



# Control Relays



- Relays for Control & Monitoring
- DIN Rail Mount
- 24mm & 48mm Wide Units
- Wide range of options

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# Control Relays

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EN - LIQUID LEVEL CONTROL

- Automatic level control of conductive liquids
- Sensitivity adjustable from 5kΩ to 100kΩ via front face dial
- Fill (UP)/empty (DOWN) function selectable by front face switch
- AC current on probes
- Slim 22.5mm housing

**OPERATING PRINCIPLE**

Control of maximum and/or minimum levels of conductive liquids (tap water, sea water, waste water, chemical solutions, coffee etc).

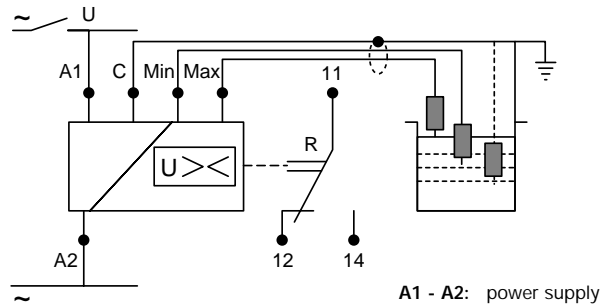
The principle is based on measurement of the apparent resistance of the liquid between two submerged probes. When this value is lower than the preset threshold on the unit front face, the output relay changes state. To avoid electrolytic phenomena, an AC current runs across the probes.

Applications found in environmental, chemical industries and food technology etc.

**Regulation of two levels : Minimum / Maximum**

The output relay changes state when the level of liquid reaches the maximum electrode, with the minimum electrode submerged. It returns to its initial state when the minimum probe is no longer in contact with the liquid.

**WIRING AND APPLICATIONS**

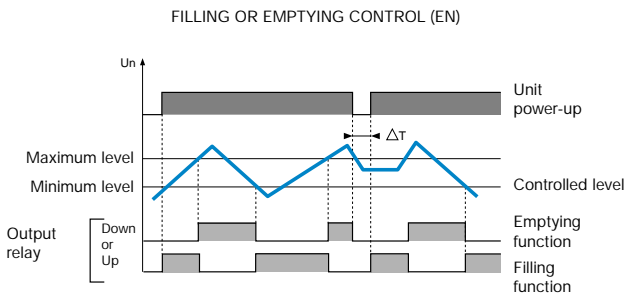


**GENERAL SPECIFICATION**

|   |   |
|---|---|
| Supply voltage Un   | 230 V, 110 V, 48 V, 24 V ~, 50 / 60 Hz                |
| Operating range   | 0.85 to 1.15 x Un*                                    |
| Maximum power consumption   | 3 VA  |
| Adjustable sensitivity  | 5 kΩ to 100 kΩ  |
| Measurement accuracy (at maximum sensitivity)                     | 0 • + 30%   |
| Electrode voltage (maximum)                                       | 24 V ~ (50 / 60 Hz)                                   |
| Electrode current (maximum)                                       | 1 mA (50 / 60 Hz)                                     |
| Maximum cable capacity  | 10 nF   |
| Response time   | high level: 300 ms<br>low level: 500 ms               |
| Output relay (according to AC1, resistive load)                   | 1 AgCdO changeover<br>8 A ~ max.                      |
| Galvanic isolation via transformer (4 kV, 8 mm creepage distance) | Class II VDE 0551                                     |
| Isolation of contacts and electrodes from power supply            | 2.5 kV ~  |
| Temperature   | use: - 20 °C to + 60 °C<br>stored: - 30 °C to + 70 °C |
| Weight  | 140 g   |

**Note**  
The probe cable (maximum 100 metres) does not have to be screened, but avoid mounting it in parallel with the power supply cables. A screened cable can be used, with the screening connected to the common.

\* Voltage limited to Un + 10% if other products are mounted adjacently on the same DIN rail.



**Note :** If the power break ΔT lasts for 0.5 seconds or more, the relay re-energises instantly if in "UP" mode and is de-energised if in "DOWN" mode.

For probes see page 82

**ORDERING GUIDE**

| Type    | Voltage | Part No    |
|---------|---------|------------|
| EN.230A | 230Vac  | 84 870 004 |
| EN.110A | 110Vac  | 84 870 003 |
| EN.48A  | 48Vac   | 84 870 002 |
| EN.24A  | 24Vac   | 84 870 001 |

For dimensions see page 95.



FN - LIQUID LEVEL CONTROL WITH ALARM

- Automatic level control of conductive liquids
- High or low level alarm selectable
- Sensitivity adjustable from 5kΩ to 100kΩ via front face dial
- Fill (UP)/empty (DOWN) function selectable by front face switch
- Compact 45mm wide housing

**GENERAL SPECIFICATION**

|                                |  |
|--------------------------------|--|
| <b>POWER SUPPLY</b>            |  |
| Supply voltage Un              | 230, 120, 48 and 24 V ~ 50/60 Hz galvanic isolation via transformer            |
| Supply tolerance               | 0.85 to 1.15 Un except 120 V ~ : 0.85 to 1.1 Un                                |
| Power                          | nominal 3 VA at Un   |
|                                | maximum 4 VA at Un + 15 %  |
| Immunity from micro power cuts | 10 ms  |
| Delay on pick-up               | T1 = approx. 2 s   |
| Response time on power-up      | T4 = 500 ms  |
| Insulation coordination        | Category III, degree of pollution 2 conforming to IEC 664.1 / VDE0110 : 4 KV/2 |

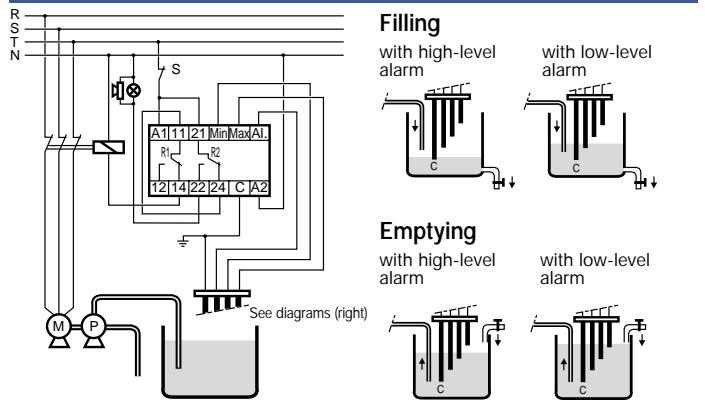
|                                  |                                 |
|----------------------------------|---------------------------------|
| <b>CONTROL CIRCUIT</b>           |                                 |
| Sensitivity range FN             | 5 kΩ to 100 kΩ                  |
|                                  | FN LS 250 Ω to 5 kΩ             |
| Display accuracy                 | ± 30 % with maximum sensitivity |
| Electrode voltage                | 15 V ~ (50 .. 60 Hz)            |
| Electrode current                | 1 mA                            |
| Response time on probe immersion | T2 = 400 ms                     |
|                                  | on emersion T3 = 700 ms         |

|                          |   |
|--------------------------|---|
| <b>OUTPUT CIRCUIT</b>    |   |
| Output                   | 2 AgCdO changeover                        |
| Breaking capacity        | 2000 VA 80 W                              |
| Maximum breaking current | 8 A ~ 8 A ---                             |
| Minimum breaking current | 100 mA ~ 100 mA ---                       |
| Maximum breaking voltage | 250 V ~ 250 V ---                         |
| <b>Mechanical life</b>   |   |
| Electrical life          | AC12 2000 VA - 10 <sup>5</sup> operations |
|                          | AC15 Cos φ = 0.3 - 6000 operations        |
|                          | DC13 L/R = 300 ms - 6000 operations       |

|                                |   |
|--------------------------------|---|
| <b>GENERAL CHARACTERISTICS</b> |   |
| Casing material                | Self-extinguishing  |
| Terminal capacity              | 2 x 1.5 mm <sup>2</sup> with ferrule<br>2 x 2.5 mm <sup>2</sup> without ferrule |
| Temperature limits             | Use -20°C to +60°C (conforming to IEC 68.1.14)                                  |
|                                | Stored -30°C to +70°C (conforming to IEC 68.1.1/2)                              |
| Relative humidity              | 93% (+2%; -3%) without condensation   |
| Weight                         | 280 g approximately   |

**Note :**  
The probe cable does not have to be screened, but avoid mounting it close to the power supply cables. To conform to the EMC directive (89/336/EEC), a screened cable must be used, with the screening connected to the common and the earth.  
For probes see page 82

**WIRING AND APPLICATIONS**



**OPERATING PRINCIPLE**

Control of the level of a conductive liquid at specific points (high and low levels) with an alarm for a level which is abnormally high or low.  
The principle is based on measurement of the apparent resistance of the liquid between submerged probes. When this value is lower than the preset threshold on the unit front face, the output relay R1 and/or the alarm relay R2 change state.

To avoid electrolytic phenomena, an AC current runs across the probes.  
**Adjusting sensitivity**  
Set the sensitivity so that the relay will change state when the probes are in contact with the liquid. Then check that the relay returns to its initial position as soon as the probes emerge.  
In certain applications, fine-tuning the sensitivity prevents inappropriate detection, such as the presence of foam or bubbles on the surface or the occurrence of leakage impedance between probes (extended line capacity, humidity, etc).  
**Note:**  
Latching of the alarm relay R2 in de-energised state if a fault occurs can be programmed via a switch on the underside of the unit (only when the unit is switched off). To reset alarm relay R2, cut the power, as long as the levels are reset.

**Programming**  
The FN level controller can be programmed using 3 switches on the lower panel:

|          |          |         |  |
|----------|----------|---------|--|
|          | 1        | 0       |  |
| Memory   | OFF      | ON      |  |
| Alarm    | Low      | High    |  |
| Function | Emptying | Filling |  |

**Note :** Memory, Alarm and Function must only be selected when the unit is switched off.

**ORDERING GUIDE**

|                    |                |                |
|--------------------|----------------|----------------|
| <b>Type</b>        | <b>Voltage</b> | <b>Part No</b> |
| FN.230A            | 230Vac         | 84 870 504     |
| FN.120A            | 120Vac         | 84 870 503     |
| FN.48A             | 48Vac          | 84 870 502     |
| FN.24A             | 24Vac          | 84 870 501     |
| FN.230A (low sens) | 230Vac         | 84 870 803     |

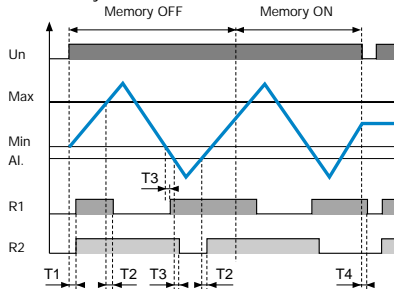
For dimensions see page 95.

**FN - LIQUID LEVEL CONTROL WITH ALARM Continued**

**OPERATING PRINCIPLE CONTINUED**

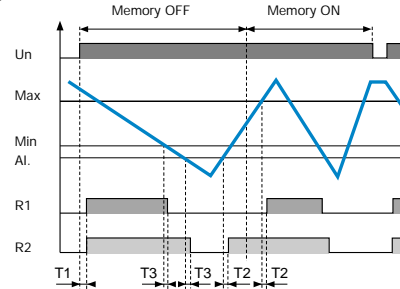
**Filling control with low alarm**

On power-up, probe Al. is submerged, relays R1 and R2 are energised and the pump is ON : filling starts, the LED for relay R1 is lit. When the level reaches the Max probe, relay R1 de-energises and the pump is OFF : filling stops, the LED for relay R1 goes off. Relay R1 re-energises when the Min probe emerges. In the event of a fault (level continues to fall) probe Al. emerges, relay R2 de-energises and the alarm is triggered : the LED for relay R2 is lit. This fault can be stored.



