

## Operating Manual SPI1021

updated: 2016-06-14/Ba  
 from Firmware: 0-0

- Grid- and Plant Protection According to CEI 0-21 and DEWA standard
- with selftest for < 6kW and Watchdog
- with integrated vector shift relay
- Pr3 = default



## Table of contents

<b>1</b>	<b>Application and brief description</b> .....	<b>3</b>
<b>2</b>	<b>Summary of the functions</b> .....	<b>3</b>
<b>3</b>	<b>Display and controls</b> .....	<b>4</b>
<b>4</b>	<b>Detailed description</b> .....	<b>5</b>
4.1	Description of the connections .....	5
4.2	functional characteristics.....	6
<b>5</b>	<b>Important information</b> .....	<b>7</b>
<b>6</b>	<b>Assembly</b> .....	<b>7</b>
<b>7</b>	<b>Connection diagrams</b> .....	<b>8</b>
<b>8</b>	<b>Commissioning</b> .....	<b>9</b>
8.1	Program Setup .....	9
8.2	Control chart .....	10
8.3	description of the parameters.....	11
8.4	Display mode (last decimal point off) .....	11
8.5	Menu mode (last decimal point on) .....	12
8.6	Configuration mode (last Decimal point flashes).....	12
8.7	Selftest execute .....	12
8.8	Display Selftest result .....	12
8.9	Alarm counter .....	12
8.10	Cumulative alarm time (display in hours) .....	13
8.11	Alarm Memory .....	13
8.12	Standby counter and standby time.....	13
8.13	Code lock .....	14
8.14	Sealing .....	14
8.15	Simulation.....	15
8.16	Possible indications in display.....	16
<b>9</b>	<b>Default settings and firmware version</b> .....	<b>17</b>
<b>10</b>	<b>Technical Data</b> .....	<b>19</b>
<b>11</b>	<b>Maintenance and repair</b> .....	<b>20</b>
<b>12</b>	<b>Troubleshooting an measures</b> .....	<b>21</b>
<b>13</b>	<b>Construction form V6</b> .....	<b>22</b>
<b>14</b>	<b>Verification in conformity</b> .....	<b>23</b>

## 1 Application and brief description

The SPI1021 monitors voltage and frequency in plants for own generation of electricity. It fulfills the requirements of CEI 0-21 + DEWA.

3 selectable programs allow measuring, 3 phases to neutral (4-wire mode), 3 phases phase-phase (3-wire mode) and single phase to neutral (2-wire).

The SPI1021 can monitor all decentralized power plants, photovoltaic, wind or thermal, that feed in the low or medium voltage grid. In applications with possible asymmetry >6kVA, power balance has to be monitored extra.

All limits are preset according to CEI 0-21(Pr1-3) or DEWA (Pr4-6). They can be changed if required and be protected with a code and/or a seal.

A counter for alarms and standbys stores the last 100 events with reason and elapsed time. In addition the time the SPI1021 has interrupted the plant is recorded. All values can be read displayed at the device and give the operator valuable information about the availability of the plant.

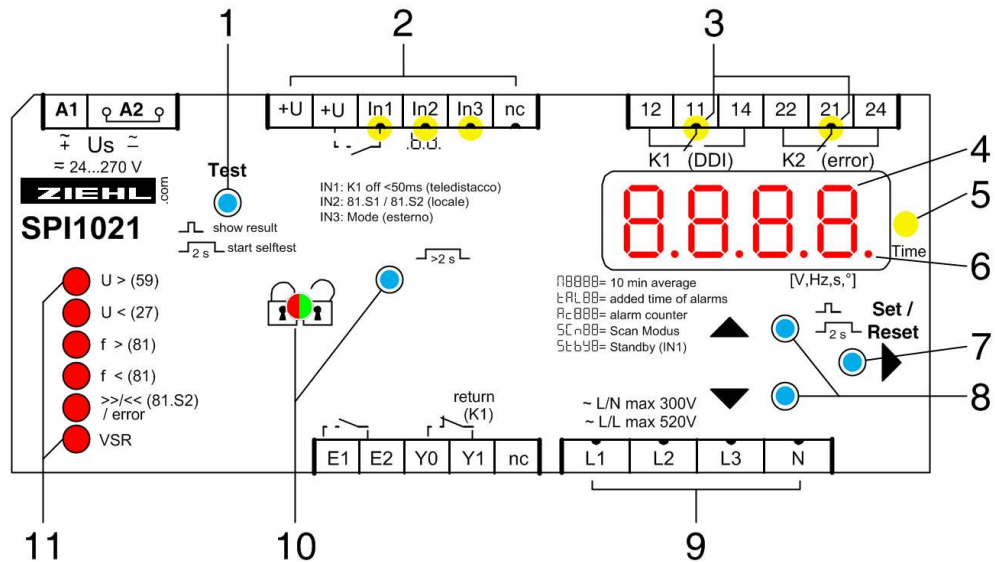
The standby input allows a remote shutoff e.g. with a RCR. It can also be used to switch to an energy saving mode by a timer or a twilight switch. Number of standbys and added time are stored and can be read in the display.

## 2 Summary of the functions

When the device has been installed, a self-test starts automatically. The self-test can be repeated when required. All values of the test are stored and can be read out at the display.

- Monitoring of under- and overvoltage 0/15-520 V
- Measuring of 3 phase with or without neutral or single phase
- Monitoring of over- and underfrequency 45-65 Hz (voltage dependent, adjustable)
- Monitoring of quality of voltage (10-minutes-average)
- Monitoring of vector-shift (connectible) an rocof (rate of change of frequency)
- Input IN2 for selection of frequency window
- Input In3 for selection of mode transitory or definitive
- Input Y0/Y1 for monitoring function of connected switch (automatic detection of nc/no)
- Relay K2 picks up (on time <500ms) only at failure at switch connected to K1, only with manual reset
- 2 restarts at switch-on error of connected switch
- Selftest with storing of values
- Switching delays adjustable 0,05...130 s
- Switching-back-delays adjustable 0...999 s
- Different switching time according to type of alarm and selected mode
- Switch-on delay 300 s
- All parameters preset according to CEI 0-21
- Alarm counter for 100 alarms with value, reason and elapsed time
- Recording of added time of alarms
- Input for standby (off time <50ms) with counter and recording of time
- Simulation for testing
- Sealing, all parameters can be read out while sealed
- Easy installation and programming with 3 preset programs
- Supply-voltage AC/DC 24-270 V
- Housing for DIN-rail-mount, 105 mm wide, mounting height 70 mm

### 3 Display and controls



#### 1 Test Button

press briefly	the selftest result is displayed, display next result
Press for > 2 s	Start selftest, K1 de-energize, K2 energize

#### 2 LEDs Inputs status (yellow)

OFF	Input not activ (open)
ON	Input activ (closed)

#### 3 LEDs relay status (yellow)

OFF	Relay is released
ON	Relay is operating

#### 4 Digital display 4-digits (red)

Depending on program, display of current voltage, frequency, vector shift, average value
Displays the alarm signals, e.g. <b>AL</b> , <b>AL</b> $\Pi$
Displays the errors with error code e.g. <b>Err</b> <b>9</b>

#### 5 LED Time (yellow)

ON	A time is displayed
----	---------------------

#### 6 Last decimal point (red)

OFF	Display mode
Illuminated	Menu mode
Flashes	Configuration mode

#### 7 Set / Reset key $\blacktriangleright$ (in display mode, normal state)

Press briefly	Display of next measured value / alarm counter
Press for > 2 s	Reset, quit error messages
Press for > 4 s	Displays the program, e.g. <b>Pr</b> <b>1</b>
Press for > 10 s	Displays the software version, e.g. <b>0-0</b>


