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## CONTROL & MONITORING RELAYS

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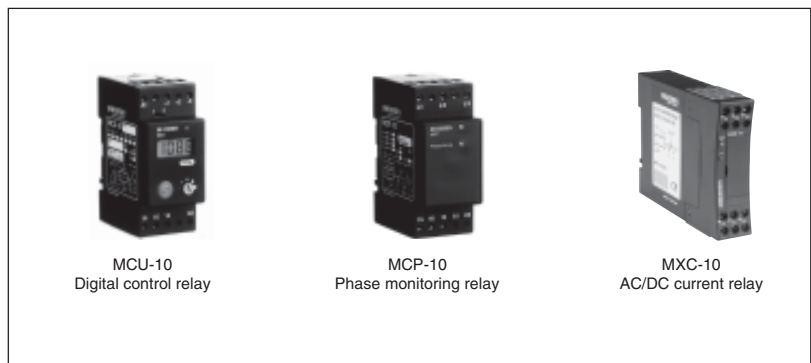
## INTRODUCTION

The Brodersen monitoring relays are high quality products incorporating up-to-date circuit design together with modern, efficient components to ensure a long trouble free life in a wide range of operating conditions.

Power consumption and, thus, heat dissipation are minimal and the entire range has been designed and tested to the latest requirements for EMC immunity and emission.

A wide range of commonly used standards of voltage, current, temperature and process signals can be monitored by the Brodersen relays.

The Brodersen Control and Monitoring relays are produced in two design categories; installation and industrial design. The installation design is based on DIN rail or 11 pole plug-in mounting and are designed to fit into installation enclosures. The industrial design is in 22,5mm housing with the terminals placed to optimize installation time in industrial applications.



## SELECTION GUIDE

	Input	Output	Display	Adjustments	Description	Type	Page
	AC/DC Voltage AC/DC Current 3-phase Voltage 3-phase Monitoring Temperature RTDs Temperature Thermocouples Liquid Level, Conductive Standard Process Signal	Output Relay Analogue Output, Setpoint Analogue Output, Measuring	LCD Display LED Indication	Setpoints Hysteresis Delay			
36mm Installation Design for Din Rail or 11-Pole Plug-In Mounting	•	•	•		Phase monitoring relay	MCP-10	38
	•	•	••	•	Digital voltage relay	MCU-10 DV/AV	40
	•	•	••	•	Digital current relay	MCU-10 DC/AC	42
	•	•	••	•	Digital thermostat relay	MCU-10 P/N/T	44
	•	•	••	•	Digital thermostat relay	MCU-10 J/K/S/R	46
	•	•	••	•	Digital process signal relay	MCU-10 U	48
22,5mm Industrial Design for Din Rail Mounting	•	••	•	••	AC/DC voltage relay	MXV-10	50
	•	••	•	••	AC/DC voltage relay	MXV-20	52
	•	••	•	••	AC/DC current relay	MXC-10	54
	•	••	•	••	AC/DC current relay	MXC-20	56
	•	••	•	••	AC/DC current relay	MXC-30	58
	•	••	•	•	3 phase voltage relay	MXV-30	60
	•	••	•	•	Phase monitoring relay	MXP-10	62
	•	••	•	•	Phase monitoring relay	MXP-20	64
	•	••	•	•	Liquid level relay	MXL-10	66
	•	••	•	••	Thermostat relay	MXT-10	68
	•	••	•	••			

# Control & Monitoring Relays

## Phase Failure Relay MCP-10



### DESCRIPTION

Control relay for monitoring of correct phase sequence, phase break and undervoltage. Connection to 3-phase mains supply with or without neutral. Fixed limits for energizing and de-energizing the single or double output relay. LED indication of supply voltage and phase failure. Versions available for DIN rail or 11-pole plug-in base mounting. Versions available for separate supply and measuring voltage.

### OPERATION

The phase failure relay monitors phase sequence, phase break and undervoltage. The output relay is energized when all three phase voltages are present and the phase conditions (voltage and phase sequence) are correct. The phase failure relay has a fixed time delay to prevent faulty energization and de-energization caused by short interferences. LED indication of supply voltage connected (green) and phase or voltage failure (red). The phase failure relay uses L2 and L3 (6 and 7) for supply voltage. The indicators therefore only work if these phases are present. An improvement of the measuring range is obtained by connecting neutral to the relay (see the technical data).

### OPTION

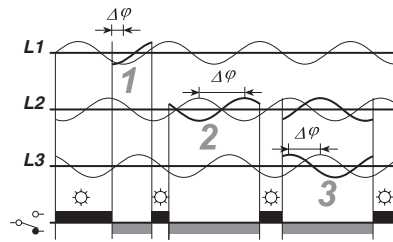
#### Separate supply and measuring voltage S.

The supply voltage for the internal circuit is separated from the measuring voltage which allows the measuring circuit and the LED indicators to work if one or more of the monitored phases are interrupted.

### VERSIONS/ORDERING CODES

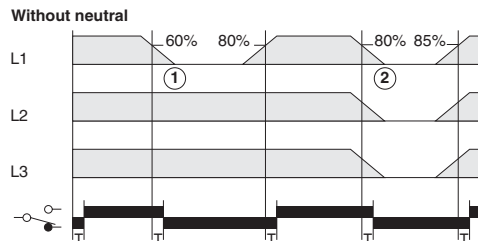
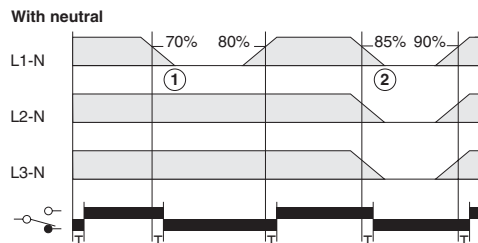
<b>Type:</b> Phase failure relay.	MCP-10	S	1	380	/S230
<b>Mounting:</b> 11-pole plug-in. DIN rail.	S	D			
<b>Output relay:</b> SPDT. DPDT <sup>1)</sup> .	1	2			
<b>Measuring/supply voltage:</b> <sup>3)</sup>	220	380	400	415	
3 x 220V AC	220				
3 x 380V AC	380				
3 x 400V AC	400				
3 x 415V AC	415				
<b>Options:</b> <sup>3)</sup>					
Separate supply voltage: 220/240V AC ±10%.	/S230				

### PHASE MONITORING



1. Lightly loaded 3-phase motor and L1 interrupted ( $\phi > 20^\circ$ ).
2. Ohmic load or heavily loaded 3-phase motor and L2 interrupted ( $\phi=180^\circ$ ).
3. Reversed order of the phases L2 and L3 i.e. incorrect phase sequence( $\phi=120^\circ$ ).

### VOLTAGE MONITORING



1. Voltage drop on one phase.
2. Voltage drop on all 3 phases (symmetrical).

If one of the phases connected to an idle 3-phase motor is interrupted, no changes can be measured in the voltage and phase conditions, and the phase failure relay will not detect the failure.

## TECHNICAL DATA

### Phase measuring:

**With neutral:** Fault:  $\phi > 25^\circ$ , typically by  $\phi > 20^\circ$ .  
**Without neutral:** Fault:  $\phi > 50^\circ$ , typically by  $\phi > 40^\circ$ .

### Voltage measuring:

#### With neutral:

Change on 1 phase:

Energized output relay:  $> 90\%$  of  $V_{nom.}$ , typically by  $> 80\%$ .  
 Fault:  $< 65\%$  of  $V_{nom.}$ , typically by  $< 70\%$ .

Change of 3 phases, symm.:

Energized output relay:  $> 90\%$  of  $V_{nom.}$ .  
 Fault:  $< 80\%$  of  $V_{nom.}$ , typically by  $< 85\%$ .

Without neutral:

Change on 1 phase:

Energized output relay:  $> 90\%$  of  $V_{nom.}$ , typically by  $> 80\%$ .  
 Fault:  $< 50\%$  of  $V_{nom.}$ , typically by  $< 60\%$ .

Change on 3 phases, symm.:

Energized output relay:  $> 90\%$  of  $V_{nom.}$ , typically by  $> 85\%$ .  
 Fault:  $< 75\%$  of  $V_{nom.}$ , typically by  $< 80\%$ .

**Temperature drift:** All specifications apply for the specified temperature range.

**Output relay:** SPDT or DPDT.

Load ( $\cos\phi=1$ ):  
 D1/S1: 8A/240V AC  
 10mA/24V DC  
 S2: 5A/240V AC  
 10mA/24V DC

Frequency: Max. 1000 operations per hour at max. load.  
 Mechanical lifetime: Min.  $10 \times 10^6$  operations.  
 Electrical lifetime: Min. 100.000 operations at full load.  
 Time delay: 0.3-0.9 sec.

**Mounting:** S1/S2: 11-pole plug in.  
 D1: Directly on 35 mm DIN rail (EN50022).

**Terminals:** Max. conductor size 4mm<sup>2</sup>.  
 Screw type terminals with self-lifting clamps shrouded in accordance with VDE0106 (finger and back of hand protection).

### Supply/measuring voltage:

3 x 220V AC + 10%,  
 3 x 380V AC + 10%,  
 3 x 400V AC + 10%,  
 3 x 415V AC + 10%.

220V AC  $\pm 10\%$  (option S).  
 240V AC  $\pm 10\%$  (option S).

Other AC voltages on request.

**Mains frequency:** 45-66Hz.

**Consumption:** 1-3VA.

**EMC:** Conforming to EN 50081-1/EN 50082-2.

**Isolation:** 2kV AC according to EN 60950 class I.

**Ambient temperature:** -25 to 55°C.

**Protection:** S1/S2: IP40.

D1: IP20.

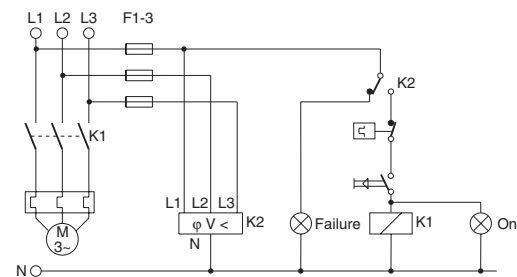
**Housing:** Noryl SE-1.

**Weight:** Typically 170 g.

## NOTES/REMARKS

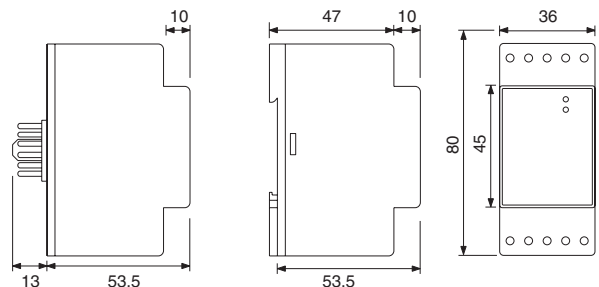
- 1) Double output relay only available in S2 version.
- 2) Terminal 2 (A1) is only used when a separate supply voltage is connected.
- 3) Available with user-specified voltage. Please specify voltage.

## APPLICATION

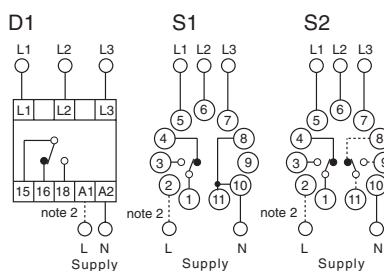


Monitoring of the supply voltage to a 3-phase motor with signal lamp indication of phase failure and motor contactor on.

## MECHANICAL DIMENSIONS



## WIRING DIAGRAMS



# Control & Monitoring Relays

Digital Control Relay MCU-10...DV/AV



## DESCRIPTION

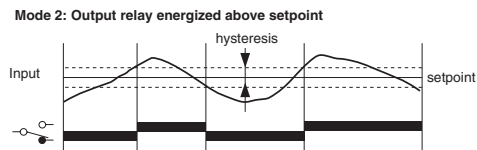
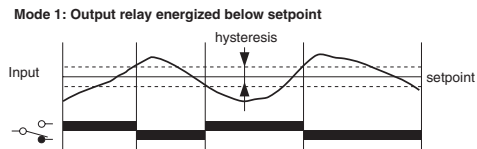
Digital control relay with 3½-digit LCD display. The control relay is used for control and measurement of AC/DC voltage. The actual input signal type and measuring range must be specified when the control relay is ordered. 3½ digit LCD display with selectable read-out of actual input and setpoint. Output relay with LED indication of energized output relay. Built-in power supply for direct mains supply. Galvanic isolation between input and supply. Standardized housing for 11-pole plug-in or DIN rail mounting. Bases for DIN rail, surface and chassis mounting are listed under Accessories for MCP-10, see page 128.

## VERSION/ORDERING CODES

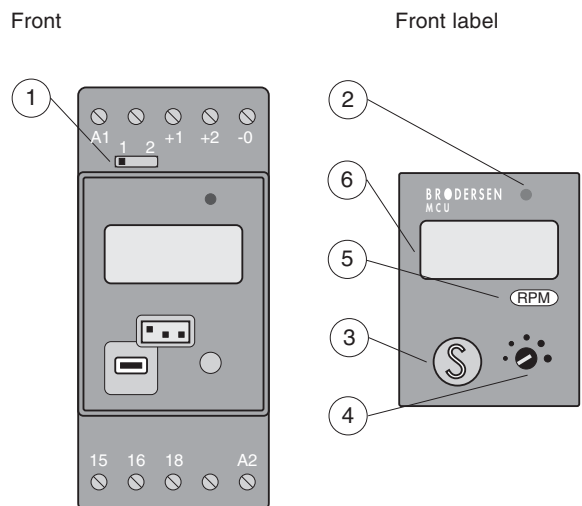
<b>Type:</b> Digital control relay.	MCU-10	MCU-10	S	1	230	DV3
<b>Mounting:</b> 11-pole plug-in. DIN rail.		S	D			
<b>Output relay:</b> SPDT		1				
<b>Supply voltage:</b> 12-48V DC/10-30V AC 12V AC/DC 24V AC/DC 24V AC 110/120V AC 220/240V AC 380/415V AC	G24 912 <sup>1)</sup> 924 <sup>1)</sup> 024 115 230 400					
<b>Input:</b>						
<b>Voltage:</b> DC: 0-19.99V. 0-199.9V. 0-500V.  AC: 0-19.99V. 0-199.9V. 0-500V.	DV1 DV2 DV3  AV1 AV2 AV3					

## OPERATION

The display shows the actual input signal when the supply voltage is connected. The setpoint is displayed by pressing the S button and the setpoint is adjusted on the front mounted potentiometer. The output mode switch for selecting whether the output relay should be energized above or below the adjusted setpoint, see the diagrams below. The red LED indicator will light up when the output relay is energized.



## FRONT



1. Output mode selector 2. LED indication of energized output relay 3. Button for setpoint read-out 4. Setpoint adjustment 5. Unit label position 6. Display field.

## TECHNICAL DATA

### Measuring ranges:

AC	DC
0-19.99V	0-19.99V
0-199.9V	0-199.9V
0-500V	0-500V

### Input impedance:

AC.: 1kOhm/V.  
DC: 1MOhm (>10V).

