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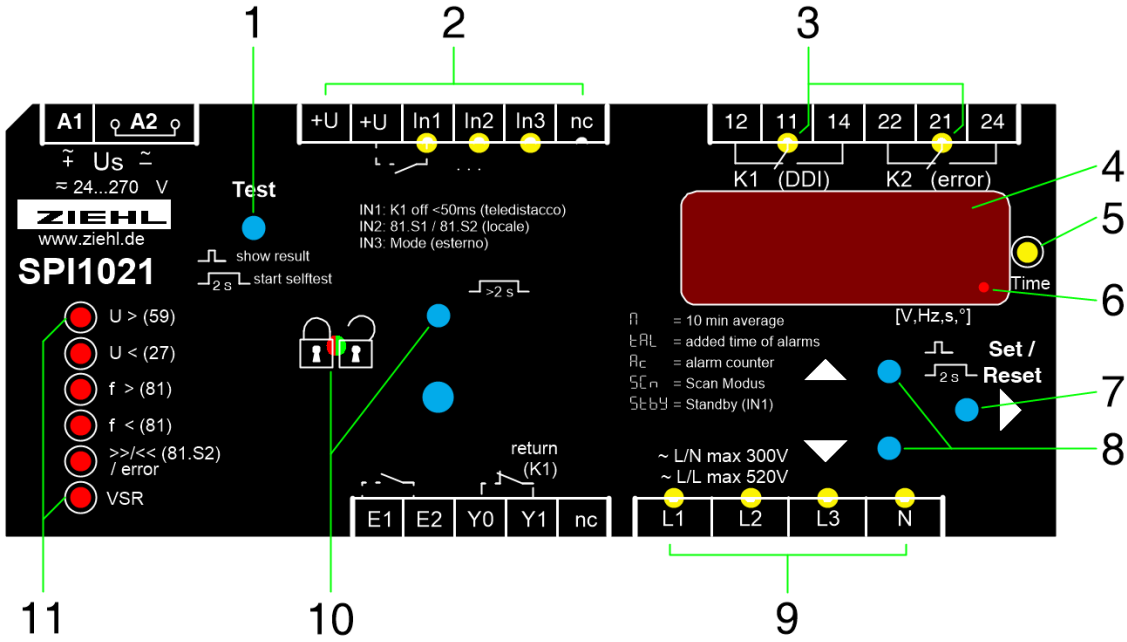
Operating Manual SPI1021

updated: 2017-07-10/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

1 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. AL , AL 1
Displays the errors with error code e.g. Err9

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 ▶ (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. Pr 1
Press for > 10 s	Displays the software version, e.g. 0-0

8 Up / Down key ▲▼ (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 ≥ 2 s resets the stored values
Press for > 2 s	Display of MAX (Up) / MIN (Down) - measured values, additional pushing of Set button for ≥ 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, Loc is displayed for 3s
LED green	Setting and simulation enabled

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

ON, AL or AL 1	Limit value undercut / exceeded
FLASHES, AL or AL 1	Reset delay doF counting down

