

## 6.4 3UG4513 line monitoring relay

### 6.4.1 Operator controls and connection terminals

#### Front view / terminal labeling 3UG4513

| Front view | Description                           |   |
|------------|---------------------------------------|---|
|            | <b>Position digits</b>                |   |
|            | ①                                     | Terminal block (removable)<br>Connection is possible using screw-type terminals or spring-loaded terminals. |
|            | ②                                     | Rotary button for setting the nominal line voltage (3~U <sub>n</sub> )                                      |
|            | ③                                     | Rotary button for setting the tripping delay (Delay)  |
|            | ④                                     | Device article number   |
|            | ⑤                                     | Label   |
|            | ⑥                                     | Function symbol   |
|            | ⑦                                     | Status display: LED phase failure / phase sequence (red)  |
|            | ⑧                                     | Status display: LED coil symbol (green)   |
|            | <b>Terminal labels</b>                |   |
|            | L1, L2, L3                            | Rated control supply voltage  |
|            | 12                                    | Output relay K1 CO contact NC contact   |
|            | 11                                    | Output relay K1 CO contact root   |
|            | 14                                    | Output relay K1 CO contact NO contact   |
|            | 22                                    | Output relay K2 CO contact NC contact   |
|            | 21                                    | Output relay K2 CO contact root   |
| 24         | Output relay K2 CO contact NO contact |   |

You can find additional information on the connection terminals and the permissible conductor cross-sections in the Chapter "Connection methods (Page 21)".

You can find information on connecting in the Chapter "Circuit diagrams (Page 126)".

## 6.4.2 Function

### General functionality

The 3UG4513 line monitoring relays monitor for **phase sequence**, **phase failure** of one of the three phases, and **undershoot** of at least one line-to-line voltage of the set nominal line voltage by 20 % in a three-phase system.

The devices are **self-powered** (measuring voltage = rated control supply voltage) and work on the closed-circuit principle. The 3UG4513 line monitoring relays monitor all phases of three-phase AC networks from 160 to 690 V through terminals L1 / L2 / L3 and also draw power from all three phases simultaneously.

The 3UG4513 line monitoring relay features two rotary buttons for setting the trip delay (Delay) and the nominal line voltage ( $U_n$  3AC).

The hysteresis is 5 % of the set value of the nominal line voltage.

The 3UG4513 line monitoring relays feature 2 output relays (output relay K1 and output relay K2). The relays work synchronously.

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### Note

The specified voltages represent the absolute thresholds.

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### Monitoring

If the line voltage is switched on, the LED "coil symbol" will light up green. If the correct phase sequence is applied to terminals L1-L2-L3 and if the monitored line-to-line voltage is in the permissible range of the set nominal line voltage ( $U_n$  3AC), the output relays pick up.

If the phase sequence is incorrect, the "phase failure / phase sequence" LED flashes red and the output relays remain in their quiescent position.

If the monitored line-to-line voltage falls symmetrically (all three phase voltages at the same time) or asymmetrically (only one phase voltage) to more than 20 % below the value for the nominal line voltage set on the front of the device, after the time set on the front has elapsed (Delay), the output relays will drop out and the "phase failure / phase sequence" LED will light up red continuously. On a phase failure, the "phase failure / phase sequence" LED lights up red continuously and the output relays drop out to protect the application from any damage that may result. The set delay time has no effect on the phase failure monitoring.

Thanks to a special measuring method, a phase failure is detected with certainty despite wide-range voltage from 160 to 690 V AC and reverse power of up to 80 % from the load in the case of regenerative power recovery.

You will find the switching states of the output relays below in section "Function diagrams" and in Chapter "Diagnostics (Page 125)."

