

Over/Under Voltage, Phase Sequence, & Phase Imbalance Monitoring

Features

- Over- and under-voltage and phase imbalance limit points digitally programmable, independently of one another
- Phase sequence fault detection
- High repeatability through innovative microprocessor technology
- Voltage monitoring based on RMS measurement
- Adjustable relay delay up to 24.9 seconds per limit point
- Easy to read LCD display
- Password protected programming access

The Model **M470** is used for protection of 3-phase AC powered equipment and systems. The limit points for over-voltage, under-voltage, and phase imbalance margin can be programmed independently of each other. Therefore the instrument can be configured to precisely suit specific power line and load conditions.

Independently programmable time delays for relay energisation / de-energisation prevent unwanted responses to transient voltage variations.

Microprocessor based operation and digital programming ensure quick and precise set-up and adjustment of limit values.

prompted through the programming sequence by parameter symbols on the LCD display. After entering the password, the user can adjust the high and low voltage limit points, phase imbalance margin (as a percentage of voltage measuring range), and relay energise / de-energise delay times upto 24.9 seconds. The instrument can thus

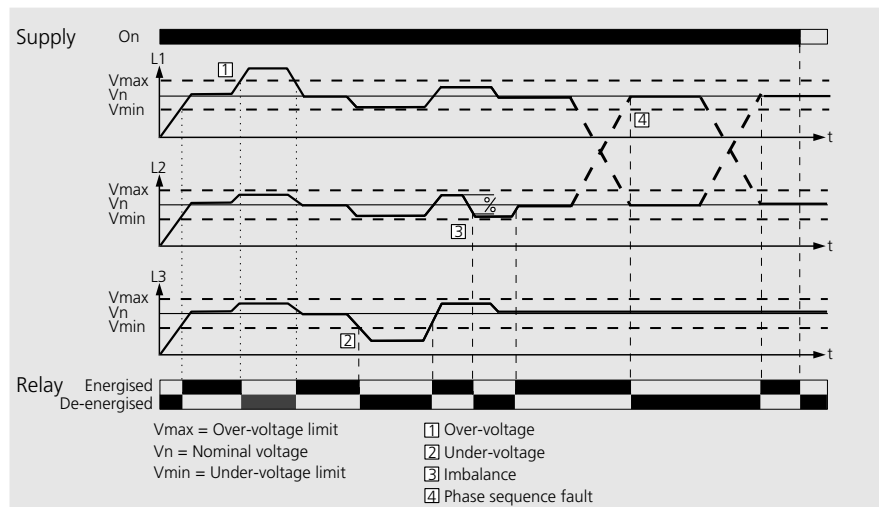
be configured exactly per the application requirements. Effects of voltage transients can be suppressed by setting suitable relay delay times. After completing the programming sequence, the settings are stored in the unit's non-volatile memory, unaffected by power supply interruptions.



Mode of Operation

The **M470** can be programmed via its front membrane keypad, while its supply voltage is switched on. To prevent unintended changes in the settings, programming is possible only through password access. The user is

Function Diagrams



Models and Ordering Data

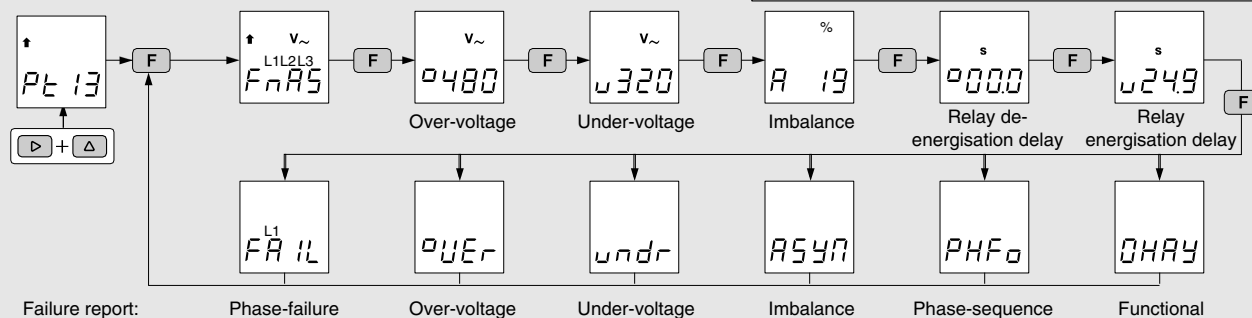
Contacts	1 change-over contact 1 normally open contact	
Measuring range	500VAC	690VAC
Type M470	Order No.	
230 VAC	072 00044	072 00041
115 VAC	072 00045	072 00042
24 VAC	072 00046	072 00043