2 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-- 59.S2 59>S2	U--	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	U--	**Overvoltage**	V	264	458	264	264	458	115	
	H--	Hysteresis	V	10.5	17.5	10.5	10.5	17.5	4.5	
	dAL	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- 59.S1 59>S1	U-	Alarm on/off		on	on	on	on	on	on	
	U-	**Overvoltage**	V	264	458	264	253	438	120	
	H-	Hysteresis	V	10.5	17.5	10.5	10.5	17.5	4.3	
	dAL	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	
U1 59-Av	U1	Alarm on/off		on	on	on	on	on	on	
	U1	**Overvoltage**	V	253	438	253	253	438	110	
	H1	Hysteresis	V	10.0	17.5	10.0	10.0	17.5	4.3	
	dAL	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_ 27.S1 27<S1	U_	Alarm on/off		on	on	on	on	on	on	
	U_	**Undervoltage**	V	196	339	196	196	339	85	
	H_	Hysteresis	V	8.0	13.5	8.0	8.0	13.5	3.5	
	dAL	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__ 27.S2 27<S2	U__	Alarm on/off		on	on	on	on	on	on	
	U__	**Undervoltage**	V	92	159	92	92	159	3.0	
	H__	Hysteresis	V	3.7	3.7	3.7	3.7	6.4	1.5	
	dAL	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-- 81.S2 81>S2	F--	Alarm on/off		on	on	on	on	on	on	
	F--	**Overfrequency**	Hz	51.50	51.50	51.50	54.00	54.00	54.00	
	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	
F- 81.S1 81>S1	F-	Alarm on/off		on	oFF	oFF	oFF	oFF	oFF	
	F-	**Overfrequency**	Hz	50.50	50.50	50.50	52.50	52.50	52.50	
	H-	Hysteresis	Hz	0.10	0.10	0.10	0.10	0.10	0.10	
	dAL	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	
				Pr 1	Pr2	Pr3 *	Pr4	Pr5	Pr6	
F_ 81.S1 81<S1	F_	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	F_	**Underfrequency**	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__	**Underfrequency**	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	0.10	0.10	0.10	
	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	
uSr 78	uSr	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	uSr	**Vector shift**	°	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	
	uSr	Number of phases		3Ph	3Ph		3Ph	3Ph	3Ph	
rocF 81r	rocF	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	dFdt	**delta f / delta t**	Hz /s	0.800	0.800	0.800	2.000	2.000	2.000	
	PEr	periods		20	20	20	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 SCn	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	
	uSr	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

3 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.

