Electronic Measuring Relays for Current, Voltage and Overfrequency

ALME Catalog

Edition 3.12
This catalog contains a selection of the most important measuring relays for current, voltage and overfrequency from our extensive product range.

The electrical level isolation between the measured circuit and the power supply provided by the low mutual capacitance 2-window transformer in the power supply provides these sturdy, long lasting measuring relays for switching cabinet mounting with immunity to interference.

The measuring relays are normally equipped with one relay with one changeover switch. The housing is of fibreglass reinforced plastic, providing a high resistance to shock, weather, and fire. The devices can be snapped onto a standard mounting rail or screwed onto a mounting plate.

In addition, we manufacture measuring relays precisely to your specifications.

Declarations of conformity

The devices described in this catalog have been developed and manufactured in accordance with the regulations set down by following Directives:

- 73 / 23 / EWG Directive for low voltage operation
- 89 / 336 / EWG Electromagnetic conformity

Specifications and testing procedure

The sensors and devices included in this selected list are manufactured in accordance with the following Standards and IEC, EN, VDE Specifications and Guidelines:

DIN VDE 0660 part 208, part 100, part 100 A3, part 200,
DIN EN 50 081 and -082,
DIN VDE 0838,
DIN EN 55 011, -014, -022, -025,
DIN EN 50 217,
DIN VDE 0847,
DIN VDE 0453 / 303,
IEC 801 1 ... 4,
IEC 255 - 4,
IEC 947.

Certification and CE marking

Our company has been certified according to DIN EN ISO 9001 since 1994. The EMC tests are performed in our own testing laboratory, which is also available to our customers for testing their products.

Electronic Measuring Relays

Contents and housing data

0 Introduction

0.0.1 Contents, basics
0.0.2 Technical data, housing dimensions

1 Current measuring relays

1.0.1 Tasks, operation mode, requirement profiles
1.1.1 AIN Measuring relays for AC/DC

2 Voltage measuring relays

2.0.1 Tasks, operation mode, requirement profiles
2.1.1 AUN Measuring relays for AC/DC

3 Frequency measuring relays

3.0.1 Tasks, operation mode, requirement profiles
3.1.1 FUR Frequency measuring relays for converters

V Agencies and distributors

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Safety regulations, product liability

The measuring relays presented in this catalog may be installed and commissioned only by appropriately trained persons. Valid safety regulations must be adhered to. The systems must be disconnected from power and measures taken to prevent them from being unintentionally switched on again. Normal and interference-free operation of the components can only be guaranteed for the specifications defined in this catalog or in single descriptions. No liability is assumed for damages resulting from inappropriate or improper use.

All characteristics presented in this catalog are for information purposes only and imply no legally binding assurance thereof.

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### Articles sorted by ref. no.

<table>
<thead>
<tr>
<th>Ref. no.</th>
<th>Type designation</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.27-01-003</td>
<td>AIN1/410ca - 1.60 - 42 VAC</td>
<td>1.1.1</td>
</tr>
<tr>
<td>16.27-01-005</td>
<td>AIN1/410ca - 1.60 - 24 VAC</td>
<td>1.1.1</td>
</tr>
<tr>
<td>16.27-01-007</td>
<td>AIN1/410ca - 1.60 - 115/230 VAC</td>
<td>1.1.1</td>
</tr>
<tr>
<td>16.27-02-003</td>
<td>AIN1/411cq - 1.60 - 42 VAC</td>
<td>1.1.2</td>
</tr>
<tr>
<td>16.27-02-005</td>
<td>AIN1/411cq - 1.60 - 24 VAC</td>
<td>1.1.2</td>
</tr>
<tr>
<td>16.27-02-007</td>
<td>AIN1/411cq - 1.60 - 115/230 VAC</td>
<td>1.1.2</td>
</tr>
<tr>
<td>16.27-03-003</td>
<td>AINF1/410ca - 1.60 - 42 VAC</td>
<td>1.1.3</td>
</tr>
<tr>
<td>16.27-03-005</td>
<td>AINF1/410ca - 1.60 - 24 VAC</td>
<td>1.1.3</td>
</tr>
<tr>
<td>16.27-03-007</td>
<td>AINF1/410ca - 1.60 - 115/230 VAC</td>
<td>1.1.3</td>
</tr>
<tr>
<td>16.27-04-003</td>
<td>AINF1/410cq - 1.60 - 42 VAC</td>
<td>1.1.4</td>
</tr>
<tr>
<td>16.27-04-007</td>
<td>AINF1/410cq - 1.60 - 115/230 VAC</td>
<td>1.1.4</td>
</tr>
<tr>
<td>16.28-01-003</td>
<td>AUN1/510ca - 1.60 - 42VAC</td>
<td>2.1.1</td>
</tr>
<tr>
<td>16.28-01-005</td>
<td>AUN1/510ca - 1.60 - 24VAC</td>
<td>2.1.1</td>
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<td>AUN1/511cq - 1.60 - 42VAC</td>
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<tr>
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<td>2.1.2</td>
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<td>2.1.4</td>
</tr>
<tr>
<td>16.28-04-007</td>
<td>AUNF1/510cq - 1.60 - 115/230VAC</td>
<td>2.1.4</td>
</tr>
<tr>
<td>17.04-54-006</td>
<td>FUR1/210ab - 2.60 - 24VDC</td>
<td>3.1.1</td>
</tr>
<tr>
<td>17.04-54-007</td>
<td>FUR1/210ab - 2.60 - 115/230VAC</td>
<td>3.1.1</td>
</tr>
<tr>
<td>17.04-54-016</td>
<td>FUR1/210ab - 2.60 - 24VDC 5-100Hz</td>
<td>3.1.1</td>
</tr>
</tbody>
</table>

### Articles sorted by type

<table>
<thead>
<tr>
<th>Type designation</th>
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<tbody>
<tr>
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<td>3.1.1</td>
</tr>
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<td>3.1.1</td>
</tr>
</tbody>
</table>

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## Electronic Measuring Relays

### Measuring relays for AC/DC / over- and undercurrent

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Ref. no</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIN1/410ca - 1.60 - (Uv)</td>
<td>Measuring relay for AC/DC</td>
<td>16.27-01</td>
</tr>
<tr>
<td>AIN1/411cq - 1.60 - (Uv)</td>
<td>Measuring relay for AC/DC</td>
<td>16.27-02</td>
</tr>
</tbody>
</table>

**Task**

Monitors AC or DC circuits for under- and overcurrent of an adjustable threshold S.

