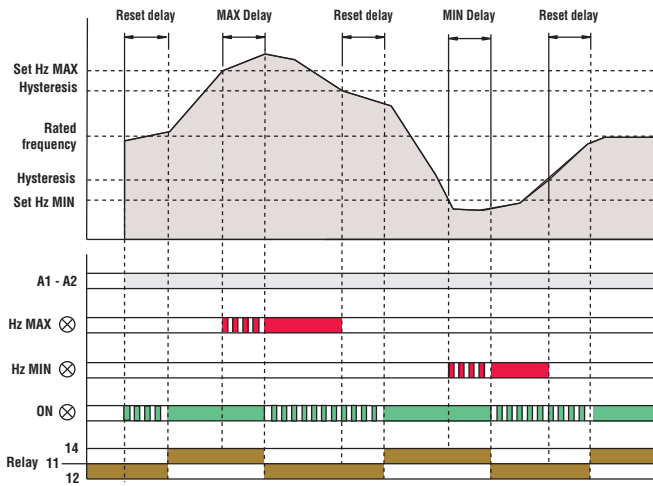
#### Positions



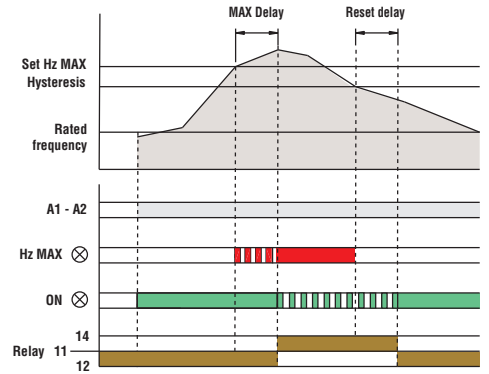
### Frequency monitoring relay PMF20



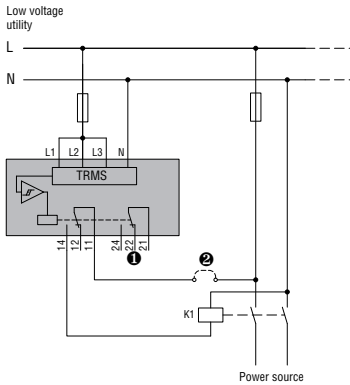
#### MAX-MIN, MAX or MIN function



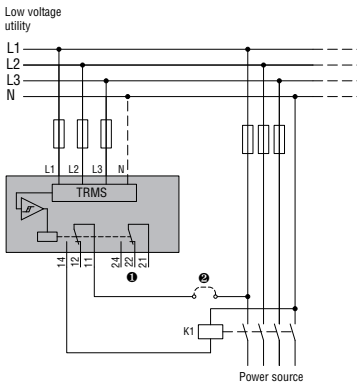
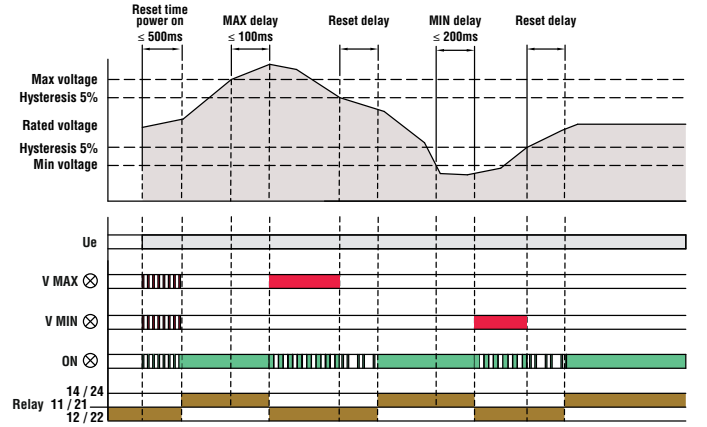
#### MAX function