#### 8 Up / Down key $\blacktriangle$ $\blacktriangledown$ (in display mode, normal state)

Press briefly	Change to the menu mode, display of alarm memory (Down) / cumulative time of alarms, standby counter, standby time (Up), pushing Set button for $\geq 2$ s resets the stored values
Press for > 2 s	Display of MAX (Up) / MIN (Down) - measured values, additional pushing of Set button for $\geq 2$ s deletes the stored values

#### 9 LEDs measurement allocation (yellow)

LEDs	Measured value
Lx and N ON	Voltage value (L1 against N, L2 against N, L3 against N)
Lx and Ly ON	Voltage value (L1 against L2, L2 against L3, L1 against L3)
Lx FLASHING quickly	Vector surge (L1, L2, L3)
L1 FLASHING	Frequency

## 10 sealable button + LED

Press for > 2 s	Lock / Unlock
 LED red	Settings and simulation mode are locked, While attempting to set, <b>Loc</b> is displayed for 3s
LED green	Setting and simulation enabled

## 11 LEDs frequency / voltage / VSR Limit value undercut / exceeded (red)

ON, <b>AL</b> or <b>AL Π</b>	Limit value undercut / exceeded
FLASHES, <b>AL</b> or <b>AL Π</b>	Reset delay <b>dαF</b> counting down

## 4 Detailed description

### 4.1 Description of the connections

Connection	Description
A1 and A2	Rated control supply voltage $U_s$ , see Technical Data
11, 12, 14; 21, 22, 24	Relay K1 (DDI) und K2 (rincalzo, back up, only with manual reset)
E1 – E2 Enable – Input	volt-free contact
	$u_{Sr} \rightarrow \text{OFF}$ , no function
	$u_{Sr} \rightarrow \text{on}$ , E1-E2 closed: Vector shift active but not evaluated, monitoring of feedback contacts off for use with generator (mains synchronization)
Y0, Y1 Inputs feedback contacts	Volt-free n/o or n/c contact, self-learning when switching on Set value > turn-on time section switch under $r_{EL} \rightarrow t_{rEL}$ / can switch-off if not connected or if external devices/switches can activate the section switch ( <b>OFF</b> )
+U	Supply output for digital outputs, DC 15...35 V
IN1 (teledistacco, RCR)	volt-free contact
	closed: K1 released <50 ms (Standby mode, <b>StBY</b> )
IN2 (comando locale)	volt-free contact
	<u>transitory mode</u>
	open: $F_{-}^{-} + F_{-} = \text{on}$ ; $F_{-} + F_{-} = \text{OFF}$
	closed: $F_{-}^{-} + F_{-} = \text{OFF}$ ; $F_{-} + F_{-} = \text{on}$
IN3 (segnale esterno)	volt-free contact
	$\Pi_{odE} \rightarrow t_{rAn}$ , $\Pi_{odE} \rightarrow dEF_{-}$ , no function
	$\Pi_{odE} \rightarrow In3$ , closed: Definitiv mode open: Transitory mode
	alternative response time: $dAL_{-} + dAL_{-}$ active
L1, L2, L3, N	Phase L1, L2, L3 and neutral conductor

## 4.2 functional characteristics

Functional characteristics	Explanation
VSR display value	The highest measured value is always displayed. The display value is reset to 0 by deleting the max. Value and when resetting into the go (good) state.
Delay Enable On time	Runs down when starting the unit and after opening the enable input; during this time there is no evaluation of the vector shift
Reset time	When a reset time <code>d0F</code> is running, it is always counted down in the display (shortest one first)
Reset	Use the Reset key or interrupt the control voltage for > 2 s (comply with reset delay)
Display mode <code>5cn</code>	After the last measurement it switches into the scan mode; this is indicated by the display <code>5cn</code> . All measurements will now be displayed cyclically for the time set in <code>d,t</code> .
MIN / MAX values	All min and max values are saved zero-voltage maintained (non-volatile).
Alarm counter	The unit saves max 100 alarms (cause, measurement value, at operating time). The LEDs indicate the cause; the tripping value that led to the alarm each stands in the 7-segment display. Alternately the time difference, current operating time – tripping operating time is displayed. (how long ago the alarm triggered)
Cumulative alarm time <code>tAL</code>	The cumulative alarm time TAL indicates how long the relay was switched off due to an alarm. It is recorded with a resolution of 1 minute and only when the control voltage is applied. Query: In the display mode <code>▶</code> button to <code>Ac</code> is displayed. 1x <code>▲</code> button = Cumulative alarm time <code>tAL</code> .
Standby mode <code>u5r</code> → <code>5tb4</code>	If IN1 is closed (e.g., by ripple control receiver, timer, dimmer), Relays K1 and K2 are switched off. The number and duration of the shut-downs is recorded. Query: In the display mode <code>▶</code> button to <code>Ac</code> is displayed. 2x <code>▲</code> button = Standby counter <code>5tb4</code> . 1x <code>▲</code> button = Standby time <code>5tb4</code> .
Automatic restart attempts	If there is an error by the feedback contacts <code>Err1</code> , 2 restart attempts are automatically performed in an interval of 10s. False triggering by undervoltage trips (e.g. during a thunderstorm) do not lead to permanent shut-down.



## 5 Important information



**A marked switch and a protective device must be provided in the supply line in the vicinity of the device (easily accessible) as a disconnecting element (rated current  $\leq 6A$ ).**

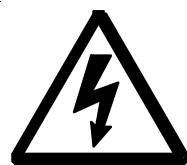
Flawless and safe operation of such a device requires proper transport and storage, professional installation and later commissioning along with operation as intended.

Only persons who are familiar with the installation, commissioning and operation of the device and who are correspondingly qualified for their job are permitted to work on the device. They must comply with the contents of the operating manual, the instructions attached to the device and the pertinent safety regulations for the erection and operation of electrical equipment.

The devices are built and certified in accordance with EN 60255 and leave the factory in a safe and technically flawless condition. To maintain this condition they must comply with the safety regulations marked in the operating manual with the headline "Caution". Failure to follow the safety regulations can lead to death, bodily injury or property damage to the device itself and to other devices and equipment.

If the information contained in the operating instructions/operating manual are not sufficient, please contact us directly or contact your responsible agency or representative.

Instead of the industrial norms and stipulations stated in the operating manual and applicable in Europe you must comply with the valid and applicable regulations in the country of utilisation if the device is used outside of the area of application.



### **WARNING**

**Hazards electrical voltage!**

**Can lead to an electric shock and burns.**

**Disconnect and de-energize before working on the system and the device.**

## 6 Assembly

The device can be mounted:

- Distribution panel or control panel on 35 mm rail according to EN 60715

**Comply with the maximum permissible temperature when installing in a switch cabinet. Ensure sufficient clearance to other devices or heat sources. If cooling is inhibited, e.g., through close proximity to devices with increased surface temperature or interference with the cooling-air current, the permissible ambient temperature is decreased.**