**Use**

Monitor for drives, electroplating baths, valves, electro-magnetic clutches and brakes, electromagnetic chucks, etc.

**Range extensions**

Currents exceeding 15 A: with NWN shunt resistor according to DIN 43 703 and measuring relay AUN for voltage range 4 ... 60 mV. For AC, also using SWN current converter according to DIN 42 600.

**Hysteresis H and times X, Y and Z**

**Version /410ca:** H fixed 5 % of S, no times.

**Version /411cq:** H adjustable 5 ... 50 % of S, start time delay X adjustable to approx. 5 s, pull-in delay Y and dropout delay Z adjustable together up to approx. 0.5 s.

See catalog pages 1.1.1 and 1.1.2

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## Electronic Measuring Relays

### Measuring relays for over- and undercurrent

<table>
<thead>
<tr>
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<th>Ref. no</th>
</tr>
</thead>
<tbody>
<tr>
<td>AINF1/410ca - 1.60 - (Uv)</td>
<td>Measuring relay for AC/DC</td>
<td>16.27-03</td>
</tr>
<tr>
<td>AINF1/410cq - 1.60 - (Uv)</td>
<td>Measuring relay for AC/DC</td>
<td>16.27-04</td>
</tr>
</tbody>
</table>

**Task**

Monitors AC or DC circuits for under- and overcurrent by using a window comparator.

**Use**

Monitor for drives, electroplating baths, valves, electro-magnetic clutches and brakes, electromagnetic chucks, etc.

**Range extensions**

Currents exceeding 15 A: with NWN shunt resistor according to DIN 43 703 and AUNF measuring relay for voltage range 4 ... 60 mV. For AC, also using SWN current converter according to DIN 42 600.

**Hysteresis H and times X, Y and Z**

**Version /410ca:** H fixed 5 % of S, no times.

**Version /411cq:** H fixed 5 % of S, start time delay X adjustable up to approx. 5 s, pull-in delay Y and dropout delay Z adjustable together up to approx. 0.5 s.

See catalog pages 1.1.3 and 1.1.4

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### Measuring relays for AC/DC

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref. no.</th>
<th>Page</th>
<th>Current range</th>
<th>Operating voltage</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1NF1/410ca - 1.60 - 42 VAC</td>
<td>16.27-01-003</td>
<td>1.1.1</td>
<td>1 mA ... 15 A</td>
<td>42 V AC</td>
<td>threshold adjustable, H fixed, no times</td>
</tr>
<tr>
<td>A1NF1/410ca - 1.60 - 24 VAC</td>
<td>16.27-01-005</td>
<td>1.1.1</td>
<td>1 mA ... 15 A</td>
<td>24 V AC</td>
<td>threshold adjustable, H fixed, no times</td>
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<tr>
<td>A1NF1/410ca - 1.60 - 115/230 VAC</td>
<td>16.27-01-007</td>
<td>1.1.1</td>
<td>1 mA ... 15 A</td>
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<tr>
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<td>16.27-02-003</td>
<td>1.1.2</td>
<td>1 mA ... 15 A</td>
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<td>24 V AC</td>
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<th>Page</th>
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<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1NF1/410ca - 1.60 - 42 VAC</td>
<td>16.27-03-003</td>
<td>1.1.3</td>
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<td>1.1.3</td>
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</tr>
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<td>16.27-04-003</td>
<td>1.1.4</td>
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<td>42 V AC</td>
<td>threshold adjustable, H fixed</td>
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<td>1 mA ... 15 A</td>
<td>115/230 V AC</td>
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</tr>
</tbody>
</table>
Electronic Measuring Relays
AIN measuring relays for AC and DC current

**Technical data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line voltage Uv</td>
<td>please indicate when ordering</td>
</tr>
<tr>
<td>Alternating voltage</td>
<td>230 / 115, 42, 24 V AC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>± 10 %</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 ... 60 Hz</td>
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<tr>
<td>Operating temperature</td>
<td>0 ... + 60 °C</td>
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<tr>
<td>Power consumption</td>
<td>approx. 4 VA</td>
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<td>Housing (see table)</td>
<td>60 (page 0.0.1)</td>
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<tr>
<td>Weight</td>
<td>approx. 300 g</td>
</tr>
<tr>
<td>Input (E)</td>
<td>4 current ranges selectable</td>
</tr>
<tr>
<td>Output</td>
<td>Relay 1 changeover switch</td>
</tr>
<tr>
<td>Switching voltage</td>
<td>24 ... 250 V AC or DC</td>
</tr>
<tr>
<td>Switching current</td>
<td>0.05 ... 6 A</td>
</tr>
<tr>
<td>Switching capacity, AC</td>
<td>max. 1250 VA</td>
</tr>
<tr>
<td>Switching capacity, DC</td>
<td>max. 50 W</td>
</tr>
<tr>
<td>Switching frequency</td>
<td>max. 5000 / h</td>
</tr>
<tr>
<td>Switching cycles</td>
<td>30 x 10⁶</td>
</tr>
<tr>
<td>Response times</td>
<td>Exceeding threshold / falling below threshold approx. 25 ms / approx. 100 ms</td>
</tr>
<tr>
<td>Indicators</td>
<td>1 green LED Power ON</td>
</tr>
<tr>
<td></td>
<td>1 red LED Relay pulled-in</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Setting accuracy ± 5 %</td>
</tr>
<tr>
<td></td>
<td>Repeatability ± 0.5 %</td>
</tr>
<tr>
<td></td>
<td>Temperature dependance ± 0.1 % / °C</td>
</tr>
<tr>
<td>Operation mode</td>
<td>Overcurrent monitor a</td>
</tr>
<tr>
<td></td>
<td>without bridge B between the terminals 6-7 the relay drops out when exceeding threshold S.</td>
</tr>
<tr>
<td></td>
<td>Undercurrent monitor b</td>
</tr>
<tr>
<td></td>
<td>with bridge B between the terminals 6-7 the relay pulls-in when exceeding threshold S.</td>
</tr>
<tr>
<td>Hysteresis (H)</td>
<td>fixed 5 % of S, no times</td>
</tr>
</tbody>
</table>