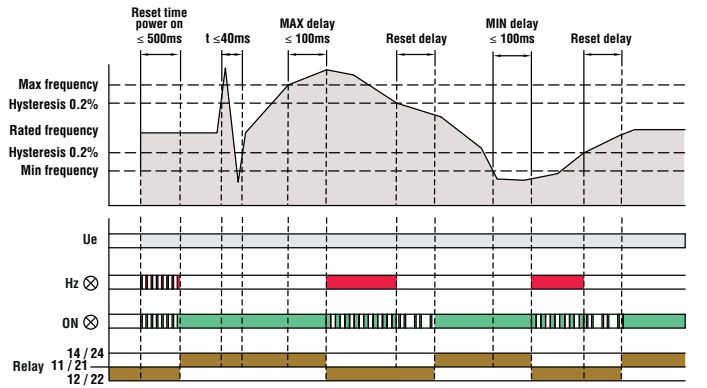
### Voltage and frequency monitoring relay (per ENEL guide ed. 2.1 (12.2010)) PMVF10



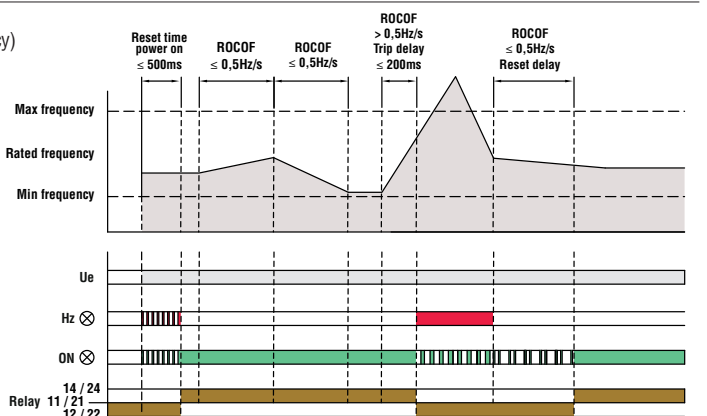
#### Voltage tripping function



#### Frequency tripping function



#### ROCOF function (Rate Of Change Of Frequency)



- ① Contact available for signalling, second contactor or inverter stop.
- ② Remote disconnection control device.

Operation			
Position	Voltage control	Frequency threshold	ROCOF
A	L-L ( $\Delta$ )	$\pm 0.3\text{Hz}$	OFF
B	L-N ( $\lambda$ )	$\pm 0.3\text{Hz}$	OFF
C	L-L ( $\Delta$ )	$\pm 1\text{Hz}$	OFF
D	L-N ( $\lambda$ )	$\pm 1\text{Hz}$	OFF
E	L-L ( $\Delta$ )	$\pm 0.3\text{Hz}$	ON
F	L-N ( $\lambda$ )	$\pm 0.3\text{Hz}$	ON
G	L-L ( $\Delta$ )	$\pm 1\text{Hz}$	ON
H	L-N ( $\lambda$ )	$\pm 1\text{Hz}$	ON