**Measuring accuracy:** 1% of full scale  $\pm$  1 digit.

**Hysteresis:** 1% of full range.

### Temperature drift:

Voltage, current and temperature: Max. 0.01% per °C.

**Display:** 3½-digit LCD-type (-1999 to 1999).

Digit height: 6.5 mm.  
Display update time: Typically 0.4 sec.

**Scale:** The scale is adjusted to the actual measuring range listed in the ordering key.

**Output relay:** SPDT (single changeover contact).  
Load (cos $\phi$ =1): D1/S1: Max. 8A/240V AC  
Min. 10mA/24VDC  
Frequency: Max. 1000 operations per hour at max. load.  
Mechanical life time: Min. 10 x 10<sup>6</sup> operations.  
Electrical life time: Min. 100.000 operations at max. load.  
Time delay: Typically 1s.

**Mounting:** S1: 11-pole plug-in.  
D1: Directly on 35 mm DIN-rail (EN50022).

**Terminals:** Max. conductor size 4 mm<sup>2</sup>.  
Screw type terminals with self-lifting clamps shrouded in accordance with VDE0106 (finger and back of hand protection).

**Supply voltage:** 12-48VDC(10.5-60V)/12-30VAC.(10.5-35V).  
12V AC/DC (10-18V) <sup>1)</sup>.  
24V AC/DC (18-35V) <sup>1)</sup>.  
24V AC (22-26V).  
110/120V AC (95-135V).  
220/240V AC (195-265V).  
380/415V AC (342-418V).

**Mains frequency:** 45-66Hz.

**Consumption:** 1-3VA.

**Protection:** S1: IP40.  
D1: IP20.

**EMC:** Conforming to EN 50081-2/EN 50082-1.

**Ambient temperature:**-25-55°C.

### Isolation:

AC versions: 4kV AC according to EN 60950 class II.  
G24 version: 1kV AC

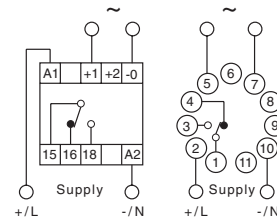
**Dimensions:** Identical to MCP-10, see page 38.

**Housing:** Black Noryl SE-1.

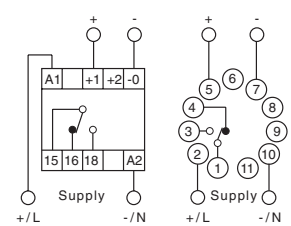
**Weight:** Typically 170 g.

## WIRING DIAGRAMS

AC



DC



## NOTES/REMARKS

1) There is no galvanic isolation between input and supply. External isolation should be provided to prevent damage to the controller when measuring voltage/current or a G- or other version with internal isolation should be used.

# Control & Monitoring Relays

Digital Control Relay MCU-10...DC/AC



## DESCRIPTION

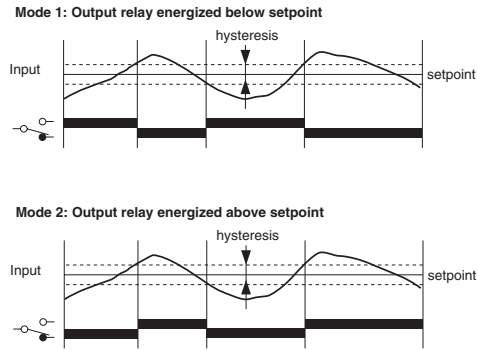
Digital control relay with 3½-digit LCD display.  
 The control relay is used for control and measurement of AC/DC current.  
 The actual input signal type and measuring range must be specified when the control relay is ordered.  
 3½ digit LCD display with selectable read-out of actual input and setpoint.  
 Output relay with LED indication of energized output relay.  
 Built-in power supply for direct mains supply. Galvanic isolation between input and supply.  
 Standardized housing for 11-pole plug-in or DIN rail mounting.  
 Bases for DIN rail, surface and chassis mounting are listed under Accessories for MCP-10, see page128.

## VERSION/ORDERING CODES

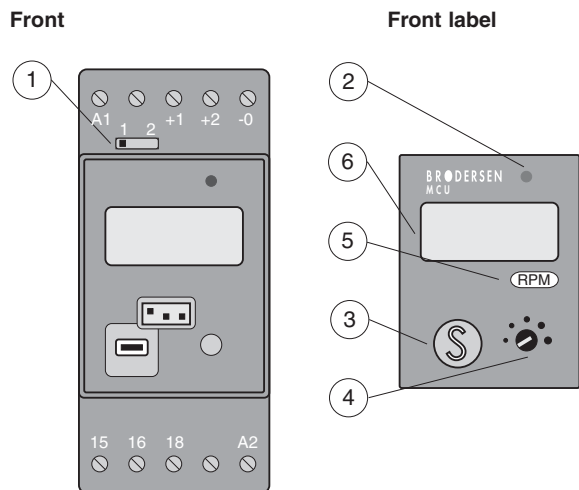
<b>Type:</b> Digital control relay. MCU-10	MCU-10	S	1	230	DC1
<b>Mounting:</b> 11-pole plug-in. DIN rail.		S D			
<b>Output relay:</b> SPDT		1			
<b>Supply voltage:</b> 12-48VDC/10-30V AC 12V AC/DC 24V AC/DC 24V AC 110/120V AC 220/240V AC 380/415V AC	G24 912 <sup>1)</sup> 924 <sup>1)</sup> 024 115 230 400				
<b>Input:</b>					
<b>Current:</b> DC: 0-19.99mA. 0-199.9mA. 0-10.00A. 0-100.0A.	DC1 DC2 DC3 <sup>2)</sup> DC4 <sup>2)</sup>				
AC: 0-19.99mA. 0-199.9mA. 0-1.99A. 0-199.9A. 0-500A.	AC1 AC2 AC3 AC4 <sup>3)</sup> AC5 <sup>4)</sup>				

## OPERATION

The display shows the actual input signal when the supply voltage is connected.  
 The setpoint is displayed by pressing the **S** button and the setpoint is adjusted on the front mounted potentiometer.  
 The output mode switch for selecting whether the output relay should be energized above or below the adjusted setpoint, see the diagrams below.  
 The red LED indicator will light up when the output relay is energized.



## FRONT



1. Output mode selector 2. LED indication of energized output relay 3. Button for setpoint read-out 4. Setpoint adjustment 5. Input label position 6. Display field.



## TECHNICAL DATA

### Measuring ranges:

AC		DC	
0-19.99mA		0-19.99mA	
0-199.9mA		0-199.9mA	
0-1.99A			
0-199.9A	with external current transformer (1A sec.)	0-10.00A	with external shunt (60mV voltage drop)
0-500A		0-100.0A	

**Input impedance:**  $\frac{1V}{I \text{ max}}$

$\frac{60mV}{I \text{ max}}$  with shunt.

**Measuring accuracy:** 1% of full scale  $\pm$  1 digit.

**Hysteresis:** 1% of full range.

**Temperature drift:**  
Voltage, current and temperature: Max. 0.01% per °C.

**Display:** 3½-digit LCD-type (-1999 to 1999).  
Digit height: 6.5 mm.  
Display update time: Typically 0.4 sec.

**Scale:** The scale is adjusted to the actual measuring range listed in the ordering key.

**Output relay:** SPDT (single changeover contact).  
Load ( $\cos\phi=1$ ): D1/S1: Max. 8A/240V AC  
Min. 10mA/24VDC  
Frequency: Max. 1000 operations per hour at max. load.  
Mechanical life time: Min.  $10 \times 10^6$  operations.  
Electrical life time: Min. 100.000 operations at max. load.  
Time delay: Typically 1s.

**Mounting:** S1: 11-pole plug-in.  
D1: Directly on 35 mm DIN-rail (EN50022).

**Terminals:** Max. conductor size 4 mm<sup>2</sup>.  
Screw type terminals with self-lifting clamps shrouded in accordance with VDE0106 (finger and back of hand protection).

**Supply voltage:** 12-48VDC(10.5-60V)/12-30V AC.(10.5-35V).  
12V AC/DC (10-18V) <sup>1)</sup>.  
24V AC/DC (18-35V) <sup>1)</sup>.  
24V AC (22-26V).  
110/120V AC (95-135V).  
220/240V AC (195-265V).  
380/415V AC (342-418V).

**Mains frequency:** 45-66Hz.

**Consumption:** 1-3VA.

**Protection:** S1: IP40.  
D1: IP20.

**EMC:** Conforming to EN 50081-2/EN 50082-1.

**Ambient temperature:** -25-55°C.

**Isolation:**  
AC versions: 4kV AC according to EN 60950 class II.  
G24 version: 1kV AC

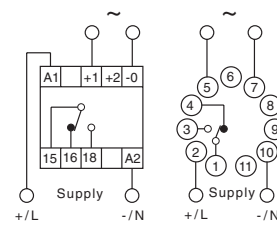
**Dimensions:** Identical with MCP-10, see page 39.

**Housing:** Black Noryl SE-1.

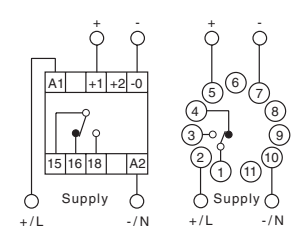
**Weight:** Typically 170 g

## WIRING DIAGRAMS

AC



DC



## NOTES/REMARKS

- 1) There is no galvanic isolation between input and supply. External isolation should be provided to prevent damage to the controller when measuring voltage/current or a G- or other version with internal isolation should be used.
- 2) With external shunt type AAS-010 (0-10.0 A DC) or type AAS-100 (0-100 A DC).
- 3) With external current transformer type AAT-200.1.
- 4) With external current transformer type AAT-500.1.

# Control & Monitoring Relays

Digital Control Relay MCU-10...P/N/T



## DESCRIPTION

Digital control relay with 3½-digit LCD display.  
 The control relay is used for control and measurement of Temperature with Pt-100, Ni-100, and thermistors  
 The actual input signal type and measuring range must be specified when the control relay is ordered.  
 3½ digit LCD display with selectable read-out of actual input and setpoint.  
 Output relay with LED indication of energized output relay.  
 Built-in power supply for direct mains supply. Galvanic isolation between input and supply.  
 Standardized housing for 11-pole plug-in or DIN rail mounting.  
 Bases for DIN rail, surface and chassis mounting are listed under Accessories for MCP-10, see page 128.

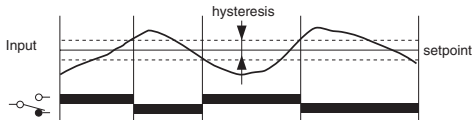
## VERSION/ORDERING CODES

<b>Type:</b> Digital control relay.	MCU-10	MCU-10	S	1	230	P1
<b>Mounting:</b> 11-pole plug-in. DIN rail.	S					
<b>Output relay:</b> SPDT	1					
<b>Supply voltage:</b> 12-48VDC/10-30V AC 12V AC/DC 24V AC/DC 24V AC 110/120VAC 220/240V AC 380/415V AC	G24 912 <sup>1)</sup> 924 <sup>1)</sup> 024 115 230 400					
<b>Input:</b>						
<b>RTDs:</b> Pt-100: -50.0-199.9°C. -50-850°C.	P1 P3					
Ni-100: -50.0-199.9°C.	N1					
Thermistor (KTY): -30.0-100.0°C.	T1					

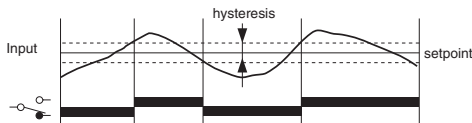
## OPERATION

The display shows the actual input signal when the supply voltage is connected.  
 The setpoint is displayed by pressing the S button and the setpoint is adjusted on the front mounted potentiometer.  
 The output mode switch for selecting whether the output relay should be energized above or below the adjusted setpoint, see the diagrams below.  
 The red LED indicator will light up when the output relay is energized.

Mode 1: Output relay energized below setpoint



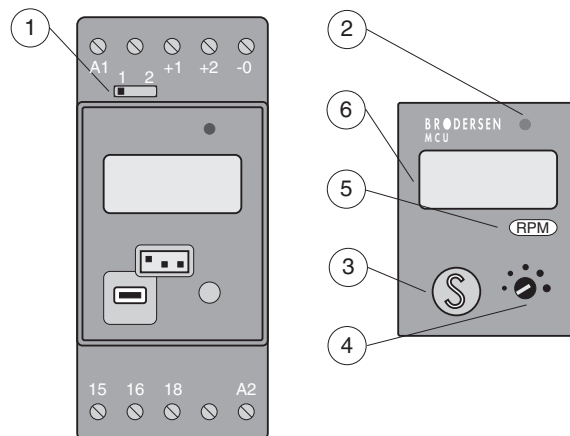
Mode 2: Output relay energized above setpoint



## FRONT

Front

Front label



1 Output mode selector. 2 LED indication of energized output relay.  
 3 Button for setpoint read-out. 4 Setpoint adjustment. 5 Unit label position. 6 Display field.

## TECHNICAL DATA

### Measuring ranges:

RTDs/Thermistors		
Pt-100	Ni-100	Thermistor (KTY)
-50.0-199.9°C	-50.0-199.9°C	-30.0-100.0°C
-50-850°C		

**Measuring accuracy:** 1% of full scale  $\pm$  1 digit.

**Hysteresis:** 1% of full range.

**Temperature drift:** Max. 0.01% per °C.

**Display:** 3½-digit LCD-type (-1999 to 1999).  
Digit height: 6.5 mm.  
Display update time: Typically 0.4 sec.

**Scale:** The scale is adjusted to the actual measuring range listed in the ordering key, except U1 version with user adjustable scale (-1999 to 1999, max. 2000 steps).

**Output relay:** SPDT (single changeover contact).  
Load (cos $\phi$ =1): D1/S1: Max. 8A/240V AC  
Min. 10mA/24VDC  
Frequency: Max. 1000 operations per hour at max. load.  
Mechanical life time: Min. 10 x 10<sup>6</sup> operations.  
Electrical life time: Min. 100.000 operations at max. load.  
Time delay: Typically 1s.

**Mounting:** S1: 11-pole plug-in.  
D1: Directly on 35 mm DIN-rail (EN50022).

**Terminals:** Max. conductor size 4 mm<sup>2</sup>.  
Screw type terminals with self-lifting clamps shrouded in accordance with VDE0106 (finger and back of hand protection).

**Supply voltage:** 12-48V DC (10.5-60V)/12-30V AC(10.5-35V).  
12V AC/DC (10-18V) <sup>1)</sup>.  
24V AC/DC (18-35V) <sup>1)</sup>.  
24V AC (22-26V).  
110/120V AC (95-135V).  
220/240V AC (195-265V).  
380/415V AC (342-418V).