**Operation**

- **Input (E)**: 4 current ranges selectable
- **Output**: Relay 1 changeover switch
- **Switching voltage**: 24 ... 250 V AC or DC
- **Switching current**: 0.05 ... 6 A
- **Switching capacity, AC**: max. 1250 VA
- **Switching capacity, DC**: max. 50 W
- **Switching frequency**: max. 5000 / h
- **Switching cycles**: 30 x 10⁶

**Response times**

- Exceeding threshold / falling below threshold approx. 25 ms / approx. 100 ms

**Indicators**

- 1 green LED - Power ON
- 1 red LED - Relay pulled-in

**Accuracy**

- Setting accuracy ± 5 %
- Repeatability ± 0.5 %
- Temperature dependence ± 0.1 % / °C

**Operation mode**

- **Overcurrent monitor (a)**: without bridge B between the terminals 6-7 the relay drops out when exceeding threshold S.
- **Undercurrent monitor (b)**: with bridge B between the terminals 6-7 the relay pulls-in when exceeding threshold S.
- Hysteresis (H) fixed 5 % of S, no times

**Diagram**

- Measuring current I
- Threshold S
- Hysteresis H
- Operation mode a
- Operation mode b

**Overload capacity**

<table>
<thead>
<tr>
<th>Input</th>
<th>Range</th>
<th>Input resistance</th>
<th>Overload capacity continuous</th>
<th>3 s, 5 % DF¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>1 ... 15 A</td>
<td>5 mΩ</td>
<td>20 A</td>
<td>33 A</td>
</tr>
<tr>
<td>E2</td>
<td>0.1 ... 1.5 A</td>
<td>50 mΩ</td>
<td>3 A</td>
<td>6 A</td>
</tr>
<tr>
<td>E3</td>
<td>10 ... 150 mA</td>
<td>0.5 Ω</td>
<td>1.2 A</td>
<td>2 A</td>
</tr>
<tr>
<td>E4</td>
<td>1 ... 15 mA</td>
<td>5 Ω</td>
<td>0.3 A</td>
<td>0.5 A</td>
</tr>
</tbody>
</table>

**DIagram**

- **Wiring**
  - AC/DC 2-pole
  - AC/DC measuring relay with LED

- **Input**
  - E1
  - E2
  - E3
  - E4

- **Output**
  - L
  - N

- **Overload capacity**
  - 3 s, 5 % DF¹

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A1N measuring relays for AC and DC current

Technical data

- Line voltage Uv: please indicate when ordering
- Alternating voltage: 230 / 115, 42, 24 V AC
- Tolerance: ± 10 %
- Frequency: 50 ... 60 Hz
- Operating temperature: 0 ... + 60 °C
- Power consumption: approx. 4 VA
- Housing: 60 (see table)
- Weight: approx. 300 g
- Input (E): 4 current ranges selectable
- Output:
  - Relay: 1 changeover switch
  - Switching voltage: 24 ... 250 V AC or DC
  - Switching current: 0.05 ... 6 A
  - Switching capacity, AC: max. 1250 VA
  - Switching capacity, DC: max. 50 W
  - Switching frequency: max. 5000 / h
  - Switching cycles: 30 x 10⁶
- Response times:
  - Exceeding threshold / falling below threshold: approx. 25 ms / approx. 100 ms
- Indicators:
  - 1 green LED: Power ON
  - 1 red LED: Relay pulled-in
- Accuracy:
  - Setting accuracy: ± 5 %
  - Repeatability: ± 0.5 %
  - Temperature dependance: ± 0.1 % / °C
- Operation mode:
  - a Overcurrent monitor:
    - Without bridge B between the terminals 6-7 the relay drops out when exceeding threshold S.
  - b Undercurrent monitor:
    - With bridge B between the terminals 6-7 the relay pulls-in when exceeding threshold S.
  - Hysteresis (H): adjustable 5 ... 50 % of S
  - Start time delay (X): adjustable up to approx. 5 s
  - Pull-in (Y) / drop out delay (Z): log. adjustable up to approx. 0.5 s

For the exact type designation and ref. no. please see page 1.0.2

Diagram

- Measuring current I
- Threshold S
- Hysteresis H
- X = Start time delay t₁
- Y = Power on delay t₂
- Z = Power off delay t₃

Inputs

- Bridge op. mode
- P = Power supply
- Uv = 230 / 115 VAC

Overload capacity

<table>
<thead>
<tr>
<th>Input</th>
<th>Range</th>
<th>Input resistance</th>
<th>Overload capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>continuous</td>
<td>3 s, 5 % DF</td>
<td></td>
</tr>
<tr>
<td>E1</td>
<td>1 ... 15 A</td>
<td>5 mΩ</td>
<td>20 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>33 A</td>
</tr>
<tr>
<td>E2</td>
<td>0.1 ... 1.5 A</td>
<td>50 mΩ</td>
<td>3 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6 A</td>
</tr>
<tr>
<td>E3</td>
<td>10 ... 150 mA</td>
<td>0.5 Ω</td>
<td>1.2 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 A</td>
</tr>
<tr>
<td>E4</td>
<td>1 ... 15 mA</td>
<td>5 Ω</td>
<td>0.3 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.5 A</td>
</tr>
</tbody>
</table>