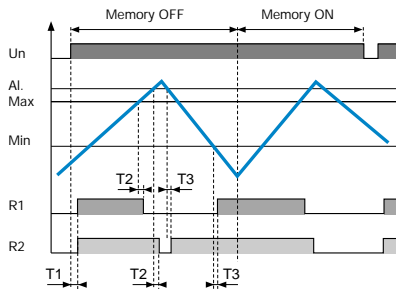
**Emptying control with low alarm**

On power-up, probes Min, Max and Al. are submerged, relays R1 and R2 are energised and the pump is ON : emptying starts, the LED for relay R1 is lit. When the Min probe emerges, relay R1 de-energises and the pump is OFF : emptying stops, the LED for relay R1 goes off. If, in the event of a fault, the level continues to fall and probe Al. emerges, relay R2 de-energises and the alarm is triggered : the LED for relay R2 is lit. This fault can be stored.



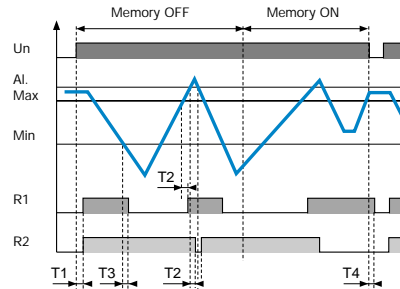
**Filling control with high alarm**

On power-up, the level in the tank is low, relays R1 and R2 are energised and the pump is ON : filling starts, the LED for relay R1 is lit. When the level reaches the Max probe, relay R1 de-energises and the pump is OFF : filling stops, the relay LED goes off. If, in the event of a fault, the level continues to rise and reaches probe Al., relay R2 de-energises and the alarm is triggered : the LED for relay R2 is lit. This fault can be stored.



**Emptying control with high alarm**

On power-up, probes Min, Max are submerged and probe Al. is above the level of the liquid. Relays R1 and R2 are energised and the pump is ON : emptying starts, the LED for relay R1 is lit. When the Min probe emerges, relay R1 de-energises and the pump is OFF : emptying stops, the LED for relay R1 goes off. If, in the event of a fault, the level continues to rise and reaches probe Al., relay R2 de-energises and the alarm is triggered : the LED for relay R2 is lit. This fault can be stored.

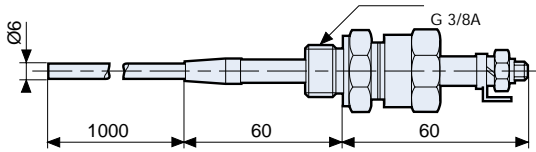


**Note:** T1 : Delay on pick-up T2 : Response time on probe immersion

T3 : Response time on probe immersion T4 : Response time on power-down

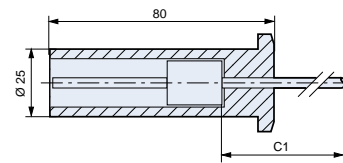
**LIQUID LEVEL CONTROL ACCESSORIES**

**S3 (79 696 014)**



- Electrode holder with a single sensor
- Standard length 1000 mm
- 304 stainless steel
- Special high temperature : 200 °C and high pressure : up to 25 kg/cm<sup>2</sup>

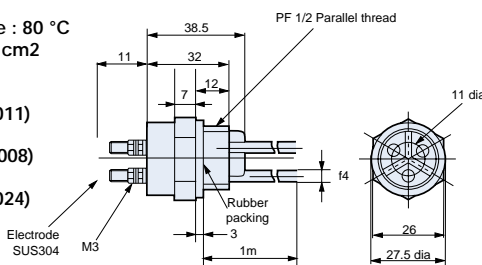
**S7 (79 696 043)**



- Protected electrode for mounting by suspension
- Protective shell : nylon 6/6 (S4)

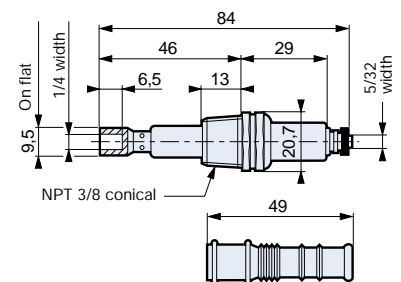
**S8 (79 696 044)**

- A light, compact, 3-sensor electrode holder
- Operating temperature : 80 °C
- Max. pressure : 2 kg / cm<sup>2</sup>
- Electrodes :
  - Length 300 mm = T300 (79 696 011)
  - Length 1000 mm = T1000 (79 696 008)
  - Length 600 mm = T600 (79 696 024)



**S5 (79 696 006)**

- Suitable for high pressures and high temperatures. For use up to 350 °C and 15 kg/cm<sup>2</sup>
- Metal parts of stainless steel, isolated by ceramic.
- 3/8" BSP mounting thread.



NB. With all of the above controls the probe cable should not exceed 100m. This does not need to be screened but should not run next to power cables. If it is screened the screen needs to be connected to common ground. Maximum cable capacitances are: low sensitivity 100nF, standard sensitivity 10nF, high sensitivity 1nF.



MCI AC CURRENT CONTROL

- Monitors ac currents
- Measures from 1A to 20A directly
- Built-in CT for ease of installation
- Slim 17.5mm housing
- Wide supply voltage 24Vac/dc, 110-240Vac
- 1 x N/O output relay

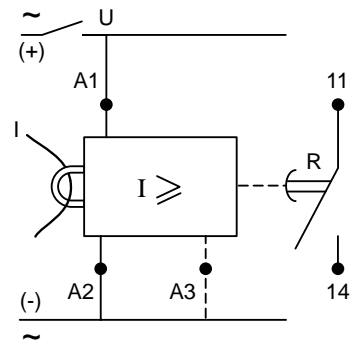
GENERAL SPECIFICATION

|                                     |   |
|-------------------------------------|---|
| Supply voltage Un                   | 24 V ~ / 110 to 240 V ~   |
| Frequency                           | 50 / 60 Hz  |
| Supply tolerance                    | ± 15% for<br>24 V ~<br>- 15% to + 10 %<br>from 110 V to 240 V ~ |
| Maximum consumption                 | 1 VA at 24 V ~<br>9 VA at 240 V ~<br>0.6 W at 24 V ~            |
| Temperature-dependent drift         | 0.06% / °C  |
| Repetition accuracy                 | 0.45%   |
| Relative humidity                   | 95% RH  |
| <b>Input</b>                        |   |
| Measured current range              | from 1 A to 20 A<br>sinusoidal                                  |
| Frequency range of measured current | from 30 Hz to 400 Hz  |
| Display accuracy                    | ± 10% of the max.<br>scale value                                |
| Switching hysteresis                | 15% of the value<br>displayed                                   |
| Maximum permanent current           | 40 A  |
| Accidental overload current         | 100 A / 3 s   |
| Response time to sensing T2         | 400 ms ± 50%  |
| Response time to sensing T3         | 120 ms ± 50%  |
| Delay on pick-up T1                 | 500 ms maximum  |

**Notes:**  
The graduated set-point scale on the front relates to sinusoidal or delta current measurement. The MCI can measure non-sinusoidal currents, for example currents subject to phase control. In this case, the display may be affected by an error coefficient which is a function of the tripping angle of the phase controller (form factor).

|                                 |  |
|---------------------------------|--|
| <b>Output</b>                   | One normally open contact.   |
| <b>Breaking capacity</b>        | 1250 VA  |
| <b>Maximum breaking current</b> | 5 A ~ - 5 A ~  |
| <b>Minimum breaking current</b> | 10 mA ~ - 10 mA  |
| <b>Maximum breaking voltage</b> | 250 V ~ - 250 V ~  |
| <b>Electrical life</b>          | 10 <sup>5</sup> operations at 1250 VA resistive                                    |
| <b>Mechanical life</b>          | 30 x 10 <sup>6</sup> operations  |
| <b>Type of contacts</b>         | AgCdO  |
| <b>Terminal capacity</b>        | 2 x 1.5 mm <sup>2</sup> with ferrule or<br>2 x 2.5 mm <sup>2</sup> without ferrule |
| <b>Temperature limits</b>       | <b>Use</b> -20 °C to + 60 °C<br><b>Stored</b> -30 °C to + 70 °C                    |
| <b>Weight</b>                   | 80 g   |
| <b>Dielectric strength</b>      | 2.5 kV / 1 minute /<br>1 mA / 50 Hz<br>(IEC 255.5)                                 |

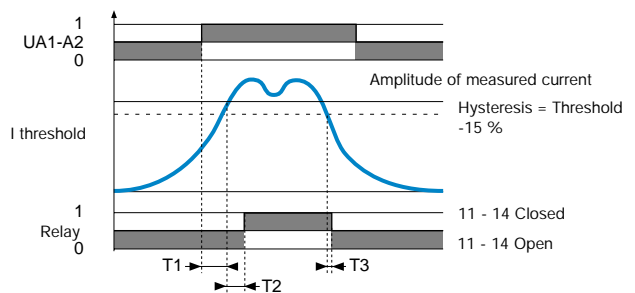
WIRING



A1 - A2 : Power supply 110...240V~  
A1 - A3 : Power supply 24V ~

OPERATING PRINCIPLE

The relay contact (11 and 14) closes if the current is greater than the threshold.  
The relay contact (11 and 14) opens if the current is less than 15 % (hysteresis) of the threshold.



**Note :**  
Delay on pick-up (T1) 500 ms maximum. Response time to sensing (T2) 400 ms ± 50 %.  
Response time to turn-off (T3) 120 ms ± 50 %.

ORDERING GUIDE

|             |                      |                |
|-------------|----------------------|----------------|
| <b>Type</b> | <b>Voltage</b>       | <b>Part No</b> |
| MCI         | 24Vac/dc, 110-240Vac | 84 871 102     |



EI CURRENT CONTROL

- EIL = 5mA to 500mA ac/dc  
EIH = 100 mA to 10A ac/dc  
EIT = 10 to 100A (with CT) ac only
- Selectable latching or non-latching output relay
- Up to 20s adjustable power on delay to allow for startup surges
- Under or over current selectable
- Separate dial for setting of threshold and hysteresis

OPERATING PRINCIPLE

AC/DC control without memory.

When the value of the controlled current, either AC or DC, reaches the threshold displayed on the front face, the output relay changes state at the end of time delay T1.

It returns instantly to the initial state when the current drops below the hysteresis threshold, or when the power supply is disconnected.

AC/DC control with memory.

The output relay changes state at the end of time delay T1 and remains latched in this position. To reset the memory function the auxiliary supply must be disconnected.

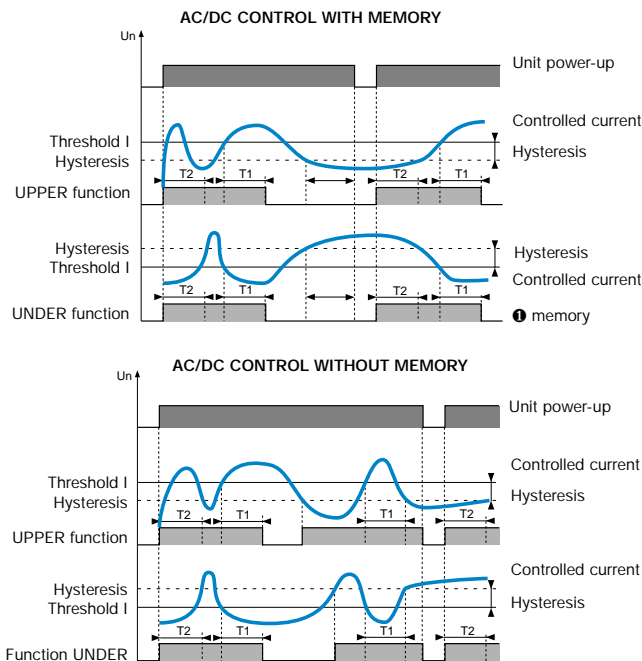
Over-current function (UPPER).

The time delay on energisation T2 prevents current peaks due to motor starting. The delay on upward crossing of threshold T1 provides immunity to transients and other interference, thereby preventing spurious triggering of the output relay.

Under-current function (UNDER).

The time delay on energisation T2 prevents the occurrence of current troughs. The delay on downward crossing of threshold T1 provides immunity to random dips, thereby preventing spurious triggering of the output relay.

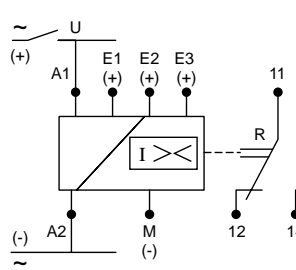
**Note:** In underload function, the absolute value of the hysteresis cannot be greater than the measurement range maximum.