TYPE	Single phase	PMV55	—	—	—	—
	Three phase	—	PMV10	PMV20	PMV30	PMV40
	Three phase with/without neutral	—	—	—	—	—
<b>DESCRIPTION</b>						
		Mimum and maximum AC voltage	Phase loss and incorrect phase sequence		Minimum AC voltage, phase loss and incorrect phase sequence	Asymmetry, phase loss and incorrect phase sequence
<b>CONTROL CIRCUIT</b>						
Rated voltage to control (Ue)		208-240VAC	208-480VAC	100-240VAC	208-240VAC	
		380-440VAC		208-575VAC	380-575VAC	
				380-600VAC	600VAC	
Maximum voltage set-point		105-115% Ue	—	—	—	—
Minimum voltage set-point		80-95% Ue	—	—	80-95% Ue	—
Asymmetry set-point		—	—	—	—	5-15%Ue
Minimum and maximum frequency set-point		—	—	—	—	—
Tripping time		0.1-20s	60ms		0.1-20s	
Resetting time		0.1-20s (0.5s at power up)	0.5s		0.1-20s (0.5s at power up)	
Resetting hysteresis		3%	5%		3%	
Instantaneous tripping for Ue		<70% Ue configured	Umin<70% Umax		<70% Ue configured	<70% minimum Ue
Repeat accuracy		< ±0.1%	< ±1%		< ±0.1%	< ±0.1%
<b>POWER SUPPLY</b>						
Auxiliary voltage (Us)		Self powered				
Operating range		0.7-1.2Ue	0.85-1.1Ue		0.7-1.2Ue	
Frequency		50/60Hz ±5%				
Power consumption (maximum)		10VA (208-240VAC)❶ 17VA (380-440VAC)❶	20VA❶	28VA❶	11VA (208-240VAC)❶ 30VA (380-575VAC)❶ 19VA (600VAC)❶	
Power dissipation (maximum)		1.5W	2.2W	2.5W		
<b>RELAY OUTPUTS</b>						
Number of relays		1				
Relay state		Normally enegised De-energises at tripping				
Contact arrangement		1 changeover (SPDT)				
Rated operational voltage		250VAC				
Maximum switching voltage		400VAC				
Conventional free-air thermal current (Ith)		8A				
UL/CSA and IEC/EN 60947-5-1 designation		B300				
Electrical life (with rated load)		10 <sup>9</sup> cycles				
Mechanical life		30x10 <sup>6</sup> cycles				
Indications		1 green LED for power on and tripping 2 red LEDs for tripping	1 green LED for power on and tripping		1 green LED for power on and tripping 1 red LED for tripping	
<b>CONNECTIONS</b>						
Terminal tightening torque (maximum)		0.8Nm (7lbin)				
Conductor section min-max		0.2-4.0mm <sup>2</sup> (24-12AWG)				
<b>INSULTION (input-output)</b>						
IEC rated insulation voltage Ui		440VAC	480VAC	600VAC		
IEC rated impulse withstand voltage Uimp		6kV				
IEC power frequency withstand voltage		4kV				
<b>AMBIENT CONDITIONS</b>						
Operating temperature		-20...+60°C				
Storage temperature		-30...+80°C				
<b>HOUSING</b>						
Material		Selft-extinguishing polyamide				

❶ Power consumption (maximum) at 50Hz.

# Protection relays

## Technical characteristics

### Voltage monitoring relays

	—	—	—	—	—	—
	PMV50	PMV60	PMV70	—	—	—
	—	—	—	PMV50 N	PMV70 N	PMV80 N
	Minimum and maximum AC voltage, phase loss and incorrect phase sequence	Minimum AC voltage, phase loss, incorrect phase sequence and asymmetry	Minimum and maximum AC voltage, phase loss, incorrect phase sequence asymmetry	Minimum and maximum AC voltage, phase loss, neutral loss and incorrect phase sequence	Minimum and maximum AC voltage, phase loss, neutral loss, incorrect phase sequence and asymmetry	Minimum and maximum AC voltage and frequency, phase loss, neutral loss and incorrect phase sequence
	208-240VAC	208-240VAC	208-240VAC	208-240VAC	208-240VAC	208-240VAC
	380-575VAC	380-575VAC	380-575VAC	380-440VAC	380-440VAC	380-440VAC
	600VAC	600VAC	600VAC	480-600VAC	480-600VAC	480-600VAC
	1051-15% Ue	—	105-115% Ue	105-115% Ue	105-115% Ue	105-115% Ue
	80-95% Ue	80-95% Ue	80-95% Ue	80-95% Ue	80-95% Ue	80-95% Ue
	—	5-15% Ue	5-15% Ue	—	5-15% Ue	—
	—	—	—	—	—	1-10% rated frequency
			0.1-20s			0.1-20s   0.1-5s frequency
	0.1-20s (0.5s at power up)	0.1-20s (0.5s at power up)	0.5s	0.1-20s	0.5s	0.5s
	3%	3%	3%	3%	3%	3%   0.5% frequency
			<70% Ue configured < ±0.1%			
			Self powered			
			0.7-1.2Ue			
			50/60Hz ±5%			
		11VA (208-240VAC)ⓘ 30VA (380-575VAC)ⓘ 19VA (600VAC)ⓘ				27VA max
		2.5W				1.9W max
		1				2
			Normally energised De-energises at tripping			
		1 changeover (SPDT)				2 changeover (SPDT each)
			250VAC			
			400VAC			
			8A			
			B300			
			10 <sup>5</sup> cycles			
			30x10 <sup>6</sup> cycles			
		1 green LED for power on and tripping 2 red LED's for tripping	1 green LED for power on and tripping 3 red LED's for tripping			1 green LED for power on and tripping 2 red LED's for tripping
			0.8Nm (7lbin)			
			0.2-4.0mm <sup>2</sup> (24-12AWG)			
			600VAC			
			6kV			
			4kV			
			-20...+60°C			
			-30...+80°C			
			Self-extinguishing polyamide			