Wiring

- AC/DC measuring relay with LED

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## Technical data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line voltage Uv</td>
<td>Please indicate when ordering</td>
</tr>
<tr>
<td>Alternating voltage</td>
<td>230 / 115, 42, 24 V AC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>± 10 %</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 ... 60 Hz</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 ... + 60 °C</td>
</tr>
<tr>
<td>Power consumption</td>
<td>Approx. 4 VA</td>
</tr>
<tr>
<td>Housing</td>
<td>80 (page 0.0.1)</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 300 g</td>
</tr>
<tr>
<td>(see table) Input (E)</td>
<td>4 current ranges selectable</td>
</tr>
<tr>
<td>Output</td>
<td></td>
</tr>
<tr>
<td>Relay</td>
<td>Changeover switch</td>
</tr>
<tr>
<td>Switching voltage</td>
<td>24 ... 250 V AC or DC</td>
</tr>
<tr>
<td>Switching current</td>
<td>0.05 ... 6 A</td>
</tr>
<tr>
<td>Switching capacity AC / DC</td>
<td>Max. 1250 VA / max. 50 W</td>
</tr>
<tr>
<td>Switching frequency / cycles</td>
<td>Max. 5000 / h / 30 x 10⁶</td>
</tr>
<tr>
<td>Response times</td>
<td></td>
</tr>
<tr>
<td>Exceeding threshold / falling below threshold</td>
<td>Approx. 25 ms / approx. 100 ms</td>
</tr>
<tr>
<td>Indicators</td>
<td></td>
</tr>
<tr>
<td>1 green LED</td>
<td>Power ON</td>
</tr>
<tr>
<td>1 red LED</td>
<td>Relay pulled-in</td>
</tr>
<tr>
<td>Accuracy</td>
<td></td>
</tr>
<tr>
<td>Setting accuracy</td>
<td>± 5 %</td>
</tr>
<tr>
<td>Repeatability</td>
<td>± 0.5 %</td>
</tr>
<tr>
<td>Temperature dependence</td>
<td>± 0.1 % / °C</td>
</tr>
<tr>
<td>Operation mode</td>
<td></td>
</tr>
<tr>
<td>a with wire bridge between the terminals 6-7 the relay drops out when exceeding the low threshold and pulls-in when exceeding the high one</td>
<td></td>
</tr>
<tr>
<td>b with wire bridge between the terminals 6-7 the relay pulls-in when exceeding the low threshold and drops out when exceeding the high one</td>
<td></td>
</tr>
<tr>
<td>Hysteresis (H)</td>
<td>Fixed 5 % of S, no times</td>
</tr>
</tbody>
</table>

## Operation mode

- **a**: without wire bridge between the terminals 6-7 the relay drops out when exceeding the low threshold and pulls-in when exceeding the high one
- **b**: with wire bridge between the terminals 6-7 the relay pulls-in when exceeding the low threshold and drops out when exceeding the high one

## Overload capacity

<table>
<thead>
<tr>
<th>Input</th>
<th>Range</th>
<th>Input resistance</th>
<th>Overload capacity continuous</th>
<th>3 s, 5 % DF</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>1 ... 15 A</td>
<td>5 mΩ</td>
<td>20 A</td>
<td>33 A</td>
</tr>
<tr>
<td>E2</td>
<td>0.1 ... 1.5 A</td>
<td>50 mΩ</td>
<td>3 A</td>
<td>6 A</td>
</tr>
<tr>
<td>E3</td>
<td>10 ... 150 mA</td>
<td>0.5 Ω</td>
<td>1.2 A</td>
<td>2 A</td>
</tr>
<tr>
<td>E4</td>
<td>1 ... 15 mA</td>
<td>5 Ω</td>
<td>0.3 A</td>
<td>0.5 A</td>
</tr>
</tbody>
</table>

## Diagram

The diagram illustrates the measuring current, thresholds S1 and S2, and the hysteresis H for different operation modes (a and b).

For general description see catalog page 1.0.1

---

Electronic Measuring Relays

**AINF measuring relays for AC and DC current**

**Device**

<table>
<thead>
<tr>
<th>AINF measuring relay for over- and undercurrent</th>
</tr>
</thead>
<tbody>
<tr>
<td>AINF1/410ca-1.60 - (Uv)</td>
</tr>
<tr>
<td>16.27-03-xxx</td>
</tr>
</tbody>
</table>

**Technical data**

- **Line voltage Uv**: Please indicate when ordering
- **Alternating voltage**: 230 / 115, 42, 24 V AC
- **Tolerance**: ± 10 %
- **Frequency**: 50 ... 60 Hz
- **Operating temperature**: 0 ... + 60 °C
- **Power consumption**: Approx. 4 VA
- **Housing**: 80 (page 0.0.1)
- **Weight**: Approx. 300 g

**Inputs**

- 1 green LED: Power ON
- 1 red LED: Relay pulled-in

**Response times**

- Exceeding threshold / falling below threshold: Approx. 25 ms / approx. 100 ms

**Indicators**

- 1 green LED: Power ON
- 1 red LED: Relay pulled-in

**Accuracy**

- **Setting accuracy**: ± 5 %
- **Repeatability**: ± 0.5 %
- **Temperature dependence**: ± 0.1 % / °C

**Operation mode**

- **a**: without wire bridge between the terminals 6-7 the relay drops out when exceeding the low threshold and pulls-in when exceeding the high one
- **b**: with wire bridge between the terminals 6-7 the relay pulls-in when exceeding the low threshold and drops out when exceeding the high one

**Hysteresis (H)**

- Fixed 5 % of S, no times

**Overload capacity**

<table>
<thead>
<tr>
<th>Input</th>
<th>Range</th>
<th>Input resistance</th>
<th>Overload capacity continuous</th>
<th>3 s, 5 % DF</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>1 ... 15 A</td>
<td>5 mΩ</td>
<td>20 A</td>
<td>33 A</td>
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<td>0.1 ... 1.5 A</td>
<td>50 mΩ</td>
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<td>2 A</td>
</tr>
<tr>
<td>E4</td>
<td>1 ... 15 mA</td>
<td>5 Ω</td>
<td>0.3 A</td>
<td>0.5 A</td>
</tr>
</tbody>
</table>

**Wiring**

- **AC/DC 2-pole**: Wires are labeled E1, E2, E3, E4, M, 6, 7, L, 115 V AC, 230 V AC, and Load