During the time delays, the yellow LED flashes at a frequency of 1 Hz.

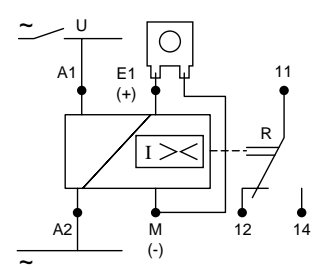
WIRING

EIL/EIH



A1 - A2: power supply

EIT



A1 - A2: power supply

GENERAL SPECIFICATION

| Type   | EIL   | EIH           | EIT          |
|--|---|---------------|--------------|
| Supply voltage Un                            | 230 V, 110 V, 48 V, 24 Vac 50 / 60 Hz (galvanic isolation by transformer)<br>24 V --- (No galvanic isolation) (1) |               |              |
| Supply tolerance                             | 0.85 to 1.15 Un*  |               |              |
| Maximum power consumption                    | 3 VA ~<br>1 W ---   |               |              |
| Frequency of measured signal                 | 40 Hz to 500 Hz   |               |              |
| Adjustable hysteresis                        | 5 to 50% of the displayed threshold   |               |              |
| Threshold value range                        | 10 to 100% of the measurement   |               |              |
| Display accuracy of the preset threshold     | ±10%  |               |              |
| Repetition accuracy with constant parameters | ±0.1%   |               |              |
| Voltage drift                                | ±0.1% (±10% Un)   |               |              |
| Temperature drift                            | ±0.02%  |               |              |
| Delay on energisation T2                     | 1 s to 20 s ±10%  |               |              |
| Delay on upward crossing of threshold T1     | 0.1 s to 3 s, 0 ± 10%   |               |              |
| Delay on pick-up                             | 500 ms  |               |              |
| Output relay                                 | 1 AgCdO changeover, 8 A ~ max   |               |              |
| Temperature Use                              | -20 °C to +60 °C  |               |              |
| limits Stored                                | -30 °C to +70 °C  |               |              |
| Weight                                       | 140 g   |               |              |
| Measurement range                            | E1-M  | E2-M          | E3 M         |
| Inputs Sensitivity                           | 2 to 20 mA  | 10 to 100 mA  | 50 to 500 mA |
| Input resistance                             | 0.1 to 1 Ω  | 0.5 to 5 Ω    | 1 to 10 Ω    |
|  | 0.1 to 1 Ω  | 0.02 to 0.1 Ω | 0.01 to 20 Ω |

(1) The "negative" poles of the auxiliary power supply and the measurement circuit are connected inside the unit.

\* Voltage limited to Un + 10% if other products are mounted adjacently on the same DIN rail.

ORDERING GUIDE

| Type     | Voltage | Part No    | Type     | Voltage | Part No    | Type                | Voltage | Part No    |
|----------|---------|------------|----------|---------|------------|---------------------|---------|------------|
| EIL.230A | 230Vac  | 84 871 005 | EIH.230A | 230Vac  | 84 871 010 | EIT.230A            | 230Vac  | 84 871 205 |
| EIL.110A | 110Vac  | 84 871 004 | EIH.110A | 110Vac  | 84 871 009 | EIT.110A            | 110Vac  | 84 871 204 |
| EIL.48A  | 48Vac   | 84 871 003 | EIH.48A  | 48Vac   | 84 871 008 | EIT.48A             | 48Vac   | 84 871 203 |
| EIL.24A  | 24Vac   | 84 871 002 | EIH.24A  | 24Vac   | 84 871 007 | EIT.24A             | 24Vac   | 84 871 202 |
| EIL.24D  | 24Vdc   | 84 871 001 | EIH.24D  | 24Vdc   | 84 871 006 | EIT.24D             | 24Vdc   | 84 871 201 |
|          |         |            |          |         |            | Current transformer |         | 26 852 304 |

For dimensions see page 95.



EUL/EUH VOLTAGE CONTROL

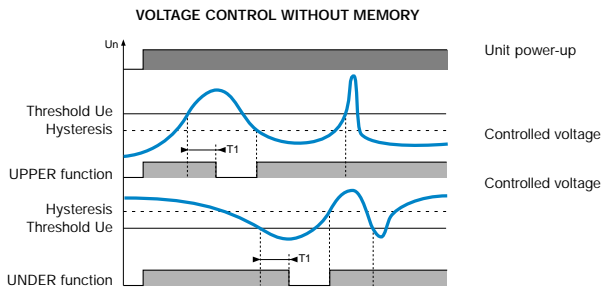
- Monitors ac and dc voltages
- Measuring from 0.2V to 600V  
EUL = 0.2V to 60V ac/dc  
EUH = 10V to 600V ac/dc
- Selectable latching or non-latching output relay
- Under or over voltage selectable
- Separate dial for setting of threshold and hysteresis

OPERATING PRINCIPLE

Control of AC / DC voltage without memory

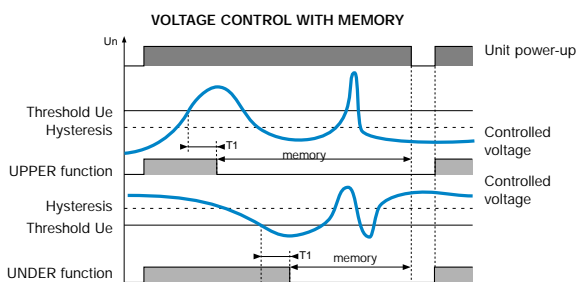
When the value of the controlled voltage, AC or DC, reaches the threshold  $U_e$  displayed on the front face, the output relay changes state at the end of a time delay  $T_1$ , which can be set on the front face at between 0.1 and 3 s.

Once the voltage drops below 5 to 50% of the threshold (hysteresis), the output relay changes state again instantly. Changing the hysteresis on the front face does not therefore modify the value of the preset threshold.

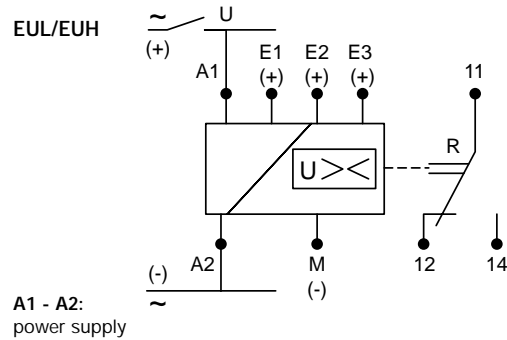


Control of AC / DC voltage with memory

When the value of the controlled voltage, AC or DC, reaches the threshold  $U_e$  displayed on the front face, the output relay changes state at the end of a time delay  $T_1$  which can be set on the front face at between 0.1 and 3 s, and remains latched in this position.



WIRING



GENERAL SPECIFICATION

| <b>Types</b>  | <b>EUL EUH</b>  |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
|---|---|-----------|-----------|-------------|------------|-------------|------|------|-------------|------------|-----------|-----------|-------------|------------|-------------|------------------|------|-------|------|--------|--------|--------|
| <b>Supply voltage <math>U_n</math></b>                        | 24 V, 120 V, 230 V 50 / 60 Hz (galvanic isolation via transformer).<br>24 V ... (No galvanic isolation) <sup>(1)</sup>  |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| <b>Operating range</b>  | 0.85 to 1.15 $U_n^*$  |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| <b>Maximum power consumption</b>                              | 3 VA ~ / 1 W ...  |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| <b>Frequency of measured signal</b>                           | 40 to 500 Hz  |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| <b>Threshold <math>U_e</math></b>                             | Adjustment from 1 to 100% of the measurement range  |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| <b>Hysteresis</b>   | Adjustment from 5 to 50% of the displayed threshold   |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| <b>Display accuracy</b>                                       | ±10% of the full scale  |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| <b>Delay on upward crossing of threshold <math>T_1</math></b> | 0.1 to 3 s ± 10%  |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| <b>Output relay</b>   | 1 AgCdO changeover, 8 A- max  |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| <b>Operating temperature</b>                                  | -20 °C to +60 °C  |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| <b>Storage temperature</b>                                    | -30 °C to +70 °C  |           |           |             |            |             |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| <b>Measurement range</b>                                      | <table border="1"> <thead> <tr> <th>Input</th> <th>E1-M</th> <th>E2-M</th> <th>E3-M</th> <th>E1-M</th> <th>E2-M</th> <th>E3-M</th> </tr> </thead> <tbody> <tr> <td>Sensitivity</td> <td>0.2 to 2 V</td> <td>1 to 10 V</td> <td>6 to 60 V</td> <td>15 to 150 V</td> <td>30 to 300V</td> <td>60 to 600 V</td> </tr> <tr> <td>Input resistance</td> <td>2 kΩ</td> <td>10 kΩ</td> <td>60kΩ</td> <td>100 kΩ</td> <td>300 kΩ</td> <td>600 kΩ</td> </tr> </tbody> </table> | Input     | E1-M      | E2-M        | E3-M       | E1-M        | E2-M | E3-M | Sensitivity | 0.2 to 2 V | 1 to 10 V | 6 to 60 V | 15 to 150 V | 30 to 300V | 60 to 600 V | Input resistance | 2 kΩ | 10 kΩ | 60kΩ | 100 kΩ | 300 kΩ | 600 kΩ |
| Input   | E1-M  | E2-M      | E3-M      | E1-M        | E2-M       | E3-M        |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| Sensitivity   | 0.2 to 2 V  | 1 to 10 V | 6 to 60 V | 15 to 150 V | 30 to 300V | 60 to 600 V |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |
| Input resistance  | 2 kΩ  | 10 kΩ     | 60kΩ      | 100 kΩ      | 300 kΩ     | 600 kΩ      |      |      |             |            |           |           |             |            |             |                  |      |       |      |        |        |        |

(1) The "negative" poles of the auxiliary power supply and the measurement circuit are connected inside the unit.

\* Voltage limited to  $U_n + 10\%$  if other products are mounted adjacently on the same DIN rail.

ORDERING GUIDE

| Type     | Voltage | Part No    | Type     | Voltage | Part No    |
|----------|---------|------------|----------|---------|------------|
| EUL.230A | 230Vac  | 84 872 005 | EUH.230A | 230Vac  | 84 872 010 |
| EUL.120A | 120Vac  | 84 872 004 | EUH.120A | 120Vac  | 84 872 009 |
| EUL.24A  | 24Vac   | 84 872 002 | EUH.24A  | 24Vac   | 84 872 007 |
| EUL.24D  | 24Vdc   | 84 872 001 | EUH.24D  | 24Vdc   | 84 872 006 |

There is no galvanic isolation on 24Vdc version. Terminals M and A2 are connected internally...





**EUS/EUSF VOLTAGE CONTROL**

- Monitors its own power supply voltage
- Measures from 7.5 to 275v (EUS)
- Measures from 20 to 260v (EUSF)
- Selectable latching or non-latching output relay
- LED indication of relay status and power on
- Separate dial for setting of threshold and hysteresis

**OPERATING PRINCIPLE**

EUS - The operating principle of the EUS control relays is identical to that for the EU control relays. Two operating modes are available :

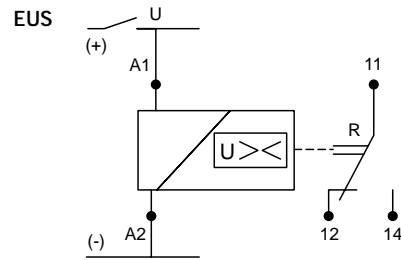
- AC / DC voltage control without memory
- AC / DC voltage control with memory (see previous page).

EUSF - The EUSF window threshold relay controls an electrical voltage which acts as its own power supply (simplified wiring). When the value of the controlled voltage, AC or DC, goes outside the window, the output relay de-energises at the end of a time delay T1 which can be set on the front face at between 0.1 and 3 s.

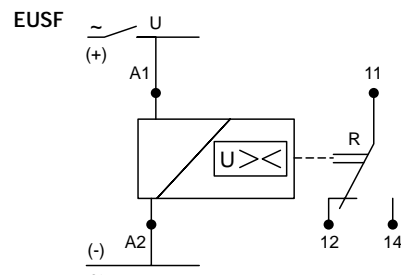
It switches back on when the voltage returns within the window and stays between the upper and lower thresholds displayed by two potentiometers on the front face. Fixed hysteresis ensures bounce-free relay switching around the thresholds.