**Mains frequency:** 45-66Hz.

**Consumption:** 1-3VA.

**Protection:** S1: IP40.  
D1: IP20.

**EMC:** Conforming to EN 50081-2/EN 50082-1.

**Ambient temperature:**-25-55°C.

**Isolation:**  
AC versions: 4kV AC according to EN 60950 class II.  
G24 version: 1kV AC

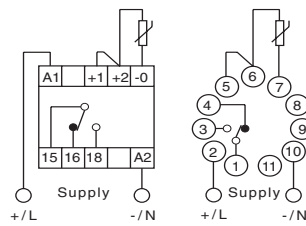
**Dimensions:** Identical to MCP-10, see page 38.

**Housing:** Black Noryl SE-1.

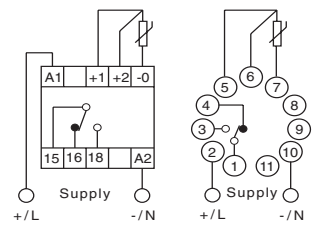
**Weight:** Typically 170 g.

## WIRING DIAGRAMS

RTD/Thermistor (2-wire)



RTD/Thermistor (3-wire)



The MCU-10 temperature controller is supported by a wide range of temperature sensors, see the temperature sensor data sheet for detailed technical information and ordering codes.

## NOTES/REMARKS

1) There is no galvanic isolation between input and supply. External isolation should be provided to prevent damage to the controller when measuring voltage/current or a G- or other version with internal isolation should be used.

# Control & Monitoring Relays

Digital Control Relay MCU-10...J/K/S/R



## DESCRIPTION

Digital control relay with 3½-digit LCD display. The control relay is used for control and measurement of temperature with thermocouples. The actual input signal type must be specified when the control relay is ordered. 3½ digit LCD display with selectable read-out of actual input and setpoint. Output relay with LED indication of energized output relay. Built-in power supply for direct mains supply. Galvanic isolation between input and supply. Standardized housing for 11-pole plug-in or DIN rail mounting. Bases for DIN rail, surface and chassis mounting are listed under Accessories for MCP-10, see page 128.

## VERSION/ORDERING CODES

<b>Type:</b> Digital control relay.	MCU-10	MCU-10	S	1	230	J1
<b>Mounting:</b> 11-pole plug-in. DIN rail.	S D					
<b>Output relay:</b> SPDT	1					
<b>Supply voltage:</b> 12-48V DC/10-30V AC 12V AC/DC 24V AC/DC 24V AC 110/120V AC 220/240V AC 380/415V AC	G24 912 <sup>1)</sup> 924 <sup>1)</sup> 024 115 230 400					
<b>Input:</b> Fe-CuN -50-1200°C. NiCr-Ni: -50-1350°C. PtRh-Pt 10%: -50-1750°C. PtRh-Pt 13%: -50-1750°C.	J1 <sup>2)</sup> K1 <sup>2)</sup> S1 <sup>2)</sup> R1 <sup>2)</sup>					

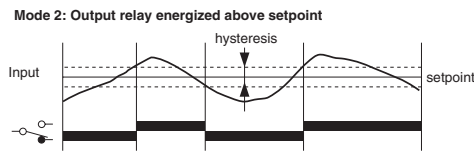
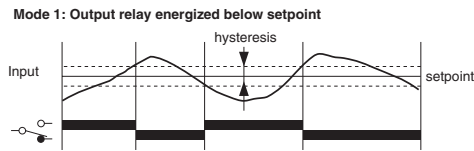
## OPERATION

The display shows the actual input signal when the supply voltage is connected.

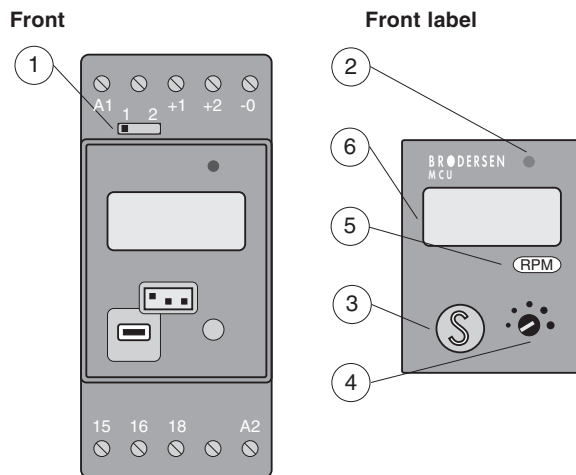
The setpoint is displayed by pressing the **S** button and the setpoint is adjusted on the front mounted potentiometer.

The output mode switch for selecting whether the output relay should be energized above or below the adjusted setpoint, see the diagrams below.

The red LED indicator will light up when the output relay is energized.



## FRONT



1. Output mode selector 2. LED indication of energized output relay 3. Button for setpoint read-out 4. Setpoint adjustment 5. Unit label position 6. Display field.

## TECHNICAL DATA

### Measuring ranges:

Thermocouples			
Fe-CuNi	NiCr-Ni	PtRh-Pt 10%	PtRh-Pt 13%
-50 -1200°C	-50 -1350°C	-50 -1750°C	-50 -1750°C

**Measuring accuracy:** 1% of full scale  $\pm$  1 digit <sup>2)</sup>.

**Hysteresis:** 1% of full range.

### Temperature drift:

Voltage, current and temperature:  
Standard process: Max. 0.01% per °C.  
Max. 0.02% per °C.

**Display:** 3½-digit LCD-type (-1999 to 1999).  
Digit height: 6.5 mm.  
Display update time: Typically 0.4 sec.

**Output relay:** SPDT (single changeover contact).  
Load ( $\cos\phi=1$ ): D1/S1: Max. 8A/240V AC  
Min. 10mA/24VDC  
Frequency: Max. 1000 operations per hour at max.load.  
Mechanical life time: Min.  $10 \times 10^6$  operations.  
Electrical life time: Min. 100.000 operations at max. load.  
Time delay: Typically 1s.

**Mounting:** S1: 11-pole plug-in.  
D1: Directly on 35 mm DIN-rail (EN50022).

**Terminals:** Max. conductor size 4 mm<sup>2</sup>.  
Screw type terminals with self-lifting clamps shrouded in accordance with VDE0106 (finger and back of hand protection).

**Supply voltage:** 12-48V DC (10.5-60V)/12-30V AC(10.5-35V).  
12V AC/DC (10-18V) <sup>1)</sup>.  
24V AC/DC (18-35V) <sup>1)</sup>.  
24V AC (22-26V).  
110/120V AC (95-135V).  
220/240V AC (195-265V).  
380/415V AC (342-418V).

**Mains frequency:** 45-66Hz.

**Consumption:** 1-3VA.

**Protection:** S1: IP40.  
D1: IP20.

**EMC:** Conforming to EN 50081-1/EN 50082-2.

**Ambient temperature:**-25-55°C.

### Isolation:

AC versions: 4kV AC according to EN 60950 class II.  
G24 version: 1kV AC

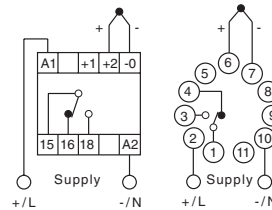
**Dimensions:** Identical to MCP-10, see page 38.

**Housing:** Black Noryl SE-1.

**Weight:** Typically 170 g.

## WIRING DIAGRAMS

### Thermocouple



The MCU-10 temperature controller is supported by a wide range of temperature sensors, see the temperature sensor data sheet for detailed technical information and ordering codes.

## NOTES/REMARKS

1) There is no galvanic isolation between input and supply. External isolation should be provided to prevent damage to the controller when measuring voltage/current or a G- or other version with internal isolation should be used.

2) The specified accuracy is valid within the subranges:

J1: 0 -1100 °C. S1: 150 -1550 °C.  
K1: 0 -1150 °C. R1: 150 -1550 °C.

# Control & Monitoring Relays

## Digital Control Relay MCU-10...U



### DESCRIPTION

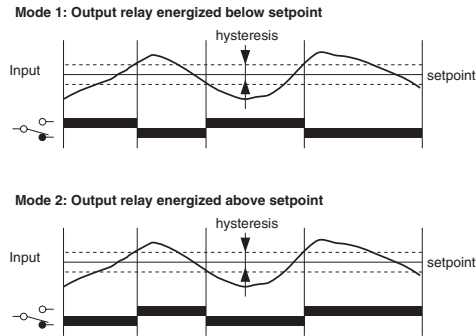
Digital control relay with 3½-digit LCD display.  
 The scaling facilities of the MCU-10...U make it ideal as a monitor or control device for normal standard process signals, e.g. 4-20mA. Any output from a transmitter can be scaled to engineering units and a unit label can be inserted on the front of the control relay. A sheet with common units is enclosed with the relay.  
 Typical applications:  
 General process instrumentation.  
 Signal monitor with read-out in engineering units.  
 3½ digit LCD display with selectable read-out of actual input and setpoint.  
 Output relay with LED indication of energized output relay.  
 Built-in power supply for direct mains supply. Galvanic isolation between input and supply.  
 Standardized housing for 11-pole plug-in or DIN rail mounting. Bases for DIN rail, surface and chassis mounting are listed under Accessories for MCP-10, see page 128.

### VERSION/ORDERING CODES

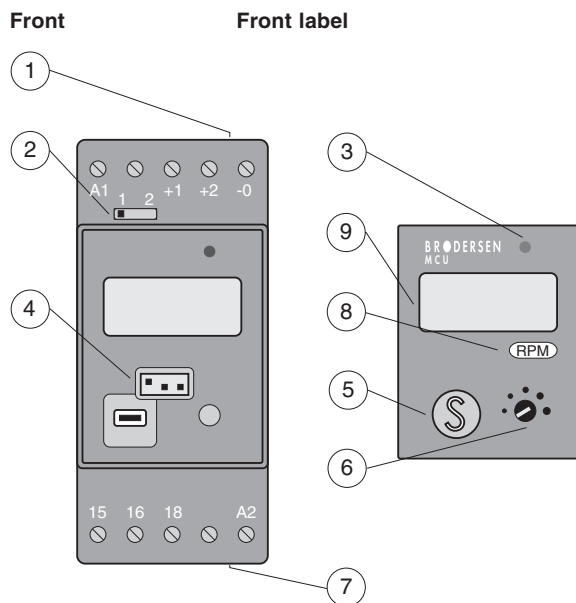
<b>Type:</b> Digital control relay.	MCU-10	MCU-10	S	1	230	U1
<b>Mounting:</b> 11-pole plug-in. DIN rail.	S					
<b>Output relay:</b> SPDT	1					
<b>Supply voltage:</b> 12-48V DC/10-30V AC 12V AC/DC 24V AC/DC 24V AC 110/120V AC 220/240V AC 380/415V AC	G24 912 <sup>1)</sup> 924 <sup>1)</sup> 024 115 230 400					
<b>Input:</b> Standard process signals: 0-20mA DC/4-20mA DC and 0-10V DC/2-10V DC	U1					

### OPERATION

The display shows the actual input signal when the supply voltage is connected.  
 The setpoint is displayed by pressing the S button and the setpoint is adjusted on the front mounted potentiometer.  
 The output mode switch for selecting whether the output relay should be energized above or below the adjusted setpoint, see the diagrams below.  
 The red LED indicator will light up when the output relay is energized.



### FRONT



1. Input selector 2. Output mode selector 3. LED indication of energized output relay 4. Decimal point position 5. Button for setpoint read-out 6. Setpoint adjustment 7. Scale and offset adjustment 8. Unit label position 9. Display field.

## TECHNICAL DATA

### Measuring ranges:

<b>DC</b>
0-20mA/4-20mA and 0-10V/2-10V. The actual input signal is selected via a switch on the control relay.

**Measuring accuracy:** 1% of full scale  $\pm$  1 digit.

**Hysteresis:** 1% of full range.

### Input impedance:

Voltage: 1Mohm.  
Current: 50Ohm.

**Temperature drift:** Max. 0.02% per °C.

**Display:** 3½-digit LCD-type (-1999 to 1999).  
Digit height: 6.5 mm.  
Display update time: Typically 0.4 sec.

**Scale:** The scale is adjusted to the actual measuring range which is user adjustable (-1999 to 1999, max. 2000 steps).

**Decimal point:** Selectable \_ \_ \_ \_ \_

**Output relay:** SPDT (single changeover contact).  
Load (cos $\phi$ =1): D1/S1: Max. 8A/240V AC  
Min. 10mA/24VDC  
Frequency: Max. 1000 operations per hour at max. load.  
Mechanical life time: Min. 10 x 10<sup>6</sup> operations.  
Electrical life time: Min. 100.000 operations at max. load.  
Time delay: Typically 1s.

**Mounting:** S1: 11-pole plug-in.  
D1: Directly on 35 mm DIN-rail (EN50022).

**Terminals:** Max. conductor size 4 mm<sup>2</sup>.  
Screw type terminals with self-lifting clamps shrouded in accordance with VDE0106 (finger and back of hand protection).

**Supply voltage:** 12-48VDC(10.5-60V)/12-30VAC(10.5-35V).  
12V AC/DC (10-18V) <sup>1)</sup>.  
24V AC/DC (18-35V) <sup>1)</sup>.  
24V AC (22-26V).  
110/120V AC (95-135V).  
220/240V AC (195-265V).  
380/415V AC (342-418V).

**Mains frequency:** 45-66Hz.

**Consumption:** 1-3VA.

**Protection:** S1: IP40.  
D1: IP20.

**EMC:** Conforming to EN 50081-1/EN 50082-2.

**Ambient temperature:**-25-55°C.

### Isolation:

AC versions: 4kV AC according to EN 60950 class II.  
G24 version: 1kV AC

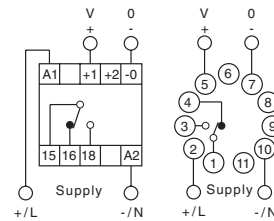
**Dimensions:** Identical to MCP-10, see page 39.

**Housing:** Black Noryl SE-1.

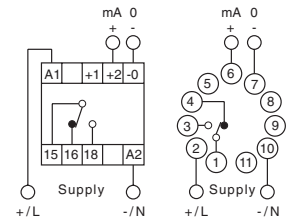
**Weight:** Typically 170 g.

## WIRING DIAGRAMS

### Voltage

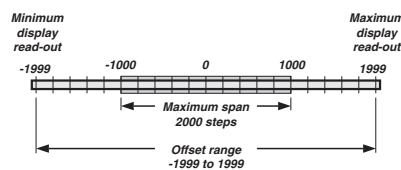


### Current



## CONFIGURATION/CALIBRATION

The control relay for standard process signals is fully user adjustable within in the scale limits -1999 to 1999 with a maximum span of 2000 steps, e.g. a scale from -1000 to 1000.



The offset is adjustable within the range -1999 to 1999 ,however, the maximum offset must be smaller than the required span:

**Max. offset ≤ Span = Max. scale - Min. scale**  
a scale e.g. 500 to 800 ( 500 ≤ 300 = 800 - 500 ) can therefore not be obtained.

Selectable decimal point position: \_ \_ \_ \_ \_  
Selectable input range:0-20mA/0-10V or 4-20mA/2-10V.

Example: Adjust the control relay to a scale -1000 to 1000, input signal 4-20mA.