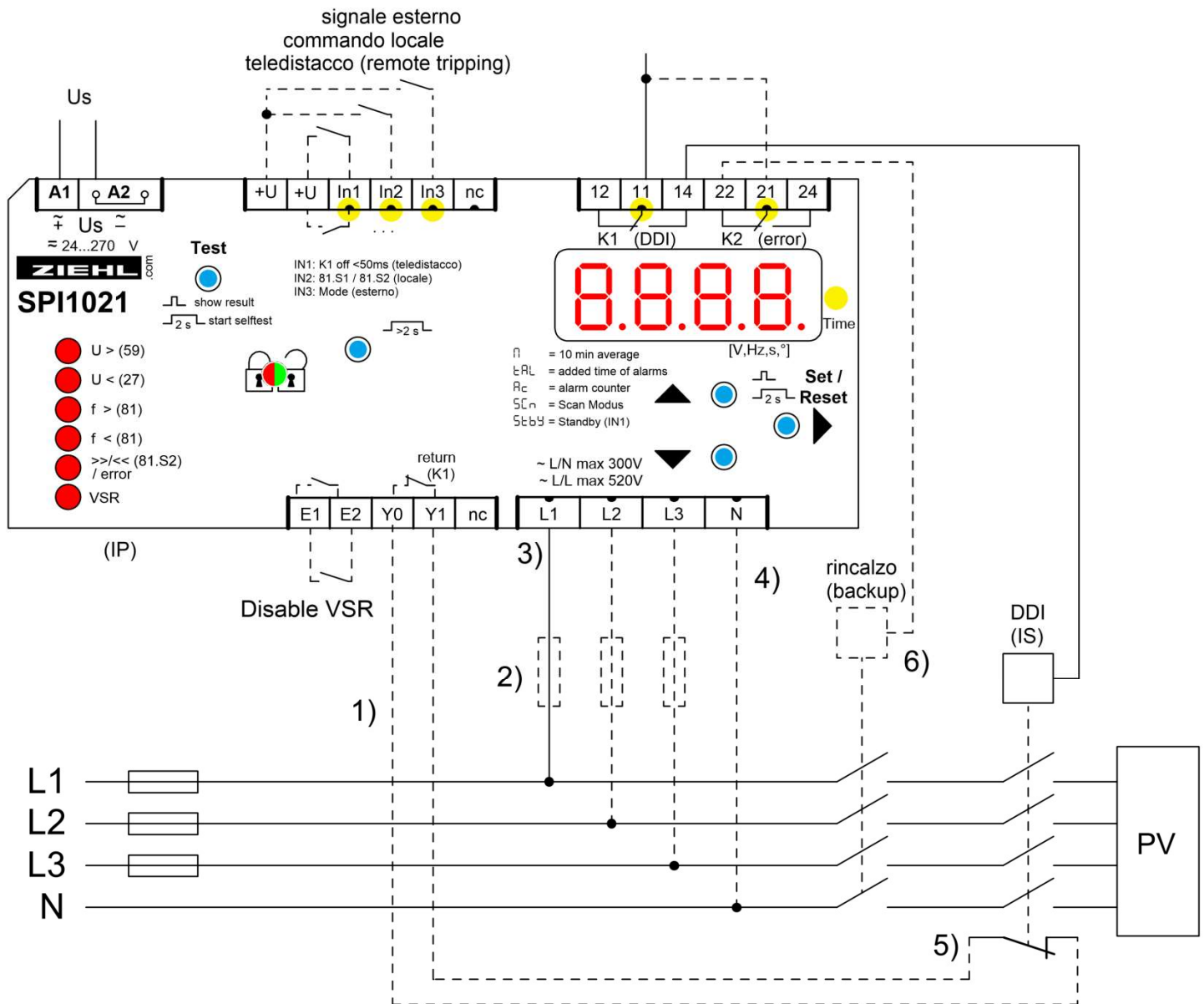


### **Caution!**

Before you apply mains voltage to the device, make sure that the permissible control voltage **Us** on the side rating plate matches the mains voltage connected to the device!

## 7 Connection diagrams

### 1x PV, 2x section switch



- 1) Feedback contacts not connected set  $r_{EL} \rightarrow t_{rEL} \rightarrow \text{OFF}$ .
- 2) Fuses only when line protection necessary, e.g. 3x16A
- 3)  $P_r \exists$  Phase connect to L1, L2 and L3 are not connected
- 4) N connected set  $P_r 1$ ,  $P_r 3$ ,  $P_r 4$
- 5) NC- or NO-contacts can be connected, automatic detection when switching on
- 6) must be connected for plants  $\geq 20\text{kW}$



## 8 Commissioning

### 8.1 Program Setup


The suitable program must be set on the SPI1021 in accordance with the application. If the SPI1021 is sealed/locked (red LED illuminated), the sealing has to be deactivated first.

Pr	Connection	Limit	Rated voltage	default setting	Standard
1	3 AC with N	2x overvoltage, 2x undervoltage	230V	CEI 0-21	CEI 0-21 + DEWA
2	3 AC without N	2x overfrequency, 2x underfrequency	400V	CEI 0-21	
*3	1 AC with N	10min mean value, 1x vector shift,	230V	CEI 0-21	
4	3 AC with N	1x rocof	230V	DEWA	
5	3 AC without N		400V	DEWA	
6	3 AC without N		100V	DEWA	

\* default setting

Adjustment process:

If present, remove seal (only authorized person)

- Apply control supply voltage at A1-A2
- Slightly lift the key cover and turn 180°
- Actuate the small blue button by firmly pressing the button cover (LED starts flashing) until the green LED  is illuminated.