Note : Time delay T1 on crossing the upper and lower thresholds provides protection to transients, thus preventing spurious triggering of the output relay.

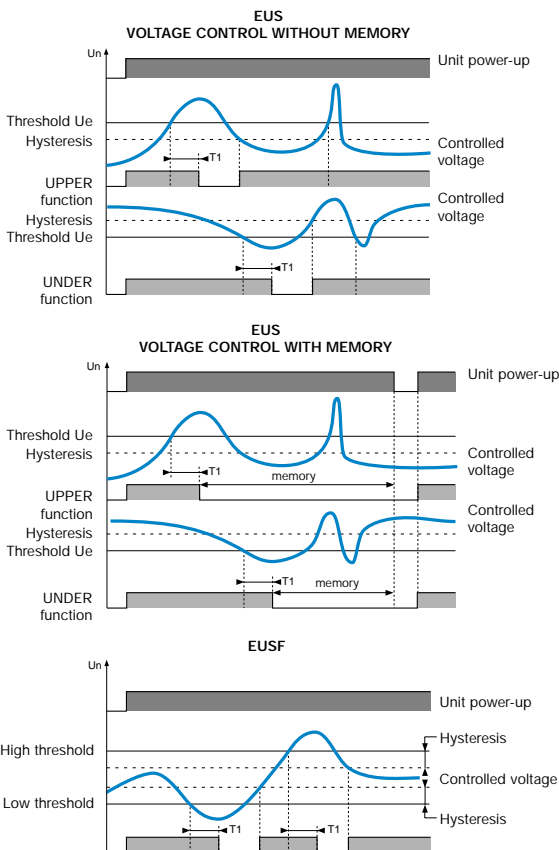
**WIRING AND APPLICATIONS**



A1 - A2 : Power supply



A1 - A2 : Power supply



**GENERAL SPECIFICATION**

| TYPES  | EUS   | EUSF   |
|--|---|--|
| <b>Supply voltage</b>                        | 7.5 to 18 V ...<br>15 to 150 V ... ~<br>50 to 275 V ... ~                       | 20 to 80 V ... ~<br>65 to 260 V ... ~<br>with protection<br>against connection<br>errors |
| <b>Maximum power consumption</b>             | (1)   | (1)  |
| <b>Frequency of measured signal</b>          | 50 / 60 Hz  | 50 / 60 Hz   |
| <b>Threshold Ue</b>                          | Direct adjustment<br>9.6 to 15.6 V ...<br>20 to 80 V ... ~<br>65 to 260 V ... ~ | Direct adjustment<br>20 to 80 V ... ~<br>65 to 260 V ... ~                               |
| <b>Hysteresis</b>                            | Adjustable from 5<br>to 20%   | Fixed 5%   |
| <b>Display accuracy</b>                      | ±10% of the full scale  | ±10% of the full scale   |
| <b>Delay on upward crossing of threshold</b> | 0.1 to 3 s ± 10%  | 0.1 to 3 s ± 10%   |
| <b>Output relay</b>                          | 1 AgCdO changeover,<br>8 A a max  | 1 AgCdO changeover,<br>8 A a max   |
| <b>Operating temperature</b>                 | -20 °C to +60 °C  | -20 °C to +60 °C   |
| <b>Storage temperature</b>                   | -30 °C to +70 °C  | -30 °C to +70 °C   |

(1) : 0,5 W at 12 ...  
0,5 VA at 80 and 260 -  
1,5 W at 80 ... and 260 ...

**ORDERING GUIDE**

| Type        | Setting range (as displayed on dial) | Supply voltage  | Part No    |
|-------------|--------------------------------------|-----------------|------------|
| EUS.12D     | 9.6 to 15.6Vdc                       | 7.5 - 18V dc    | 84 872 100 |
| EUS.20-80   | 20 to 80V ac/dc                      | 15-150V ac/dc   | 84 872 101 |
| EUS.90-270  | 65 to 260V ac/dc                     | 50 - 275V ac/dc | 84 872 102 |
| EUSF.20-80  | 20 to 80V ac/dc                      | 20 - 80-V ac/dc | 84 872 201 |
| EUSF.90-270 | 65 to 260V ac/dc                     | 65 - 260V ac/dc | 84 872 202 |

For dimensions see page 95.

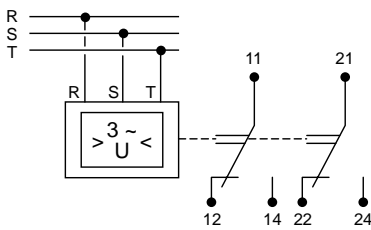


F3US/F3USN 3 PHASE UNDER/OVER VOLTAGE

- Window type under/over voltage of 3 phase network
- Powered from supply being measured
- Detects loss of phase
- LED indication of under or over voltage and relay status
- 2 changeover relay output
  - 1 for over voltage
  - 1 for under voltage
- Minimum and maximum threshold separately adjustable
- F3USN detects absence of neutral also

WIRING AND APPLICATIONS

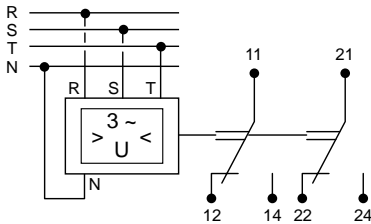
F3US



Terminal identification

- Terminals
- L1 - L2 - L3 :3-phase network being monitored
  - 11 - 12 - 14 :Output relay (R1) lower threshold
  - 21 - 22 - 24 :Output relay (R2) upper threshold

F3USN



Terminals

- L1 - L2 - L3 - N :3 phase network being monitored
- 11 - 12 - 14 :Output relay (R1) lower threshold
- 21 - 22 - 24 :Output relay (R2) upper threshold

OPERATING PRINCIPLE

The two relays are energised when the measured voltages are between the minimum and maximum thresholds which can be separately adjusted via two potentiometers on the front face.

If one or more voltages goes outside the window, the relay corresponding to the fault de-energises following a delay which can be adjusted on the front face. The relays each have individual delays (0.1 to 10 sec.).

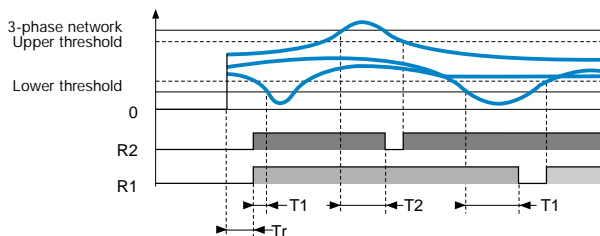
A hysteresis fixed at 3 % ensures bounce-free relay switching when the voltage levels return to a value between the upper and lower thresholds.

The unit is not affected by the phase sequence nor by harmonic distortion.

A green LED indicates the presence of the power supply voltage.

Two yellow LEDs indicate when the upper and lower thresholds have been exceeded.

The LEDs go out when the voltages are within the set window.



|               | Lower threshold | Upper threshold |
|---------------|-----------------|-----------------|
| F3US - 230 V  | 195 to 225      | 235 to 264      |
| F3US - 400 V  | 340 to 392      | 408 to 460      |
| F3USN - 230 V | 112 to 130      | 135 to 152      |
| F3USN - 400 V | 195 to 225      | 235 to 264      |

GENERAL SPECIFICATION

|  |  |
|--|--|
| Supply voltage Un on terminals L1 - L2 | 230 and 400 V ~ ± 20 % - 50/60 Hz  |
| Power                                  | 4 VA maximum at Un<br>8 VA maximum at Un +20 %   |
| Delay on pick-up                       | Approximately 3 s  |
| Immunity from micro power cuts         | 10 ms  |
| Insulation coordination                | Installation category III, degree of pollution 2 conforming to IEC 664.1 / VDE 0110 : 4 KV/2 |

CONTROL CIRCUIT

|                               |  |
|-------------------------------|--|
| Adjustment of upper threshold | 102 to 115 % of Un                                   |
| Adjustment of lower threshold | 85 to 98 % of Un                                     |
| Fault delay                   | 0.1 to 10 sec (0, +50 %)                             |
| Hysteresis                    | Approximately 3 %                                    |
| Display accuracy              | ± 10%  |
| Repetition accuracy           | upper threshold : 0.06 %<br>lower threshold : 0.09 % |
| Temperature drift             | ± 0.05 % / °C  |

OUTPUT CIRCUIT

|                          |   |
|--------------------------|---|
| Output                   | 2 AgCdO changeovers   |
| Breaking capacity        | 2000 VA                      80 W   |
| Maximum breaking current | 8 A ~                              8 A ∞  |
| Maximum breaking voltage | 250 V ~                            250 V ∞  |
| Minimum breaking current | 100 mA ~                            100 mA ∞  |
| Mechanical life          | 30 x 10 <sup>6</sup> operations   |
| Electrical life          | AC12 2000 VA - 10 <sup>5</sup> operations<br>AC15 Cos φ = 0.3 - 6000 operations<br>DC 13 L/R = 300 ms - 6000 operations |

GENERAL CHARACTERISTICS

|  |  |
|--|--|
| Delay on crossing threshold  | 0.1 to 10 s (0 ± 50 %)   |
| Display  | Power supply Green LED<br>Overvoltage relay Yellow LED<br>Undervoltage relay Yellow LED                    |
| Class of protection  | IEC 529 - Terminal IP 20, Casing IP 50   |
| Casing material  | Self-extinguishing   |
| Mounting   | Panel or DIN-rail mounted  |
| Weight   | 310 g  |
| Tightening capacity of terminals   | 2 x 1.5 mm <sup>2</sup> with ferrule<br>2 x 2.5 mm <sup>2</sup> without ferrule                            |
| Tightening torque  | 0.6 Nm maximum (M3 screw / IEC 947-1)  |
| Temperature limits   | Used -20 °C to +60 °C (conforming to IEC 68.2.14)<br>Stored -30 °C to + 70 °C (conforming to IEC 68.2.1/2) |
| Relative humidity in accordance with IEC 68.2.30 Vibrations (IEC 68.2.6) | 93 % (+2 % : -3 %) no condensation   |
|  | Amplitude 0.35 mm<br>Frequency 10 to 55 Hz   |
| Insulation resistance (IEC 255.5)  | > 10 MΩ at 500 V ∞   |
| Dielectric strength (IEC 255.5)  | > 2.5 kV / 1 min / 1 mA / 50 Hz  |
| Impulse voltage (IEC 255.5/664.1)  | 5 kV / Wave 1.2 - 50 μs  |

ORDERING GUIDE

Use F3USN for highly unbalanced systems.

Type  
F3US.400  
F3UN.400

Measurement Range  
340Vac to 460Vac  
195Vac to 264Vac

Part No  
84 873 201  
84 873 211

For dimensions see page 95.