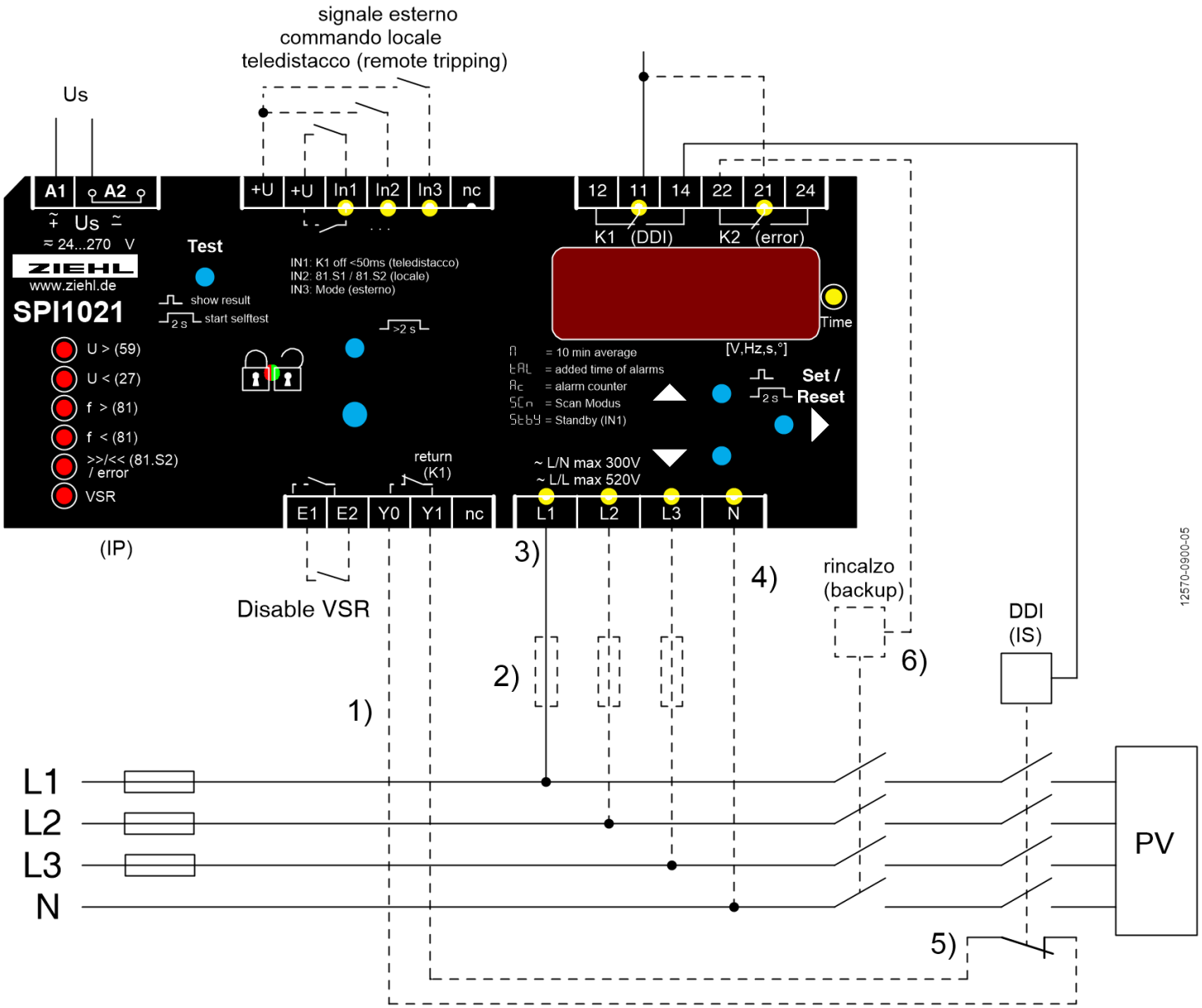
4 Summary of the functions

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) and 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

5 Connection diagram

1x PV, 2x section switch



1) Feedback contacts not connected set rEL . → trEL. → oFF.
2) Fuses only when line protection necessary, e.g. 3x16A
3) Pr 3 Phase connect to L1, L2 and L3 are not connected
4) N connected set Pr 1 , Pr 3 , Pr 4
5) NC- or NO-contacts can be connected, automatic detection when switching on
6) must be connected for plants ≥ 20kW

6 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 ≤ 6A).

Flawless and safe operation of such a device requires proper transport and storage, professional instillation 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.

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 Assembly

The device can be mounted:

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

8 Detailed description

8.1 Description of the connections

Connection	Description
A1 and A2	Rated control supply voltage Us, 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
	uSr . → oFF. , no function
	uSr . → 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 rEL . → trEL. / can switch-off if not connected or if external devices/switches can activate the section switch (oFF .)
+U	Supply output for digital outputs, DC 15…35 V
IN1 (teledistacco, RCR)	volt-free contact
	closed: K1 released <50 ms (Standby mode, StbY.)
IN2 (commando locale)	volt-free contact
	transitory mode open: F--. + F__ . = on. ; F- . + F_ . = oFF. closed: F--. + F__ . = oFF. ; F- . + F_ . = on. definitiv mode open: F--. + F__ . = oFF. ; F- . + F_ . = on. closed: F--. + F__ . = on. ; F- . + F_ . = oFF. ; alternative response time : dAL-. + dAL_. active
IN3 (signale esterno)	volt-free contact
	nodE. → trAn. , nodE. → dEF1. , no function
	nodE. → In 3. , closed: Definitiv mode open: Transitory mode
L1, L2, L3, N	Phase L1, L2, L3 and neutral conductor

8.2 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 doF 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 Scn	After the last measurement it switches into the scan mode; this is indicated by the display Scn . All measurements will now be displayed cyclically for the time set in di t .
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 tAL .	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 ▶ button to Ac . is displayed. 1x ▲ button = Cumulative alarm time tAL .
Standby mode uSr . → StbY.	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 ▶ button to Ac . is displayed. 2x ▲ button = Standby counter StbY. 1x ▲ button = Standby time StbY.
Automatic restart attempts	If there is an error by the feedback contacts Err1 , 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.
Frequency undervoltage protection UonF	if one of the measured voltages less than UonF , the frequency evaluation is interrupted until all voltages have exceeded UonF . (does not apply to device start / apply of the control voltage)