- 1) Set the switches for input, output mode and decimal point position. Mount the front label and connect the supply voltage.
- 2) Apply min. signal 4mA and adjust Offset to display read-out 0000.
- 3) Apply max. signal 20mA and adjust Scale to a display read-out 1999. Adjust **Offset** to display read-out 1000.
- 4) Apply min. signal 4mA and check display read-out is -1000. If incorrect, return to step 2 and readjust the control relay.

The control relay is now calibrated and ready to use.

## NOTES/REMARKS

- 1) There is no galvanic isolation between input and supply. External isolation should be provided to prevent damage to the controller when measuring voltage/current or a G- or other version with internal isolation should be used.

# Control & Monitoring Relays

## Single Phase Voltage Relay MXV-10



### DESCRIPTION

Single phase voltage relay for detecting AC/DC over-or under-voltage. The relay is delivered in two variations for over-and under-voltage.

**Over-voltage:**

When the monitored voltage rises and reaches the determined setpoint, which is adjusted on the front panel, the relay energises. When the voltage drops and passes the setpoint, minus the hysteresis which is adjustable on the front, the relay de-energises.

**Under-voltage:**

When the monitored voltage drops and reaches the determined setpoint, which is adjusted on the front panel, the relay energises. When the voltage rises and passes the setpoint, plus the hysteresis which is adjustable on the front, the relay de-energises.

There is also a latch function where the relay after energising will remain energised, regardless of input voltage, until the latch jumper or the operating voltage is disconnected. Typically used in safety circuits. The contact function of the relay can also be inverted.

The relay has an analogue, 2-10VDC, output which when connected to an external voltmeter can be used for the accurate adjustment of the setpoint.

### Features

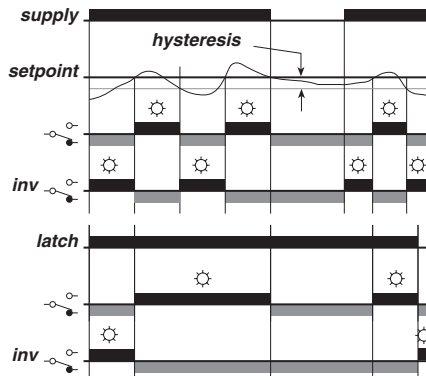
- Monitoring of 1-500VAC/DC in 5 ranges in one version.
- Adjustable setpoint.
- Adjustable hysteresis of 0,5-20%.
- Automatic locking function (latch).
- Inversion of the relay function.
- Output SPDT and 2-10VDC with reference to setpoint.
- Supply voltage 24VDC, 24/115VAC or 24/230VAC.

### VERSIONS/ORDERING CODES

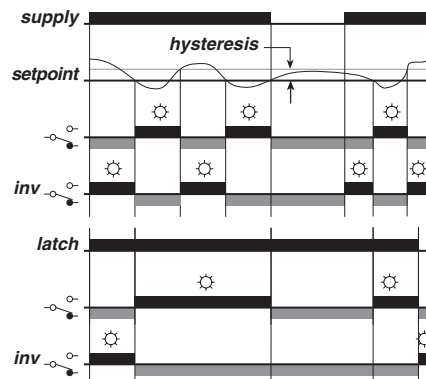
<b>Type:</b> Single phase voltage relay	MXV-10	MXV-10	230	1
<b>Supply voltage</b> 24V DC 115V AC / 24V AC 230V AC / 24V AC	924	115	230	
<b>Over/under voltage</b> Over voltage Under voltage	1	2		

### OPERATION

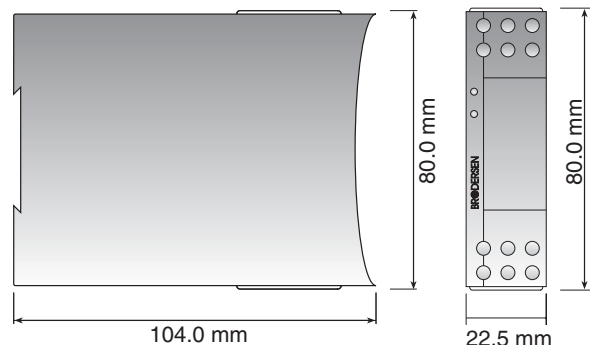
#### Over voltage, code 1



#### Under voltage, code 2



### MECHANICAL DIMENSIONS





## TECHNICAL DATA

### Input:

Input signal	Impedance	U <sub>max</sub>
1-5V AC/DC	500k	700V AC
4-20V AC/DC	500k	700V AC
10-50V AC/DC	500k	700V AC
40-200V AC/DC	500k	700V AC
100-500V AC/DC	500k	700V AC

Frequency :	45-65 Hz
Temperature drift	Max. 0,05%/°C
Setting accuracy:	Typically ± 10%
Hysteresis:	0,5-20% of chosen range, adjustable
Response time:	time constant $\tau = 0,8s$ , Worst case of response time max. $5 \times \tau$

### Output:

SPDT relay:	Contact material, AgNi 0,15 with hardened gold plating Au. Max load AC, 8A/240V AC ( $\cos\phi=1$ ) Max. breaking capacity 2000VA. Inductive load. See fig. 1. Max load DC, 8A/24V DC Max breaking capacity 50-270W see fig. 2.
-------------	--

Max. in rush current:	15A (max. 4s/duty cycle less than 10%).
Min. in rush current:	10mA, 24V DC.
Frequency :	Max. 1000 operations pr. hour.
Life span:	Mech. Min. $3 \times 10^7$ operations Elect. Min $1 \times 10^5$ operations with full load. <20ms.
Delay;	<20ms.
Analogue output:	2-10V DC, refers to setpoint in chosen range. $I_{max} = 2mA / R_{load} > 5k\Omega$ . Accuracy better than +/- 0,5%.

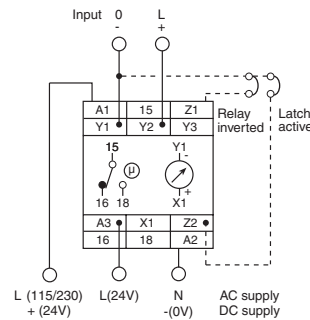
### Supply voltage:

Versions:	924=24V DC (20,4-27,6)V DC. 115=24/115V AC (20,4-27,6/98-132)V AC. 230=24/230V AC (20,4-27,6/196-264)V AC.
Net frequency:	45-65Hz.
Consumption:	AC; 3VA DC; 2W

### General data::

Ambient temperature:	-20 to 55°C.
Storage temperature:	-40 to 80°C.
Mounting:	35mm DIN-rail (EN50022).
Terminals:	Screw terminals with dual compartment. Terminal screws are combined crosshead/slotted. Up to 2 x 2,5mm <sup>2</sup> wire (2 x 1,5mm <sup>2</sup> inc. ferrule). Recommended torque, 0,5Nm. Max 0,7 Nm. (VDE0609-1). Terminal identification in accordance with DIN46199/EN50005.
Indicators:	Green LED = operating voltage. Red LED = relay switched on.
Protection:	IP20.
Electrical isolation:	3,75kVAC (1 min.) between input, supply and relay output (EN60950). <b>Note:</b> No galvanic isolation between input and analogue output.
Housing:	Noryl (GE), UL94V1.
Terminal block:	Noryl (GE), UL94V0.
Weight:	180 g.

## WIRING DIAGRAM



### Coding:

Relay inv.; Jumper Y1 - Z1  
Latching; Jumper Y1 - Z2

### Analogue output 2-10V DC;

X1 = (+) V  
Y1 = (-) 0

## SPECIFICATIONS

MXV-10 is designed and developed with regard to relevant specifications:

- EN62024-1 / VDE0113 electrical material on machines.
- VDE0110 / IEC664 Isolation specifications/creepage and clearance distances.
- Electrical safety in accordance with EN61010.
- IEC414 Safety regulations for control and monitoring equipment.
- EMC: Emission EN50081-1.  
Immunity EN50082-2.
- Humidity in accordance with IEC68-2-3; RH=95%, 40°C.
- Vibration in accordance with IEC68-2-6;
- Shock when mounted, in accordance with IEC68-2-27.

MXV-10 is CE-marked in accordance with EMC-and the Low Voltage Directive.

## OUTPUT LOAD DIAGRAMS

Fig. 1

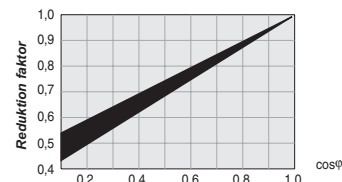
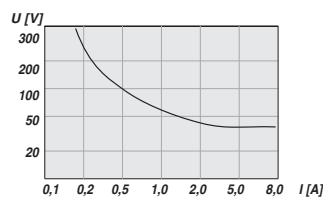


Fig. 2



## Control & Monitoring Relays

### Single Phase Voltage Relay MXV-20



#### DESCRIPTION

Single phase voltage relay for detecting a level of AC or DC voltage.

When the monitored voltage rises and reaches the determined setpoint, which is adjusted on the front panel, the relay energises. When the voltage drops and passes the setpoint, minus the hysteresis which is adjustable on the front, the relay de-energises. With inverted relay function the internal relay work the opposite way.

The Voltage relay has a latch function where the relay after energising will remain energised, regardless of input voltage, until the latch jumper or the operating voltage is disconnected. Typically used in safety circuits.

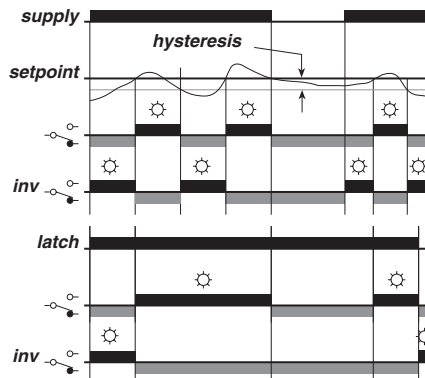
#### Features

- Monitoring of 1-500VAC/DC in 4 ranges in one version.
- Adjustable setpoint.
- Adjustable hysteresis of 3-35%.
- Automatic locking function (latch).
- Inversion of the relay function.
- Output SPDT.
- Supply voltage 24VDC, 24VAC, 115VAC, 230VAC or 400VAC.

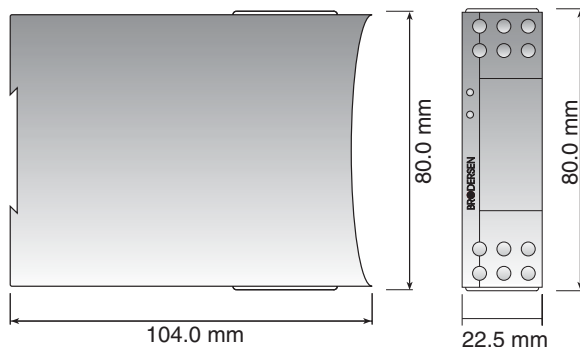
#### VERSIONS/ORDERING CODES

Type:	MXV-20	MXV-20	230	1
Single phase voltage relay				
Supply voltage	924			
24V DC	024			
24V AC	115			
115V AC	230			
230V AC	400			
400V AC				
Measuring range:	1			
1-5V AC/DC	2			
4-20V AC/DC	3			
10-50V AC/DC	4			
40-200V AC/DC	5			
100-500V AC/DC				

#### OPERATION



#### MECHANICAL DIMENSIONS



## TECHNICAL DATA

### Input:

Input signal	Impedance	U <sub>max</sub>
1-5V AC/DC	5,5kOhm	50V AC
4-20V AC/DC	22kOhm	100V AC
10-50V AC/DC	55kOhm	150V AC
40-200V AC/DC	220kOhm	300V AC
100-500V AC/DC	550kOhm	525V AC

Accuracy	1%
Temperature drift	Max. 0,05%/°C
Setting accuracy:	Typically ± 10%
Hysteresis:	Adjustable 3-35%
Response time:	Time constant $\tau = 0,2s$ , Worst case of response time max. $5 \times \tau$

### Output:

SPDT relay

Contact material:	AgNi 0,15 with hardened gold plating Au.
Max load AC:	8A/240V AC ( $\cos\phi=1$ ) Max. breaking capacity 2000VA, Inductive load. See fig. 1.
Max load DC:	8A/24V DC Max breaking capacity 50-270W see fig. 2.
Max. in rush current:	15A (max. 4s/duty cycle less than 10%).
Min. in rush current:	10mA, 24V DC.
Frequency :	Max. 1000 operations pr. hour.
Life span:	Mech. Min. $3 \times 10^7$ operations Elect. Min $1 \times 10^5$ operations with full load.
Delay:	<20ms.

### Supply voltage:

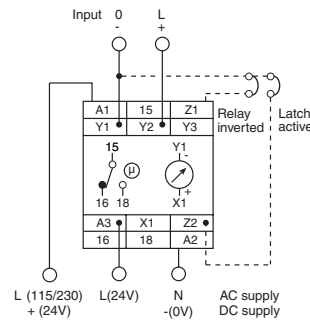
Versions:	924=24V DC (20,4-27,6)V DC. 024=24V AC (20,4-27,6)V AC. 115=115V AC (98-132)V AC. 230=230V AC (196-264)V AC. 400=400V AC (340-460)V AC.
-----------	---

Net frequency:	40-70Hz.
Consumption:	AC; max. 3VA DC; max. 2W

### General data:

Ambient temperature:	-20 to 55°C.
Storage temperature:	-40 to 80°C.
Mounting:	35mm DIN-rail (EN50022).
Terminals:	Screw terminals with dual compartment. Terminal screws are combined crosshead/ slotted. Up to 2 x 2,5mm <sup>2</sup> wire (2 x 1,5mm <sup>2</sup> inc. ferrule). Recommended torque, 0,5Nm. Max 0,7 Nm. (VDE0609-1). Terminal identification in accordance with DIN46199/EN50005.
Indicators:	Green LED = operating voltage. Red LED = relay switched on.
Protection:	IP20.
Electrical isolation:	3,75kVAC (1 min.) between input, supply and relay output (EN60950). <b>Note:</b> No galvanic isolation between input and analogue output.
Housing:	Noryl (GE), UL94V1.
Terminal block:	Noryl (GE), UL94V0.
Weight:	180 g.

## WIRING DIAGRAM



**Coding:**  
Relay inv.; Jumper Y1 - Z1  
Latching; Jumper Y1 - Z2

## SPECIFICATIONS

MXV-20 is designed and developed with regard to relevant specifications:

- EN60204-1 / VDE0113 electrical material on machines.
- VDE0110 / IEC664 Isolation specifications/creepage and clearance distances.
- Electrical safety in accordance with EN61010.
- IEC414 Safety regulations for control and monitoring equipment.
- EMC: Emission EN50081-1.  
Immunity EN50082-2.
- Humidity in accordance with IEC68-2-3; RH=95%, 40°C.
- Vibration in accordance with IEC68-2-6:
- Shock when mounted, in accordance with IEC68-2-27.

MXV-20 is CE-marked in accordance with EMC-and the Low Voltage Directive.