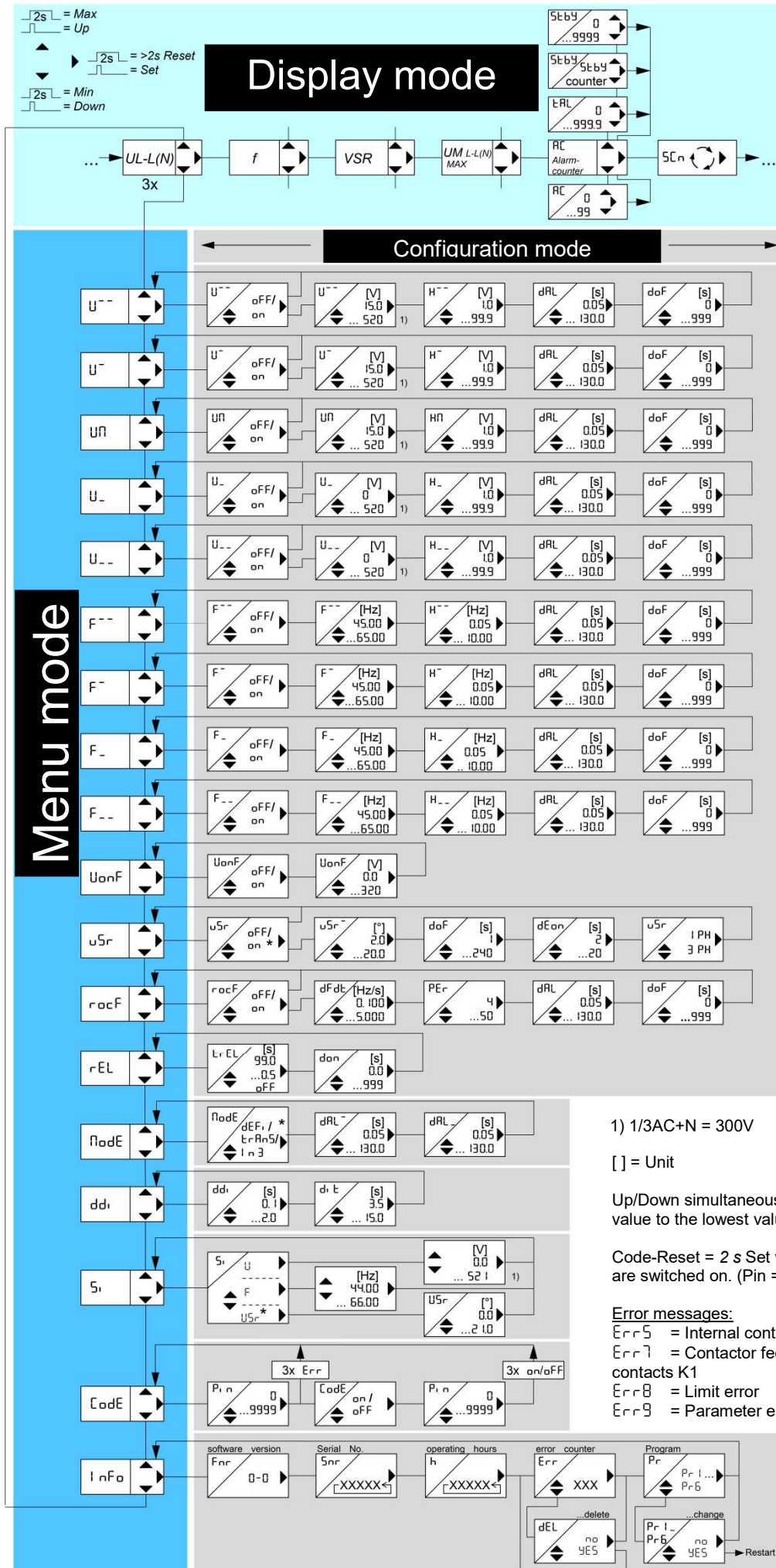
Sealing is deactivated

- Press ▲ button 1x → display I nFα.
  - Press ► button 5x → display Pr l.
  - Set the program with the buttons ▲ ▼
  - Press ► button 1x → display no.
  - Press ▼ button 1x → display 9E5.
  - Press ► button
- ⇒ Device resets and starts with the newly selected program

Hint:

When changing programs, all parameters of the selected program are reset to “default settings (see table „Default settings“). **Only change the parameters after having selected the correct program.**

## 8.2 Control chart Pr 1...6



### 8.3 description of the parameters

Parameters	Display	Explanation	Adjustment range
<b>Power up delay (delay On)</b>	<code>don</code>	Runs once at startup device, adjustable <code>rEL</code> → <code>don</code>	<code>0.0</code> ... <code>999</code>
<b>Limit value</b>	<code>U<sup>-</sup></code> <code>U<sub>-</sub></code> <code>U<sub>n</sub></code>	Voltage limit value	<code>15.0</code> ... <code>300</code> <code>15.0</code> ... <code>520</code>
<b>Limit value</b>	<code>F<sup>-</sup></code> , <code>F<sub>-</sub></code>	Frequency limit value	<code>45.00</code> ... <code>65.00</code>
<b>Frequency Undervoltage</b>	<code>UonF</code>	frequency undervoltage, below this value the frequency protection is inhibited	<code>0.0</code> ... <code>320</code>
<b>Hysteresis</b>	<code>H</code>	253V (Limit) – 3V (Hysteresis) = 250V (Reset value) If the limit value is offset in Pr1 or Pr2 at <code>F<sup>-</sup></code> , the hysteresis also has to be adapted.	<code>1.0</code> ... <code>99.0</code> <code>0.05</code> ... <code>10.00</code>
<b>Response time (delay Alarm)</b>	<code>dAL</code>	An alarm is suppressed for the set time (seconds)	<code>0.05</code> ... <code>130.0</code>
<b>Turn-on time (delay Off)</b>	<code>doF</code>	Reset is delayed for the set time, also during voltage recovery, this time (seconds) is always counted down in the display	<code>0</code> ... <code>999</code>
<b>Enable time (delay On)</b>	<code>dEon</code>	There is no evaluation of the vector shift during this time; starts with the application of the control voltage and when opening the Enable input	<code>2</code> ... <code>20</code>
<b>VSR</b>	<code>uSr</code>	<code>1 Ph</code> : a vector surge on one phase leads to an alarm <code>3 Ph</code> : a vector surge on all phases simultaneously leads to an alarm	<code>1 Ph</code> ... <code>3 Ph</code>
<b>Limit value</b>	<code>dfdt</code>	ROCOF, df/dt limit value	<code>0.10</code> ... <code>5.00</code>
<b>Periods</b>	<code>PEr</code>	Measuring time ROCOF, (4=sensitive, 50=insensitive) Response time= <code>PEr</code> * Period duration + <code>dAL</code>	<code>4</code> ... <code>50</code>
<b>delay Display</b>	<code>ddi</code>	Interval during which the display is updated in the display mode	<code>0.1</code> ... <code>2.0</code>

### 8.4 Display mode (last decimal point off)

In the display mode, the SPI1021 is in its normal state; here, depending on the program, the actual voltage, the highest actual 10 minute mean value, the frequency or the vector surge is displayed. In addition, the alarm signals (e.g. `AL`, `AL n`) and error codes (e.g. `Err9`) are displayed.

Function button Set / Reset	<u>Press briefly:</u> Switches the measurement, alarm counter
	<u>Press for &gt; 2 s:</u> Resets after locked alarm (not possible if doF Reset delay is counting down)
	<u>Press for &gt; 4 s:</u> Displays the program, e.g. <code>Pr 1</code>
	<u>Press for &gt; 10 s:</u> Displays the software version, e.g. <code>0-03</code>
Function key Up / Down	<u>Press briefly:</u> Change into the menu mode, Display alarm counter: Down = Query the memory Up = Query the cumulative alarm time
	<u>Press for ≥ 2 s:</u> Displays MAX and MIN measurements, additionally pressing the Set key for ≥ 2 s deletes the saved values

## 8.5 Menu mode (last decimal point on)

The menu mode is used to select the menu items. If no key is pressed for 30 s, one automatically returns to the display mode.

Function button Set / Reset	<u>Press briefly:</u> Change into the configuration mode
	<u>Press for <math>\geq 2</math> s:</u> Returns to the display mode (the most recently set values are then applied)
Function key Up / Down	<u>Press briefly:</u> Select menu item; changes into the display mode

## 8.6 Configuration mode (last Decimal point flashes)

In the configuration mode you can set the value of a parameter. The display alternates between the parameter relation and the currently set value until one of the Up/Down buttons is pressed, which changes the value of the parameter. If no key is pressed for 2 s the display starts alternating again.

If no key is pressed for 30 s (simulation mode 15 min) one automatically returns to the display mode (the most recently set value is applied during this)

Function button Set / Reset	<u>Press briefly:</u> The settings are taken over; continue to next parameter. Changes into menu mode after the last parameter
	<u>Press for <math>\geq 2</math> s:</u> Returns to the display mode (the most recently set values are then applied)
Function key Up / Down	<u>Press briefly/long:</u> Value change of the parameter (slow/fast)

Hint: Simultaneously pressing the Up and Down keys resets the adjustable value to zero. If the Up or Down button is kept pressed while setting the value the change in the display is accelerated.

## 8.7 Selftest execute

The SPI1021 has an automatic selftest as recommended in CEI 0-21 and DEWA.

K1 can pick up only after the selftest has been passed once.

Selftest starts automatically as soon as measuring voltage is connected for the first time to a new device and when there is no alarm! Selftest also starts automatically when program has been changed.

Selftest can be started manually by pressing button Test for  $\geq 2$  s.

During the Selftest is **LE5E** displayed.

At the end of the test the result **PA55** (passed) or **FRi L** (not passed) is displayed for 30 seconds. Reset stops the test.

During selftest supply- and measuring-voltage may not be disconnected.

## 8.8 Display Selftest result

The values and times have been measured during selftest can be displayed by pressing button Test shortly.

Kind of limit (**U<sup>-</sup>**, **U<sub>-</sub>**, **F<sup>-</sup>**, **F<sub>-</sub>**), measured value and switching time are displayed. LEDs (yellow) at the terminals L1...N show the according phase.

By pressing Test shortly display changes to the values of the next phase / kind of limit. At last the result **PA55** (passed) or **FRi L** (not passed) is displayed.

Display automatically returns to normal mode 30 s after button Test has been pressed for the last time.

