Voltage- and Frequency Relay UFR1001

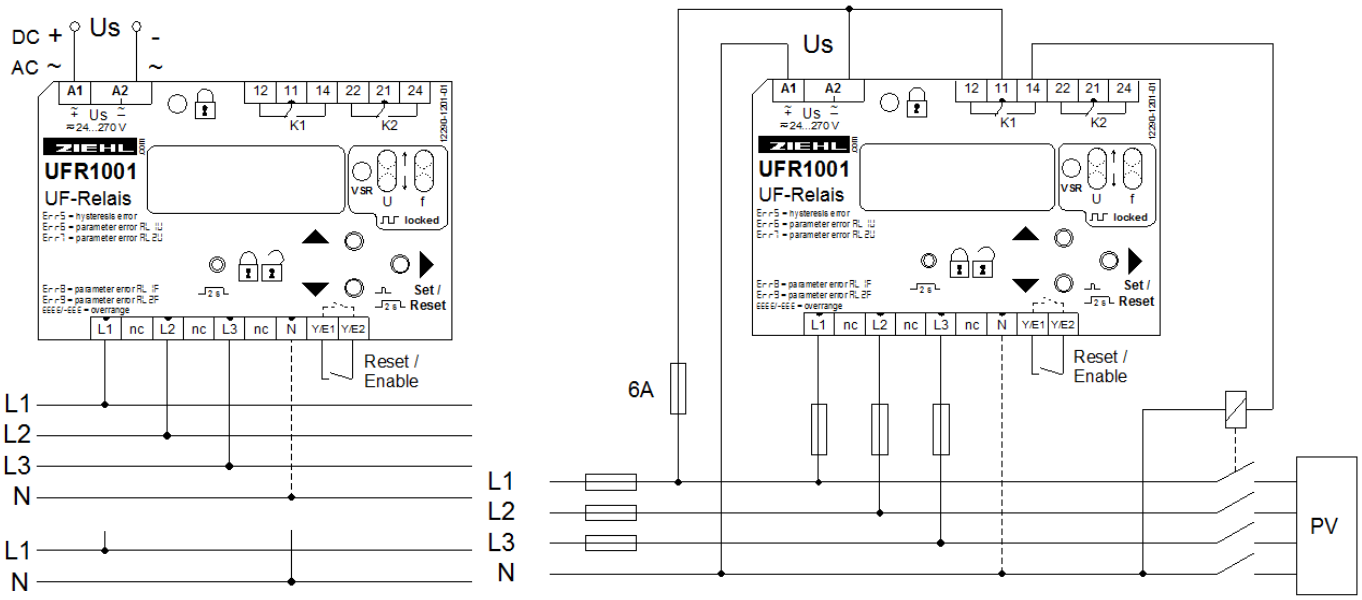
with integrated vector shift relay, sealable

UFR1001

Part number: **S222295**

The voltage- and frequency relay UFR1001 monitors voltage and frequency in two- or three-phase networks with or without neutral and switches off rapidly when required.
The device can be easily adapted to the requirements of the carrier of the power network.
With the integrated vector-step relay it can also monitor networks at synchronous generators.
After selecting a basic program, for each relay limits can be programmed for over-/undervoltage and over-/underfrequency.
In programs with vector-step-monitoring, K2 is used for vector-step only.
Applications are monitoring power-networks at great solar-plants, in block power heating stations, also with synchronous generators (vector shift) or generally monitoring the quality in power networks at machines or power-supplies.

- Monitoring of over- and undervoltage 40…520 V
- monitoring of over- and underfrequency 45…65 Hz
- monitoring of quality of voltage (10-minutes-average)
- monitoring of vector-shift 2…20 °, 1 or 3-phase
- Switching-delay adjustable <0,05…60,0 s
- Switching-back-delay adjustable 0…1000 s
- Alarm-counter for up to 100 alarms (with measured value and reason)
- Added time of alarm up to 999 hours. Displays the time, alarms have been active (while supply voltage applied only)
- LEDs for alarms, allocation of values and states of relays
- 2 output-relays, each for monitoring frequency and/ or voltage
- function of relays (nc- or no -operating mode) programmable
- interlocked switching or autoreset
- input for Enable / Reset
- easy programming by help of basic programs
- Sealing of settings is possible
- code-lock against manipulation of settings
- universal power-supply AC/DC 24-270 V
- housing for DIN-rail-mount, 70 mm wide, mounting height 66 mm