## HDI/HDU DIGITAL DISPLAY

- Monitors ac and dc currents (HDI), Voltages (HDU)
- HDI Measures from 2mA to 10A directly  
HDIL = 2mA to 500mA  
HDIH = 100mA to 10A
- HDU Measures from 0.2V to 600V  
HDUL = 0.2V to 60V ac/dc  
HDUH = 10V to 600V ac/dc
- Selectable latching or non-latching output relay
- Over or undercurrent measurement
- Hysteresis adjustable from 5-50%

### GENERAL SPECIFICATION

|                                |  |
|--------------------------------|--|
| <b>POWER SUPPLY</b>            |  |
| Supply voltage                 | 230, 120, 24 V -<br>50 / 60 Hz 24 V ... no galvanic isolation (1)<br>protected against polarity reversal                     |
| Supply tolerance               | 0.85 to 1.10 x Un  |
| Maximum power consumption      | 3 VA at 230, 120 and 24 V -<br>1 W at 24 V ...   |
| Immunity from micro power cuts | 10 ms  |
| Delay on pick-up               | 500 ms   |
| Insulation coordination        | Category III Degree of pollution 2 acc.<br>to IEC 664-1, VDE 0110 : 4 KV/2   |
| Output                         | 1 AgCdO changeover relay - 5 A - 250 V   |
| Minimum current                | 100 mA   |
| Mechanical life                | 5 x 10 <sup>9</sup> operations   |
| Maximum rate                   | 360 operations / hr at full load   |
| Electrical life                | AC12 : 1250 VA - 10 <sup>5</sup> operations<br>AC15 : cos φ = 0.3 - 6000 operations<br>DC13 : L/R = 300 ms - 6000 operations |
| Delay on threshold crossing    | 0.1 to 3 sec ± 10 % Relay status   |
| Display on LCD                 | OVER or UNDER mode Memory function<br>Type of signal (- or ...) Measurement overflow   |
| Protection class               | IEC 529, terminal block IP 20<br>panel-mounted IP 40, casing IP 50   |
| Weight                         | ~ 160 g  |
| Terminal capacity              | 2 x 1.5 mm <sup>2</sup> with ferrule<br>2 x 2.5 mm <sup>2</sup> without ferrule  |
| Temperature                    | Use - 20 to + 60 °C<br>Stored - 30 to + 70 °C  |
| Relative humidity              | 93 % (+2% - 3 %) without condensation  |

### WIRING AND APPLICATIONS

| INPUT CIRCUITS                    | E1 - M   | E2 - M             | E3 - M             |
|-----------------------------------|--|--------------------|--------------------|
| <b>HDU - L</b>                    | <b>0.2 - 2 V</b>                                 | <b>1 - 10 V</b>    | <b>6 - 60 V</b>    |
| Input resistance                  | 2 kΩ   | 10 kΩ              | 60 kΩ              |
| Maximum permanent voltage at 20°C | 4 V  | 20 V               | 120 V              |
| Peak overload < 1 ms at 20°C      | 50 V   | 100 V              | 300 V              |
| Maximum line voltage              | 250 VAC  |                    |                    |
| <b>HDU - H</b>                    | <b>15 - 150 V</b>                                | <b>30 - 300 V</b>  | <b>60 - 600 V</b>  |
| Input resistance                  | 100 kΩ   | 300 kΩ             | 650 kΩ             |
| Maximum permanent voltage at 20°C | 200 V  | 350 V              | 650 V              |
| Peak overload < 50 μs at 20°C     | 2 kV   | 2 kV               | 2 kV               |
| Maximum line voltage              | Mains 277 / 480 VAC                              |                    |                    |
| <b>HDI - L</b>                    | <b>2 - 20 mA</b>                                 | <b>10 - 100 mA</b> | <b>50 - 500 mA</b> |
| Input resistance                  | 5 Ω  | 1 Ω                | 0.2 Ω              |
| Maximum permanent current at 20°C | 40 mA  | 200 mA             | 1 A                |
| Peak overload < 1 ms at 20°C      | 1 A  | 5 A                | 8 A                |
| Maximum line voltage              | Mains 277 / 480 VAC                              |                    |                    |
| <b>HDI - H</b>                    | <b>0.1 - 1 A</b>                                 | <b>0.5 - 5 A</b>   | <b>1 - 10 A</b>    |
| Input resistance                  | 0.1 Ω  | 0.02 Ω             | 0.01 Ω             |
| Maximum permanent current at 20°C | 2 A  | 10 A               | 14 A               |
| Peak overload < 1 s at 20°C       | 17 A   | 20 A               | 50 A               |
| Maximum line voltage              | Mains 277 / 480 VAC                              |                    |                    |
| <b>HDI &amp; HDU</b>              | Hysteresis Adjustable from 5 to 50% of threshold |                    |                    |
| Signal frequency measured in ~    | 40 to 500 Hz                                     |                    |                    |
| Threshold display precision       | ± 10%  |                    |                    |

### OPERATING PRINCIPLE

#### Operating principle

These devices are designed to control an AC or DC electrical signal : voltage using HDUs, current using HDIs.

The threshold and hysteresis can be adjusted separately via two potentiometers on the front face. Before powering up the device, the operating mode should be selected using two dipswitches located under the device (with/without memory, over/under value). The mode is validated when power is applied to terminals

#### A1 - A2.

The signal to be monitored is connected between terminals E1, E2, or E3 (depending on the range) and terminal M.

#### Operating diagrams

##### Control of voltage (HDU) or current (HDI) without memory

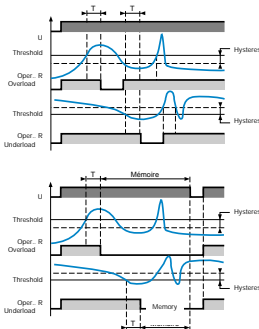
When the value of the controlled signal, AC or DC, reaches the threshold set on the front face, the output relay opens (failsafe) at the end of time delay T. It closes immediately when the signal goes below (or above in under value mode) the threshold minus hysteresis (plus hysteresis in under value mode).

##### Control of voltage (HDU) or current (HDI) with memory

When the threshold is reached, the output relay opens at the end of time-out T and remains in that position.

To reset the relay, the supply must be cut.

This operating mode enables the detection of over or under values of short duration.



#### Notes

The threshold crossing time delay T, which can be adjusted on the front face from 0.1 to 3 sec, ensures immunity to transients and other interference, thus preventing spurious triggering of the output relay.

In "under value" mode, the absolute value of the hysteresis cannot be more than the maximum of the measurement range.

#### Programming - display

##### Normal mode

In this mode, the device displays the value of the measured signal, its form (a or c), the mode selected (OVER or UNDER), the memory function (ON or OFF), and the state of the output relay. In the event of measurement overflow, the display indicates OVERFLOW (by three dashes on the screen, and the flashing symbol OVER).

##### Parameter definition mode

If the user wishes to modify one of his three parameters (Threshold, Hysteresis, or Threshold delay), he simply has to set the corresponding potentiometer and the value of the modified parameter appears automatically on the screen.

After 2 seconds, the current value of the measured signal reappears on the screen : return to NORMAL mode.

##### Exception

In UNDER mode (underload), with hysteresis being always greater than the threshold, it is possible that it will exceed the maximum measurement range according to the settings (Threshold + Hysteresis > Max. Threshold). To alleviate this problem, when the user sets his hysteresis or his threshold in proportions which exceed the management capacity, the value of the hysteresis is corrected automatically so that it does not exceed the range maximum. In addition, the user is warned by the flashing symbol UNDER.

##### Parameter display mode

To review the parameters, press the pushbutton (VISU) several times in succession, which will initiate successive display of the settings. Keeping the pushbutton held down will enable you to scroll through the values.

### ORDERING GUIDE

| Type      | Voltage | Measuring Range | Part No    | Type      | Voltage | Measuring Range   | Part No    |
|-----------|---------|-----------------|------------|-----------|---------|-------------------|------------|
| HDIL.230A | 230Vac  | 2mA to 500mA    | 84 871 305 | HDUL.230A | 230Vac  | 0.2v to 60V ac/dc | 84 872 305 |
| HDIL.120A | 120Vac  | 2mA to 500mA    | 84 871 304 | HDUL.120A | 120Vac  | 0.2v to 60V ac/dc | 84 872 304 |
| HDIL.24A  | 24Vac   | 2mA to 500mA    | 84 871 302 | HDUL.24A  | 24Vac   | 0.2v to 60V ac/dc | 84 872 302 |
| HDIH.230A | 230Vac  | 100mA to 10A    | 84 871 310 | HDIH.230A | 230Vac  | 10v to 600V ac/dc | 84 872 310 |
| HDIH.120A | 120Vac  | 100mA to 10A    | 84 871 309 | HDIH.120A | 120Vac  | 10v to 600V ac/dc | 84 872 309 |
| HDIH.24A  | 24Vac   | 100mA to 10A    | 84 871 307 | HDIH.24A  | 24Vac   | 10v to 600V ac/dc | 84 872 307 |

24dc versions available please enquire

For dimensions see page 95.

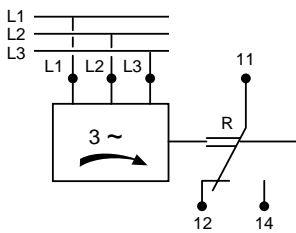


EWS/EWS2/EWS3 3 PHASE MONITOR

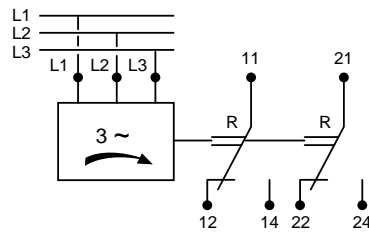
- Monitors
  - phase sequence
  - total loss of phase (no regenerated voltage allowed)
- Multi voltage (on EWS and EWS2)
- Powered from supply being measured
- LED indication of relay status
- 3 changeover relay outputs on EWS3

WIRING AND APPLICATIONS

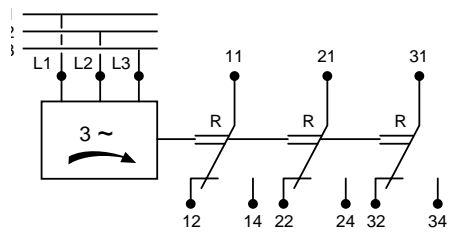
EWS



EWS2



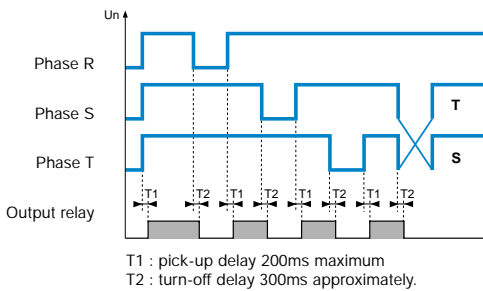
EWS3



OPERATING PRINCIPLE

EWS control relays monitor phase sequence and loss of one of the three phases. When the phase sequence is correct and none of the three phases is absent, the output relay(s) (EWS2, EWS3) are activated and the LED is lit.

If either fault - absence or phase sequence - exists, the output relay(s) de-energises at the end of time delay T2, and the LED goes off.



GENERAL SPECIFICATION

|                          |   |
|--------------------------|---|
| Frequency                | 50 / 60 Hz  |
| Maximum consumption      | 5 VA at 200 V-<br>20 VA at 400 V-<br>25 VA at 460 V-          |
| Pick-up delay T1         | maximum 200 ms  |
| Turn-off delay T2        | 300 ms approximately in the event of disconnection of a phase |
| Output relay             | AgCdO changeover  |
| Breaking capacity        | 2000 V- 80 W ...  |
| Maximum breaking current | 8 A- 8 A ...  |
| Maximum breaking voltage | 250 V- 250 V ...  |
| Electrical life          | 10 <sup>6</sup> operations at 2000 VA resistive               |
| Mechanical life          | 2.10 <sup>6</sup> operations                                  |
| Operating temperature    | - 20 °C to + 60 °C  |
| Storage temperature      | - 30 °C to + 70 °C  |
| Weight                   | 100 g EWS<br>110 g EWS2<br>135 g EWS3                         |
| Dielectric strength      | 2.5 KVA / 1 minute / 1 mA / 50 Hz (IEC 255.5)                 |

ORDERING GUIDE

| Type     | Output Relay | Measurement Range    | Supply Voltage        | Part No    |
|----------|--------------|----------------------|-----------------------|------------|
| EWS      | 1 changeover | 3 x 200Vac to 500Vac | 3 x 230Vac to 440Vac  | 84 892 290 |
| EWS2     | 2 changeover | 3 x 200Vac to 460Vac | 3 x 230Vac to 400 Vac | 84 873 001 |
| EWS3     | 3 changeover | 3 x 340Vac to 460Vac | 3 x 380Vac to 400Vac  | 84 873 003 |
| EWS3.230 | 3 changeover | 3 x 200Vac to 265Vac | 3 x 230Vac            | 84 873 002 |

For dimensions see page 95.