TYPE	PMA20	PMA30	PMA40	
DESCRIPTION	Single-phase maximum current monitoring AC/DC multiscale	Single-phase minimum or maximum current monitoring AC/DC multiscale	Single-phase minimum and maximum current monitoring AC/DC multiscale	
<b>CONTROL CIRCUIT</b>				
Rated current to be monitored I <sub>e</sub>	5 - 16A		0.02 - 0.05 - 0.25 - 1 - 5 - 16A	
Rated frequency	50/60Hz ±5%			
Overload capacity	5 I <sub>e</sub> for 1s 160A for 10ms Constant 16A		50mA - 1A	16A
			5 I <sub>e</sub> for 1s 10I <sub>e</sub> for 10ms Constant 2I <sub>e</sub>	5 I <sub>e</sub> for 1s 160A for 10ms Constant 16A
Connection	Direct or by current transformer			
Adjustment	Tripping values	5-100% f.s.		
	Tripping time	0.1-30s		
	Inhibition time	1-60s		
	Resetting hysteresis	1-50%	3% fixed	
Resetting	Automatic / Manual			
External input	Resetting / Inhibition		—	
Repeat accuracy	±1% with constant parameters			
<b>AUXILIARY SUPPLY</b>				
Auxiliary supply voltage U <sub>s</sub>	24-240VAC/DC			
Operating range	0.85-1.1 U <sub>s</sub>			
Rated frequency	50/60Hz ±5%			
Power consumption (maximum)	3.2VA			7VA
Power dissipation (maximum)	1.6W			1.7W
<b>RELAY OUTPUTS</b>				
Number of relays	1		2	
Relay state	Normally energised / de-energised (selectable)			
Contact arrangement	1 changeover contact (SPDT)			
Rated operational voltage	250VAC			
Maximum switching voltage	400VAC			
IEC conventional free air thermal current I <sub>th</sub>	8A			
UL/CSA and IEC/EN 60947-5-1 designation	B300			
Electrical life (with rated load)	10 <sup>5</sup> cycles			
Mechanical life	30x10 <sup>6</sup> cycles			
Indications	1 green LED for power on/inhibition 1 red LED for tripping		1 green LED for power on/inhibition 2 red LEDs for max/min tripping	
<b>CONNECTIONS</b>				
Tightening torque maximum	0.8Nm (7lbin)			
Conductor section min-max	0.2-4.0mm <sup>2</sup> (24-12AWG)			
<b>INSULATION (input-output)</b>				
IEC rated insulation voltage U <sub>i</sub>	415V			
IEC rated impulse withstand voltage U <sub>imp</sub>	4kV			
IEC power frequency withstand voltage	2.5kV			
<b>AMBIENT CONDITIONS</b>				
Operating temperature	-20...+60°C			
Storage temperature	-30...+80°C			
<b>HOUSING</b>				
Material	Self-extinguishing polyamide			