9 Commissioning

9.1 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 2x overfrequency, 2x underfrequency 10min mean value, 1x vector shift, 1x rocof	230V	CEI 0-21	CEI 0-21 + DEWA
2	3 AC without N		400V	CEI 0-21	
*3	1 AC with N		230V	CEI 0-21	
4	3 AC with N		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.

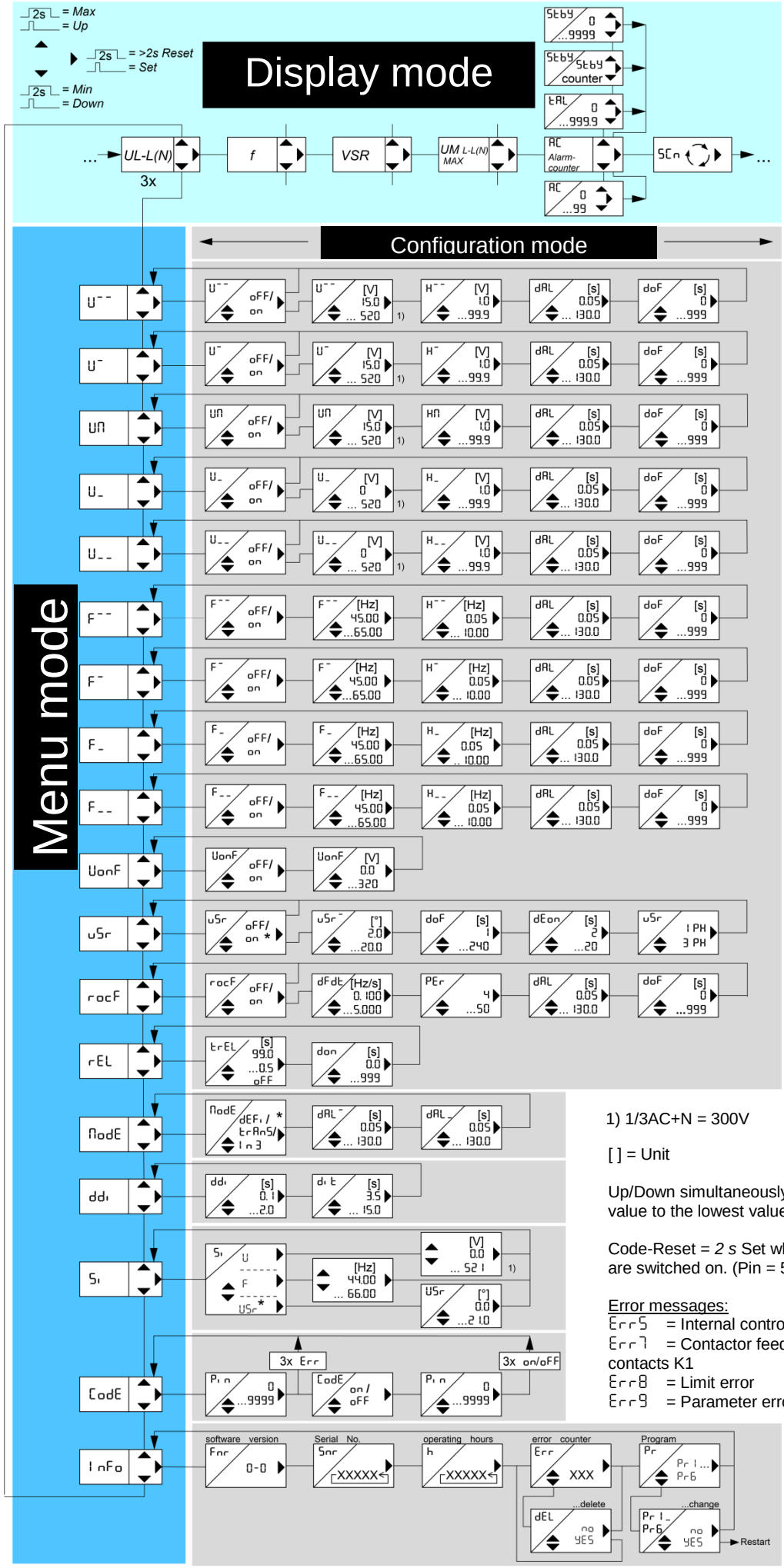
Sealing is deactivated

- Press ▲ button 1x → display `InFo.`
- Press ▶ button 5x → display `Pr 1.`
- Set the program with the buttons ▲ ▼
- Press ▶ button 1x → display `no.`
- Press ▼ button 1x → display `YES.`
- 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.**

9.2 Control chart Pr 1…6



9.3 description of the parameters

Parameters	Display	Explanation	Adjustment range
Power up delay (delay On)	don	Runs once at startup device, adjustable rEL . → don .	0.0 … 999
Limit value	U-- U- U_ U__ UN	Voltage limit value	15.0 … 300 15.0 … 520
Limit value	F-- , F- , F_ , F__	Frequency limit value	45.00 … 65.00
Frequency Undervoltage	UonF	frequency undervoltage, below this value the frequency protection is inhibited	0.0 … 320
Hysteresis	H	253V (Limit) – 3V (Hysteresis) = 250V (Reset value) If the limit value is offset in Pr1 or Pr2 at F- , the hysteresis also has to be adapted.	1.0 … 99.0 0.05 … 10.00
Response time (delay Alarm)	dAL	An alarm is suppressed for the set time (seconds)	0.05 … 130.0
Turn-on time (delay Off)	doF	Reset is delayed for the set time, also during voltage recovery, this time (seconds) is always counted down in the display	0 … 999
Enable time (delay On)	dEon	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	2 … 20
VSR	uSr	1 Ph : a vector surge on one phase leads to an alarm 3 Ph : a vector surge on all phases simultaneously leads to an alarm	1 Ph … 3 Ph
