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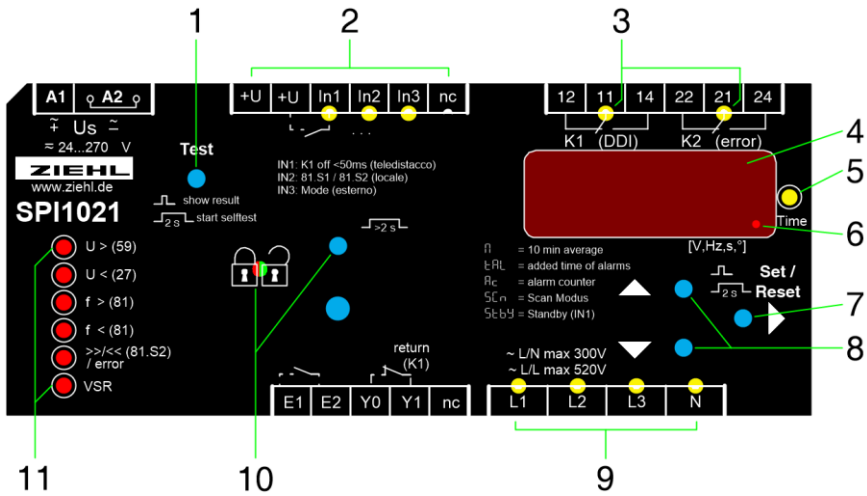
Quick Guide SPI1021

updated: 2022-08-03 /Sc
from Firmware: 0-0

- Grid- and Plant Protection According to CEI 0-21 and DEWA standard
- with self-test for < 11kW and Watchdog
- with integrated vector shift relay
- for plants with possible asymmetry ≥ 6kVA, power balance has to be monitored extra
- Pr3 = default

Detailed operating manual see: http://www.ziehl.com/en/AllProducts/detail/SPI1021-55

1. Display and controls



1 Test Button

press briefly	the self-test result is displayed, display next result
Press for > 2 s	Start self-test, K1 de-energize, K2 energize (K2 = off in Pr4, 5 and 6)

2 LEDs Inputs status (yellow)

OFF	Input not active (open)	ON	Input active (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 n`	Limit value undercut / exceeded
FLASHES, `AL` or `AL n`	Reset delay `doF` counting down

2. 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
	<u>transitory mode</u> open: `F--.` + `F__ .` = `on.` ; `F- .` + `F_ .` = `oFF.` closed: `F--.` + `F__ .` = `oFF.` ; `F- .` + `F_ .` = `on.` <u>definitive mode</u> 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: Definitive mode open: Transitory mode
L1, L2, L3, N	Phase L1, L2, L3 and neutral conductor

3. Default settings and firmware version

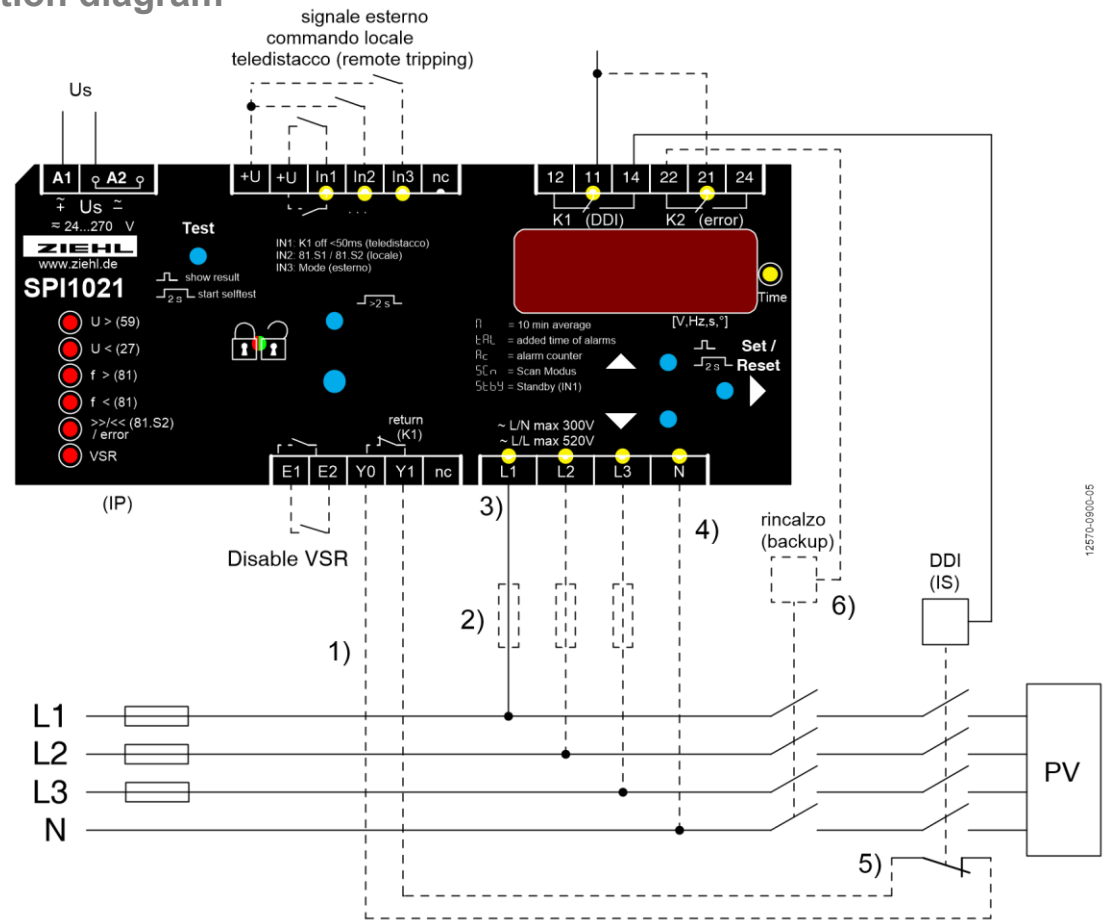
When changing programs, all parameters are reset to the *default settings.