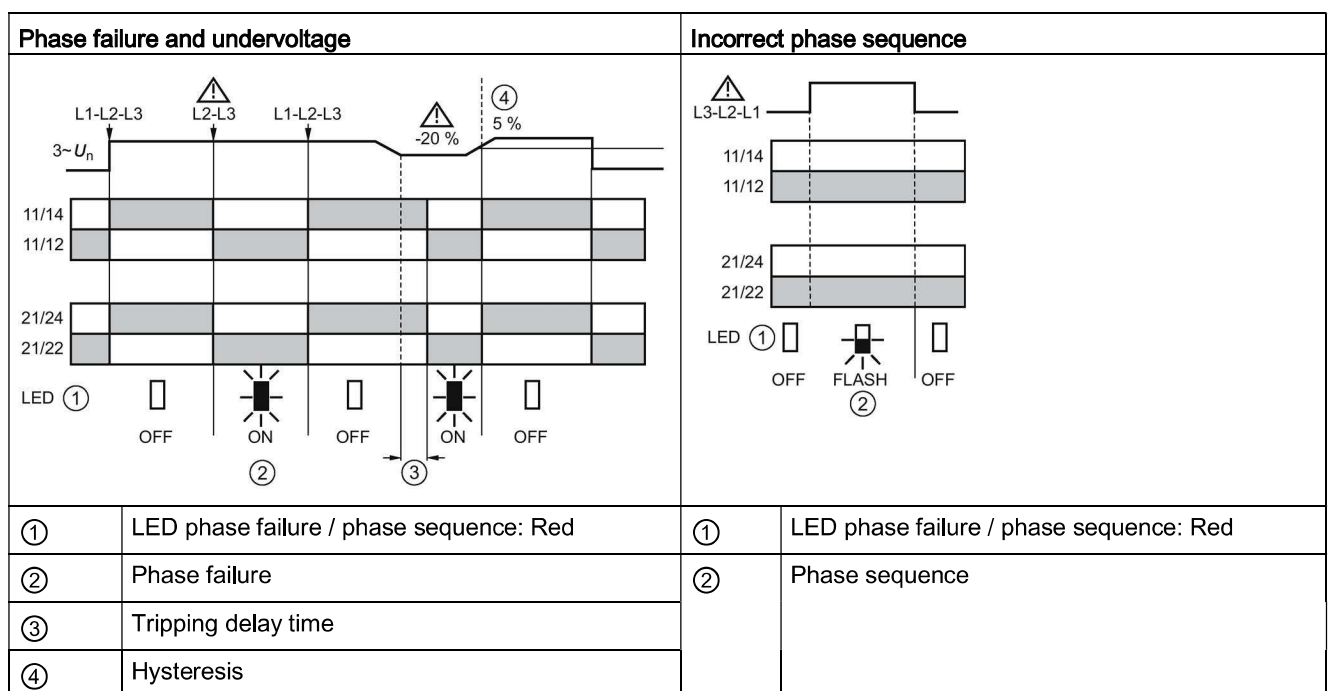
## Reset response

The device features an autoreset that resets the output relays to their original state after an error message and rectification of the fault that has occurred.

### Note

The red LED is a fault diagnostics display and does not indicate the current state of the relay!

## Function diagrams 3UG4513



### 6.4.3 Operation

#### Parameters

The following parameters can be set on the relevant rotary button using a screwdriver:

Table 6-2 Parameter information, 3UG4513 line monitoring relay

| Parameters                               | Control element <sup>1)</sup> | Setting range |                     | Increment  |
|--|-------------------------------|---------------|---------------------|------------|
|  |                               | Minimum value | Maximum value       |            |
| Tripping delay time (Delay)              | 3                             | 0.1 s         | 20 s                | Continuous |
| Nominal line voltage (3~U <sub>n</sub> ) | 2                             | 200 V         | 690 V <sup>2)</sup> | Continuous |

<sup>1)</sup> The position digits refer to the front view in Chapter "Operator controls and connection terminals (Page 121)."

<sup>2)</sup> absolute threshold

The parameters are described in Chapter "Parameters (Page 363)."

#### Required tools

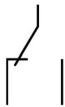
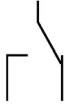



The same screwdriver can be used to set the parameters as for mounting the line monitoring relays.

## 6.4.4 Diagnostics

### 6.4.4.1 Diagnostics with LED

#### Status display

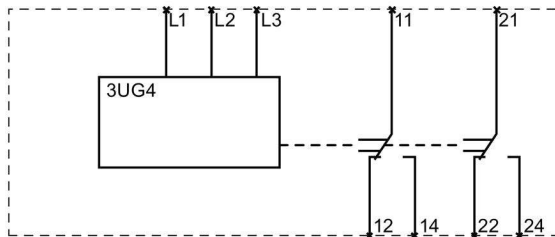
The following information about the operating state is displayed on the 3UG4513 line monitoring relays:

| Operating status  | LED                 |                                      | State of the output relays  |
|---|---------------------|--------------------------------------|---|
|   | Coil symbol (green) | Phase failure / phase sequence (red) | 12/ 11/ 14<br>22/ 21/ 24  |
| <ul style="list-style-type: none"> <li>Supply voltage not present</li> </ul>  | Off                 | Off                                  |    |
| <ul style="list-style-type: none"> <li>Supply voltage present</li> <li>Correct phase sequence</li> <li>All phases available</li> <li>Line-to-line voltage OK</li> </ul> | On                  | Off                                  |   |
| <ul style="list-style-type: none"> <li>Supply voltage present</li> <li>Incorrect phase sequence</li> </ul>  | On                  | flashing                             |  |
| <ul style="list-style-type: none"> <li>Supply voltage present</li> <li>Phase failure</li> </ul>   | On                  | On                                   |  |
| <ul style="list-style-type: none"> <li>Supply voltage present</li> <li>Line-to-line voltage undershot</li> </ul>  | On                  | On                                   |  |