## 8.9 Alarm counter

The alarm counter **Rc** is increased by 1 with every shut-down. Up to 100 shut-downs are counted. That allows quick detection of how often the SPI1021 has shut down since the last delete of the alarm counter (see cumulative alarm time).

Query the alarm counter:

- |   |
|---|
| <ul style="list-style-type: none"> <li>Change into the display mode</li> </ul>  |
| <ul style="list-style-type: none"> <li>Press the  button several times until <math>\rightarrow</math> display <b>Rcxx</b></li> </ul> |

## 8.10 Cumulative alarm time (display in hours)

The cumulative alarm time **ƒRL** indicates how long the relay was switched off due to an alarm. It is recorded with a resolution of 1 minute and only when the control voltage is applied.

Query the cumulative alarm time:

• Change into the display mode
• Press the <b>▶</b> button several times until → display <b>RcXX</b>
• Press the <b>▲</b> button 1x → display <b>ƒRL</b> / <b>x.XX</b>

Delete the alarm counter and cumulative alarm time (only together):

• Display alarm counter <b>RcXX</b>
• Press the <b>▲</b> button 1x → display <b>ƒRL</b> / <b>x.XX</b>
• Keep the <b>▶</b> button pressed for 2s until → display <b>ƒRL</b> / <b>0.00</b>

## 8.11 Alarm Memory

Independent of the alarm counter, the SPI1021 stores the most recent 100 shut-down causes (cause, measurement value, at operating time). Simulated alarms are also registered. The LEDs indicate the cause; the tripping value that led to the alarm each stands in the 7-segment display. Alternative to that the time is shown in hours which have passed since the last tripping (with applied control voltage). These values remain saved even after the power has been turned off.

Query alarm memory:

• Change into the display mode
• Press the <b>▶</b> button several times → display <b>RcXX</b>
• Press the <b>▼</b> button 1x → display <b>x.XX</b> / <b>x.XX</b> (tripping value or error no. / time that has passed in hours)
• Press the <b>▼</b> button 1x, go to next alarm

The alarm memory is only deleted during a program change.

## 8.12 Standby counter and standby time

The standby counter **StbY**, is increased by 1 with every standby shut-down. Up to 9999 shut-downs are counted. That lets the SPI1021 quickly detect how often, e.g., shut-down was performed through a ripple control receiver.

Query the standby counter:

• Change into the display mode
• Press the <b>▶</b> button several times until → display <b>RcXX</b>
• Press the <b>▲</b> button 2x → display <b>StbY</b> / <b>xxxx</b>

The standby time **StbY** indicates how long the relay was switched off by the standby mode. It is recorded with a resolution of 1 minute and only when the control voltage is applied and if no alarm is present.

Query the standby time:

• Change into the display mode
• Press the <b>▶</b> button several times until → display <b>RcXX</b>
• Press the <b>▲</b> button 3x → display <b>StbY</b> / <b>x.XX</b> (Time LED is illuminated)

Delete the standby counter and standby time (only together):

• Display alarm counter <b>RcXX</b>
• Press the <b>▲</b> button 2x → display <b>StbY</b> / <b>xxxx</b>
• Keep the <b>▶</b> button pressed for 2s until → display <b>StbY</b> / <b>0</b>

### 8.13 Code lock

You can protect the set parameters by enabling the code lock here.

The device acknowledges an incorrect entry with **Err** (flashes three times).

Adjustment process:

<ul style="list-style-type: none"><li>• Select the menu item with the ▲▼ buttons until → display <b>Code</b>.</li></ul>
<ul style="list-style-type: none"><li>• Press the ▶ button 1x → display <b>Pin</b> / <b>0</b></li></ul>
<ul style="list-style-type: none"><li>• Set the <b>saved</b> pin code with the ▲▼ buttons (<b>default setting is 504</b> )</li></ul>
<ul style="list-style-type: none"><li>• Press the ▶ button 1x → display <b>Code</b> / <b>oFF</b></li></ul>
<ul style="list-style-type: none"><li>• Use the ▲▼ buttons to set the desired code lock:<ul style="list-style-type: none"><li>○ <b>oFF</b> off, all parameters can be changed</li><li>○ <b>oN</b> on, no parameters can be changed</li></ul></li></ul>
<ul style="list-style-type: none"><li>• Press the ▶ button 1x → display <b>Pin</b> / <b>504</b></li></ul>
<ul style="list-style-type: none"><li>• Use the ▲▼ buttons to set the new, desired pin code (<b>caution: write down the pin code</b>)</li></ul>
<ul style="list-style-type: none"><li>• Press the ▶ button 1x</li></ul>
<ul style="list-style-type: none"><li>⇒ Code lock on, display <b>oN</b> flashes three times</li><li>⇒ Code lock off, display <b>oFF</b> flashes three times</li></ul>
<ul style="list-style-type: none"><li>⇒ Return to menu mode, menu item code lock</li></ul>

If there any problems with the code lock (Pin forgotten), the lock can be switched off and the pin can be reset to 504 by keeping the Set key pressed while switching on the mains until **Code** / **oFF** appears in the display.

### 8.14 Sealing




All the settings and the simulation mode can be locked.

If the  LED is illuminated, the SPI1021 is locked.

If an attempt is made to change a setting in the locked state, for 3s the display shows **Loc**.

Adjustment procedure Sealing/Lock ON (OFF):

<ul style="list-style-type: none"><li>• If present, remove seal (only authorized person)</li></ul>
<ul style="list-style-type: none"><li>• Apply control supply voltage at A1-A2</li></ul>
<ul style="list-style-type: none"><li>• Slightly lift the key cover and turn 180°</li></ul>
<ul style="list-style-type: none"><li>• Actuate the small blue button by <u>pressing the button cover very firmly</u> (LED starts flashing) until the green LED  is illuminated.</li></ul>



## 8.15 Simulation

Here, the voltage, frequency or a vector surge can be simulated and the setting can be tested. All 3 phases plus the 10 minute mean value are always simulated. All functions of the device operate as if this value is actually being measured. Alarm and error messages are only indicated with the LEDs and not in the display. The set values are simulated until the menu item `Sr` is exited with the  $\blacktriangle$  or  $\blacktriangledown$  button. If the SPI1021 is sealed/locked, simulation is not possible.

If the section switch feedback contacts are connected to the SPI1021 and enabled, (set value > section-switch turn-on time under `trEL`), after a shut-down, the tripping time (dAL + time of slowest section switch) is displayed.

Adjustment process:

<ul style="list-style-type: none"><li>• Select the menu item with the <math>\blacktriangle</math> <math>\blacktriangledown</math> buttons until <math>\rightarrow</math> display <code>Sr</code></li></ul>
<ul style="list-style-type: none"><li>• Press the <math>\blacktriangleright</math> button 1x <math>\rightarrow</math> display <code>Sr / U</code></li></ul>
<ul style="list-style-type: none"><li>• Use the <math>\blacktriangle</math> <math>\blacktriangledown</math> buttons to set the measurement factor for simulation:<ul style="list-style-type: none"><li>○ <code>U</code> Voltage + 10min mean value (frequency = last simulated value)</li><li>○ <code>F</code> Frequency (voltage = last simulated value)</li><li>○ <code>uSr</code> Vector shift</li></ul></li></ul>
<ul style="list-style-type: none"><li>• Press the <math>\blacktriangleright</math> button 1x <math>\rightarrow</math> display <code>230</code> (selected measurement factor is simulated)</li></ul>
<ul style="list-style-type: none"><li>• Use the <math>\blacktriangle</math> <math>\blacktriangledown</math> buttons to set the desired value</li></ul>

After exiting the Simulation menu item with the  $\blacktriangle$   $\blacktriangledown$  buttons, the unit switches over to monitoring the limits. The unit automatically returns to the display mode if no button is pressed for 15 minutes.