Limit value	dFdt	ROCOF, df/dt limit value	0.10 … 5.00
Periods	PEr	Measuring time ROCOF, (4=sensitive, 50=insensitive) Response time= PEr * Period duration + dAL	4 … 50
delay Display	ddi	Interval during which the display is updated in the display mode	0.1 … 2.0

9.4 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 1) and error codes (e.g. Err9) are displayed.

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

9.5 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	Press briefly: Change into the configuration mode
	Press for ≥ 2 s: Returns to the display mode (the most recently set values are then applied)
Function key Up / Down	Press briefly: Select menu item; changes into the display mode

9.6 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	Press briefly: The settings are taken over; continue to next parameter. Changes into menu mode after the last parameter
	Press for ≥ 2 s: Returns to the display mode (the most recently set values are then applied)
Function key Up / Down	Press briefly/long: 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.

9.7 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 ≥2 s.
During the Selftest is tESt displayed.
At the end of the test the result PASS (passed) or FAIL (not passed) is displayed for 30 seconds. Reset stops the test.
During selftest supply- and measuring-voltage may not be disconnected.

9.8 Display Selftest result

The values and times have been measured during selftest can be displayed by pressing button Test shortly.
Kind of limit (U¯ , U_ , F¯ , F_), 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 PASS (passed) or FAIL (not passed) is displayed.
Display automatically returns to normal mode 30 s after button Test has been pressed for the last time.