## OUTPUT LOAD DIAGRAMS

Fig. 1

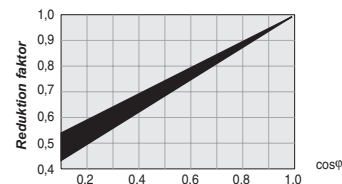
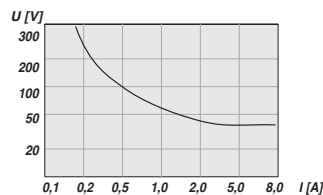


Fig. 2



# Control & Monitoring Relays

## Single Phase Current Relay MXC-10



### DESCRIPTION

A relay for monitoring AC or DC Current via an internal shunt. The relay is delivered in two variations for over- or under-current.

**Over-current:**  
When the monitored current rises and reaches the determined setpoint, which is adjusted on the front panel, the relay energises. When the current drops and passes the setpoint, minus the hysteresis which is adjustable on the front, the relay de-energises.

**Under-current:**  
When the monitored current drops and reaches the determined setpoint, which is adjusted on the front panel, the relay energises. When the current rises and passes the setpoint, plus the hysteresis which is adjustable on the front, the relay de-energises.

There is also a latch function where the relay after energising will remain energised, regardless of input current, until the latch jumper or the operating voltage is disconnected. Typically used in safety circuits. The contact function of the relay can also be inverted.

The relay has an analogue, 2-10V DC, output which when connected to an external voltmeter can be used for the accurate adjustment of setpoint.

### Features

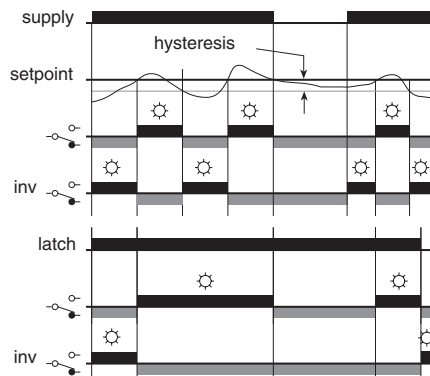
- Monitoring of 4mA - 2A AC/DC, in 5 ranges, in one version.
- Adjustable setpoint.
- Adjustable hysteresis 0,5-20%.
- Automatic locking function (Latch).
- Inversion of the relay function.
- Output SPDT and 2-10V DC referenced to the setpoint.
- Operating voltage 24VDC , 24/115VAC or 24/230VAC.

### VERSIONS/ORDERING CODES

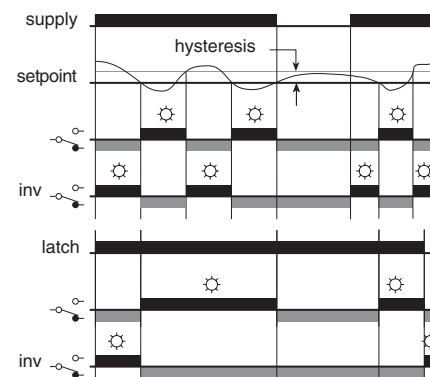
<b>Type:</b> Single phase current relay	MXC-10	MXC-10.	230.	1
<b>Supply voltage</b> 24V DC 115V AC / 24V AC 230V AC / 24V AC		924	115	230
<b>Over/under current</b> Over current Under current		1	2	

### OPERATION

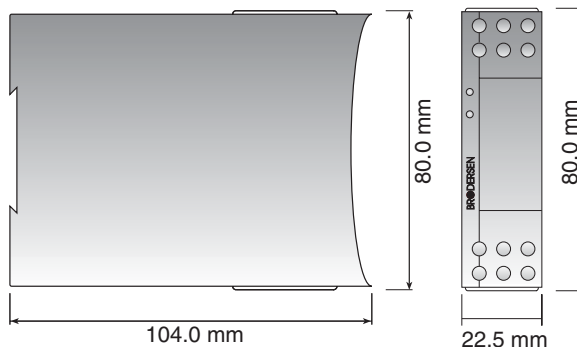
#### Over current, code 1



#### Under current, code 2



### MECHANICAL DIMENSIONS



## TECHNICAL DATA

### Input:

Input signal:	$I_{max}$	Impedance $R_i$ :	Terminals:			
4-20mA AC/DC;				340mA	50ohm	Y1/Y2
10-50mA AC/DC;						
40-200mA AC/DC;						
100-500mA AC/DC;	5A	0,1ohm	Y1/Y3			
0,4-2A AC/DC;						

Frequency:	45-65 Hz.
Temperature drift:	Max. 0,05%/°C.
Setting accuracy:	Typically $\pm 10\%$ .
Hysteresis:	0,5-20% of chosen range, adjustable
Response time:	time constant $\tau = 0,8s$ , Worst case of response time max. $5 \times \tau$ .

### Output:

SPDT relay:	Contact material, AgNi 0,15 with hardened gold plating Au. Max load AC, 8A/240V AC ( $\cos\phi=1$ ) Max. breaking capacity 2000VA. Inductive load. See fig. 1. Max load DC, 8A/24V DC Max. breaking capacity 50-270W, See fig.2.
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Max. in rush current:	15A (max. 4s/duty cycle less than 10%).
Min. in rush current:	10mA, 24V DC.
Frequency :	Max.1000 operations pr.hour.
Life time:	Mech. $\text{Min.} 3 \times 10^7$ operations. Elect. $\text{Min.} 1 \times 10^5$ operations with full load.
Delay:	<20ms.

**Analogue output:** 2-10V DC, refers to setpoint in chosen range.

$$I_{max} = 2mA / R_{load} > 5k\Omega.$$

Accuracy better than  $\pm 0,5\%$ .

### Supply voltage:

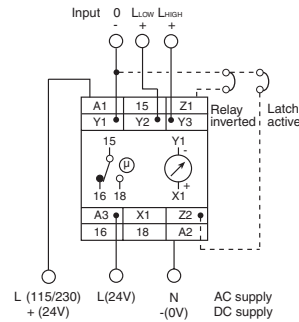
Versions:	924=24V DC (20,4-27,6)V DC. 115=24/115V AC (20,4-27,6 /98-132)V AC. 230=24/230V AC (20,4-27,6/196-264)V AC.
Net frequency:	45-65Hz.

Consumption:	AC; 3VA. DC; 2W.
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### General data:

Ambient temperature:	-20 to 55°C.
Storage temperature:	-40 to 80°C.
Mounting:	35mm DIN-rail (EN50022).
Terminals:	Screw terminals with dual compartment. Terminal screws are combined crosshead/slotted. Up to $2 \times 2,5\text{mm}^2$ wire ( $2 \times 1,5\text{mm}^2$ inc. ferrule). Recommended torque, 0,5 Nm., Max 0,7 Nm. (VDE0609-1). Terminal identification in accordance with DIN46199/EN50005.
Indicators:	Green LED = working voltage. Red LED = relay switched on.
Protection:	IP20.
Electrical isolation:	3,75kVAC (1 min.) between input, supply and relay output (EN60950). <b>Note:</b> No galvanic isolation between input and analogue output.
Housing:	Noryl (GE), UL94V1.
Terminal block:	Noryl (GE), UL94V0.
Weight:	180 g.

## WIRING DIAGRAM



<b>Input:</b>	<b>Terminals:</b>
4-20mA	Y1/Y2
10-50mA	
40-200mA	Y1/Y3
100-500mA	
0,4-2A	

**Coding:**  
Relay inverter. Jumper Y1-Z1  
Latching, Jumper Y1-Z2

**Analogue output 2-10V DC;**  
X1 = (+) V  
Y1 = (-) 0

## SPECIFICATIONS:

MXC-10 is designed and developed with regard to relevant specifications:

- EN60204-1 / VDE0113 electrical material on machines.
- VDE0110 / IEC664 Isolation specifications/creepage and clearance distances.
- Electrical safety in accordance with EN61010.
- IEC414 Safety regulations for control and monitoring equipment.
- EMC: Emission EN50081-1.  
Immunity EN50082-2.
- Humidity in accordance with IEC68-2-3; RH=95%, 40°C
- Vibration in accordance with IEC68-2-6:
- Shock when mounted, in accordance with IEC68-2-27.

MXC-10 is CE-marked in accordance with EMC- and the Low Voltage Directive.

## OUTPUT LOAD DIAGRAMS

Fig. 1

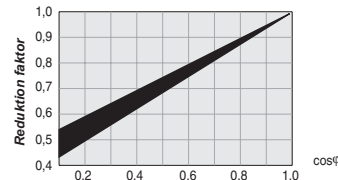
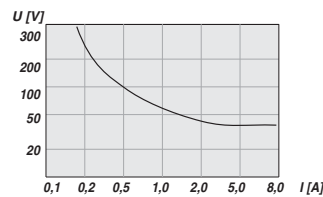


Fig. 2





**DESCRIPTION**

Single phase current relay for detecting a level of AC or DC current.

When the monitored current rises and reaches the determined setpoint, which is adjusted on the front panel, the relay energises. When the current drops and passes the setpoint, minus the hysteresis which is adjustable on the front, the relay de-energises. With inverted relay function the internal relay work the opposite way.

The Current Relay has a latch function where the relay after energising will remain energised, regardless of input current, until the latch jumper or the operating current is disconnected. Typically used in safety circuits.

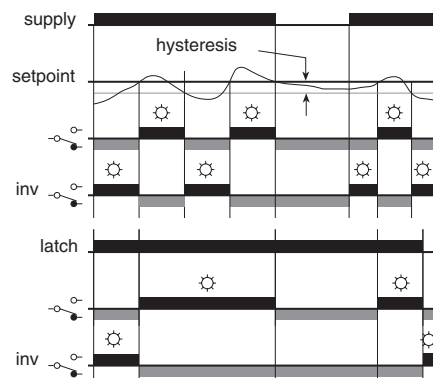
**Features**

- Monitoring of 10mA - 5A AC/DC in 5 ranges.
- Adjustable setpoint.
- Adjustable hysteresis 3-35%.
- Automatic locking function (Latch).
- Inversion of the relay function.
- Output SPDT.
- Operating voltage 24VDC , 24VAC, 115VAC, 230VAC or 400VAC.

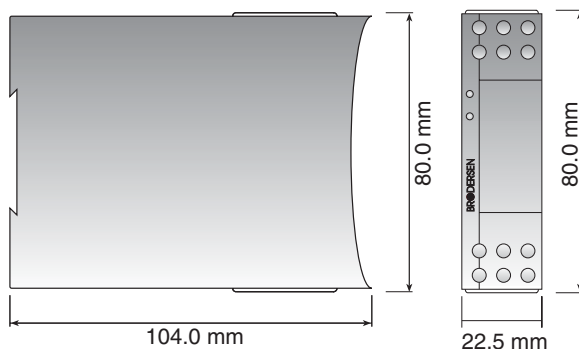
**VERSIONS/ORDERING CODES**

<b>Type:</b> Single phase current relay	MXC-20	MXC-20.	230.	1
<b>Supply voltage</b>				
24V DC		924		
24V AC		024		
115V AC		115		
230V AC		230		
400V AC		400		
<b>Measuring range:</b>				
10-50mA		1		
40-200mA		2		
0,1A-0,5A		3		
0,4A-2A		4		
1-5A		5		

**OPERATION**



**MECHANICAL DIMENSIONS**



## TECHNICAL DATA

### Input

Input signal	Impedance	I <sub>max</sub>
10-50mA AC/DC	4,7Ohm	0,7A
40-200mA AC/DC	1Ohm	1,4A
0,1-0,5A AC/DC	0,47Ohm	2,5A
0,4-2A AC/DC	0,1Ohm	5,5A
1-5A AC/DC	0,047Ohm	8A

Frequency at	
AC-input:	45-65 Hz.
Accuracy:	1%.
Temperature drift	Max. 0,05%/°C.
Setting accuracy:	Typically ± 10%.
Hysteresis:	Adjustable 3-35%.
Response time:	Time constant $\tau = 0,2s$ , Worst case of response time max. $5 \times \tau$ .
Voltage drop:	0,2V@FS.

### Output:

SPDT relay	
Contact material:	AgNi 0,15 with hardened gold plating Au.
Max load AC:	8A/240V AC ( $\cos\phi=1$ ) Max. breaking capacity 2000VA, Inductive load. See fig. 1.
Max load DC:	8A/24V DC Max. breaking capacity 50-270W see fig. 2.
Max. in rush current:	15A (max. 4s/duty cycle less than 10%).
Min. in rush current:	10mA, 24V DC.
Frequency :	Max. 1000 operations pr. hour.
Life span:	Mech. Min. $3 \times 10^7$ operations. Elect. Min $1 \times 10^5$ operations with full load.
Delay;	<20ms.

### Supply voltage:

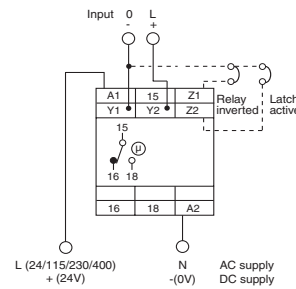
Versions:	
924=24V DC (20,4-27,6 )V DC.	
024=24V AC (20,4-27,6 )V AC.	
115=115V AC (98-132)V AC.	
230=230V AC (196-264)V AC.	
400=400VAC (340-460)V AC.	

Net frequency:	40-70Hz.
Consumption:	AC; max. 3VA DC; max. 2W

### General data:

Ambient temperature:	-20 to 55°C.
Storage temperature:	-40 to 80°C.
Mounting:	35mm DIN-rail (EN50022).
Terminals:	Screw terminals with dual compartment. Terminal screws are combined crosshead/slotted. Up to $2 \times 2,5mm^2$ wire ( $2 \times 1,5mm^2$ inc. ferrule). Recommended torque, 0,5Nm. Max. 0,7 Nm. (VDE0609-1). Terminal identification in accordance with DIN46199/EN50005.
Indicators:	Green LED = operating voltage. Red LED = relay switched on.
Protection:	IP20.
Electrical isolation:	3,75kVAC (1 min.) between input, supply and relay output (EN61010).
Housing:	Noryl (GE), UL94V1. Black
Terminal block:	Noryl (GE), UL94V0. Black
Weight:	180 g.

## WIRING DIAGRAM



### Coding:

Relay inverter: Jumper Y1-Z1  
Latching: Jumper Y1-Z2

## SPECIFICATIONS:

MXC-20 is designed and developed with regard to relevant specifications:

- EN60204-1 / VDE0113 electrical material on machines.
- VDE0110 / IEC664 Isolation specifications/creepage and clearance distances.
- Electrical safety in accordance with EN61010.
- IEC414 Safety regulations for control and monitoring equipment.
- EMC: Emission EN50081-1.  
Immunity EN50082-2.
- Humidity in accordance with IEC68-2-3; RH=95%, 40°C
- Vibration in accordance with IEC68-2-6;
- Shock when mounted, in accordance with IEC68-2-27.

MXC-20 is CE-marked in accordance with EMC- and the Low Voltage Directive.