Technical Data UFR1001

Power supply	Rated supply voltage Us	AC/DC 24-270 V, 0/45...65 Hz, <5VA DC: 20,4...297 V, AC: 20,4...297 V
Relay output		2 change-over contacts **type 2**, see "general technical informations"
Voltage	Measuring voltage phase-phase	AC 40...520 V
	Measuring voltage phase - N	AC 40...300 V
	Hysteresis	adjustable 1...99 V
	Frequency	45...65 Hz
	Error (with N)	± 0,8% of measured value ± 1 Digit
	Error (without N)	± 1% of measured value ± 1 Digit
	Measuring functions	3-phase with / without neutral, single phase to neutral
	Switching-delay	adjustable 0,05...60,00 s
	Switching-back delay (zero-voltage-proof)	adjustable 0 (> 200 ms)...1000 s
Frequency	Measuring range	45,00...65,00 Hz
	Hysteresis	0,05...5.00 Hz
	Error	± 0,05 Hz ± 1 Digit
	Switching-delay	adjustable 0,1...99,9 s
	Switching-back delay	adjustable 0...240 s
Vector-Shift	Mathod	1- or 3-phase
	Measuring range	2.0...20.0 °
	Hysteresis	0,1 °
	Switching-delay	< 50 ms
	Switching-back delay	adjustable 3...240 s
	Delay at Us on	adjustable 2...20 s
Test Conditions		EN 60 255
	Rated impulse voltage	4000 V
	Overvoltage catagory	III
	Rated Insulation voltage	AC 300 V
	Contamination level	2
	Isolation material group	II
	On-period	100 %
	Rated ambient temp. range	-20 °C...+55 °C EN 60 068-2-1 dry heat
	Interference resistance	EN 61 000-6-2
	Interference transmission	EN 61 000-6-4
Housing	Design	V 4
	Dimensions (h x w x d)	90 x 70 x 58 mm, mounting height 66 mm
	Protection housing	IP 30
	Protection terminals	IP20
	Attachment	DIN-rail 35 mm or screws M4
	Weight	app. 200 g

Voltage and Frequency Relay UFR1001E

Grid- and Plant Protection VDE-AR-N 4105, G98 + G99, DIN V VDE 0126-1-1, VFR2013/2014, NRS 0972-1:2017 Ed 2, Synergrid C10/C11, EN50438:2013, RD1699:2011/RD413:2014 and more

NEW: VDE-AR-N 4120:2018-11, VDE-AR-N 4105:2018-11, VDE-AR-N 4110:2018-11

UFR1001E

Part numbers:

UFR1001E	**S222296**
ER6 	**T224386**

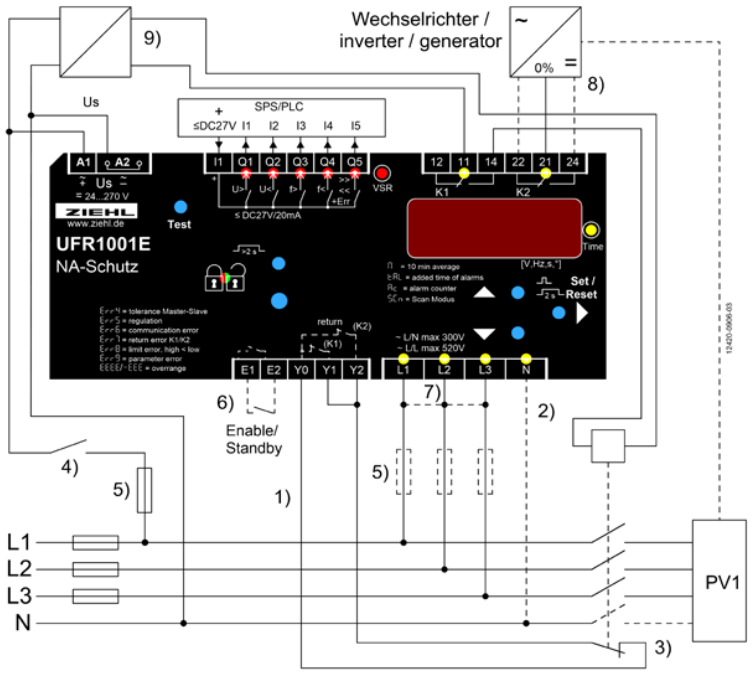
The grid- and plant protection device UFR1001E monitors voltage and frequency in plants for own generation of electricity. It complies with the requirements of VDE-AR-N 4105:2018-11, VDE-AR-N 4110:2018-11, G98, G99, ÖVE/ÖNORM E 8001-4-712:2009 and other standards for generators connected to the public grid.