---

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**Technical data**

- **Line voltage \( U_v \)**: please indicate when ordering
- **Alternating voltage**: 230 / 115, 42, 24 V AC
- **Tolerance / frequency**: ± 10 % / 50 ... 60 Hz
- **Operating temperature / power consumption**: 0 ... + 60 °C / approx. 4 VA
- **Housing**: 0.60 (page 0.0.1)
- **Weight**: approx. 300 g
  
  (see table) 4 current ranges selectable

**Output**

- **Relay**: 1 changeover switch
- **Switching voltage**: 24 ... 250 V AC or DC
- **Switching current**: 0.05 ... 6 A
- **Switching capacity AC / DC**: max. 1.250 VA / max. 50 W
- **Switching frequency / cycles**: max. 5000 / h / 30 x 10^6
- **Response times**
  - Exceeding threshold / falling below threshold: approx. 25 ms / approx. 100 ms

**Indicators**

- 1 green LED: Power ON
- 1 yellow LED: Relay pulled-in

**Accuracy**

- **Setting accuracy**: ± 5 %
- **Repeatability**: ± 0.5 %
- **Temperature dependence**: ± 0.1 % / °C

**Operation mode**

- without wire bridge between the terminals 6-7 the relay drops out when exceeding the low threshold and pulls-in when exceeding the high one
- with wire bridge between the terminals 6-7 the relay pulls-in when exceeding the low threshold and drops out when exceeding the high one

**Hysteresis (H)**: fixed 5 % of \( S \)

- **Start time delay (X)**: adjustable up to approx. 5 s
- **Pull-in (Y) / dropout delay (Z)**: adj. together up to approx. 0.5 s

**Input**

- **Input resistance**
  - E1: 1 ... 15 A
  - E2: 0.1 ... 1.5 A
  - E3: 10 ... 150 mA
  - E4: 1 ... 15 mA

**Overload capacity**

- **continuous**: 20 A
- **3 s, 5 % DF**: 33 A

**Wiring**

- **AC/DC 2-pole**
- **AC/DC measuring relay with LED**

**Device**

**AINF measuring relay for over- and undercurrent**

- **For the exact type designation and ref. no. please see page 1.0.2**
- **AINF1/410cq-1.60 - (Uv)**
- **Ref. no. 16.27-04-xxx**

For general description see catalog page 1.0.1
Electronic Measuring Relays
Measuring relays for AC/DC voltages / over- and undervoltages

Measuring relays for AC/DC voltages
Type AUN1/510ca - 1.60 - (Uv) Ref. no 16.28-01
Type AUN1/511cq - 1.60 - (Uv) Ref. no 16.28-02

Task
Monitors voltages of AC or DC circuits for exceeding or falling below an adjustable threshold S.

Use
Monitor for dry and storage batteries, emergency power sources, solar generators; monitoring electrical drives for standstill.

Range extensions
Voltages exceeding 300 V with series resistor at terminal 1 (3.67 kΩ per 1 V range extension).

Hysteresis H and times X, Y and Z
Version /510ca: H fixed 5 % of S, no times.
Version /511cq: H adjustable 5 ... 50 % of S, start time delay X adjustable up to approx. 5 s, pull-in delay Y and dropout delay Z adjustable together up to approx. 0.5 s.

See catalog pages 2.1.1 and 2.1.2

Measuring relays for over- and undervoltages
Type AUNF1/510ca - 1.60 - (Uv) Ref. no 16.28-03
Type AUNF1/510cq - 1.60 - (Uv) Ref. no 16.28-04

Task
Monitors over- and undervoltages of AC/DC circuits by using a window comparator.

Use
Monitor for dry and storage batteries, emergency power sources, solar generators; monitoring electrical drives for standstill.

Range extensions
Voltages exceeding 300 V with series resistor at terminal 1 (3.67 kΩ per 1 V range extension).

Hysteresis H and times X, Y and Z
Version /510ca: H fixed 5 % of S, no times.
Version /510cq: H fixed 5 % of S, start time delay X adjustable up to approx. 5 s, pull-in delay Y and dropout delay Z adjustable together up to approx. 0.5 s.

See catalog pages 2.1.3 and 2.1.4
### Measuring relays for AC/DC voltages

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref. no.</th>
<th>Page</th>
<th>Voltage range</th>
<th>Operating voltage Uv</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUN1/510ca - 1.60 - 42VAC</td>
<td>16.28-01-003</td>
<td>2.1.1</td>
<td>4 mV ... 300 V</td>
<td>42 V AC</td>
<td>treshold adjustable, H fixed, no times</td>
</tr>
<tr>
<td>AUN1/510ca - 1.60 - 24VAC</td>
<td>16.28-01-005</td>
<td>2.1.1</td>
<td>4 mV ... 300 V</td>
<td>24 V AC</td>
<td>treshold adjustable, H fixed, no times</td>
</tr>
<tr>
<td>AUN1/510ca - 1.60 - 115/230VAC</td>
<td>16.28-01-007</td>
<td>2.1.1</td>
<td>4 mV ... 300 V</td>
<td>115 / 230 V AC</td>
<td>treshold adjustable, H fixed, no times</td>
</tr>
<tr>
<td>AUN1/511cq - 1.60 - 42VAC</td>
<td>16.28-02-003</td>
<td>2.1.2</td>
<td>4 mV ... 300 V</td>
<td>42 V AC</td>
<td>treshold adjustable, H adjustable</td>
</tr>
<tr>
<td>AUN1/511cq - 1.60 - 24VAC</td>
<td>16.28-02-005</td>
<td>2.1.2</td>
<td>4 mV ... 300 V</td>
<td>24 V AC</td>
<td>treshold adjustable, H adjustable</td>
</tr>
<tr>
<td>AUN1/511cq - 1.60 - 115/230VAC</td>
<td>16.28-02-007</td>
<td>2.1.2</td>
<td>4 mV ... 300 V</td>
<td>115 / 230 V AC</td>
<td>treshold adjustable, H adjustable</td>
</tr>
</tbody>
</table>