## OUTPUT LOAD DIAGRAMS

Fig.1

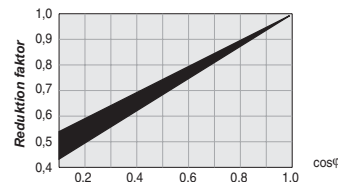
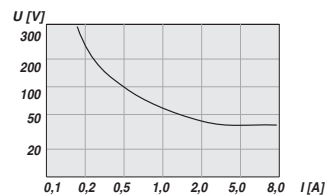


Fig. 2



# Control & Monitoring Relays

## Single Phase High Current Relay via External Shunts MXC-30



### DESCRIPTION

A relay for monitoring high AC or DC current by connecting AC current transformer with secondary current of 0-1,0A AC or a DC shunt with voltage drop of 0-60mV DC.

The relay is delivered in two variations for over-or under-current. Over-current:

When the monitored current rises and reaches the determined setpoint, which is adjusted on the front panel, the relay energises. When the current drops and passes the setpoint, minus the hysteresis which is adjustable on the front, the relay de-energises.

Under-current:

When the monitored current drops and reaches the determined setpoint, which is adjusted on the front panel, the relay energises. When the current rises and passes the setpoint, plus the hysteresis which is adjustable on the front, the relay de-energises.

There is also a latch function where the relay after energising will remain energised, regardless of input current, until the latch jumper or the operating voltage is disconnected. Typically used in safety circuits. The contact function of the relay can also be inverted.

The relay has an analogue, 2-10V DC, output which when connected to an external voltmeter can be used for the accurate adjustment of setpoint.

#### Features:

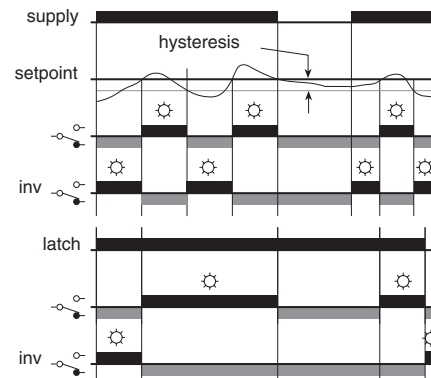
- Monitoring of up to 500A, range depend of the connected AC current transformer or DC shunt.
- Adjustable setpoint and hysteresis.
- Latch function and inversion of the relay function.
- Output SPDT and 2-10V DC referenced to the setpoint.
- Operating voltage 24VDC , 24/115VAC or 24/230VAC.

### VERSIONS/ORDERING CODES

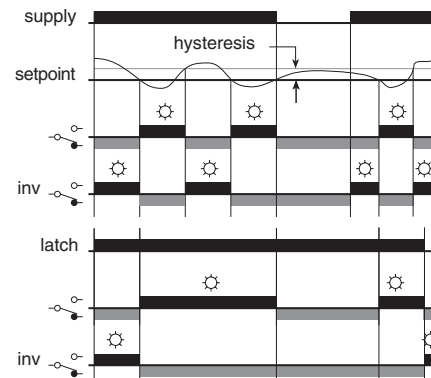
<b>Type:</b> Single phase high current relay.	MXC-30	230	1
<b>Supply voltage:</b> 24V DC. 115V AC/ 24V AC. 230V AC / 24V AC.	924	115	230
<b>Over/under current:</b> Over current. Under current.	1	2	

### OPERATION

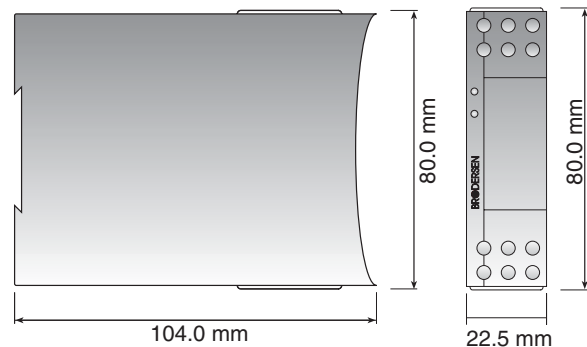
#### Over current, code 1



#### Under current, code 2



### MECHANICAL DIMENSIONS





## TECHNICAL DATA

## Input:

Input signal:  
0-60mV DC;  
0-1,0A AC;

$$V_{\max} = 10V$$

$$I_{\max} = 1,4A_{\text{RMS}}$$

Temperature drift: Max. 0,05%/°C.  
Setting accuracy: Typically  $\pm 10\%$ .  
Hysteresis: 3-30% of chosen range, adjustable.  
Response time: Time constant  $\tau = 0,12s$ ,  
Worst case of response time max.  $5 \times \tau$ .

## Output:

SPDT relay: Contact material, AgNi 0,15 with hardened gold plating Au.  
Max. load AC, 8A/240V AC ( $\cos\phi=1$ )  
Max. breaking capacity 2000VA.  
Inductive load. See fig. 1.  
Max. load DC, 8A/24V DC  
Max. breaking capacity 50-270W, See fig. 2.

Max. in rush current: 15A (max. 4s/duty cycle less than 10%).  
Min. in rush current: 10mA, 24V DC.  
Frequency : Max. 1000 operations pr.hour.  
Life time: Mech. Min.  $3 \times 10^7$  operations.  
Elect. Min.  $1 \times 10^5$  operations with full load.  
Delay; <20ms.

**Analogue output:** 2-10V DC, refers to setpoint in chosen range.  
 $I_{\max} = 2mA / R_{\text{load}} > 5k\Omega$ .  
Accuracy better than  $\pm 0,5\%$ .

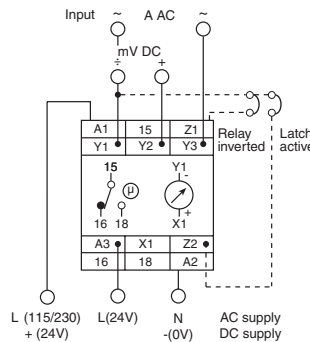
## Supply voltage:

Versions: 924=24V DC (20,4-27,6)V DC.  
115=24/115V AC (20,4-27,6 /98-132)V AC.  
230=24/230V AC (20,4-27,6/196-264)V AC.  
45-65Hz.  
Consumption: AC; 3VA.  
DC; 2W.

## General data:

Ambient temperature:-20 to 55°C.  
Storage temperature:-40 to 80°C.  
Mounting: 35mm DIN-rail (EN50022).  
Terminals: Screw terminals with dual compartment.  
Terminal screws are combined crosshead/slotted.  
Up to 2 x 2,5mm<sup>2</sup> wire (2 x 1,5mm<sup>2</sup> inc. ferrule).  
Recommended torque, 0,5 Nm.,  
Max. 0,7 Nm. (VDE0609-1).  
Indicators: Green LED = working voltage.  
Red LED = relay on.  
Protection: IP20.  
Electrical isolation: 3,75kVAC (1 min.) between i supply and output (EN60950).  
Housing: Noryl (GE), UL94V1.  
Terminal block: Noryl (GE), UL94V0.  
Weight: Approx. 200g.

## WIRING DIAGRAM



**Input:** 0-60mVDC  
0-1,0A AC

**Terminals:** Y1/Y2  
Y1/Y3

**Coding:**  
Relay inverter Jumper Y1- Z1  
Latching, Jumper Y1- Z2

**Analogue output 2-10V DC;**  
X1 = (+) V  
Y1 = (-) 0

## SPECIFICATIONS

MXC-30 is designed and developed with regard to relevant specifications:

- EN60204-1 / VDE0113 electrical material on machines.
- VDE0110 / IEC664 Isolation specifications/creepage and clearance distances.
- Electrical safety in accordance with EN61010.
- IEC414 Safety regulations for control and monitoring equipment.
- EMC: Emission EN50081-1.  
Immunity EN50082-2.
- Humidity in accordance with IEC68-2-3; RH=95%, 40°C
- Vibration in accordance with IEC68-2-6;
- Shock when mounted, in accordance with IEC68-2-27.

MXC-30 is CE-marked in accordance with EMC- and the Low Voltage Directive.

## OUTPUT LOAD DIAGRAMS

Fig.1

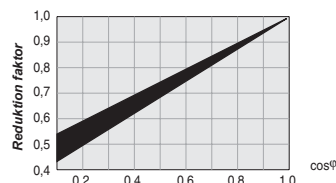
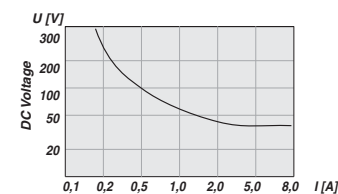


Fig. 2



## ACCESSORIES

- Brodersen current transformers: Type AAT-xxx.x
- Brodersen DC current shunts: Type AAS-xxx



**DESCRIPTION**

A relay for monitoring a 3-phase AC power supply with/without Neutral. When the voltage of the 3 phases U,V,W (L1, L2, L3) are within the range, adjustable on the front, the relay is energised. If one or more of the phase voltages moves outside the limits, the relay de-energises. A LED indicates over or under voltage. When all the voltages are again within the limits the relay will re-energise. There is also a latch function where the relay after de-energising will remain de-energised, regardless of input voltage, until the latch jumper or the operating voltage is disconnected. Typically used in safety circuits. LED indication is still available when latched. With connection of Neutral the measuring abilities are optimal, as Neutral works as a measuring reference. Without Neutral, the phase monitoring relay generates a Neutral reference from the connected phases.

**Note:** 3x400 gives a nominal voltage between phases of 400VAC. The voltage between Phase and Neutral will be 230V AC.

**Features**

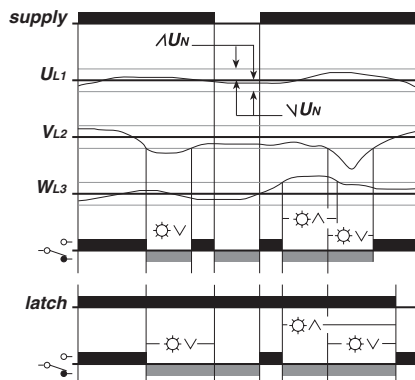
- Monitoring of over and under voltage, on 3 phase power supply with or without Neutral.
- Adjustable upper and lower voltage limits (80-99% /101-120% of Un).
- Automatic locking (Latch).
- Output SPDT.
- Separate operating voltage 230V AC, or 400V AC.

**VERSIONS/ORDERING CODES**

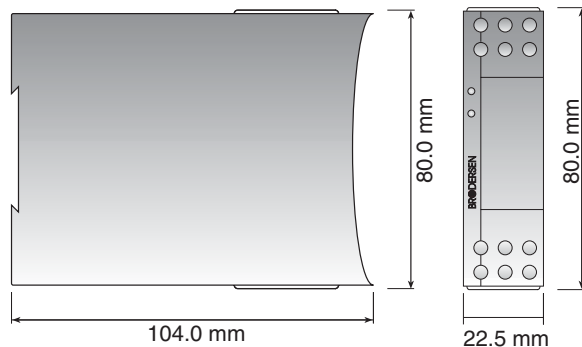
<b>Type:</b> 3-phase voltage relay	MXV-30	MXV-30	230 / 230
<b>Supply voltage</b> 230V AC 400V AC	230 400		
<b>Measurement voltage</b> 3 x 230V AC 3 x 400 V AC	(132V L/N) (230V L/N)	230 400	

**OPERATION**

**Over and under voltage**



**MECHANICAL DIMENSIONS**



## TECHNICAL DATA

### Input:

Input signal	Impedance	$U_{MAX}$
3 x 230V AC+N	316kOhm	600V AC
3 x 400V AC+N	560kOhm	600V AC

Frequency:	45-65Hz.
Measuring cycle:	80ms.
Response time:	$\tau = 0,5s$ , worstcase $5 \times \tau$ .
Temperature drift:	Max.0,05%/°C.
Setting accuracy:	$U_n =$ Typically $\pm 3\%$ .
Hysteresis:	Set 2%.

### Output:

SPDT relay:	Contact material, AgNi 0,15 with hardened gold plating Au. Max. load AC, 8A/240V AC ( $\cos \varphi=1$ ) Max. breaking capacity 2000VA . Inductive load. See fig. 1. Max. load DC, 8A/24V DC Max. breaking capacity 50-270W. See fig. 2.
-------------	--

Max. in rush current:	15A (max. 4s/duty cycle less than 10%).
Min. in rush current:	10mA, 24V DC.
Frequency :	Max. 1000 operations pr. hour.
Life time:	Mech. Min. $3 \times 10^7$ operations Elect. Min. $1 \times 10^5$ operations with full load.
Delay:	<20ms.

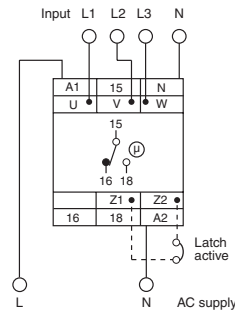
### Supply voltage:

	230V AC (184-276V).
	400V AC (320-480V).
Consumption:	3VA.

### General data:

Ambient temperature:	-20 to 55°C.
Storage temperature:	-40 to 80°C.
Mounting:	35mm DIN-rail (EN50022).
Terminals:	Screw terminals with dual compartment. Terminal screws are combined crosshead/slotted. Up to $2 \times 2,5mm^2$ wire ( $2 \times 1,5mm^2$ inc. ferrule). Recommended torque, 0,5Nm. Max. 0,7 Nm. (VDE0609-1). Terminal identification in accordance with DIN46199/EN50005.
Indicators:	Red LED $\wedge$ = over voltage (failure-relay off). Red LED $\vee$ = under voltage (failure-relay off).
Protection:	IP20.
Electric isolation:	3,75kVAC (1 min.) between input, supply and relay output (EN60950).
Housing:	Noryl (GE), UL94V1.
Terminal block:	Noryl (GE), UL94V0.
Weight:	180 g.

## WIRING DIAGRAM



**Coding:**  
Latching: Jumper, Z1-Z2

Phases can be connected in any order, as the phase sequence is not of importance.

## SPECIFICATIONS:

MXV-30 is designed and developed with regard to relevant specifications:

- EN60204-1 / VDE0113 electrical material on machines.
- VDE0110 / IEC664 Isolation specifications/creepage and clearance distances.
- Electrical safety in accordance with EN61010.
- IEC414 Safety regulations for control and monitoring equipment.
- EMC: Emission EN50081-1.  
Immunity EN50082-2.
- Humidity in accordance with IEC68-2-3; RH=95%, 40°C.
- Vibration in accordance with IEC68-2-6:.
- Shock when mounted, in accordance with IEC68-2-27.

MXV-30 is CE-marked in accordance with EMC-and the Low Voltage Directive.