The UFR1001E is a dual-channel device and thus one-fault-proof. The function of the output-relays and of the connected switches can be monitored with feed-back contacts. When a connected switch does not switch off, the UFR does not switch on again. When a switch does not switch on it makes 2 restarts and thus improves availability of monitored plant.

The limits are pre-set according to VDE-AR-N 4105-2018-11, VDE-AR-N 4105:2018-11 and other standards. They can be changed if required and be protected with a code and/or a seal.
With a 2-step test both channels can be tested individually and the triggering time of connected switches is measured.
The standby input allows a remote shutoff e.g. with a RCR.

Monitoring of:

- Under- and overvoltage 15…520 V (with voltage transformers up to 1000V)
- Under- and overfrequency 45…65 Hz
- Quality of voltage (10-minutes-average)
- Vector shift 2…65°, *zuschaltbar*
- Measuring phase-neutral or phase-phase
- ROCOF rate of change of frequency df/dt 0,100...5,000 Hz/s
- Zero voltage U_0 (ANSI 59v0)



- One-fault-proof with monitoring of connected switches (defeatable when using the integrated switch of pv and battery inverter acc. to DIN EN 62109 (VDE 0126-4))
- 2 automatic restarts at switch-on error
- Passive anti-islanding protection acc. to ch. 6.5.3 and app. D2
- Switching delay adjustable 0.05 … 300 s
- Switching back delay adjustable 0 … 6.000 s
- Alarm counter for 100 alarms (trip value, cause and rel. time stamp)
- Record of added times of alarms
- Input for standby with counter and recording of time
- Test button and simulation with measuring of switching-times
- Sealing. All values can be read-out when sealed
- Easy installation and programming with pre-set programs
- Housing for DIN-rail-mount, 105 mm wide, mounting height 66 mm

Accessory: Installation frame ER6 for panel mount

Preset values:

- VDE-AR-N 4105:2018-11 (Pr2), VDE-AR-N 4105-2011-08 (Pr1)
- VDE-AR-N 4110:2018-11 (PR11-14) and BDEW (Pr 3-6)
- G98 (G83/2) and G99 (G59/3) for Great Britain
- TOR producers type A, B, C, D for Austria
- Synergrid C10/C11 for Belgium
- NA/EEA-NE7 CH 2020 for Switzerland

Certificates:

Certificate of conformity Grid and Plant protection acc. to VDE-AR-N 4105 2011-08 and 2018-11 "Plants for generation of own energy in low voltage grid"
Certificate for component VDE-AR-N 4110 and 4120
Cerfitficate of conformity Grid and Plant protection acc. to BDEW requirement "Plants for generation of own energy in medium voltage grid""

Certificate of compliance DIN V VDE 0126-1-1

gelistet bei Energex RED STD00233

TOR Erzeuger A,B,C,D
Certificate ÖVE/ÖNORM E 8001-4-712:2009-12, Enclosure A

approved Synergrid C10/C11

Certificate de conformité
DIN V VDE 0126-1-1, VFR2013/VFR 2014

Certificate of compliance G59/3:2013, G83/2:2012, G99/1-1+2+3:2018 und G98/1-1+2:2018