### Measuring relays for over- and undervoltages

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref. no.</th>
<th>Page</th>
<th>Voltage range</th>
<th>Operating voltage Uv</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUNF1/510ca - 1.60 - 42VAC</td>
<td>16.28-03-003</td>
<td>2.1.3</td>
<td>4 mV ... 300 V</td>
<td>42 V AC</td>
<td>treshold adjustable, H fixed, no times</td>
</tr>
<tr>
<td>AUNF1/510ca - 1.60 - 24VAC</td>
<td>16.28-03-005</td>
<td>2.1.3</td>
<td>4 mV ... 300 V</td>
<td>24 V AC</td>
<td>treshold adjustable, H fixed, no times</td>
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<td>16.28-03-007</td>
<td>2.1.3</td>
<td>4 mV ... 300 V</td>
<td>115 / 230 V AC</td>
<td>treshold adjustable, H fixed, no times</td>
</tr>
<tr>
<td>AUNF1/510cq - 1.60 - 42VAC</td>
<td>16.28-04-003</td>
<td>2.1.4</td>
<td>4 mV ... 300 V</td>
<td>42 V AC</td>
<td>treshold adjustable, H fixed</td>
</tr>
<tr>
<td>AUNF1/510cq - 1.60 - 24VAC</td>
<td>16.28-04-005</td>
<td>2.1.4</td>
<td>4 mV ... 300 V</td>
<td>24 V AC</td>
<td>treshold adjustable, H fixed</td>
</tr>
<tr>
<td>AUNF1/510cq - 1.60 - 115/230VAC</td>
<td>16.28-04-007</td>
<td>2.1.4</td>
<td>4 mV ... 300 V</td>
<td>115 / 230 V AC</td>
<td>treshold adjustable, H fixed</td>
</tr>
</tbody>
</table>
**Technical data**

- **Line voltage** Uv: please indicate when ordering
- **Alternating voltage**: 230 / 115, 42, 24 V AC
- **Tolerance**: ± 10 %
- **Frequency**: 50 ... 60 Hz
- **Operating temperature**: 0 ... + 60 °C
- **Power consumption**: approx. 4 VA
- **Housing**: 60 (page 0.0.1)
- **Weight**: approx. 300 g

**Input**

- **Input (E)**: 5 voltage ranges selectable

**Output**

- **Relay output**: 1 changeover switch
- **Switching voltage**: 24 ... 250 V AC or DC
- **Switching current**: 0.05 ... 6 A
- **Switching capacity for AC**: max. 1250 VA
- **Switching capacity for DC**: max. 50 W
- **Switching frequency**: max. 5000 / h
- **Switching cycles**: 30 x 10^6

**Response times**

- Exceeding threshold / falling below threshold: approx. 25 ms / approx. 100 ms

**Indicators**

- 1 green LED: Power ON
- 1 red LED: Relay pulled-in

**Accuracy**

- **Setting accuracy**: ± 5 %
- **Repeatability**: ± 0.5 %
- **Temperature dependance**: ± 0.1 % / °C

**Operation mode**

- **a** Overvoltage monitor: without bridge B between the terminals 6-7 the relay drops out when exceeding threshold S
- **b** Undervoltage monitor: with bridge B between the terminals 6-7 the relay pulls in when exceeding threshold S

**Hysteresis (H)**: fixed 5 % of S, no times

---

**Device**

For the exact type designation and ref. no. please see page 2.0.2

**measuring relay for AC and DC voltages**

- **AUN1/510ca-1.60 - (Uv)**
- **Ref. no.**: 16.28-01-xxx

**Diagram**

[Diagram showing the electronic measuring relays with LED display and wiring diagram]
Technical data
Line voltage $U_v$ please indicate when ordering
Alternating voltage
- $230 \pm 15 \%$, $50 \ldots 60$ Hz
- $115 \pm 10 \%$, $50 \ldots 60$ Hz
Operating temperature $0 \ldots + 60 ^\circ C$
Power consumption approx. $4 \text{ VA}$
Housing $60 (\text{ page } 0.0.1)$
Weight approx. $300 \text{ g}$

Operation mode
a Overvoltage monitor
- without bridge B between the terminals 6-7, the relay drops out when exceeding threshold $S$
- with bridge B between the terminals 6-7, the relay pulls in when exceeding threshold $S$

b Undervoltage monitor
- with bridge B between the terminals 6-7, the relay pulls in when exceeding threshold $S$
- with bridge B between the terminals 6-7, the relay drops out when exceeding threshold $S$

Hysteresis (H) adjustable $5 \ldots 50 \%$ of $S$
Start time delay (X) adjustable up to approx. $5 \text{ s}$
Pull-in (Y) / dropout delay (Z) adjust. together up to approx. $0.5 \text{ s}$

Indicators
1 LED green Power ON
1 LED yellow Relay pulled-in

Accuracy
Setting accuracy $\pm 5 \%$
Repeatability $\pm 0.5 \%$
Temperature dependence $\pm 0.1 \% / ^\circ C$

Wiring AC and DC voltage measuring relay with LED display

For the exact type designation and ref. no. please see page 2.0.2

### Diagram

- **Measured voltage $u$**
- **Threshold $S$**
- **Hysteresis $H$**
- **X**
- **Y, Z**
- **K1 Op. mode a**
- **K1 Op. mode b**
- **Power on**
- $x = \text{Start time delay } t_x$
- $y = \text{Pull-in delay } t_y$
- $z = \text{Dropout delay } t_z$

For general description see catalog page 2.0.1

### Table

<table>
<thead>
<tr>
<th>Input</th>
<th>Range</th>
<th>Input resistance</th>
<th>Overload capability continuous</th>
<th>3 s, 5 % DF</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>20 ... 300 V</td>
<td>1 MΩ</td>
<td>400 V</td>
<td>400 V</td>
</tr>
<tr>
<td>E2</td>
<td>4 ... 60 V</td>
<td>220 kΩ</td>
<td>250 V</td>
<td>330 V</td>
</tr>
<tr>
<td>E3</td>
<td>0.4 ... 6 V</td>
<td>22 kΩ</td>
<td>80 V</td>
<td>100 V</td>
</tr>
<tr>
<td>E4</td>
<td>40 ... 600 mV</td>
<td>2.2 kΩ</td>
<td>25 V</td>
<td>33 V</td>
</tr>
<tr>
<td>E5</td>
<td>4 ... 60 V</td>
<td>220 Ω</td>
<td>8 V</td>
<td>10 V</td>
</tr>
</tbody>
</table>