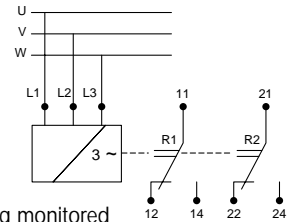
## FW 3 PHASE MONITOR

- Monitors
  - Phase sequence
  - Loss of phase (with up to 70% regenerated voltage)
  - Under voltage up to -15%
- Adjustable time delay on relay activation
- Measures 3 phase 230 or 400V systems
- Powered from supply being measured
- LED indication of power on and relay status
- 2 changeover relay outputs

## GENERAL SPECIFICATION

|  |   |
|--|---|
| Power supply                               | Self-powered - L1 - L2 terminals  |
| Supply tolerance                           | 0.7 to 1.2 x Un   |
| Frequency                                  | 50 / 60 Hz  |
| Consumption                                | 6 VA max.   |
| Immunity from micro power cuts             | 10 ms   |
| Delay on pick-up                           | 500 ms  |
| Insulation coordination                    | Category III<br>Degree of pollution 2 acc. to IEC 664-1,<br>VDE 0110 : 4 KV/2   |
| Input circuit                              |   |
| Measurement input resistance               | 1 K $\Omega$ x Un   |
| Regeneration rate                          | max 70 % of preset threshold  |
| Under-voltage detection (symmetrical drop) | ~ 15 % of pres. threshold   |
| Threshold display accuracy                 | $\pm$ 10 %  |
| Output relay                               | 2 AgCdO changeover  |
| Breaking capacity                          | 2000 VA a - 80 Wc   |
| Maximum breaking current                   | 8 A ac  |
| Minimum breaking current                   | 100 mA ac   |
| Maximum breaking voltage                   | 250 V ac  |
| Electrical life                            | 250 V ac AC12 : 2000 VA - 10 <sup>5</sup> operations<br>AC15 : cos $\varphi$ = 0.3 - 6000 operations<br>DC13 : L/R = 300 ms - 6000 operations |
| Mechanical life                            | 5 x 10 <sup>5</sup> operations  |
| Maximum rate (at full load)                | 360 operations / hr   |
| Time delay in the event of a fault         | 0.2 to 10 s (0 to +50 %)  |
| Display                                    | Voltage presence green LED<br>Relay yellow LED  |
| Casing                                     | Self-extinguishing  |
| Terminals                                  | Without ferrule 2 x 2.5 mm <sup>2</sup><br>With ferrule 2 x 1.5 mm <sup>2</sup><br>Tightening 0.6 mN max                                      |
| Temperature limits                         | Use - 20 °C to +60 °C<br>Stored -30 °C to +70 °C  |
| Relative humidity                          | 93 % without condensation   |
| Vibration                                  | Amplitude 0.35 mm<br>Frequency 10 -55 Hz  |
| Insulation resistance                      | >100 M $\Omega$ at 500 V  |
| Dielectric strength                        | 3 kV at 1 mA for 1 minute / 50 Hz   |
| Approvals                                  | UL and (c) UL (File E 87 133)   |
| Weight                                     | ~ 350 g   |

## WIRING AND APPLICATIONS



## Terminal Identification

L1 - L2 - L3: 3-phase network being monitored

12 - 13 - 14: Output relay

L1 - L2 - L3: Output relay

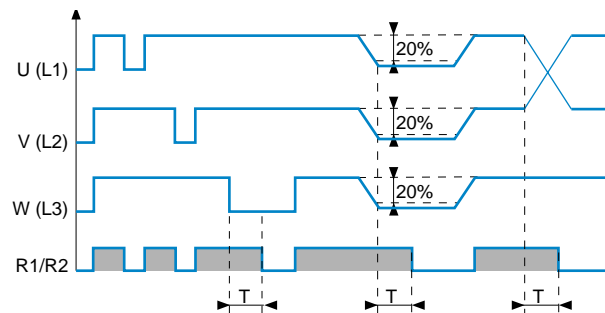
## OPERATING PRINCIPLE

In a 3-phase network, the FW simultaneously monitors phase sequencing, loss of phase with a maximum regeneration rate of 70 % of the voltage displayed by a potentiometer on the front face, and symmetrical voltage drop on the 3 phases of less than 20 % of the preset value.

When the 3 phases succeed one another, the output relay is activated and indicated via a yellow LED.

The output relay de-energises (LED off) after a time delay T, adjustable between 0.2 and 10 seconds on the front face, if one of the following faults is present :

- reversed direction of phase rotation
- absence of one or more phases
- voltage drop



## Note:

Time delay T is not operational during loss of L1 and L2. It operates during loss of L3, phase inversion or voltage drop. Its role is to prevent spurious triggering of output relays during transient states, notably during motor starting.

## ORDERING GUIDE

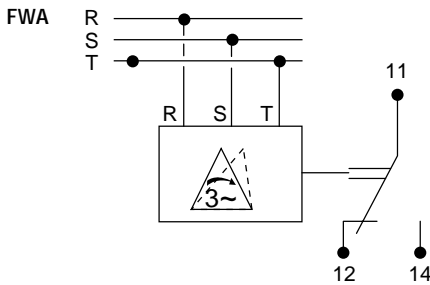
| Type   | Monitoring Voltage | Part No    |
|--|--------------------|------------|
| FW.400   | 3x400Vac           | 84 873 012 |
| FW.230   | 3x230Vac           | 84 873 010 |
| Other voltage ranges available please enquire. |                    |            |



**FWA 3 PHASE MONITOR**

- **Monitors**
  - phase sequence
  - loss of phase (with up to 95% regenerated voltage)
  - under voltage up to -15%
  - asymmetry between phases
- Adjustable time delay on relay activation
- Measures 3 phase 230 or 400V systems
- Powered from supply being measured
- LED indication of power on and relay status

**WIRING AND APPLICATIONS**

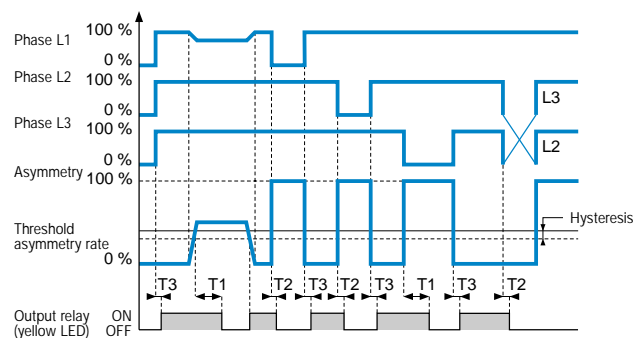


**Terminal identification**

Terminals L1 - L2 - L3 :3 phase network being monitored  
 11 - 12 - 14 :Output relay

**OPERATING PRINCIPLE**

The device is self-powered by two phases.  
 A green LED indicates the presence of the power supply voltage.  
 When the phase sequence is correct and the asymmetry rate is lower than the threshold displayed on the front face, the output relay is energised, indicated by a yellow LED.  
 The output relay de-energises after a delay T1, adjustable from the front face, if one of the following faults is present :  
 - incorrect phase sequence,  
 - absence of L3,  
 - asymmetry rate higher than the threshold displayed. This imbalance represents the increase or decrease in the voltage of two phases compared to the voltage of a different phase.  
 The output relay de-energises instantaneously in the event of a break on L1 or L2.  
 A hysteresis fixed at approximately 10 % ensures bounce-free relay switching around the threshold.  
 As differential measurement is used, the FWA does not react to symmetrical increases or decreases in the network.



**Note :**  
 T2 : Delay on power-down.  
 T3 : Delay on power-up.

**GENERAL SPECIFICATION**

|   |  |
|---|--|
| <b>AUXILIARY POWER SUPPLY</b>                             |  |
| Auxiliary voltage (self-powered from terminals L1 and L2) | 230 V ~ , 400 V ~  |
| Operating range   | 0.8 • 1.2 x Un   |
| Frequency   | 50 and 60 Hz   |
| Consumption   | 4 VA max. at Un/8 VA at Un +20%  |
| Immunity from micro power cuts                            | 10 ms  |
| Delay on power-up T3                                      | 1 s max.   |
| Delay on power-down T2                                    | 300 ms max.  |
| Insulation coordination                                   | Installation category III Degree of pollution 2 conforming to IEC 664-1, VDE 0110 : 4 KV/2                             |
| <b>INPUT CIRCUIT</b>                                      |  |
| 3-phase network   | Nominal voltage 3 x 230 V ~ - 3 x 400 V ~<br>Operating range 185 to 275 V ~ - 320 to 480 V ~                           |
| Frequency (can be altered via switch underneath device)   | 50 and 60 Hz   |
| Regeneration rate   | Maximum 95 % Un  |
| Adjustment of asymmetry rate                              | 5 to 20 % Un   |
| Threshold display accuracy (in accordance with VDE 0435)  | ± 20 % at full scale   |
| Temperature drift   | 0.1 % / °C   |
| Repetition accuracy                                       | ± 1 % at full scale  |
| Fixed hysteresis  | 10 % of displayed threshold  |
| <b>OUTPUT CIRCUIT</b>                                     |  |
| Output  | 1 volt-free changeover relay   |
| Type of contacts  | AgCdO  |
| Breaking capacity   | 2000 VA 80 W ---   |
| Maximum breaking current                                  | 8 V ~ ---  |
| Maximum breaking voltage                                  | 250 V ~ ---  |
| Minimum breaking current                                  | 100 mA ~ ---   |
| Electrical life   | AC12 2000 VA - 10 <sup>5</sup> operations<br>AC15 Cos φ = 0.3 - 6000 operations<br>DC13 L/R = 300 ms - 6000 operations |
| Maximum rate  | 360 operations / hour at full load   |
| Mechanical life   | 5 x 10 <sup>6</sup> operations   |
| <b>OTHER CHARACTERISTICS</b>                              |  |
| Delay in the event of fault (T1)                          | 0.5 to 10 s (-0, +60 %)  |
| Display   | Power supply Green LED<br>Relay Yellow LED   |
| Class of protection (IEC 529)                             | Term. block : IP 20 - Casing : IP 30   |
| Casing material   | Self-extinguishing   |
| Mounting  | Panel or DIN-rail mounted  |
| Weight  | 360 g  |
| Tightening capacity of terminals                          | 2 x 1.5 mm <sup>2</sup> with ferrule<br>2 x 2.5 mm <sup>2</sup> without ferrule  |
| Temperature limits  | Used -20 °C to +60 °C (conforming to IEC 68.2.14)<br>Stored -30 °C to +70 °C (conforming to IEC 68.2.1/2)              |
| Vibrations (IEC 68.2.6)                                   | Amplitude 0.35 mm<br>Frequency 10 to 55 Hz   |
| Insulation resistance (IEC 255.5)                         | > 100 mΩ at 500 V ---  |
| Dielectric strength (IEC 255.5)                           | 2.5 KV / 1 min / 1 mA / 50 Hz  |
| Impulse voltage (IEC 255.5 / 664.1)                       | 5 KV / Wave 1.2 - 50 μs  |

**ORDERING GUIDE**

|             |                           |                |
|-------------|---------------------------|----------------|
| <b>Type</b> | <b>Monitoring Voltage</b> | <b>Part No</b> |
| FWA.400     | 3x400Vac                  | 84 873 301     |
| FWA.230     | 3x230Vac                  | 84 873 300     |

For dimensions see page 95.

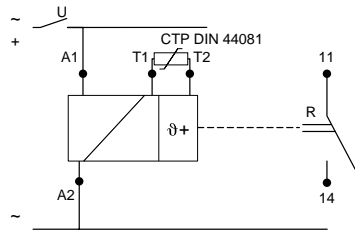


ETM/ETM2 MOTOR TEMPERATURE PROTECTION

- Monitors temperature of PTC thermistor that is built in to motor
- Push button test facility (ETM2 only)
- Sensor open/short circuit detection
- Latched output relay with manual reset or automatic reset (ETM2) (automatic reset only on ETM)
- LED indication of power on and relay status (ETM2 only)
- 1 N/O (ETM) or 1 changeover (ETM2) relay output

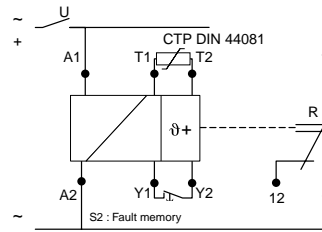
WIRING AND APPLICATIONS

ETM relay



**Terminal identification**  
 A1 - A2 : Supply Voltage  
 11 - 14 : Output relay  
 External : PTC probe

ETM 2 relay



A1 - A2 : Supply Voltage  
 11 - 12 - 14 : Output relay  
 T1 - T2 : External PTC probe  
 Y1 - Y2 : Remote reset contact

OPERATING PRINCIPLE

Control relay ETM & ETM2 is used in combination with PTC thermistor probes (not supplied) for thermal protection of machines (motors, alternators, transformers, etc). The probes are placed at critical points on the equipment to be protected (normally inserted into the stator windings of motors). The resistance of the PTC probe has a positive temperature coefficient. As soon as the nominal trip temperature of the probe is exceeded, the resistance of the probe increases rapidly. Protection relay ETM & ETM2 detects this and opens the power supply circuit of the protected equipment (eg motor) and the yellow fault indicator LED lights up (version ETM2).