## OUTPUT LOAD DIAGRAMS

Fig. 1

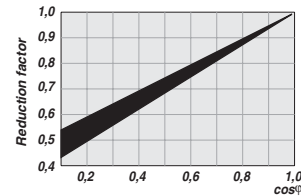
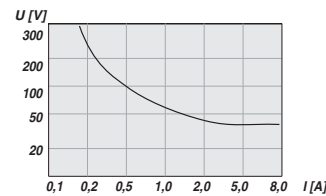


Fig. 2





**DESCRIPTION**

A relay for monitoring a 3-phase AC power supply with or without Neutral. The relay monitors that all phases are available and in the correct phase sequence (U,V,W), that none of the phases are shifted more than 20°C in relation to each other and that one or more of the phase voltages are not too low. When all three monitoring criteria are fulfilled the relay is activated. If one or more of the criteria are not fulfilled the relay de-energises and a red LED indicates failure. The nominal phase voltage is adjustable  $\pm 15\%$  of the selected voltage version (3 x 115/3x230/3x400VAC). The low-voltage limit is also adjustable from 60-98% thus allowing detection of a motor-generated phase.

With connection of Neutral the measuring abilities are optimal, as Neutral works as a measuring reference. Without Neutral, the phase monitoring relay generates a Neutral reference from the connected phases.

**Features**

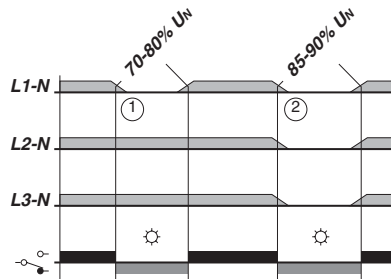
- Monitoring of
  - Phase rotation
  - Phase shift less than 20°
  - Low voltage
- Adjustable measuring voltage  $U_n \pm 15\%$  of rated voltage  $U_n$ .
- Low voltage detection, adjustable 60- 98% of measuring voltage  $U_n$ .
- Output SPTD.
- Operating voltage via phases V and W (L2 and L3).

**VERSION/ORDERING CODES**

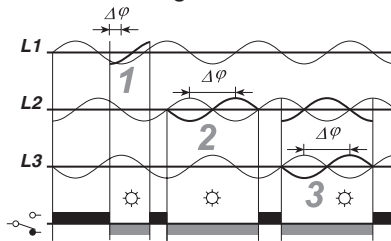
<b>Type:</b>		
Phase monitoring relay	MXP-10	MXP-10 230
<b>Supply voltage/measuring voltage</b>		
3 x 115V AC	115	
3 x 230V AC	230	
3 x 400V AC	400	

**OPERATION**

**Voltage monitoring**



**Phase monitoring**



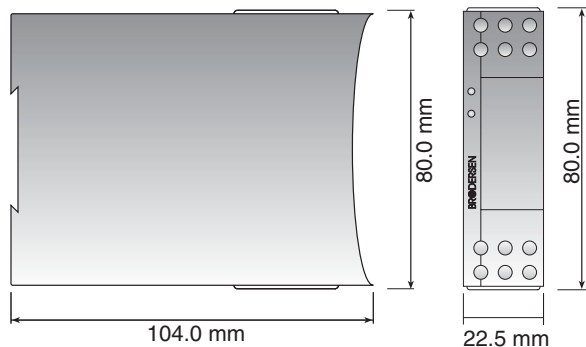
**Examples of types of phase error:**

1. Motor-generated phase, for example, when L1 is disconnected to an unloaded or lightly loaded 3-phase motor ( $\Delta\phi > 20^\circ$ ).
2. Ohmic load or heavily loaded 3-phased motor, where L2 is disconnected ( $\Delta\phi = 180^\circ$ ).
3. Reversed phase sequence (L2 and L3) ( $\Delta\phi = 120^\circ$ ).

**OPTION:**

Can be delivered with separate supply voltage

**MECHANICAL DIMENSIONS**



## TECHNICAL DATA

### Input:

Input signal	Impedance	U <sub>max</sub>
3 x 115V AC + N	150 kOhm	600V AC
3 x 230V AC + N	316 kOhm	600V AC
3 x 400V AC + N	560 kOhm	600V AC

Frequency:	47-53Hz.
Measuring cycle:	80ms.
Temperature drift:	Max. 0,05%/°C.
Response time:	$\tau = 0.2s$ , worstcase $5 \times \tau$ .
Setting accuracy:	Un = Typically $\pm 3V$ AC. Low voltage typically $\pm 1\%$ .

### Output:

SPDT relay:	Contact material; AgNi0.15 with hardened gold plating Au. Max. Load AC; 8A/240VAC ( $\cos\phi=1$ ) Max. breaking capacity 2000VA. Inductive load. See fig. 1. Max. load DC, 8A/24V DC Max. breaking capacity 50-270W. See fig. 2.
-------------	--

Max. in rush current:	15A (max. 4s/duty cycle less than 10%).
-----------------------	---

Min. in rush current:	10mA, 24V DC.
Frequency :	Max. 1000 operations pr. hour.

Life time:	Mech.Min. $3 \times 10^7$ operations. Elect.Min. $1 \times 10^5$ operations. with full load.
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Delay;	<20ms.
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### Supply voltage:

Supplied via phase:	V(L2) and W(L3).
Consumption:	3VA.

### General data:

Ambient temperature:	-20 to 55°C.
Storage temperature:	-40 to 80°C.

Mounting:	35mm DIN-rail (EN50022).
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Terminals:	Screw terminals with dual compartment. Terminal screws are combined crosshead/slotted. Up to $2 \times 2.5mm^2$ wire ( $2 \times 1.5mm^2$ inc. ferrule). Recommended torque, 0.5 Nm.,
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	Max. 0,7 Nm. (VDE0609-1). Terminal identification in accordance with DIN46199/EN50005.
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Indicators:	Green LED = operating voltage. RedLED = relay off - failure.
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Protection:	IP20.
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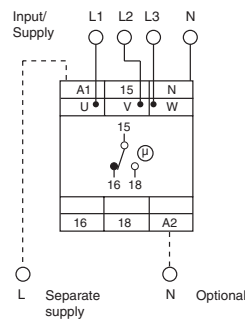
Electric isolation:	3.75kVAC (1 min.) between input, supply and relay uotput (EN60950).
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Housing:	Noryl (GE), UL94V1.
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Terminal block:	Noryl (GE), UL94V0.
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Weight:	180 g.
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## WIRING DIAGRAM



## SPECIFICATIONS:

MXP-10 is designed and developed with regard to relevant specifications:

- EN60204-1 / VDE0113 electrical material on machines.
- VDE0110 / IEC664 Isolation specifications/creepage and clearance distances.
- Electrical safety in accordance with EN61010.
- IEC414 Safety regulations for control and monitoring equipment.
- EMC: Emission EN50081-1  
Immunity EN50082-2
- Humidity in accordance with IEC68-2-3; RH=95%, 40°C
- Vibration in accordance with IEC68-2-6:
- Shock when mounted, in accordance with IEC68-2-27.

MXP-10 is CE-marked in accordance with EMC-and the Low Voltage Directive.

## OUTPUT LOAD DIAGRAMS

Fig. 1

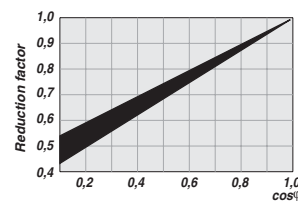
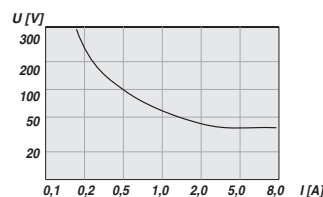


Fig. 2





**DESCRIPTION**

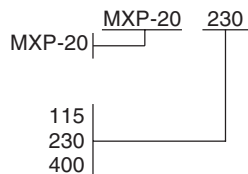
A relay for monitoring a 3-phase AC power supply with or without Neutral. The relay monitors that all phases are available and in the correct phase sequence L1, L2, L3 (U,V,W), that none of the phases are shifted more than 20° in relation to each other and that one or more of the phase voltages are not too low. When all three monitoring criteria are fulfilled the relay is activated. If one or more of the criteria are not fulfilled the relay de-energises and a red LED indicates failure. Fixed limits for energizing and de-energizing the single output relay. With connection of Neutral the measuring abilities are optimal, as Neutral works as a measuring reference. Without Neutral, the phase monitoring relay generates a Neutral reference from the connected phases.

**Features:**

- Monitoring of
  - Phase rotation
  - Phase shift less than 20°
  - Low voltage
- Output SPTD.
- Operating voltage via phases L2 and L3 (V and W).
- Delay= 0,5s to prevent faulty energization and deenergization caused by short interferences.

**VERSION/ORDERING CODES**

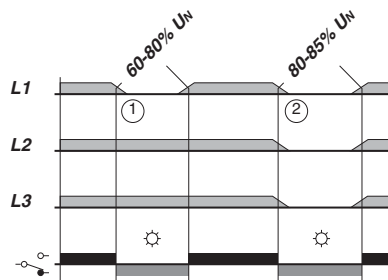
**Type:**  
Phase monitoring relay.



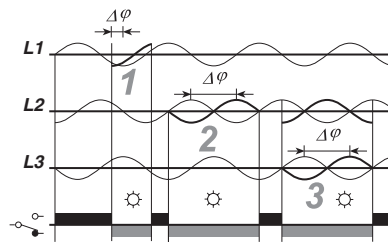
**Supply voltage/measuring voltage:**  
3 x 115V AC  
3 x 230V AC  
3 x 400V AC

**OPERATION**

**Voltage monitoring**



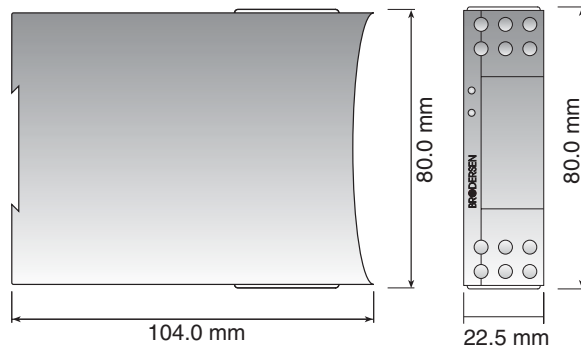
**Phase monitoring**



**Examples of types of phase error :**

1. Motor-generated phase, for example, when L1 is disconnected to an unloaded or lightly loaded 3-phase motor ( $\Delta\phi > 20^\circ$ ).
2. Ohmic load or heavily loaded 3-phased motor, where L2 is disconnected ( $\Delta\phi = 180^\circ$ ).
3. Reversed phase sequence (L2 and L3) ( $\Delta\phi = 120^\circ$ ).

**MECHANICAL DIMENSIONS**



## TECHNICAL DATA

### Input:

Input signal	Impedance	U <sub>max</sub>
3 x 115V AC + N	150 kOhm	300V AC
3 x 230V AC + N	316 kOhm	435V AC
3 x 400V AC + N	560 kOhm	580V AC

Frequency: 45-66Hz.

Temperature drift: All specifications apply for the specified temperature range.

Delay: 0.3s-0.7s.

### Phase measuring:

With neutral: Fault:  $\Delta\phi >25^\circ$ , typically  $\Delta\phi >20^\circ$   
Without neutral: Fault:  $\Delta\phi >50^\circ$ , typically  $\Delta\phi >40^\circ$

### Voltage measuring:

With neutral:  
Change on 1 phase:  
Energized output relay:  $>90\%$  of V<sub>nom.</sub>, typically by  $>80\%$ .  
Fault:  $<65\%$  of V<sub>nom.</sub>, typically by  $<70\%$ .

Change of 3 phases, symm.:  
Energized output relay: 90% of V<sub>nom.</sub>  
Fault:  $<80\%$  of V<sub>nom.</sub>, typically by  $<85\%$ .

### Without neutral:

Change on 1 phase:  
Energized output relay:  $>90\%$  of V<sub>nom.</sub>, typically by  $>80\%$ .  
Fault:  $<50\%$  of V<sub>nom.</sub>, typically by  $<60\%$ .

Change of 3 phases, symm.:  
energized output relay: 90% of V<sub>nom.</sub>, typically by  $>85\%$ .  
Fault:  $<75\%$  of V<sub>nom.</sub>, typically by  $<80\%$ .

### Output:

SPDT relay: Contact material; AgNi0.15 with hardened gold plating Au.  
Max. Load AC; 8A/240V AC ( $\cos\phi=1$ )  
Max. breaking capacity 2000VA. Inductive load. See fig. 1.  
Max. load DC, 8A/24V DC  
Max. breaking capacity 50-270W. See fig. 2.

Max. in rush current: 15A (max. 4s/duty cycle less than 10%).

Min. in rush current: 10mA, 24V DC.

Frequency: Max. 1000 operations pr. hour.

Life time: Mech. Min.  $3 \times 10^7$  operations.

Elect: Min.  $1 \times 10^5$  operations with full load.

Delay:  $<20$ ms.

### Supply voltage:

Supplied via phase: V(L2) and W(L3).  
Consumption: 3VA.

### General data:

Ambient temperature: -20 to 55°C.

Storage temperature: -40 to 80°C.

Mounting: 35mm DIN-rail (EN50022)

Terminals: Screw terminals with dual compartment.

Terminal screws are combined crosshead/slotted.

Up to 2 x 2.5mm<sup>2</sup> wire (2 x 1.5mm<sup>2</sup> inc. ferrule).

Recommended torque, 0.5 Nm.,

Max. 0.7 Nm. (VDE0609-1).

Terminal identification in accordance with DIN46199/EN50005.

Weight: 180 g.

Indicators: Green LED = operating voltage.

Red LED = relay off - failure.

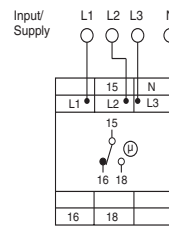
Protection: IP20.

Electric isolation: 3.75kVAC (1 min.) between input, supply and relay output (EN60950).

Housing: Noryl (GE), UL94V1.

Terminal block: Noryl (GE), UL94V0.

## WIRING DIAGRAM



## SPECIFICATIONS:

MXP-20 is designed and developed with regard to relevant specifications:

- EN60204-1 / VDE0113 electrical material on machines.
- VDE0110 / IEC664 Isolation specifications/creepage and clearance distances.
- Electrical safety in accordance with EN61010.
- IEC414 Safety regulations for control and monitoring equipment.
- EMC: Emission EN50081-1  
Immunity EN50082-2
- Humidity in accordance with IEC68-2-3; RH=95%, 40°C
- Vibration in accordance with IEC68-2-6:
- Shock when mounted, in accordance with IEC68-2-27.

MXP-20 is CE-marked in accordance with EMC-and the Low Voltage Directive.

## OUTPUT LOAD DIAGRAMS

Fig. 1

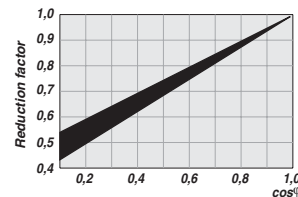
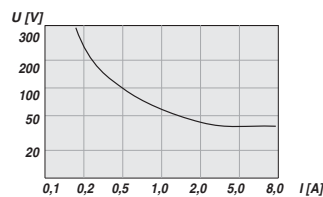


Fig. 2





**DESCRIPTION**

A level control relay for most conductive fluids. With a 2 or 3 wire probe, one or two levels in a container can be controlled.

The probe is a conducting rod, the length of which can be adjusted to the container and the levels which have to be controlled.