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# Electronic Measuring Relays

## AUNF measuring relays for over- and undervoltages

<table>
<thead>
<tr>
<th>Device</th>
<th>AUNF measuring relay for over- and undervoltages</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the exact type designation and ref. no. please see page 2.0.2</td>
<td>AUNF1/510ca-1.60 - (Uv) 16.28-03-xxx</td>
</tr>
</tbody>
</table>

### Technical data
- **Line voltage Uv**: please indicate when ordering
- **Alternating voltage**: 230 / 115, 42, 24 V AC
- **Tolerance / frequency**: ± 10 % / 50 ... 60 Hz
- **Operating temperature**: 0 ... + 60 °C
- **Power consumption**: approx. 4 VA
- **Housing**: 80 (page 0.0.1)
- **Weight**: approx. 300 g
- **(see table) Input (E)**: 5 voltage ranges selectable

### Output
- **Relay output**: 1 changeover switch
- **Switching voltage**: 24 ... 250 V AC or DC
- **Switching current, AC**: max. 1250 VA
- **Switching capacity, AC**: max. 50 W
- **Switching frequency / switching cycles**: max. 5000 / h / 30 x 10^6

### Response times
- **Exceeding threshold / falling below threshold**: approx. 25 ms / approx. 100 ms

### Indicators
- **1 green LED**: Power ON
- **1 red LED**: Relay pulled-in

### Accuracy
- **Setting accuracy**: ± 5 %
- **Repeatability**: ± 0.5 %
- **Temperature dependence**: ± 0.1 % / °C

### Operation mode
- **a** without wire bridge B between the terminals 6-7 the relay drops out when exceeding the low threshold S and pulls-in again when exceeding the high one.
- **b** without wire bridge B between the terminals 6-7 the relay pulls-in when exceeding the low threshold S and drops out again when exceeding the high one.

- **Hysteresis (H)** fixed 5 % of S, no times

### Pulse diagram

#### Measured voltage u
- **Threshold S1**
- **Hysteresis H**
- **Threshold S2**
- **K1 Op. mode a**
- **K1 Op. mode b**

### Wiring

#### AC/DC 2-pole

#### AC and DC voltage measuring relay with LED display

### For general description see catalog page 2.0.1

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AUNF meas. relays for over- and undervoltages

**Technical data**
- Line voltage \( U_v \) please indicate when ordering
- Alternating voltage: 230 / 115, 42, 24 V AC
- Tolerance / frequency: ± 10 % / 50 ... 60 Hz
- Operating temperature / power consumption: 0 ... + 60 °C / approx. 4 VA
- Housing: 60 (page 0.0.1)
- Weight: approx. 300 g
- (see table) Input (E): 5 voltage ranges selectable

**Output**
- Relay output: 1 changeover switch
- Switching voltage: 24 ... 250 V AC or DC
- Switching current: 0.05 ... 6 A
- Switching capability AC / switch. capability DC: max. 1.250 VA / max. 50 W
- Switching frequency / switching cycles: max. 5000 / h / 30 x 10⁶

**Response times**
- Exceeding threshold / falling below threshold: approx. 25 ms / approx. 100 ms

**Indicators**
- 1 LED green: Power ON
- 1 LED yellow: Relay pulled-in

**Accuracy**
- Setting accuracy: ± 5 %
- Repeatability: ± 0.5 %
- Temperature dependence: ± 0.1 % / °C

**Operation mode**
- a without wire bridge B between the terminals 6-7 the relay drops out when exceeding the low threshold \( S \) and pulls-in again when exceeding the high one.
- b without wire bridge B between the terminals 6-7 the relay pulls-in when exceeding the low threshold \( S \) and drops out again when exceeding the high one.

**Hysteresis (H):** adjustable 5 % of \( S \)

**Pull-in (Y) / dropout delay (Z):**
- Start time delay (X) adjustable up to approx. 5 s
- adjust, together up to approx. 0.5 s

**Input**
- **Range**: 20 ... 300 V
- **Input resistance**: 1.1 MΩ
- **Overload capability**: 400 V continuous
- **3 s, 5 % DF**: 3 s, 5 % DF

**Wiring**
- **AC/DC 2-pole**
- **AC and DC voltage measuring relay** with LED display

For general description see catalog page 2.0.1

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2.1.4
**Electronic Measuring Relays for Automation**

**FUR frequency measuring relays for converters**

Task

Monitors frequencies for exceeding an adjustable threshold S.

Application

Overfrequency monitor for motors driven by static frequency converters or other quasi sinusoidal or rectangular wave power sources.

Function

The motor voltage is connected directly to E0 and E1 (up to 250 V AC or E0 and E2 (up to 500 V AC). The device can be operated with or without latching behaviour. In latching mode, a recognized over-frequency is reset by means of either an electrically isolated contact between terminals P and E3 or an external voltage (e.g. the output of a PLC) on terminals E3 and M. For operation without latching, terminals P and E3 must be bridged.

Operating mode

Relay drops out when threshold S is exceeded.