Certificate of compliance EN 50549-1:2019, EN 50438:2013

accepted by Tepco

Netherlands EN50549-1

RD1699:2011 / RD413:2014

Certificate of compliance NRS 097-2-1:2017 2.0 South Africa

Technical Data UFR1001E

Power supply	Rated supply voltage Us	AC/DC 24-270 V, 0/45...65 Hz, <5VA DC: 20,4...297 V, AC: 20,4...297 V
Relay output		2 change-over contacts see operating manual
Voltage	Measurement phase-phase	AC 15...530 V (< 5 V display: 0)
	Setting range phase-phase	AC 15...520 V
	Measuring voltage phase-neutral	AC 10...310 V (< 5 V display: 0)
	Setting range phase-neutral	AC 15...300 V
	Measurement method	true RMS
	Hysteresis	adjustable 1,0...180 V
	Measurement accuracy	with neutral: ±0,6% of measured value without neutral: ±0,8% of measured value
	Accuracy of display	>100V: -1 digit (resolution 1 V) <100V: -1 digit (resolution 0,1 V)
	Measurement functions	3-phase with / without neutral
	Switching-delay (dAL)	adjustable 0,05 (± 15ms)...300,0 s
	Switching-back-delay (doF)	adjustable 0 (approx. 200 ms)...6.000 s
Frequency	Measurement range	40...70 Hz
	Setting range	45,00...65,00 Hz
	Hysteresis	0,05...10,00 Hz
	Measurement accuracy	± 0,04 Hz ± 1 digit
	Switching delay (dAL)	adjustable 0,05 (± 15ms)...300,0 s
	Switching-back-delay (doF)	adjustable 0 (>200 ms)...6.000 s
Vector-Shift	Measurement range	0...90,0°
	Setting range	2,0...65,0°
	Switching-delay (dAL)	< 50 ms
	Switching-back-delay (doF)	adjustable 3...240 s
	Delay at Us on	adjustable 2...20 s
ROCOF (df/dt)	Setting range	0,100...5,000 Hz/s, 4...50 cycles
Digital outputs insulated	Voltage I1	DC 4,5...27 V
	Current Q1...Q5	max. 20 mA / output
Input Feed-back-contacts	Voltage Y0...Y1/2	DC 15...35 V
	Switching time connected switches	adjustable 0,5...99,0 s
Test Conditions		EN 60255
	Rated impulse voltage	4000 V
	Overvoltage category	III
	Pollution degree	2
	Rated Insulation voltage Ui	300 V
	Operating time	100 %
	Operating temperature	-20 °C...+55 °C
	Storage temperature	-25 °C...+70 °C
	Climatic conditions (IEC/EN 60721-3-3)	3K5 (except condesation and formation of ice)
	EMC - immunity	EN 61 000-6-2
	EMC - emission	EN 61 000-6-3
Housing	Design / Installation Frame	V6 / Front mounting kit type ER6, 6 TE
	Dimensions (h x w x d)	90 x 105 x 69 mm, mounting height 66 mm
	Protection housing	IP30
	Protection terminals	IP20
	Attachment	DIN-rail 35 mm according to EN 60 715 or screws M4
	Weight	ca. 250 g

Voltage- and Frequency-Relay SPI1021

Grid- and Plant Protection according to CEI 0-21 (Italy) and DEWA-standard (Dubai), with integrated Vector-Shift-Relay

SPI1021

Part numbers:

SPI1021 **S222300**

ER6 **T224386**

Declaration of confrmity with requirements of **CEI 0-21 Italy**. *Dichiarazione die confomità alle prescrizioni alla Norma CEI 0-21 Italia..*

Declaration of conformity with requirements of **DEWA 2016 Dubai (DRRG).**

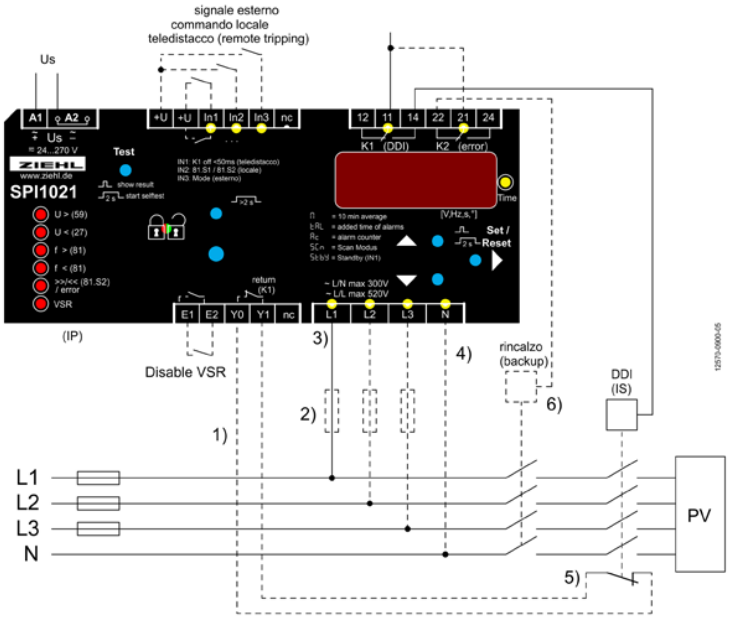
The SPI1021 monitors voltage and frequency in plants for own generation of electricity. It fulfills the requirements of CEI 0-21 (Italy) and DEWA-standard (Dubai) Interface Protection (IP) according to DEWA Distributed Renewable Resources Generation programme (DRRG19, September 01, 2016).
6 selectable 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, photovoltaic, wind or thermal plants, that feed in the low voltage and medium voltage grid. In applications with possible asymmetry >6 kVA, power balance has to be monitored extra.