To control 1 level (2-wire probes), one of the probes is constantly covered by the fluid and the length of the probe dictates the level. To control 2 levels (3-wire probes), one of the probes is constantly covered by fluid and the length of the two other probes dictates min. and max. levels.

As conductivity will differ from fluid to fluid, the sensitivity can be adjusted on the front panel, to adjust the reaction time from the time the actual level is registered, to the relay being energised/de-energised.

**Features**

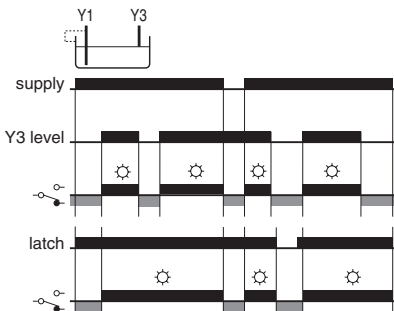
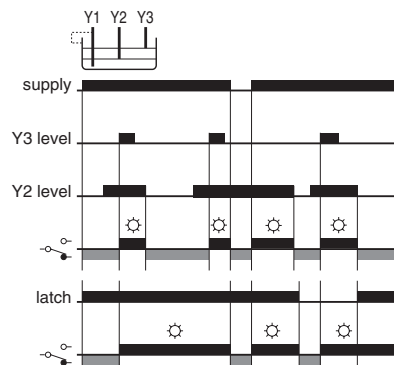
- Monitoring/control of levels of conducting fluids via 2 or 3 wire probes.
- Signal at max. and min. level in the same version.
- Sensitivity adjustable on input 5 - 50kOhm.
- Response time adjustable 0,1 - 5 sec.
- Automatic locking (Latch).
- Output SPDT.
- Supply voltage 24/115VAC or 24/230VAC and 24VDC.

**VERSION/ORDERING CODES**

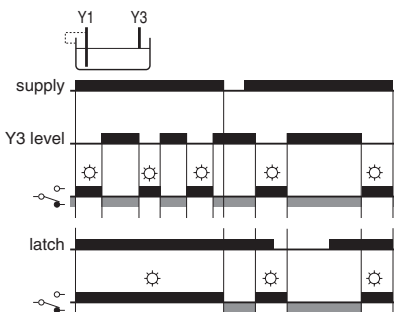
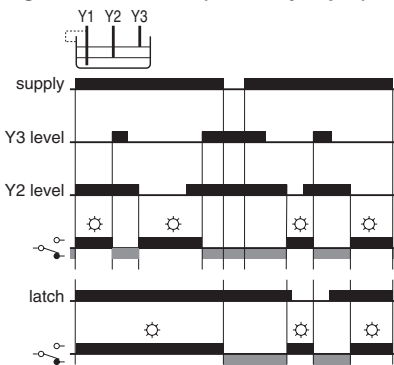
<b>Type:</b> Level relay	MXL-10	MXL-10	230
<b>Supply voltage</b> 24V DC 115V AC / 24V AC 230V AC / 24V AC	924	115	230

**OPERATION**

**Signal at maximum (with jumper).**



**Signal at minimum (without jumper)**





## TECHNICAL DATA

### Input:

Sensitivity: 5kOhm-50kOhm, adjustable.  
 Probe Voltage: Max. 12Vp-p AC, 1kHz.  
 Probe current: Max. 360µA.  
 Temperature drift: Max. 0,05%/°C.  
 Hysteresis: <0,1%.  
 Reaction time: 0,1-5s, adjustable.  
 Probe Cabel: Max. length 100m.  
 Capacity max. 10nF.  
 Isolation resistance>220kOhm.

### Output:

SPDT relay: Contact material, AgNi 0,15 with hardened gold plating Au.  
 Max. load AC: 8A/240V AC (cosφ=1)  
 Max. breaking capacity 2000VA. Inductive load. See fig.1.  
 Max. load DC: 8A/24V DC.  
 Max. breaking capacity 50-270W. See fig. 2.  
 Max in rush current: 15A (max. 4s/duty cycle less than 10%).  
 Min in rush current: 10mA, 24V DC.  
 Frequency : Max. 1000 operations pr. hour.

Life time: Mech. Min. 3 x 10<sup>7</sup> operations.  
 Elect. Min. 1 x 10<sup>5</sup> operations with full load.  
 Delay: <20ms.

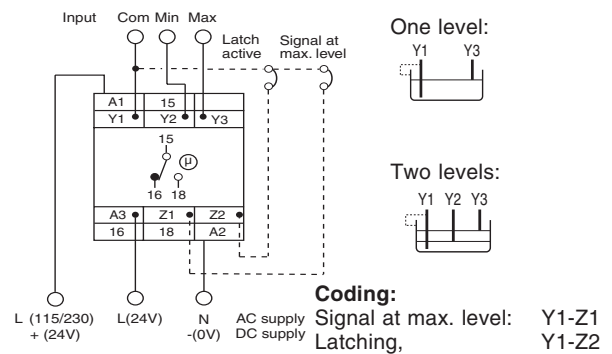
### Supply voltage:

Versions: 924=24V DC (20,4-27,6)V DC  
 115=24/115V AC (20,4-27,6 /98-132)V AC  
 230=24/230V AC (20,4-27,6/196-264)V AC  
 Net frequency: 45-65Hz  
 Consumption: AC; 3VA  
 DC; 2W

### General data::

Ambient temperature:-20 to 55°C.  
 Storage temperature:-40 to 80°C.  
 Mounting: 35mm DIN-rail (EN50022).  
 Terminals: Screw terminals with dual compartment.  
 Terminal screws are combined crosshead/slotted. Up to 2 x 2,5mm<sup>2</sup> wire (2 x 1,5mm<sup>2</sup> inc. ferrule).  
 Recommended torque, 0,5Nm, max 0,7Nm (VDE0609-1).  
 Terminal identification in accordance with DIN46199/EN50005.  
 Indicators: Green LED = operating voltage  
 Red LED = relay switched on.  
 Protection: IP20  
 Electric isolation: 3,75kVAC (1 min.) between input, supply and relay output (EN60950)  
 Housing: Noryl (GE), UL94V1.  
 Terminal block: Noryl (GE), UL94V0.  
 Weight: 180 g.

## WIRING DIAGRAM



## SPECIFICATIONS:

- MXL-10 is designed and developed with regard to relevant specifications:
- EN60204-1 / VDE0113 electrical material on machines.
  - VDE0110 / IEC664 Isolation specifications/creepage and clearance distances.
  - Electrical safety in accordance with EN61010.
  - IEC414 Safety regulations for control and monitoring equipment.
  - EMC: Emission EN50081-1.  
Immunity EN50082-2.
  - Humidity in accordance with IEC68-2-3; RH=95%, 40°C.
  - Vibration in accordance with IEC68-2-6.
  - Shock when mounted, in accordance with IEC68-2-27.

MXL-10 is CE-marked in accordance with EMC-and the Low Voltage Directive.

## OUTPUT LOAD DIAGRAMS

Fig. 1

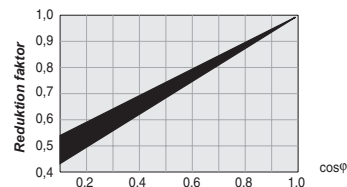
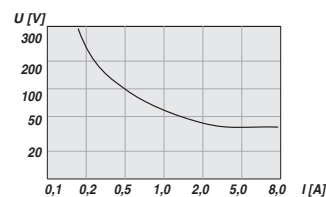
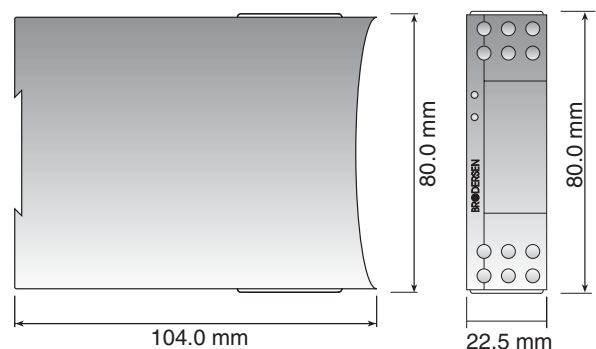


Fig. 2



## MECHANICAL DIMENSIONS



# Control & Monitoring Relays

## Thermostat Relay MXT-10



### DESCRIPTION

A thermostat relay for the monitoring or control of temperature in the range -50 to 300°C. The probe is a standard Pt100, either 2 or 3 wire. LED indication of a non-functional probe and relay activated.

When the temperature rises and reaches the determined setpoint, plus the hysteresis, which is adjusted on the front, the relay de-energises. As the temperature falls and passes the setpoint, minus the hysteresis, the relay re-energises. By strapping 2 terminals, the relay can be inverted allowing the thermostat relay to be used for the control of heating as well as cooling systems.

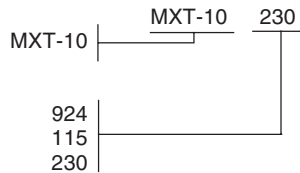
The relay has two analogue 0-10VDC outputs, one for measured temperature and the other for the setpoint.

#### Features

- 2/3 wire Pt100 input (DIN43760).
- Monitoring or control of temperature - 50 to 300°C in 5 ranges in one version.
- Adjustable Setpoint.
- Hysteresis adjustable  $\pm 0,5-20\%$ .
- Inversion of the relay contact function - heating/cooling control.
- LED indication of probe failure.
- Outputs.
- SPDT.
- Analogue 0 - 10VDC with ref. to measured temperature.
- Analogue 0 - 10VDC with ref. to setpoint.
- Supply voltage 24VDC, 24/115VAC or 24/230VAC.

### VERSIONS/ORDERING CODES

Type:  
Thermostat relay

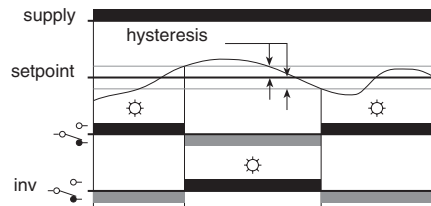


#### Supply voltage

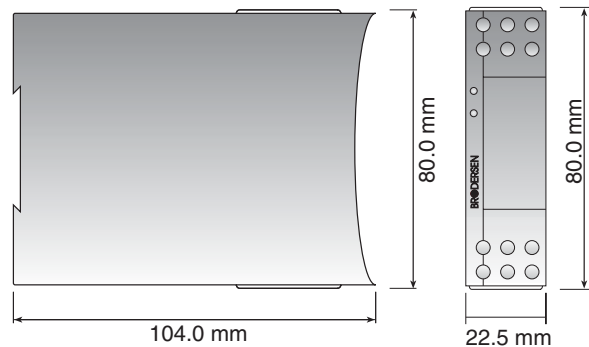
24V DC  
115V AC / 24V AC  
230V AC / 24V AC

### OPERATION

#### Temperature monitoring



### MECHANICAL DIMENSIONS



## TECHNICAL DATA

**Input:** Pt-100 probe(DIN 43760), 3 conductors with compensation for cable resistance.

Temperature range: -50-50°C  
0-50°C  
0-100°C  
100-200°C  
200-300°C

Temperature drift: Max. 0,05%/°C

Setting accuracy: Typically ± 10%

Hysteresis: ±0,5-20% of chosen area, adjustable

Response time: time constant  $\tau = 0,2s$ ,  
Worst case of response time max.  $5 \times \tau$

**Output:** SPDT relay:

Contact material, AgNi 0,15 with hardened gold plating Au.  
Max. load AC: 8A/240V AC ( $\cos \varphi = 1$ )  
Max. breaking capacity 2000VA. Inductive load. See fig. 1.  
Max. load DC: 8A/24V DC  
Max. breaking capacity 50-270W. See fig. 2.

Max. in rush current: 15A(max. 4s/duty cycle less than 10%).

Min. in rush current: 10mA, 24V DC

Frequency: Max. 1000 operations pr. time.

Life span: Mech.  $3 \times 10^7$  operations  
Elect.  $1 \times 10^5$  operations with full load.

Delay: <20ms.

Analogue outputs: 0-10V DC, refers to setpoint and measured temperature in chosen areas.

Accuracy:  $I_{max} = 2mA / R_{load} > 5 k\Omega$ .  
Setpoint: ±1%  
Measured value ±5%

### Supply voltage:

Versions: 924=24V DC (20,4-27,6)V DC  
115=24/115V AC (20,4-27,6 /98-132)V AC  
230=24/230V AC (20,4-27,6/196-264)V AC  
45-65Hz.

Net frequency:

Consumption: AC; 3VA  
DC; 2W

### General data:

Ambient temperature:-20 to 55°C.  
Storage temperature:-40 to 80°C.  
Mounting: 35mm DIN-rail (EN50022).  
Terminals: Screw terminals with dual compartment. Terminal screws are combined crosshead/slotted.Up to  $2 \times 2,5mm^2$  wire ( $2 \times 1,5mm^2$  inc. ferrule). Recommended torque, 0,5 Nm, max. 0,7 Nm (VDE0609-1). Terminal identification in accordance with DIN46199/EN50005.

Indicators: Green LED = operating voltage.  
Red LED (constant)= relay switched on.  
Red LED (flashing)= non-functional probe.

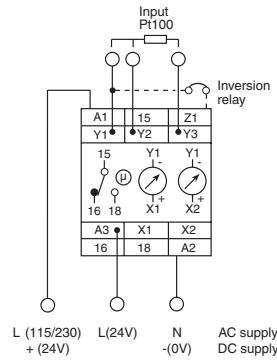
Protection: IP20.

Electric isolation: 3,75kVAC (1 min.) between input, supply and relay output (EN60950).  
**Note:** No galvanic isolation between input and analogue output.

Housing: Noryl (GE), UL94V1.  
Terminal block: Noryl (GE), UL94V0.

Weight: 180 g.

## WIRING DIAGRAM



**Coding:**  
Relay inverter, Jumper Y1-Z1

**Analogue output 0-10V DC**  
Setpoint: X1= (+) V  
Y1= (-) 0

Measured temperature: X2=(+) V  
Y1=(-) 0

## SPECIFICATIONS:

- MXT-10 is designed and developed with regard to relevant specifications:
- EN60204-1 / VDE0113 electrical material on machines.
  - VDE0110 / IEC664 Isolation specifications/creepage and clearance distances.
  - Electrical safety in accordance with EN61010.
  - IEC414 Safety regulations for control and monitoring equipment.
  - EMC: Emission EN50081-1  
Immunity EN50082-2
  - Humidity in accordance with IEC68-2-3; RH=95%, 40°C.
  - Vibration in accordance with IEC68-2-6:
  - Shock when mounted, in accordance with IEC68-2-27.

MXT-10 is CE-marked in accordance with EMC-and the Low Voltage Directive.

## OUTPUT LOAD DIAGRAMS

Fig. 1

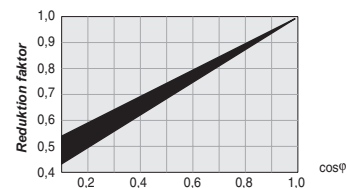


Fig. 2