# Protection relays

## Technical characteristics

### Pump protection and phase shift monitoring relays

TYPE	PMA50	PMA60
DESCRIPTION	Single and three-phase pump protection (motor under-load and over-current control) monitoring for max AC current, min $\cos\varphi$ , phase loss and incorrect phase sequence	Single and three-phase shift control for minimum and maximum $\cos\varphi$ monitoring
CURRENT AND $\cos\varphi$ CONTROL CIRCUIT		
Rated current $I_e$	5-16A	
Rated frequency	50/60Hz $\pm 5\%$	
Overload capacity	5 $I_e$ for 1s 160A for 10ms Constant 16A	
Connection	Direct or by current transformer	
Adjustments	End-scale value 5 or 16A	
Tripping for MAX current	10-100 $I_e$	—
Tripping for $\cos\varphi$	0.1-0.99 $\cos\varphi$ (MIN)	0.1-0.99 $\cos\varphi$ (MIN and MAX)
Tripping delay	0.1-10s	0.1-30s
Inhibition time	1-60s	
Automatic resetting delay	OFF-100min	—
External input	Consent for running/resetting	—
Repeat accuracy	$\pm 1\%$ with constant parameters	
VOLTAGE CONTROL CIRCUIT		
Voltage measuring range ( $U_e$ )	80...660VAC	
Tripping time for phase loss	60ms	
AUXILIARY SUPPLY		
Auxiliary supply voltage $U_s$	220-240VAC	
	380-415VAC (maximum voltage for UL/CSA)	
	440-480VAC	
Operating range	0.85-1.1 $U_s$	0.85-1.1 $U_s$
Frequency range	50/60Hz $\pm 5\%$	50/60Hz $\pm 5\%$
Power consumption (maximum)	4.5VA	4.4VA
Power dissipation (maximum)	2.3W	2.4W
RELAY OUTPUTS		
Number of relays	1	2
Relay state	Normally energised, de-energises at tripping	Normally energised / de-energised (ON-OFF) (configurable)
Contact arrangement	1 changeover contact (SPDT each)	
Rated operational voltage	250VAC	
Maximum switching voltage	400VAC	
IEC conventional free air thermal current $I_{th}$	8A	
UL/CSA and IEC/EN 60947-5-1 designation	B300	
Electrical life (With rated load)	$10^5$ cycles	
Mechanical life	$30 \times 10^6$ cycles	
Indications	1 green LED for power on/inhibition 2 red LEDs for minimum/maximum tripping	
CONNECTIONS		
Tightening torque maximum	0.8Nm (7lbin)	
Conductor section min-max	0.2-4.0mm <sup>2</sup> (24-12AWG)	
INSULATION (input-output)		
IEC rated insulation voltage $U_i$	600VAC	
IEC rated impulse withstand voltage $U_{imp}$	6kV	
IEC power frequency withstand voltage	2.5kV	
AMBIENT CONDITIONS		
Operating temperature	-20...+60°C	
Storage temperature	-30...+80°C	
HOUSING		
Material	Self-extinguishing polyamide	