Hint: A limit value should be tested that is higher than the set 10min mean value. If the 10min mean value has to be temporarily switched off, set (`U0`  $\rightarrow$  `oFF`) since otherwise it will trip first. The same applies, for example, for `U-`, during a simulation of `U-`.

## 8.16 Possible indications in display

### display mode

AL , AN	Alarm , Alarm 10min mean value
Err5 ... Err9	Error messages (see 11. Error messages and measures)
Ac , tAL	Alarm counter, cumulative alarm time
Scn , n	Scan mode, 10min mean value

### Menu mode / configuration mode

U <sup>---</sup> , U <sup>-</sup> , U <sub>--</sub> , U <sub>-</sub>	Voltage limit value
UN	Limit value 10min mean value
H <sup>---</sup> , H <sup>-</sup> , H <sub>--</sub> , H <sub>-</sub> , HN	Hysteresis (if a limit value is changed, the reset value also shifts; that means it might be necessary to adapt it)
F <sup>---</sup> , F <sup>-</sup> , F <sub>--</sub> , F <sub>-</sub>	Frequency limit value
dAL , doF	Response time, Reset time; is always counted down in the display
UonF	Frequency undervoltage (inhibited frequency protection)
uSr , rocoF	Vector surge, ROCOF
dFdt , PEr	Limit ROCOF, response time in periods (4=sensitive, 50=insensitive)
Stby	Standby mode, standby-time, standby-counter
dEon	Delay Enable On, suppression time when switching on and after opening the enable input
1 Ph , 3 Ph	Single phase, three-phase vector shift evaluation
rEL , trEL	Relay, Section switch turn-on time, oFF no feedback contacts
don	Power Up delay, runs once at power up device
ModE , trAn , dEFi	Mode, Transitory Mode, Definitiv Mode
ddi	Delay display, to calm down the display
d, t	Display duration scan mode (each measurement is displayed for this duration)
Si	Simulation
F , U	Frequency, voltage
CoDE , PLo , uSr	Code lock / sealing, vector shift
Pin	Pin code (default 504)
Info	Device information, program change
Fnr , Snr	Firmware version, serial number
h	Operating hours
Err , dEL	Error counter, delete error counter
YES , no	Yes, no query for acknowledgement
Pr	Program
on , oFF	On, Off

## 9 Default settings and firmware version

When changing programs, all parameters are reset to the \*default settings.

Menu item	Parameter / Unit		Default setting						Users data
			CEI 0-21			DEWA			
			3AC+N 230V	3AC 400V	1AC+N 230V	3AC+N 230V	3AC 400V	3AC 100V	
			Pr1*	Pr2	Pr3	Pr4	Pr5	Pr6	
U <sup>--</sup> 59.S2 59>S2	U <sup>--</sup> Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	U <sup>--</sup> <b>Overvoltage</b>	V	264	458	264	264	458	115	
	H <sup>--</sup> Hysteresis	V	10.5	17.5	10.5	10.5	17.5	4.5	
	dRL Response time	s	0.10	0.10	0.10	0.10	0.10	0.10	
	doF OFF-delay	s	0	0	0	0	0	0	
U <sup>-</sup> 59.S1 59>S1	U <sup>-</sup> Alarm on/off		on	on	on	on	on	on	
	U <sup>-</sup> <b>Overvoltage</b>	V	264	458	264	253	438	120	
	H <sup>-</sup> Hysteresis	V	10.5	17.5	10.5	10.5	17.5	4.3	
	dRL Response time	s	0.20	0.20	0.20	0.20	0.20	0.60	
	doF OFF-delay	s	0	0	0	0	0	0	
UN 59-Av	UN Alarm on/off		on	on	on	on	on	on	
	UN <b>Overvoltage</b>	V	253	438	253	253	438	110	
	HN Hysteresis	V	10.0	17.5	10.0	10.0	17.5	4.3	
	dRL Response time	s	3.00	3.00	3.00	3.00	3.00	3.00	
	doF OFF-delay	s	0	0	0	0	0	0	
U <sub>-</sub> 27.S1 27<S1	U <sub>-</sub> Alarm on/off		on	on	on	on	on	on	
	U <sub>-</sub> <b>Undervoltage</b>	V	196	339	196	196	339	85	
	H <sub>-</sub> Hysteresis	V	8.0	13.5	8.0	8.0	13.5	3.5	
	dRL Response time	s	0.40	0.40	0.40	0.40	0.40	1.50	
	doF OFF-delay	s	0	0	0	0	0	0	
U <sub>--</sub> 27.S2 27<S2	U <sub>--</sub> Alarm on/off		on	on	on	on	on	on	
	U <sub>--</sub> <b>Undervoltage</b>	V	92	159	92	92	159	3.0	
	H <sub>--</sub> Hysteresis	V	3.7	3.7	3.7	3.7	6.4	1.5	
	dRL Response time	s	0.20	0.20	0.20	0.20	0.20	0.20	
	doF OFF-delay	s	0	0	0	0	0	0	
F <sup>--</sup> 81.S2 81>S2	F <sup>--</sup> Alarm on/off		on	on	on	on	on	on	
	F <sup>--</sup> <b>Overfrequency</b>	Hz	51.50	51.50	51.50	54.00	54.00	54.00	
	H <sup>--</sup> Hysteresis	Hz	0.10	0.10	0.10	0.10	0.10	0.10	
	dRL Response time	s	0.10	0.10	0.10	10.0	10.0	10.0	
	doF OFF-delay	s	0	0	0	0	0	0	
F <sup>-</sup> 81.S1 81>S1	F <sup>-</sup> Alarm on/off		on	oFF	oFF	oFF	oFF	oFF	
	F <sup>-</sup> <b>Overfrequency</b>	Hz	50.50	50.50	50.50	52.50	52.50	52.50	
	H <sup>-</sup> Hysteresis	Hz	0.10	0.10	0.10	0.10	0.10	0.10	
	dRL Response time	s	10.00	0.10	0.10	0.10	0.10	0.10	
	doF OFF-delay	s	0	0	0	0	0	0	

Menu item	Parameter / Unit		CEI 0-21			DEWA			Users data	
			3AC+N 230V	3AC 400V	1AC+N 230V	3AC+N 230V	3AC 400V	3AC 100V		
			Pr1	Pr2	Pr3 *	Pr4	Pr5	Pr6		
F_ 81.S1 81<S1	F_	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	F_	<b>Underfrequency</b>	Hz	49.50	49.50	49.50	47.50	47.50	47.50	
	H_	Hysteresis	Hz	0.10	0.10	0.10	0.10	0.10	0.10	
	dAL	Response time	s	0.10	0.10	0.10	4.00	4.00	4.00	
	doF	OFF-delay	s	0	0	0	0	0	0	
F_ 81.S2 81<S2	F_	Alarm on/off		on	on	on	on	on	on	
	F_	<b>Underfrequency</b>	Hz	47.50	47.50	47.50	46.00	46.00	46.00	
	H_	Hysteresis	Hz	0.10	0.10	0.10	0.10	0.10	0.10	
	dAL	Response time	s	0.10	0.10	0.10	10.0	10.0	10.0	
	doF	OFF-delay	s	0	0	0	0	0	0	
UonF	UonF	Alarm on/off		oFF	oFF	oFF	on	on	on	
	UonF	Spannung 0,2 Un	V	46	80	46	46	80	20	
u5r 78	u5r	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	u5r	<b>Vector shift</b>	°	10.0	10.0	10.0	10.0	10.0	10.0	
	doF	OFF-delay	s	3	3	3	1	1	1	
	dEon	Suppression time	s	2	2	2	2	2	2	
	u5r	Number of phases		3Ph	3Ph		3Ph	3Ph	3Ph	
rocF 81r	rocF	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	dFdt	<b>delta f / delta t</b>	Hz /s	0.800	0.800	0.800	2.000	2.000	2.000	
	PEr	periods		4	4	4	20	20	20	
	dAL	Response time	s	0.10	0.10	0.10	0.10	0.10	0.10	
	doF	OFF-delay	s	60	60	60	1	1	1	
rEL	trEL	response time Y1	s	5.0	5.0	oFF	5.0	5.0	5.0	
	don	Delay On	s	300	300	300	300	300	300	
nOdE	nOdE	Mode		rAn	rAn	rAn	rAn	rAn	rAn	
	dAL_	Response time(<</>>)	s	1.00	1.00	1.00	1.00	1.00	1.00	
	dAL_	Response time(<</>>)	s	4.00	4.00	4.00	4.00	4.00	4.00	
ddi	ddi	Display delay	s	0.5	0.5	0.5	0.5	0.5	0.5	
	di t	Display duration 5Cn	s	3.5	3.5	3.5	3.5	3.5	3.5	
Si	U	Voltage	V	230	400	230	230	400	100	
	F	Frequency	Hz	50.00	50.00	50.00	50.00	50.00	50.00	
	u5r	Vector shift	°	0.0	0.0	0.0	0.0	0.0	0.0	
CodE	Pi n	Pincode		504	504	504	504	504	504	
InFo	Fnr	Firmware version		0-0d	0-0d	0-0d	0-0d	0-0d	0-0d	
	Snr	Serial number		xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	
	h	Operating hours	h	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	
	Err	Error counter		xxx	xxx	xxx	xxx	xxx	xxx	
	Pr	Program		1	2	3	4	5	6	