### Measuring relays for DC and AC voltages

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref. no.</th>
<th>Page</th>
<th>Frequency range (version)</th>
<th>Operating voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUR1/210ab - 2.60 - 24VDC</td>
<td>17.04-54-006</td>
<td>3.1.1</td>
<td>30 ... 400 Hz (B)</td>
<td>24 V DC</td>
</tr>
<tr>
<td>FUR1/210ab - 2.60 - 115/230VAC</td>
<td>17.04-54-007</td>
<td>3.1.1</td>
<td>30 ... 400 Hz (B)</td>
<td>115 / 230 V AC</td>
</tr>
<tr>
<td>FUR1/210ab - 2.60 - 24VDC</td>
<td>17.04-54-016</td>
<td>3.1.1</td>
<td>5 ... 100 Hz (A)</td>
<td>24 V DC</td>
</tr>
</tbody>
</table>
FUR frequency measuring relays for converters

**Technical Data**

- **Line voltage Uv**: please indicate when ordering
- **Alternating voltage**: 230 / 115, 42, 24 V AC
- **Tolerance**: ± 10 %
- **Direct voltage**: 24 V DC
- **Tolerance range**: ± 10 %
- **Ripple voltage**: max. 10 %
- **Power consumption**: approx. 4 VA
- **Housing size**: 60 (page 0.0.1)
- **Weight**: approx. 300 g

**Version A**: Threshold S (adjustable)
- **Threshold S (adjustable)**
  - 5 ... 100 Hz
  - Fine adjustment ≤ ± 5 % of S
  - Input current: max. 10 mA
  - Electrical isolation: yes
  - max. input frequency: 800 Hz
  - min. clock frequency of the converter: 3 kHz

**Version B**: Threshold S (adjustable)
- **Threshold S (adjustable)**
  - 30 ... 400 kHz
  - Fine adjustment ≤ ± 5 % of S
  - Input current: max. 10 mA

**Inputs**

- **Inputs E1, E2**: Range B (100, 400)
  - please indicate when ordering

**Operation without latching**

- **Input E3**
  - Signal level lo: 0 ... 4 V DC
  - Signal level hi: 18 ... 30 V DC
  - Input current: approx. 10 mA

**Output**

- **Relay output**: 1 changeover switch
  - Switching voltage: 24 ... 250 V AC or DC
  - Switching current: 0.05 ... 6 A
  - Switching capability, AC: max. 1250 VA
  - Switching capability, DC: max. 50 W
  - Switching frequency: max. 5,000 / h
  - Mech. lifetime: 30 x 10^6

**Indicators**

- **1 green LED**: power on
- **1 red LED**: relay pulled-in

**Hysteresis H (operation without fault memory)**

- Fixed: approx. 10 % of S
- Start time delay X: approx. 150 ms
- Pull-in delay Y: approx. 50 ms
- Dropout delay Z: approx. 150 ms

**Frequency and pulse rate measuring relay**

- **Input voltage**: 230 V AC or 24 V DC
- **Input resistance**: 30 kΩ
- **Range (Version)**
- **Frequency**
  - E1: 25 ... 250 V AC: 30 kΩ
    - 100 (A): 5 ... 100 Hz
    - 400 (B): 30 ... 400 Hz
  - E2: 50 ... 500 V AC: 60 kΩ
    - 100 (A): 5 ... 100 Hz
    - 400 (B): 30 ... 400 Hz

**Wiring**

- **AC 2-pole**: 230 V AC or 24 V DC
- **LED**: 115 V AC
## Agencies

### Headquarter
**Germany**

**Klaschka Industrieelektronik GmbH**  
**Customer Service**  
Am Zeller Pfad 1  
75242 Neuhausen/Enzkreis  
Fon: +49 7234 79-0  
sales@klaschka.de  
www.klaschka.de

### Other countries

**Australia**  
M. Brodribb Pty. Ltd.  
sales@brodribb.com.au

**China**  
Silkroad Trade (Shanghai)  
office@silkroad24.com

**Czech Republic**  
PROFESS spol. s r.o.  
profess@profess.cz

**Finland**  
Ins.Tsto Ri-set Oy  
posti@riset.fi

**France**  
DIPAC  
contact@dipac.fr

**Germany**

**Baden Württemberg, Hessen Süd**  
promovere GmbH  
Fon: +49 2058 782800-0  
info@wagnergmbh.de

**Nordrhein-Westfalen**  
Wagner GmbH  
Fon: +49 7234 79-0  
sales@klaschka.de  
www.klaschka.de

**Saarland, Rheinland-Pfalz, Baden**  
Klaschka Industrieelektronik GmbH  
Fon: +49 7234 79-0  
sales@klaschka.de  
www.klaschka.de

**Sachsen, Thüringen**  
Ingenieurbüro  
Dipl.-Ing. Klaus-E. Schulz  
Fon: +49 30 4747440-8  
klaus-e.schulz@t-online.de

**Malaysia, Singapore**  
Ingermark (M) Sdn Bhd  
enquiry@ingermark.com

**Netherlands**  
Teleson B.V.  
verkoop@teleson.nl

**Poland**  
AKSEL P.P.H.U.  
pruszko@aksel-gmbh.com.pl

**Singapore**  
DAB Technology Pte Ltd.  
dabtech@singnet.com.sg

**South Africa**  
Newco Instruments cc  
veni@newcosensors.co.za

**South Korea**  
MachineNet  
robotryoo@naver.com

**Spain, Portugal**  
Bosch Rexroth S.L.  
javier.novoa@boschrexroth.es

**Sweden**  
SensorGruppen AB  
info@sensorgruppen.se

**Switzerland/Liechtenstein**  
DUVILEC AG  
info@duvilec.ch

**Thailand**  
DAB Technology Co. Ltd.  
dabtech@truemail.co.th

**Turkey**  
YORUM  
yorum@yorum-automation.com

**Ukraine, Russia, White Russia**  
Dr. Klaschka GmbH  
dku@klaschka.com.ua

**USA, Canada**  
Glo-ComM  
glocomm@carolina.rr.com

**Daybreak Intl.(Taiwan) Corp.**  
Fon: +886 2 8866-1234  
sales@zolshar.ru

**Gold Globe Complete**  
Fon: +7 495 2340110  
enquiry@ingermark.com

**India**  
Rameshwar Engineering  
rameshwar@ramsharan.com

**Italy**  
BTS Elettronica s.r.l.  
info@btsitalia.it

**Mexico**  
ABAZA DIGITAL de Puebla  
abaza@prodigy.net.mx

**Indonesia**  
P.T. Gerindo Raya Sakti  
genido@indosat.net.id

**Japan**  
Suzumura Electric Co., Ltd.  
info@zolshar.ru

**Japan**  
DAB Technology Pte Ltd.  
sales@dabtech.net

**Japan**  
DAB Technology Co. Ltd.  
sales@dabtech.net

**Belgium**  
info@leuze.be

**Korea**  
MachineNet  
robotryoo@naver.com