Configuration Description

The M470 is programmed by a sequence of operations of its front membrane keys. To put the unit into programming mode, the keys \leftarrow + \rightarrow are pressed simultaneously, upon which $Pt 13$ appears on the display. The \leftarrow key is used to select one of the two numeric digits, causing it to blink. The \rightarrow key is used to change the value of the blinking digit. The value of a digit can be changed only when it is in the blinking mode. In this way, the password is set to $Pt 13$, after which programming can proceed by sequentially selecting the parameters, using the F key. After entering the password, the first operation of the F key confirms the phase imbalance monitoring function. Subsequent operations of the F key enable setting of the over-voltage limit value, under-voltage limit value, phase imbalance margin, relay de-energise delay time, and relay energise delay time. The values are entered by adjusting digit values one at a time, as for password entry. After all programming steps are finished, the message "OKAY" appears on LCD display, if voltage and phase imbalance are within programmed limits, and phase sequence is correct. To adjust any parameter value thereafter, the password must be first entered, the F key repeatedly pressed until the desired parameter step is reached, and the digit values adjusted as before. When a power fault condition occurs, both internal relays are de-energised, and the LCD display indicates the fault having the highest priority. After the fault is cleared, both relays are energised once again. In the event of a phase sequence fault, the relay de-energisation delay is ineffective (i.e., in this event, the relay is de-energised instantly). The relay energised state (contacts 11-14 closed) is indicated by the \uparrow symbol on the LCD display.

Display Parameters:

- $Pt 13$ Password: 13
- \square Over voltage limit
- \cup Under voltage limit
- $\%$ Imbalance
- s \cup 24.9 Relay de-energisation delay, max. 24.9 sec
- s \cup 24.9 Relay energisation delay, max. 24.9 sec
- \uparrow Relay energised

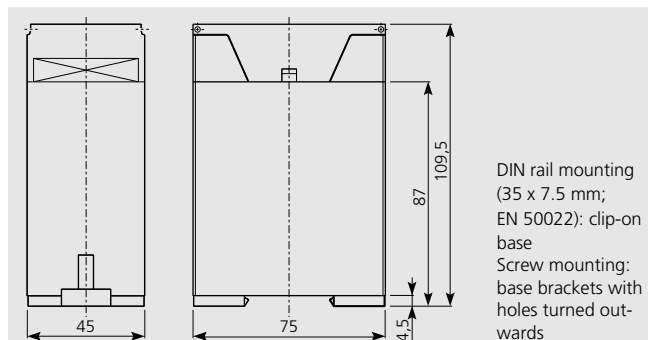


Technical Data

Voltage range	0.8 (0.85/24 V) to 1.1x rated voltage
Frequency range	50/60Hz
Power consumption	Approx. 2 VA
Relay mechanical life	10 ⁷ switching cycles
Voltage threshold accuracy	± 2%
Timing accuracy	< ± 0.5% under const. conditions
Temperature influence	< 0.01%/K
Ambient temperature	-5 °C to 60 °C, no condensation
Isolation voltage	250 V
Creep and air paths	Group III per VDE 0110; Pollution Level 2
Test voltage	2000 V per VDE 0435

Voltage measuring range	500 V _{AC} , 2 V resolution, or 690 V _{AC} , 3 V resolution
Imbalance monitoring range	5-19% of voltage measuring range
Hysteresis (fixed setting)	10 V for 500 V range; 15 V for 690 V range
Protection class	Terminals: IP 20, Enclosure: IP 40 per DIN VDE 0470-1 (11/92)
Connecting terminals	Terminal box with wire protection
Line cross section	Flexible 2.5 mm ² , connecting lead to be stripped up to max. 7 mm
Switching capacity	AC1: 250 V 5 A, DC1: 30 V 4 A
Weight	Approx. 260 g

Dimensional Diagram (all dimensions in mm)



Circuit Diagram