You will find more information about the switching behavior of the output relays in Chapter "Function (Page 122)."

### 6.4.5 Circuit diagrams

#### Internal circuit diagrams 3UG4513 line monitoring relay



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**Note**

It is not necessary to fuse the measuring circuit to protect the device. Fusing for line protection depends on the cross-section used.

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**Note**

The 3UG4513 line monitoring relays are only suitable for line frequencies of 50 / 60 Hz!

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## 6.4.6 Technical data

### Measuring circuit

| 3UG4513-.....                            |   |             |
|--|---|-------------|
| Type of voltage for monitoring           |   | AC          |
| Number of poles for main current circuit |   | 3           |
| Measurable voltage                       |   |             |
| • for AC                                 | V | 160 ... 690 |
| Adjustable voltage range                 | V | 200 ... 690 |

### General technical details

| 3UG4513-.....   |   |                        |
|---|---|------------------------|
| Product function  |   | Phase monitoring relay |
| Type of display LED   |   | Yes                    |
| Product function  |   |                        |
| • undervoltage recognition                                      |   | Yes                    |
| • overvoltage recognition                                       |   | No                     |
| • phase sequence recognition                                    |   | Yes                    |
| • phase disturbance recognition                                 |   | Yes                    |
| • asymmetry recognition   |   | Yes                    |
| • overvoltage recognition of 3 phases                           |   | No                     |
| • undervoltage recognition of 3 phases                          |   | Yes                    |
| • tension window recognition of 3 phases                        |   | No                     |
| • reset external  |   | —                      |
| • self-reset  |   | Yes                    |
| • open-circuit or closed-circuit current principle              |   | No                     |
| Starting time after the control supply voltage has been applied | s | 1                      |
| Response time maximum   | s | 0.45                   |
| Relative adjustment accuracy                                    | % | —                      |
| Relative repeat accuracy  | % | 1                      |

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|  |    | 3UG4513-.....                               |
|--|----|---|
| <b>Type of voltage of the controlled supply voltage</b>  |    | AC  |
| <b>Control supply voltage</b>  |    |   |
| • at 50 Hz at AC rated value   | V  | 160 ... 690                                 |
| • at 60 Hz at AC rated value   | V  | 160 ... 690                                 |
| <b>Working range factor supply voltage rated value</b>   |    |   |
| • at 50 Hz for AC  |    | 1   |
| • at 60 Hz for AC  |    | 1   |
| <b>Impulse voltage resistance rated value</b>  | kV | 6   |
| <b>Recorded real power</b>   | W  | 2   |
| <b>Protection class IP</b>   |    | IP20  |
| <b>Electromagnetic compatibility</b>   |    | IEC 60947-1 / IEC 61000-6-2 / IEC 61000-6-4 |
| <b>Operating current at 17 V minimum</b>   | mA | 5   |
| <b>Continuous current of the DIAZED fuse link of the output relay</b>                          |    | A   |
|  |    | 4   |
| <b>Resistance against vibration according to IEC 60068-2-6</b>                                 |    | 1 ... 6 Hz: 15 mm, 6 ... 500 Hz: 2g         |
| <b>Resistance against shock according to IEC 60068-2-27</b>                                    |    | sinusoidal half-wave 15g / 11 ms            |
| <b>Current carrying capacity of output relay</b>   |    |   |
| • at AC-15   |    |   |
| – at 250 V at 50/60 Hz   | A  | 3   |
| – at 400 V at 50/60 Hz   | A  | 3   |
| • at DC-13   |    |   |
| – at 24 V  | A  | 1   |
| – at 125 V   | A  | 0.2   |
| – at 250 V   | A  | 0.1   |
| <b>Installation altitude at a height over sea level maximum</b>                                | m  | 2 000                                       |
| <b>Conductor-bound parasitic coupling BURST according to IEC 61000-4-4</b>                     |    | 2 kV  |
| <b>Conductor-bound parasitic coupling conductor-earth SURGE according to IEC 61000-4-5</b>     |    | 2 kV  |
| <b>Conductor-bound parasitic coupling conductor-conductor SURGE according to IEC 61000-4-5</b> |    | 1 kV  |
| <b>Electrostatic discharge according to IEC 61000-4-2</b>                                      |    | 6 kV contact discharge / 8 kV air discharge |
| <b>Field-bound parasitic coupling according to IEC 61000-4-3</b>                               |    | 10 V/m                                      |