Display program: InFo → Pr or when switching on, Display firmware version: InFo → Fnr

## 10 Technical Data

### Control voltage Us:

Rated-Connection	AC/DC 24-270 V, 0/40...70 Hz, <1,8W / <6,5 VA DC: 20,4...297 V, AC: 20,4...297 V
Voltage drop	SPI1021 must be supplied with a UPS (>5s)

### Output relay:

Switching voltage	2 x change-over contact Max. AC 440 V
Conventional thermal current I <sub>th</sub>	6 A
Inrush current (at 10 % ED)	25 A max. 4 s / 50 A max. 1 s
Nominal operating current I <sub>e</sub> (AC 15)	6 A AC 250 V
Recommended series fuse	gG/gL 6 A
Contact service life, mech.	30 x 10 <sup>6</sup> switching cycles
Contact service life, electr.	1 x 10 <sup>6</sup> operating cycles at AC 250 V / 6 A 2 x 10 <sup>5</sup> operating cycles at AC 250 V / 10 A cos φ 0.6

### Voltage measurement:

Measurement voltage phase – phase	AC 15...530 V (< 5 V: 0 is displayed)
Adjustment range phase – phase	AC 0/15...520 V
Measurement voltage phase – N	AC 10...310 V (< 5 V: 0 is displayed)
Adjustment range phase – N	AC 0/15...300 V
Measurement principle	Real root mean square measurement both half waves
Hysteresis	Adjustable 1.0...99.9 V
Measurement error (with N)	± 0.6 % of the measurement value
Measurement error (without N)	± 0.8 % of the measurement value
Display accuracy	>100V: -1 digit (res. 1 V) <100V: -1 digit (res. 0.1V)
Measurement function	3-phase with/without N
Response time	Adjustable 0.05 (±15ms)... 130.0 s
Reset time	Adjustable 0(>200ms) ... 999 s

### Frequency measurement

Frequency range	40...70 Hz (U-L1 > U <sub>onF</sub> )
Adjustment range	45.00...65.00 Hz
Hysteresis	0.05...10.00 Hz
Measurement accuracy	± 0.04Hz ± 1 digit
Response time	Adjustable 0.05 (±15ms)... 130.0 s
Reset time	Adjustable 0 (>200ms) ... 999 s

### Vector surge

Measurement range	0...45.0°
Adjustment range	2.0...20.0°
Response time	< 50 ms
Reset time	Adjustable 3...240 s
Delay at U <sub>s</sub> on	Adjustable 2...20 s

### ROCOF (df/dt)

Frequency range	40...70 Hz
Adjustmet range	0,100...5,000 Hz/s, 4...50 Periods
Hysteresis	fixed 0,05Hz
Measurement error	± 0,04Hz ± 1Digit
Response time	adjustable 0,05 (±15ms) ... 130,0 s
Reset time	adjustable 0 (>200ms) ... 999 s
Measurement time	Number of adjusted Periods * Periods duration + Response time

### Digital inputs (INx)

Output voltage +U DC 15...35 V  
Current INx > 3 mA

### Contactor feedback inputs

Voltage Y0 – Y1/2 DC 15...35 V  
Current > 3 mA  
Contactor response time (section switch) Adjustable 0.5...99.0 s

### Selftest and Watchdog

Phases Pr1, 2, 4, 5, 6: all Pr3: L1 only  
Slope Rate Voltage <150V: 2,5V/s, ≥150V: 5,0V/s  
Slope Rate Frequency 0,05Hz/s  
Permissible tolerance measured value – trigger value: ≤±5%  
Response time:80...120ms  
Display result „Pass“ = passed, „Fail“ = failed  
Duration max 175s  
Watchdog internally

### Test conditions

EN 60255  
Rated impulse withstand voltage 4000 V  
Overvoltage category III  
Pollution degree 3  
Rated insulation voltage Ui 300 V  
Operating time 100 %  
Permissible ambient temperature -20 °C... +55 °C  
EN 60 068-2-2 dry heat  
EMC - noise immunity EN 61000-6-2  
EMC - noise emission EN 61000-6-3

### Housing:

Construction form V6  
Front-to-back size 55 mm  
Dimensions (W x H x D) 90 x 105 x 69 mm  
Wiring connection single strand each 1 x 4mm<sup>2</sup>  
Finely stranded with wire end ferrule each 1 x 2.5mm<sup>2</sup>  
Protection class, housing IP 30  
Protection class, terminals IP 20  
Mounting snap-on fastening on 35 mm mounting rail acc  
EN 60 715 or with M4 screwed attachment  
(additional bar not included in the scope of delivery)  
Weight: approx. 250 g

**We reserve the right to make technical changes**

## 11 Maintenance and repair

The SPI1021 is maintenance-free. Periodically test for proper functioning.