With the integrated certified self test, the device can be used in plants < 6kVA.
In programs 1-3 (3= default), the limits are preset according to CEI 0-21. In programs 4-6 they are preset according to DEWA-standard. 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 displayed at the device and give the operator valuable information about the availability of the plant.
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 15-520 V
- Measuring of 3 phase with or without neutral or single phase
- Monitoring of over- and underfrequency 45-65 Hz
- Monitoring of quality of voltage (10-minutes-average)
- RocoF "Rate of Change of Frequency" connectable
- Monitoring of vector-shift (connectible)
- 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 <500 ms) only at failure at switch connected to K1
- 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 (adjustable)
- 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 6 preset programs
- Supply-voltage AC/DC 24-270 V
- Housing for DIN-rail-mount, 105 mm wide, mounting height 70 mm

Accessory: Installation frame ER6 for panel mount



Technical Data SPI1021

Power supply	Rated supply voltage Us	AC/DC 24-270 V, 0/40...70 Hz, <5VA DC: 20,4...297 V, AC: 20,4...297 V
Relay output		2 change-over contacts
Measuring voltage	Voltage phase-phase	AC 15...530 V (< 5 V display 0)
	Setting range phase-phase	AC 15...520 V
	Voltage phase-neutral	AC 10...310 V (< 5 V display 0)
	Setting range phase-neutral	AC 15...300 V
	Measurement method	true RMS
	Hysteresis	adjustable1,0...99,9 V
	Measurement accuracy (with neutral)	±0,6% of measured value
	Measurement accuracy (without neutral)	±0,8% of measured value
	Accuracy of display	>100V: ±1 digit (resolution 1 V) <100V: ±1 digit (resolution 0,1 V)
	Measurement functions	3-phase with / without neutral, single phase
	Switching-delay (dAL)	adjustable 0,05 (± 15ms)...130,0 s
	Switching-back-delay (doF)	adjustable 0 (= 40ms)...999 s
Measuring frequency	Measurement range	40...70 Hz
	Setting range	45,00...65,00 Hz
	Hysteresis	0,05...10,00 Hz
	Measurement accuracy	± 0,01 Hz ± 1 digit
	Switching delay (dAL)	adjustable 0,05 (± 15ms)...130,0 s
	Switching-back-delay (doF)	adjustable 0 (= 40ms)...999 s
Vector-Shift	Measurement range	0...45,0°
	Measurement range	2,0...20,0°
	Switching-delay (dAL)	< 50 ms
	Switching-back-delay (doF)	adjustable 3...240 s
	Delay at Us on	adjustable 2...20 s
Digital inputs (INx)	Switching voltage + U	DC 15...37 V
	Current INx	> 3 mA
Input Feedback contact	Switching voltage Y0...Y1	DC 15...35 V
	Current Y1	> 3 mA
	Switching time connected switches	adjustable 0,5...99,0 s
Housing	Design / Installation Frame	V6 / Front mounting kit type ER6, 6 TE
	Dimensions (h x w x d)	90 x 105 x 69 mm, mounting height 70 mm
	Wiring connection single strand	1 x 4 mm2
	Finely stranded with wire end ferule	1 x 2,5 mm2
	Protection housing	IP30
	Protection terminals	IP20
	Attachment	DIN-rail 35 mm according to EN 60 715 or screws M4
	Weight	ca. 250 g

Voltage and Frequency Relay UFR1002IP

Grid- and Plant Protection VDE-AR-N 4105, 4110, 4120, NA-Box
IP interface and LCD-Display

Available 4th quarter 2022

UFR1002IP

Part numbers:

UFR1002IP	**S222301**
ER6 	**T224386**
VG1200	**S222312**

The grid decoupling relay UFR1002IP is the "big brother" of the UFR1001E and monitors voltage and frequency in three-phase and AC grids.