|  |     | 3UG4513-..... |
|--|-----|---------------|
| <b>Thermal current of the contact-affected switching element maximum</b>   | A   | 5             |
| <b>Insulation voltage for overvoltage category III according to IEC 60664 with degree of pollution 3 rated value</b> | V   | 690           |
| <b>Degree of pollution</b>   |     | 3             |
| <b>Ambient temperature</b>   |     |               |
| • during operating   | °C  | -25 ... +60   |
| • during storage   | °C  | -40 ... +85   |
| • during transport   | °C  | -40 ... +85   |
| <b>Galvanic isolation</b>  |     |               |
| • between entrance and outlet  |     | Yes           |
| • between the outputs  |     | Yes           |
| • between the voltage supply and other circuits  |     | Yes           |
| <b>Mechanical operating cycles as operating time typical</b>   |     | 10 000 000    |
| <b>Electrical operating cycles as operating time at AC-15 at 230 V typical</b>                                       |     | 100 000       |
| <b>Operating cycles with 3RT2 contactor maximum</b>  | 1/h | 5 000         |

## Mechanical design

|  |     | 3UG4513-1....   | 3UG4513-2....                       |
|--|-----|---|-------------------------------------|
| <b>Width</b>   | mm  | 22.5  |                                     |
| <b>Height</b>  | mm  | 92  | 94                                  |
| <b>Depth</b>   | mm  | 91  |                                     |
| <b>Built in orientation</b>  |     | any   |                                     |
| <b>Distance, to be maintained, to earthed part</b>                           |     |   |                                     |
| • forwards   | mm  | 0   |                                     |
| • backwards  | mm  | 0   |                                     |
| • sideways   | mm  | 0   |                                     |
| • upwards  | mm  | 0   |                                     |
| • downwards  | mm  | 0   |                                     |
| <b>Distance, to be maintained, to the ranks assembly</b>                     |     |   |                                     |
| • forwards   | mm  | 0   |                                     |
| • backwards  | mm  | 0   |                                     |
| • sideways   | mm  | 0   |                                     |
| • upwards  | mm  | 0   |                                     |
| • downwards  | mm  | 0   |                                     |
| <b>Distance, to be maintained, conductive elements</b>                       |     |   |                                     |
| • forwards   | mm  | 0   |                                     |
| • backwards  | mm  | 0   |                                     |
| • sideways   | mm  | 0   |                                     |
| • upwards  | mm  | 0   |                                     |
| • downwards  | mm  | 0   |                                     |
| <b>Type of mounting</b>  |     | snap-on mounting  |                                     |
| <b>Product function removable terminal for auxiliary and control circuit</b> |     | Yes   |                                     |
| <b>Design of the electrical connection</b>                                   |     | screw-type terminals  | spring-loaded terminals             |
| <b>Type of the connectable conductor cross-section</b>                       |     |   |                                     |
| • solid  |     | 1x (0.5 ... 4 mm <sup>2</sup> ),<br>2x (0.5 ... 2.5 mm <sup>2</sup> )   | 2x (0.25 ... 1.5 mm <sup>2</sup> )  |
| • finely stranded  |     |   |                                     |
| – with wire end processing   |     | 1x (0.5 ... 2.5 mm <sup>2</sup> ),<br>2x (0.5 ... 1.5 mm <sup>2</sup> ) | 2 x (0.25 ... 1.5 mm <sup>2</sup> ) |
| – without wire end processing  |     | —   | 2x (0.25 ... 1.5 mm <sup>2</sup> )  |
| • for AWG conductors   |     |   |                                     |
| – solid  |     | 2x (20 ... 14)  | 2x (24 ... 16)                      |
| – stranded   |     | 2x (20 ... 14)  | 2x (24 ... 16)                      |
| <b>Tightening torque</b>   |     |   |                                     |
| • with screw-type terminals  | N·m | 0.8 ... 1.2   | — ...                               |
| <b>Number of change-over switches delayed switching</b>                      |     | 2   |                                     |