9.9 Alarm counter

The alarm counter Ac 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:

- Change into the display mode
- Press the ▶ button several times until → display AcXX

9.10 Cumulative alarm time (display in hours)

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 the cumulative alarm time:

- Change into the display mode
- Press the ▶ button several times until → display Acxx
- Press the ▲ button 1x → display tAL / x.xx

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

- Display alarm counter Acxx
- Press the ▲ button 1x → display tAL / x.xx
- Keep the ▶ button pressed for 2s until → display tAL / 0.00

9.11 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 ▶ button several times → display Acxx
- Press the ▼ button 1x → display x.xx / x.xx
  (tripping value or error no. / time that has passed in hours)
- Press the ▼ button 1x, go to next alarm

The alarm memory is only deleted during a program change.

9.12 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 ▶ button several times until → display Acxx
- Press the ▲ button 2x → display Stby / xxxx

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 ▶ button several times until → display Acxx
- Press the ▲ button 3x → display Stby / x.xx (Time LED is illuminated)

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

- Display alarm counter Acxx
- Press the ▲ button 2x → display Stby / xxxx
- Keep the ▶ button pressed for 2s until → display Stby / 0

9.13 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:

- Select the menu item with the ▲▼ buttons until → display CodE.
- Press the ▶ button 1x → display Pin / 0
- Set the **saved** pin code with the ▲▼ buttons (**default setting is** 504)
- Press the ▶ button 1x → display CodE / oFF
- Use the ▲▼ buttons to set the desired code lock:
  - oFF off, all parameters can be changed
  - on on, no parameters can be changed
- Press the ▶ button 1x → display Pin / 504
- Use the ▲▼ buttons to set the new, desired pin code (**caution: write down the pin code**)
- Press the ▶ button 1x
  - ⇒ Code lock on, display on flashes three times
  - ⇒ Code lock off, display oFF flashes three times
  - ⇒ Return to menu mode, menu item code lock

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.

9.14 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):

- 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 pressing the button cover very firmly (LED starts flashing) until the green LED is illuminated.

9.15 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 SI . is exited with the ▲ or ▼ 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:

- Select the menu item with the ▲▼ buttons until → display SI .
- Press the ▶ button 1x → display SI / U
- Use the ▲▼ buttons to set the measurement factor for simulation:
  - U Voltage + 10min mean value (frequency = last simulated value)
  - F Frequency (voltage = last simulated value)
  - uSr Vector shift
- Press the ▶ button 1x → display 230 (selected measurement factor is simulated)
- Use the ▲▼ buttons to set the desired value

After exiting the Simulation menu item with the ▲▼ 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 (UN . → oFF. since otherwise it will trip first. The same applies, for example, for U⁻ , during a simulation of U⁻⁻ .

9.16 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‾‾ , U‾ , U__ , U_	Voltage limit value
UN	Limit value 10min mean value
H‾‾ , H‾ , H__ , H_ , HN	Hysteresis (if a limit value is changed, the reset value also shifts; that means it might be necessary to adapt it)
F‾‾ , F‾ , F__ , F_	Frequency limit value
dAL , doF	Response time, Reset time; is always counted down in the display
UonF	Frequency undervoltage (inhibited frequency protection)
uSr , rocF	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
nodE , trAn , dEFi	Mode, Transitory Mode, Definitiv Mode
ddi	Delay display, to calm down the display
di 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
Pi n	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

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:	2 x change-over contact
Switching voltage	Max. AC 440 V
Conventional thermal current Ith	6 A
Inrush current (at 10 % ED)	25 A max. 4 s / 50 A max. 1 s
Nominal operating current Ie (AC 15)	6 A AC 250 V
Recommended series fuse	gG/gL 6 A
Contact service life, mech.	30 x 10^6 switching cycles
Contact service life, electr.	1 x 10^6 operating cycles at AC 250 V / 6 A 2 x 10^5 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 > UonF)
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 Us 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^2
Finely stranded with wire end ferrule	each 1 x 2.5mm^2
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