Test button

The ETM2 has a TEST button which can be used to simulate a thermal overload in order to test the service condition of the relay.

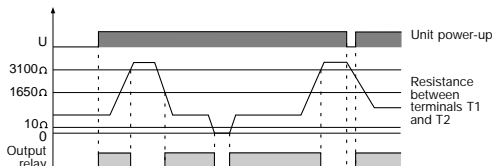
Tripping

The relay drops out as soon as the protected equipment is subjected to a thermal overload, short-circuit or break in the probe measuring circuit.

Reset WITHOUT fault latching

(Y1 and Y2 not connected for ETM2)

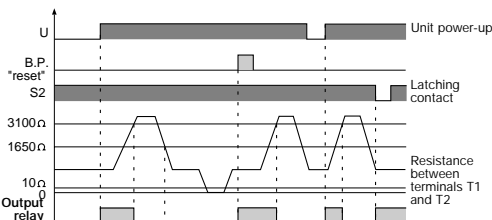
Control relay ETM & ETM2 is automatically reset as soon as the temperature drops below the trip threshold (the yellow fault indicator LED goes out).



Reset WITH fault latching (only for ETM2) (Y1 and Y2 connected)

The relay is reset either using the RESET pushbutton on the front face or by opening the external contact (remote reset), or by cutting the auxiliary power supply (terminals A1 - A2).

If the auxiliary power is cut for a period of time greater than the reset time (500 ms), the relay is reactivated if the probe detects a normal temperature when the power supply voltage is restored.



Early warning of tripping

If the equipment being protected has another PTC probe with a lower nominal trip temperature, a second ETM & ETM2 relay can be used to give early warning of tripping and thus prevent breaks in operation.

GENERAL SPECIFICATION

|                                |   |                    |
|--------------------------------|---|--------------------|
| Supply voltage Un              | 230, 120 and 24 VAC 50/60 Hz Galvanic isolation by transformer 24 VDC no galvanic isolation |                    |
| Supply tolerance               | 0.85 to 1.10 Un   |                    |
| Power                          | nominal   | 3 VA               |
|                                | maximum   | 5 VA               |
| Immunity to micro power cuts   | 10 ms   |                    |
| Delay on pick-up               | 500 ms  |                    |
| Insulation coordination        | Cat. III, degree of pollution 2 acc. to IEC 664.1 / VED 0110 : 4KV/2                        |                    |
| <b>INPUT CIRCUIT</b>           |   |                    |
| Max. resistance of cold probes | 1500 Ω  |                    |
| Trip threshold                 | 3100 Ω ± 10 %   |                    |
| Reset threshold                | 1650 Ω ± 10 %   |                    |
| Short-circuit detection        | 0 - 10 Ω  |                    |
| Measurement voltage            | ≤ 2.5 V (acc. to IEC 34.11)   |                    |
| Repetition accuracy            | ± 0.5 % with constant parameters  |                    |
| Temperature-dependent drift    | ± 0.05 % / °C   |                    |
| Voltage-dependent drift        | - 2 %   |                    |
| <b>OUTPUT CIRCUIT</b>          |   |                    |
| Output                         | 1 NO AgCdO contact  | 1 AgCdO changeover |
| Breaking capacity              | 2000 VA   | 80 W               |
| Max. breaking current          | 8 A AC  | 8 A DC             |
| Max. breaking voltage          | 250 VAC   | 250 VDC            |
| Min. breaking current          | 100 mA AC   | 100 mA DC          |
| Maximum rate                   | 360 operations / hour at full load  |                    |
| Mechanical life                | 5 x 10 <sup>6</sup> operations  |                    |
| Electrical life                | AC12 : 2000 VA - 10s  | operations         |
|                                | AC15 : Cos φ = 0.3 - 6000   | operations         |
|                                | DC13 : L/R = 300 ms - 6000  | operations         |

GENERAL CHARACTERISTICS

|                    |  |   |
|--------------------|--|---|
| Reset time         | ≤ 500 ms                                 |   |
| Response time      | ≤ 50 ms                                  |   |
| Display on ETM2    | Power supply                             | Green LED                                 |
|                    | Relay                                    | Yellow LED                                |
| Protection class   | IEC 529, Terminal block IP20 Casing IP50 |   |
| Casing material    | Self-extinguishing                       |   |
| Weight             | ~ 145 g                                  |   |
| Terminal capacity  | 2 x 1.5 mm <sup>2</sup>                  | with ferrule                              |
|                    | 2 x 2.5 mm <sup>2</sup>                  | without ferrule                           |
| Temperature limits | Use                                      | - 20 °C to + 60 °C (acc. to IEC 68.1.14)  |
|                    | Stored                                   | - 30 °C to + 70 °C (acc. to IEC 68.1.1/2) |
| Relative humidity  | 93 % (+2% ; -3%) no condensation         |   |

ORDERING GUIDE

| Type     | Supply Voltage | Part No    | Type    | Supply Voltage | Part No    |
|----------|----------------|------------|---------|----------------|------------|
| ETM2.230 | 230Vac         | 84 874 024 | ETM.230 | 230Vac         | 84 874 014 |
| ETM2.120 | 120Vac         | 84 874 023 | ETM.120 | 120Vac         | 84 874 013 |
| ETM2.24  | 24Vac/dc       | 84 874 025 | ETM.24  | 24Vac/dc       | 84 874 015 |

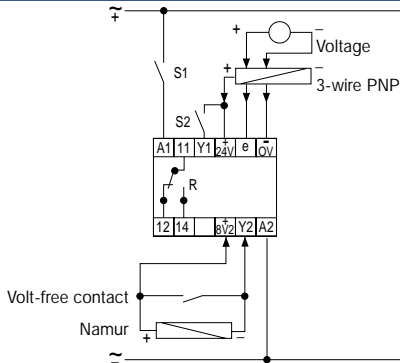
For dimensions see page 95.



FRL UNDERSPEED CONTROL

- Detection of underspeed or stopping
- Signal input by voltage, contact or sensor (3 wire or Namur)
- Selectable latching or non-latching output relay
- LED indication of relay status and power on
- Time between input pulses adjustable up to 10 minutes
- Start up delay adjustable up to 30s

WIRING AND APPLICATIONS



**Use of terminals**  
 A1 - A2 :Supply voltage  
 11 - 12 - 14 :Output relay (R)  
 +24 V - e - 0 V :PNP three-wire sensor  
 e - 0 V :Voltage input  
 +8V2 - Y2 :Contact / NAMUR sensor input

OPERATING PRINCIPLE

The FRL control relay can be used to solve underspeed problems : conveyor belts, conveyors, etc where the crossing of a low speed threshold should trigger an alarm. Speed data is collected via a sensor such as a three-wire output proximity sensor, a NAMUR sensor or by volt-free contact or voltage.

On power-up, to allow the process which is being controlled to reach its operating speed, control is inhibited for a time of between 0.3 and 30 sec, which can be adjusted on the front face.

If starting requires an inhibition time above 30 seconds, external contact S2 must be closed during starting to inhibit the FRL (during this time the yellow LED flashes), then opened when the nominal speed has been reached.

On each cycle of the process being controlled, the sensor sends a pulse to the FRL. Each of these pulses resets the internal time delay of the FRL.

If the time between two pulses is less than the value set on the FRL, the delay is reset on each pulse and the output relay remains closed.

If the speed of the process decreases, the time between pulses increases.

When the time between two pulses is greater than the value set on the FRL, the controlled process is in underspeed mode, the output relay of the FRL changes state (opens).

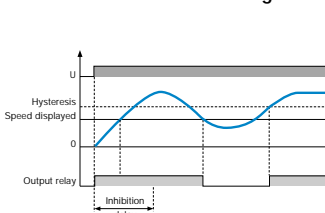
The output relay closes again when the speed of the controlled process exceeds the preset value plus the hysteresis (5 % of the value displayed).

If "memory" mode is activated, the relay remains open when an underspeed fault is detected. In this case, the output relay can only close again after a manual reset has been performed by closing external contact S2.

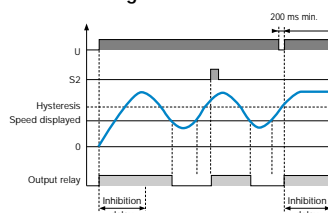
A yellow LED indicates the state of the relay.

A green LED indicates the presence of the power supply.

Without latching



With latching



GENERAL SPECIFICATION

|                              |  |
|------------------------------|--|
| Supply voltage Un            | 24, 120, 230V ~ 50/60 Hz Galvanic isolation via transformer 24V ~ without galvanic isolation |
| Supply tolerance             | 0.85 to 1.15 Un  |
| Maximum power                | Version ~ 3.5 VA max. at Un and 5 VA at Un + 15 %  |
| consumption                  | Version ~ 1 W max. at Un and 1.5 W at Un + 15 %  |
| Immunity to micro power cuts | 10 ms  |
| Insulation coordination      | Category III, degree of pollution 2 conforming to IEC 664.1/VDE 0110 : 4 KV/2                |

CONTROL / INPUT CIRCUIT

|               |                |                       |
|---------------|----------------|-----------------------|
| Input circuit | 3-wire sensors | 24 V PNP (50 mA max.) |
|               | NAMUR sensor   | 8.2 V on 1 kΩ         |
|               | Contact        | Volt-free             |
|               | Voltage input  | 30 V max.             |

|                  |                             |
|------------------|-----------------------------|
| Input resistance | 16 kΩ except for NAMUR 1 kΩ |
| High state       | Min. 4.5 V, max. 30 V       |
| Low state        | Min. 0 V, max. 1 V          |

|                             |        |
|-----------------------------|--------|
| Breaking frequency          | 200 Hz |
| Minimum pulse time          | 5 ms   |
| Minimum time between pulses | 5 ms   |

|  |             |  |
|--|-------------|--|
| Selection of delay and memory function | No memory   | 0.1 to 1 s, 1 to 10 s, 0.1 to 1 min, 1 to 10 min |
|  | With memory | 0.1 to 1 s, 1 to 10 s, 0.1 to 1 min, 1 to 10 min |

|                             |                                  |
|-----------------------------|----------------------------------|
| Hysteresis                  | 5 % of threshold displayed       |
| Display accuracy            | 10 % of full scale (@ 25 °C)     |
| Repetition accuracy         | ± 0.5 % with constant parameters |
| Temperature-dependent drift | ± 0.05 % / °C                    |
| Voltage-dependent drift     | ± 1 % / V                        |
| Reset time                  | 200 ms minimum                   |
| Reset time S2               | 100 ms minimum                   |
| Inhibition delay            | 0.3 to 30 s ± 10 %               |

OUTPUT

|                          |                    |
|--------------------------|--------------------|
| Output                   | 1 AgCdO changeover |
| Breaking capacity        | 2000 VA 80 W       |
| Maximum breaking current | 8 A ~ 8 A ~        |
| Minimum breaking current | 100 mA ~ 100 mA ~  |
| Maximum breaking voltage | 100 V ~ 100 V ~    |

|                 |                                |                                      |
|-----------------|--------------------------------|--------------------------------------|
| Mechanical life | 5 x 10 <sup>6</sup> operations |                                      |
| Electrical life | AC12                           | 2000 VA - 10 <sup>5</sup> operations |
|                 | AC15                           | Cos φ = 0.3 - 6000 operations        |
|                 | DC13                           | L/R = 300 ms - 6000 operations       |

|              |                                    |
|--------------|------------------------------------|
| Maximum rate | 360 operations / hour at full load |
|--------------|------------------------------------|

GENERAL CHARACTERISTICS

|                   |   |
|-------------------|---|
| Casing material   | Self-extinguishing                      |
| Terminal capacity | 2 x 1.5 mm <sup>2</sup> with ferrule    |
|                   | 2 x 2.5 mm <sup>2</sup> without ferrule |

|                    |        |   |
|--------------------|--------|---|
| Temperature limits | Use    | - 20 °C to + 60 °C (conforming to IEC 68.1.14)  |
|                    | Stored | - 30 °C to + 70 °C (conforming to IEC 68.1.1/2) |

|                   |   |
|-------------------|---|
| Relative humidity | 93 % (+2 % ; -3 %) without condensation |
| Weight            | 255g approximately                      |

ORDERING GUIDE

| Type     | Voltage | Part No    | Type    | Voltage | Part No    |
|----------|---------|------------|---------|---------|------------|
| FRL.230A | 230Vac  | 84 874 304 | FRL.24A | 24Vac   | 84 874 301 |
| FRL.120A | 120Vac  | 84 874 303 | FRL.24D | 24Vdc   | 84 874 300 |

For dimensions see page 95.