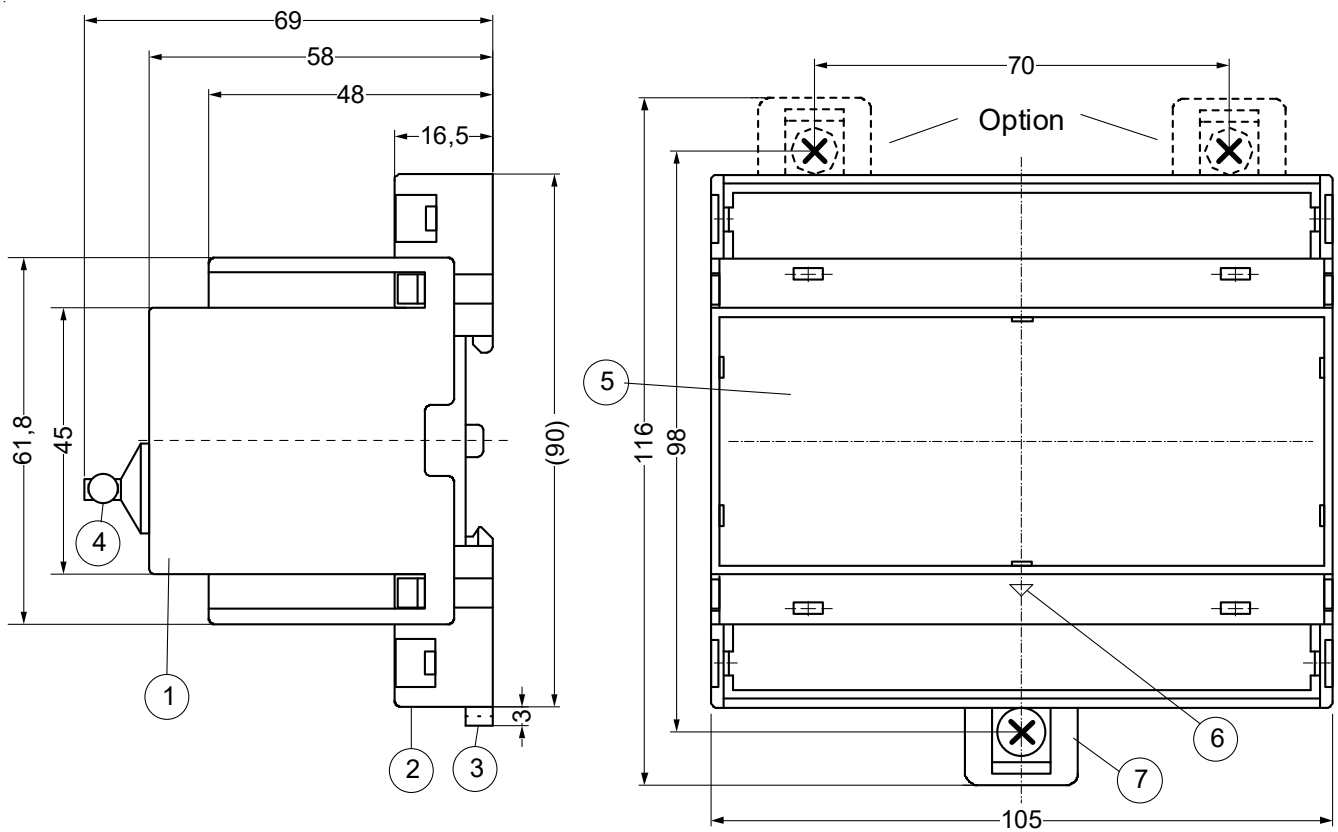


## 12 Troubleshooting an measures

Error	Cause	Remedy
<b>FR.L</b> as selftest result	Selftest failed	Check all measured voltages
<b>EEEE</b> or <b>-EEE</b> appears in the display	Measurement is above/below range	Measured voltage, frequency or the vector surge is too large or too small; comply with measurement range
<b>Err5</b> appears in the display	Error internal interface	Reset → interrupt control voltage for >5s
<b>Err7</b> also appears in the display after 2 automatic reconnection attempts, LED K1 flashes, K2 is released	Error when off the section switch, section switch connected wrong, faulty or operated from a third party switch	<u>Feedback contacts not connected</u> Set - <b>rEL</b> → <b>tREL</b> → <b>oFF</b> <u>Feedback contacts not connected</u> - Check for correct connection - Set turn-on time of section switch under <b>tREL</b> . - Do a reset → interrupt control voltage for >5s
<b>Err7</b> LED K1 flashes und <u>K2 is operating</u>	Error when off the section switch	- Check the connection - Check for broken section switch - Do a reset → interrupt control voltage for >5s
<b>Err8</b> appears in the display	Hysteresis error	Upper threshold value must be higher than the lower threshold value, check the threshold values
<b>Err9</b> appears in the display	Parameter error	Reset to factory settings, see "Program setup"
A time expires in the display	Always when an OFF-delay time <b>oF</b> is running, it is counted down in the display (shortest one first)	Wait until the time has expired (depending on the setting, several times may elapse one after the other)
Device cannot be configured / only the limits can be configured	Code lock / Sealing activated	If there are any problems with the code lock (pin forgotten), the lock can be switched off and the pin can be reset to 504 by keeping the Set key pressed while switching on the mains until <b>CoDE</b> / <b>oFF</b> appears in the display.
Implausible voltage values	Pr selected with N, but N not connected	Select Pr without N or connect N
<b>Loc</b> appears in the display	Seal is active	See Sealing
<b>CoDE</b> appears in the display	Code lock is active	See „Code lock“
<b>StBY</b> appears in the display	Standby mode, E1-E2 closed	Check parameter <b>uSr</b> .

## 13 Construction form V6

Dimensions in mm



- 1 Oberteil / cover
- 2 Unterteil / base
- 3 Riegel / bar for snap mounting
- 4 Plombierung max.  $\varnothing$  1,8 mm / sealing max.  $\varnothing$  1,8 mm
- 5 Frontplatteneinsatz / front panel
- 6 Kennzeichen für unten / position downward
- 7 Riegel bei Wandbefestigung mit Schrauben. Riegelbohrung  $\varnothing$  4,2 mm / for fixing to wall with screws,  $\varnothing$  4,2 mm.



**BUREAU  
VERITAS**

## Dichiarazione di conformità alle prescrizioni alla Norma CEI 0-21

**NOME ORGANISMO CERTIFICATORE:** Bureau Veritas Consumer Products Services Germany GmbH  
Accreditamento a DAkkS, D-ZE-12024-01-01, Rif. DIN EN 45011,  
Data validità: 19-Agosto-2015

**OGGETTO:** CEI 0-21:2012-06  
CEI 0-21:V1:2012-12 edizione Dicembre 2012  
CEI 0-21:V2:2013-12 edizione Dicembre 2013  
CEI 0-21:2014-09  
CEI 0-21:V1:2014-12 edizione Dicembre 2014  
Regola tecnica di riferimento per la connessione di Utenti attivi e passivi alle reti  
BT delle imprese distributrici di energia elettrica

**TIPOLOGIA DI APPARATO CUI SI RIFERISCE LA DICHIARAZIONE:**

DISPOSITIVO DI INTERFACCIA	PROTEZIONE DI INTERFACCIA	DISPOSITIVO DI CONVERSIONE STATICA	DISPOSITIVO DI GENERAZIONE ROTANTE
	X		

**COSTRUTTORE:** ZIEHL industrie-elektronik GmbH+Co KG  
Daimlerstraße 13  
74523 Schwäbisch Hall  
Germania

**MODELLO:** SPI1021  
**VERSIONE FIRMWARE:** 0-0  
**NUMERO DI FASI:** trifase + monofase

**NOTA:**

Per impianti con squilibrio di potenza superiore a 6kW, lo squilibrio di potenza deve essere controllato separatamente.

**RIFERIMENTI DEI LABORATORI CHE HANNO ESEGUITO LE PROVE:**

**Bureau Veritas Consumer Products Services Germany GmbH**  
Accreditamento a DAkkS, D-PL-12024-03-01, Rif. DIN EN ISO/IEC 17025  
Data validità: 11-Giugno-2019

Esaminato il certificato ISO 9001 del costruttore n°FS 529448/4542D, emesso dal British Standards Institution (BSI). Esaminati i Fascicoli Prove n°12TH0488-CEI 0-21, emessi dal laboratorio Bureau Veritas Consumer Products Services Germany GmbH. Si dichiara che il prodotto indicato è conforme alle prescrizioni CEI 0-21:2012-06, CEI 0-21 V1:2012-12, CEI 0-21 V2:2013-12, CEI 0-21:2014-09, CEI 0-21:V1:2014-12 edizione Dicembre 2014.

**Numero di certificato:** U15-0363  
**Data di emissione:** 2015-08-10

**Organismo di certificazione**

Dieter Zitzmann



Organismo di certificazione Bureau Veritas Consumer Products Services Germany GmbH  
Accreditamento a EN 45011 - ISO / IEC Guide 65