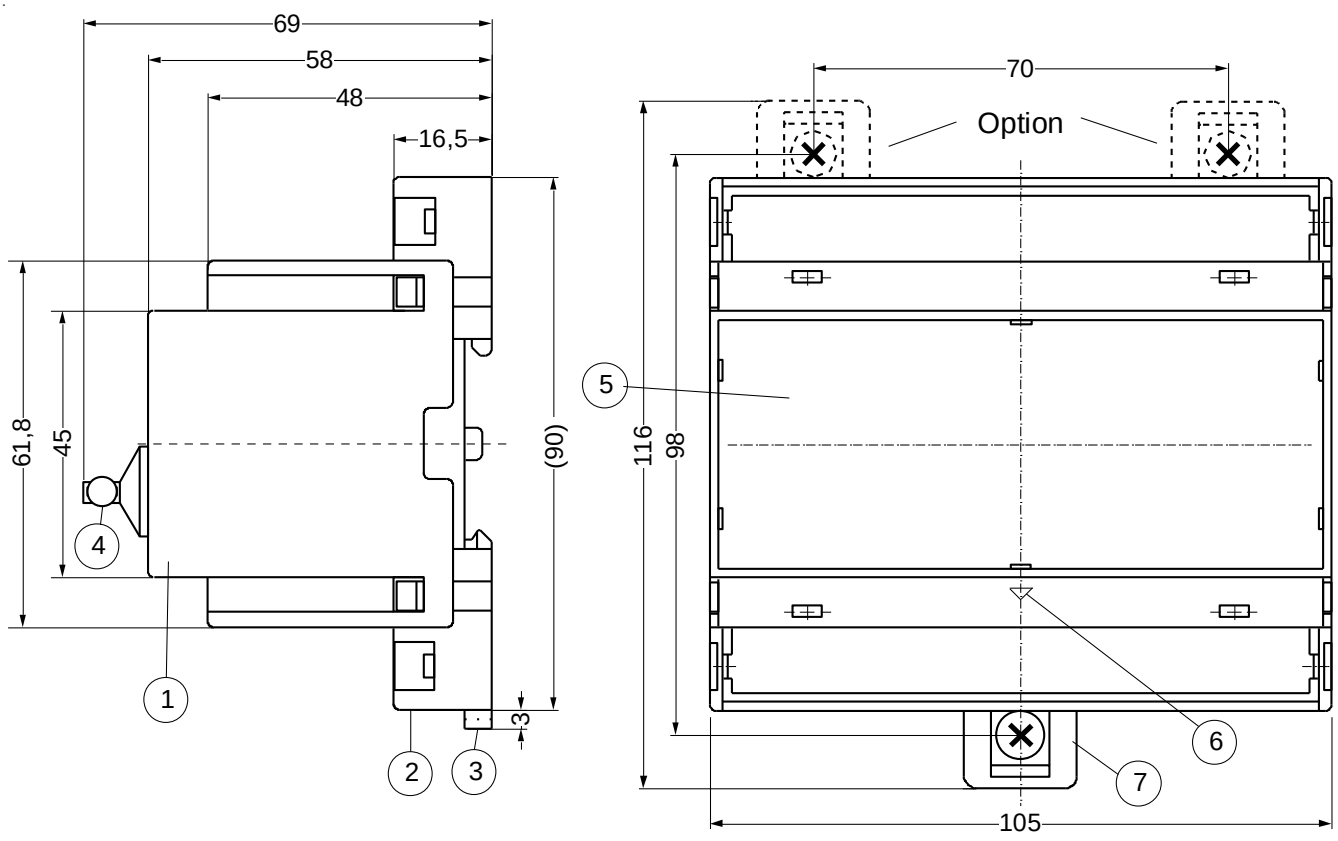
The SPI1021 is maintenance-free. Periodically test for proper functioning.