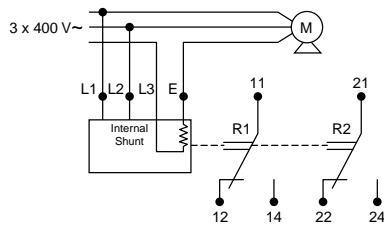
FFP MOTOR LOAD CONTROL (COSINE  $\varphi$ )



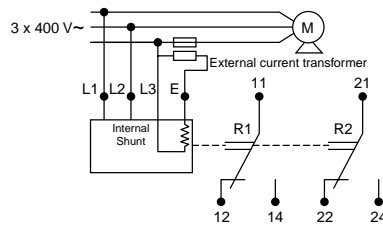
- Monitors phase shift between current and voltage (cosine  $\varphi$ )
- For monitoring of motors with load variations
- Independent setting of min and max thresholds
- Thresholds adjustable between 0 and 0.99
- Up to 20s adjustable power on delay to allow for startup surges
- Normal or reverse relay action selectable
- 2 changeover relay outputs

WIRING AND APPLICATIONS

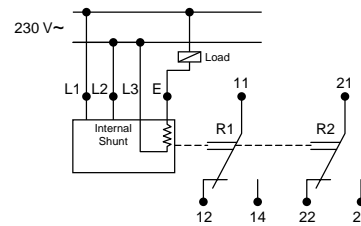
Operation on 3-phase network 1<10 A ~



Operation on 3-phase network 1>10 A ~



Operation on single phase network 230 V ~



Use of terminals

- L1 - L2 - L3: Network to be monitored
- E : Current read output
- 11 - 12 - 14: Low threshold output relay (R1)
- 21 - 22 - 24: High threshold output relay (R2)

OPERATING PRINCIPLE

The FFP control relay is used for motor protection. The variation in the power factor (current / voltage phase-shift or cosine  $\varphi$  is related to the variation in the mechanical load of the motor. The FFP control relay monitors the power factor, and therefore the mechanical load, and ensures that it stays between two defined, adjustable limits.

A green LED indicates presence of the power supply. Two yellow LEDs display the state of the output relays.

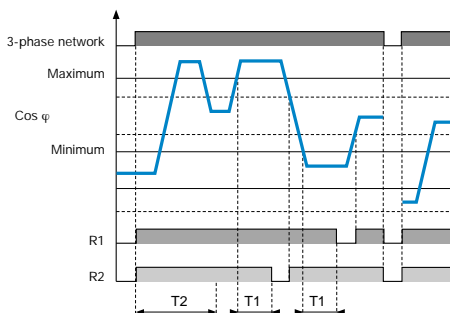
On power-up, both output relays are closed for the duration of the inhibit time (T2 adjustable between 0.5 and 20 seconds).

If the value of the power factor is between the two threshold values set, both relays are closed.

If the power factor exceeds the maximum threshold value set by the user, the high threshold relay de-energises after a delay T1 (adjustable between 0.3 and 3 seconds). During this delay, the green LED flashes (1 Hz). The relay closes again when the measured value drops below the threshold less the hysteresis.

If the power factor drops below the minimum threshold value set by the user, the low threshold relay de-energises after a delay (T1 adjustable between 0.3 and 3 seconds). During this delay, the green LED flashes. The relay closes again when the measured value is (1 Hz) above the threshold plus the hysteresis.

If the value of the high threshold is set as less than or equal to the low threshold value, the green LED flashes quickly (2 Hz).



GENERAL SPECIFICATION

|                                  |   |
|----------------------------------|---|
| Supply voltage Un                | 230, 400, 440, 480, 575 V ~ 50/60 Hz  |
|                                  | Self-powered via L1 and L2  |
| Operating range                  | 0.85 to 1.15 Un   |
| Power                            | nominal 2 VA at Un  |
|                                  | maximum 3 VA at Un + 15 %   |
| Immunity from micro power cuts   | 10 ms   |
| Insulation coordination          | Category III, degree of pollution 2 conforming to IEC 664.1 / VDE 0110 : 4 KV/2 |
| <b>INPUT / CONTROL CIRCUIT</b>   |   |
| Threshold display                | 0.1 to 0.99   |
| Voltage circuit input resistance | approx. 2 k $\Omega$ (Un)   |
| Current measurement              | by internal shunt via 2 terminals   |
| Current range                    | 0.5 to 10 A   |
| Input resistance                 | 20 m $\Omega$   |
| Maximum continuous current       | 14 A (@ 20 °C)  |
| Peak overload                    | 50 A (< 1 sec) (@ 20 °C)  |
| Delays                           | on power-up (T2) 0.5 to 20 s $\pm$ 20 % of full scale                           |
|                                  | on threshold crossing (T1) 0.3 to 3 s $\pm$ 20 % of full scale                  |
| Frequency                        | 50 ... 60 Hz  |
| Hysteresis                       | 10 % fixed for Cos $\varphi$ $\geq$ 0.4   |
|                                  | 10 % <Hyst. < 30 % for Cos $\varphi$ < 0.4                                      |
| Display accuracy                 | $\pm$ 10 % of full scale  |
| Repeat accuracy                  | $\pm$ 0.8 % with constant parameters  |
| Temperature drift                | $\pm$ 0.05 % / °C   |
| <b>OUTPUT CIRCUIT</b>            |   |
| Output                           | 2 AgCdO changeovers   |
| Breaking capacity                | 2000 VA 80 W  |
| Maximum breaking current         | 8 A ~ 8 A ---   |
| Minimum breaking current         | 100 mA ~ 100 mA ---   |
| Maximum breaking voltage         | 250 V ~ 250 V ---   |
| Mechanical life                  | 30 x 10 <sup>6</sup> operations   |
| Electrical life                  | AC12 200 VA - 10 <sup>5</sup> operations  |
|                                  | AC15 Cos $\varphi$ = 0.3 - 6000 operations                                      |
|                                  | DC13 L/R = 300 ms - 6000 operations   |
| <b>GENERAL CHARACTERISTICS</b>   |   |
| Casing material                  | Self-extinguishing  |
| Terminal capacity                | 2 x 1.5 mm <sup>2</sup> with ferrule  |
|                                  | 2 x 2.5 mm <sup>2</sup> without ferrule   |
| Temperature limits               | Use - 20 °C to + 60 °C (conforming to IEC 68.1.14)                              |
|                                  | Stored - 30 °C to + 70 °C (conforming to IEC 68.1.1/2)                          |
| Relative humidity                | 93 % (+2 % ; -3 %) no condensation  |
| Weight                           | 360 g approximately   |

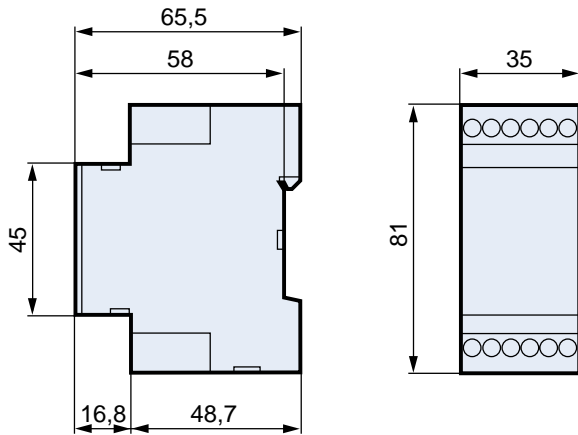
ORDERING GUIDE

|         |             |               |            |
|---------|-------------|---------------|------------|
| Type    | Voltage     | Current Range | Part No    |
| FFP.400 | 3 x 400 Vac | 0.5 to 10A    | 84 873 401 |
| FFP.230 | 3 x 230 Vac | 0.5 to 10A    | 84 873 400 |

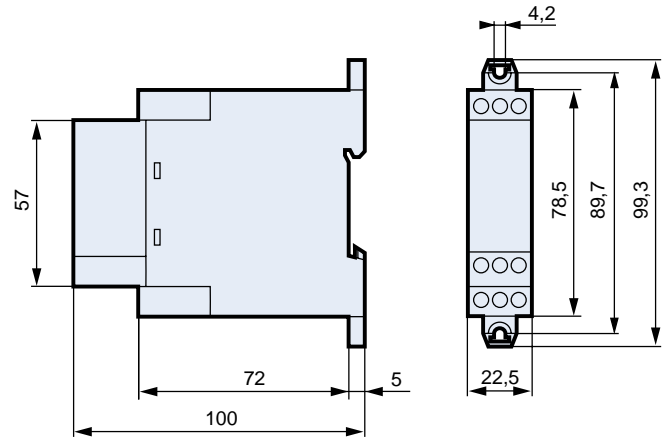
For dimensions see page 95.

**DIMENSIONS FOR CONTROL RELAYS**

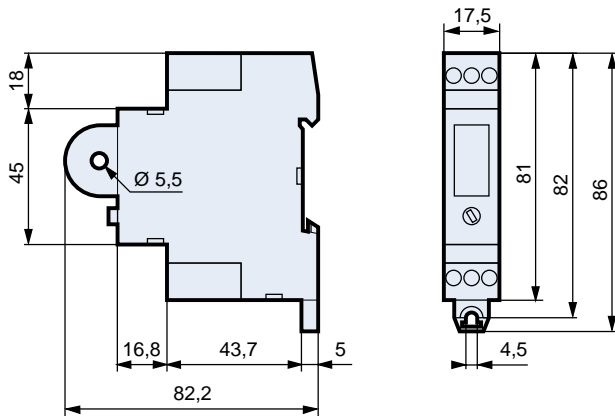
HDI - HDU



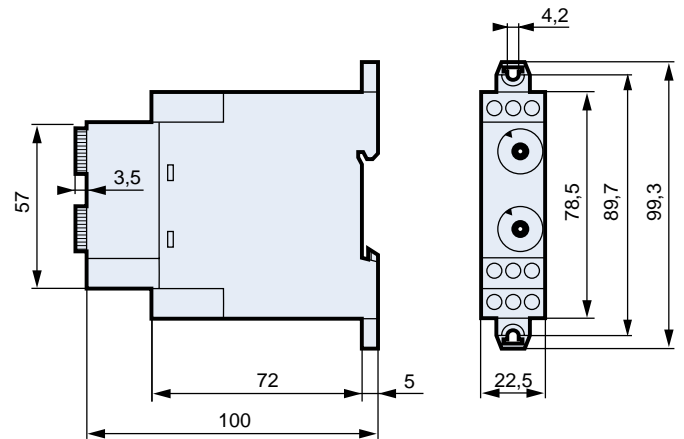
EWS - EWS2 - EWS3



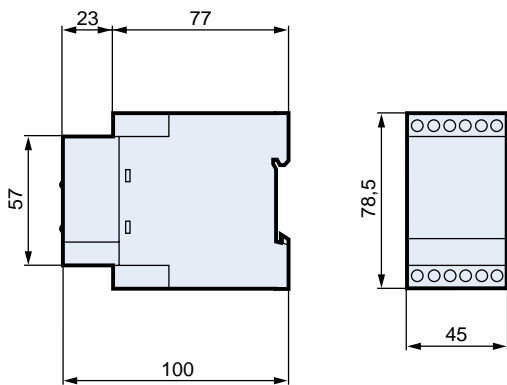
MCI



EU - EI - EIT - EUS - EUSF - ETM - ETM2 - EN



F3US - F3USN - FFP - FRL - FW - FWA - FN - F2N



Current transformer for EIT - Ref. 26 852 304