Menu item	Parameter / Unit			Default setting						User data
				CEI 0-21			**DEWA**			
				3AC+N 230V	3AC 400V	1AC+N 230V	3AC+N 230V	3AC 400V	3AC 100V	
				Pr 1	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	
UN 59-Av	UN	Alarm on/off		on	on	on	on	on	on	
	UN	**Overvoltage**	V	253	438	253	253	438	110	
	HN	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	85.0	
	H_	Hysteresis	V	8.0	13.5	8.0	8.0	13.5	3.5	
	dAL	Response time	s	1.50	1.50	1.50	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	34.5	60	34.5	92.0	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		oFF	oFF	oFF	oFF	oFF	oFF	
	F-	**Overfrequency**	Hz	50.20	50.20	50.20	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	0.10	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			User 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	49.80	49.80	49.80	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	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	Voltage 0,2 Un	V	46.0	80.0	46.0	46.0	80.0	20.0	
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		trAn	trAn	trAn	trAn	trAn	trAn	
	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	Pin	Pincode		504	504	504	504	504	504	
	CodE	On/off		oFF	oFF	oFF	oFF	oFF	oFF	
InFo	Fnr	Firmware version		0-0	0-0	0-0	0-0	0-0	0-0	
	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

4. Connection diagram



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

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 ≤ 6A).

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!

6. Assembly

The device can be mounted:

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

7. 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.**

8. Putting into operation

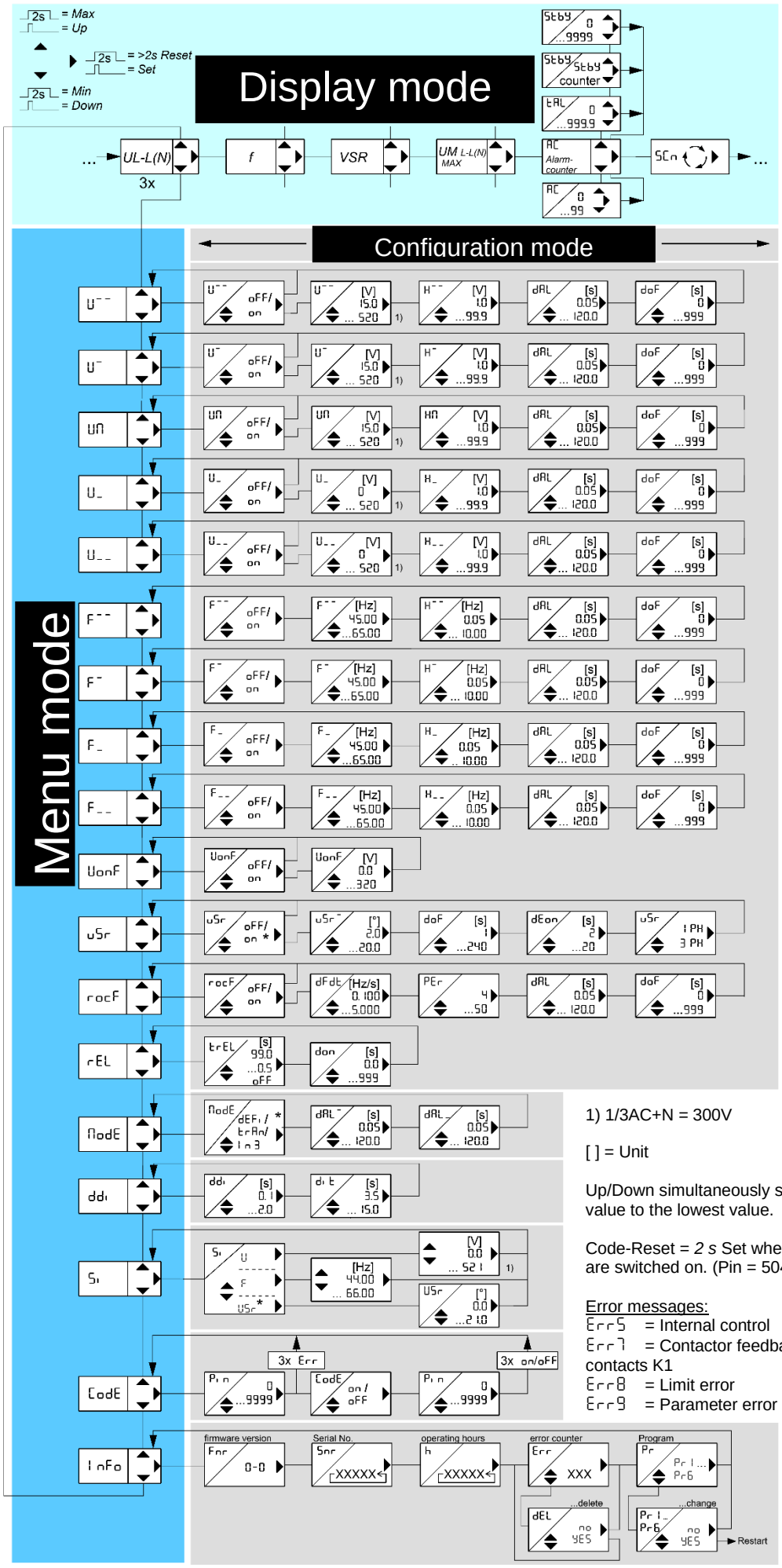
8.1 Self-test execute

In programs 1, 3, 4 the SPI1021 has an automatic self-test as recommended in CEI 0-21 and DEWA.
K1 can pick up only after the self-test has been passed once.
Self-test starts automatically as soon as measuring voltage is connected for the first time to a new device and when there is no alarm! Self-test also starts automatically when program has been changed to 1, 3, 4.
Self-test can be started manually by pressing button Test for ≥2 s.
During the Self-test 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 self-test supply- and measuring-voltage may not be disconnected!

8.2 Display Self-test result

The values and times have been measured during self-test can be displayed by pressing button Test shortly. Kind of limit (U⁻⁻, U⁻, UN, U_, U__, F⁻⁻, F⁻, F_, F__), response time, measured value, trigger value and adjusted limit are displayed. LEDs (yellow) at the terminals L1…N shows the measured and trigger value.
By pressing Test shortly display changes to the values of the next kind of limit. At last the result PASS (passed) or FAIL (not passed) is displayed and additionally the switching time from K1 if trEL is activated.
Display automatically returns to normal mode 30 s after button Test has been pressed for the last time.

9. Control Chart Pr1…6



1) 1/3AC+N = 300V

[ ] = Unit

Up/Down simultaneously sets the value to the lowest value.

Code-Reset = *2 s* Set when mains are switched on. (Pin = 504)

Error messages:

Err5 = Internal control
Err7 = Contactor feedback contacts K1
Err8 = Limit error
Err9 = Parameter error

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/B 6 A

We reserve the right to make technical changes

11. Troubleshooting and measures

Error	Cause	Remedy
FAIL as self-test result	Self-test 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
Err7 also appears in the display after 2 automatic reconnection attempts, LED K1 flashes	Error when the section switch turns on, 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
Err7 LED K1 flashes and 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.