12 Troubleshooting an measures

Error	Cause	Remedy
FAIL as selftest result	Selftest failed	Check all measured voltages
EEEE or -EEE 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
Err5 appears in the display	Error internal interface	Reset → interrupt control voltage for >5s
Err1 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	Feedback contacts not connected Set - rEL. → trEL. → oFF Feedback contacts not connected - Check for correct connection - Set turn-on time of section switch under trEL. - Do a reset → interrupt control voltage for >5s
Err1 LED K1 flashes und K2 is operating	Error when off the section switch	- Check the connection - Check for broken section switch - Do a reset → interrupt control voltage for >5s
Err8 appears in the display	Hysteresis error	Upper threshold value must be higher than the lower threshold value, check the threshold values
Err9 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 doF 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 ▶ CodE / oFF appears in the display.
Implausible voltage values	Pr selected with N, but N not connected	Select Pr without N or connect N
Loc appears in the display	Seal is active	See Sealing
CodE appears in the display	Code lock is active	See „Code lock“
StbY appears in the display	Standby mode, E1-E2 closed	Check parameter uSr.

13 Construction form V6

Dimensions in mm



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

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-12024-01-00, Rif. DIN EN ISO/IEC 17065
Data validità: 15-ottobre-2020

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
CEI 0-21; 2016-07
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

TIPO APPARECCHITURA:	**Protezione Di Interfaccia**
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.
Il modulo SPI1021 esterno assicura solo la tolleranza singola di guasto, se vengono utilizzati due moduli SPI1021 collegato in serie. Un singolo modulo SPI1021 non ha assicurato la tolleranza singola dell'anomalia.

RIFERIMENTI DEI LABORATORI CHE HANNO ESEGUITO LE PROVE:
Bureau Veritas Consumer Products Services Germany GmbH
Accreditamento a DAkkS, D-PL-12024-03-03, 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_3, 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, CEI 0-21; 2016-07.

Numero di certificato: **U17-0262**

Data di emissione: **2017-06-23**

Organismo di certificazione

Holger Schaffer
Organismo di certificazione Bureau Veritas Consumer Products Services Germany GmbH
Accreditamento a DIN EN ISO/IEC 17065

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Declaration of conformity

with the requirements of DEWA 2016

CERTIFICATION BODY: **Bureau Veritas Consumer Products Services Germany GmbH**
DAkkS accreditation, D-ZE-12024-01-00, ref. To DIN EN ISO / IEC 17065
validity date: 15-Oct-2020

APPLIED RULES AND STANDARDS: **DEWA 2016** Version 2.0, March 2016
Standards for Distributed renewable resources generators connected to the distribution network

TOPOLOGY OF THE DEVICE COVERED BY THE DECLARATION

DISCONNECTION DEVICE	INTERFACE PROTECTION DEVICE	DEVICE FOR STATIC CERVERSION	ROTATING GENERATOR DEVICE
	X		

MANUFACTURER: **ZIEHL industrie-elektronik GmbH+Co KG**
Daimlerstraße 13
74523 Schwäbisch Hall
Germany

TYPE DISCRIPTION:	**External IPS (Interface protection system)**
MODEL / TYPE:	**SPI1021**

VERSIONE FIRMWARE: **0-0**

NUMERO DI FASI: **Single-phase + three-phase**

NOTA:
For systems where the power imbalance more than 5kW, the power imbalance must be checked separately.

REFERENCE TO THE LABORATORY, WHICH PERFORMED THE APPROVAL:
Bureau Veritas Consumer Products Services Germany GmbH
DAkkS accreditation, DPL-12024-03-03, ref. To DIN EN ISO / IEC 17025
Date of validity: 11-June-2019

Examined ISO 9001 Certificate of the Manufacturer n° FS 529448/4542D, issued by British Standards Institution (BSI).

Report number: **12TH0488-DEWA-2016_0**

Certificate number: **U16-0447**

Date of issue: **2016-08-04**

Organismo di certificazione

Dieter Zitzmann

Certification body of Bureau Veritas Consumer Products Services Germany GmbH
Accredited according to DIN EN ISO/IEC 17065

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