TYPE	<b>PMF20</b>	
DESCRIPTION	Single-phase minimum and maximum frequency control	
FREQUENCY CONTROL CIRCUIT		
Rated frequency	50 or 60Hz selectable	
Operating frequency range	40-70Hz	
Adjustment	MAX tripping	101-110% operating frequency
	MIN tripping	90-99% operating frequency
	Resetting hysteresys	0.5%
	Inhibition time	0.1-20s
	Reset delay	0.1-20s
Resetting	Automatic	
Repeat accuracy	< ±0.1%	
AUXILIARY SUPPLY		
Auxiliary supply voltage Us	220-240VAC	
	380-415VAC	
Operating range	0.85-1.1 Us	
Rated frequency	50/60Hz	
Power consumption (maximum)	10VA (220-240VAC); 17VA (380-415VAC)	
Power dissipation (maximum)	1.5W	
RELAY OUTPUTS		
Number of relays	1	
Relay state	Normally energised, de-energises at tripping <sup>❶</sup>	
Contact arrangement	1 changeover contact (SPDT)	
Rated operational voltage	250VAC	
Maximum switching voltage	400VAC	
IEC conventional free air thermal current Ith	8A	
UL/CSA and IEC/EN 60947-5-1 designation	B300	
Electrical life (with rated load)	10 <sup>5</sup> cycles	
Mechanical life	30x10 <sup>6</sup> cycles	
Indications	1 green LED for power on/tripping 2 red LEDs for min-max tripping	
CONNECTIONS		
Tightening torque maximum	0.8Nm (7lbin)	
Conductor section min-max	0.2-4.0mm <sup>2</sup> (24-12AWG)	
INSULATION (input - output)		
IEC rated insulation voltage Ui	575V	
IEC rated impulse withstand voltage Uimp	6kV	
IEC power frequency withstand voltage	4kV	
AMBIENT CONDITIONS		
Operating temperature	-20...+60°C	
Storage temperature	-30...+80°C	
HOUSING		
Material	Self-extinguishing polyamide	

❶ Normally de-energised, energises at tripping with MAX function configured.

# Protection relays

## Technical characteristics

### Voltage and frequency monitoring relay

TYPE	PMVF10
<b>TRIPPING THRESHOLDS FOR VOLTAGE</b>	
Tripping for maximum voltage	113% of rated voltage U <sub>e</sub>
Tripping for minimum voltage	82.5% of rated voltage U <sub>e</sub>
Voltage threshold hysteresis	5%
Tripping delay for maximum voltage	≤0.1s
Tripping delay for minimum voltage	≤0.2s
<b>TRIPPING THRESHOLDS FOR FREQUENCY</b>	
Frequency threshold tripping	±0.3Hz or ±1Hz configurable
Frequency threshold hysteresis	0.2%
Tripping delay	≤100ms
Transient immunity time	≥40ms
ROCOF threshold	≥0.5Hz/s
ROCOF hysteresis	25mHz/s
ROCOF tripping delay	≤200ms
<b>ADJUSTABLE DELAYS</b>	
Reset delay	0.1-30s
<b>AUXILIARY SUPPLY</b>	
Rated supply voltage (U <sub>s</sub> )	230VAC / 400VAC
Operating range	0.7-1.3 U <sub>e</sub>
Rated frequency	50Hz
Power consumption/dissipation max	27VA / 1.9W
Resetting	Automatic
Reset time at power up	≤500ms
<b>RELAY OUTPUTS</b>	
Number of relays	2
Contact arrangement	1 changeover each (SPDT each)
Rated operational voltage	250VAC
Maximum switching voltage	400VAC
IEC conventional free air thermal current (I <sub>th</sub> )	8A
UL/CSA and IEC/EN 60947-5-1 designation	B300
Electrical life (with rated load)	10 <sup>5</sup> cycles
Mechanical life	30x10 <sup>6</sup> cycles
<b>CONNECTIONS</b>	
Maximum tightening torque	0.8Nm (7 lbin)
Conductor cross section min-max	0.2-4.0mm <sup>2</sup> (24-12AWG)
<b>INSULATION (input-output)</b>	
IEC rated insulation voltage U <sub>i</sub>	400V
<b>AMBIENT CONDITIONS</b>	
Operating temperature	-20...+60°C
Storage temperature	-30...+80°C
<b>HOUSING</b>	
Material	Self-extinguishing polyamide