With a color LCD display (German/English) and joystick, it is even easier to operate than the UFR1001E. Measured values and settings are clearly displayed. The device can be programmed, updates installed and the alarm memory read out via the integrated IP interface. The real-time clock (with power reserve) simplifies the traceability of the alarms. Up to 1,200 V can be monitored in conjunction with the VG1200 coupling device.

The device has a two-channel, single-fault-safe design and thus meets the requirements of VDE-AR-N 4105:2018-11. The function of the connected switch is monitored. If monitoring is activated, the device does not switch on again if a switch-off error is detected.

Limit values for different applications are preset. Where permitted, they can easily be changed. If the nominal voltage is changed, the device automatically adjusts the limit values that have already been set.
With the standby input, a remote shutdown can be implemented, e.g. with a ripple control receiver.

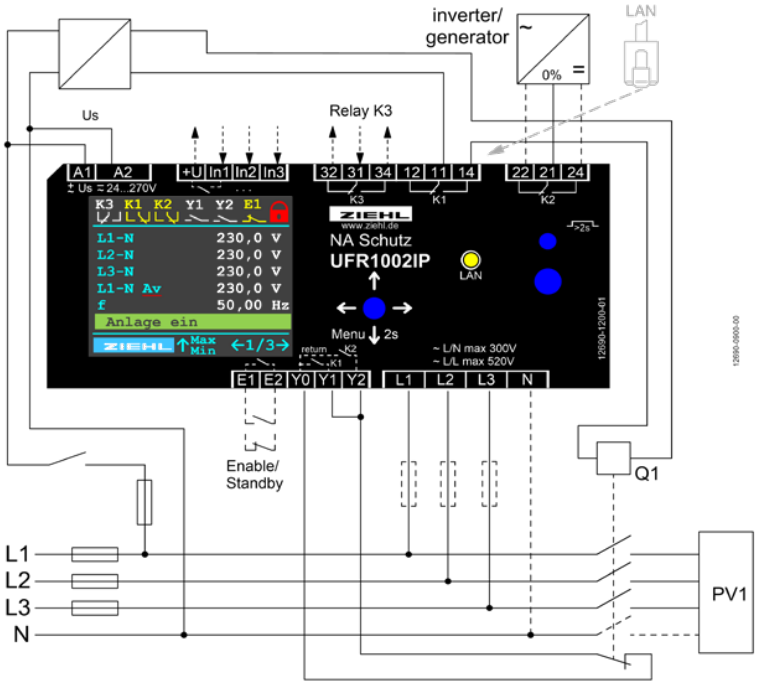
Monitoring of:
- Under/over voltage 15-520V (with ZIEHL VG1200 coupling device up to 1,200 V)
- Under/over frequency 45-65 Hz
- Voltage quality (10-minute average)
- Vector shift 2-65°
- ROCOF, rate of change of frequency df/dt 0.100...5.000 Hz/s
- Zero voltage U0 (ANSI 59v0)
- passive anti islanding protection

Approvals/certificates (applied for):
Germany:
- Certificate of conformity Grid- and Plant protection acc. to VDE-AR-N 4105 2018-11 "Plants for generation of own energy in low voltage grid"
- Certificate for component VDE-AR-N4110 and 4120

More will follow

Features:
- single-fault-proof, with monitoring of connected switch (can be switched off when using the integrated switch of PV and battery converters
- Programmable restart attempts in the event of a switch-on error in the connected switch
- Relay K3 with programmable functions, including life contact, delayed switch-on signal for switches or error messages
- Response time adjustable 0.05 … 300,0 s
- Switch-back time adjustable 0 … 6,000 s
- Preset according to VDE-AR-N 4105-2018-11 (Pr 1.02) and VDE-AR-N 4105-2011-08 (Pr 1.01)
- Preset according to VDE-AR-N 4110-2018-11 (Pr 1.11-1.14) and bdew guideline (Pr 1.3-1.6)
- automatic adjustment of the switching points when the nominal voltage is changed
- Alarm counter for 100 alarms (with trigger value, cause and date/time, time of restart)
- 3 programmable digital inputs
- Standby counter and timer with standby on/off date/time
- Test and simulation function with measurement of switch-off times
- Sealing option and code protection for settings
- Simple commissioning and programming thanks to preset basic programs and transmission via IP interface
- Supply voltage AC/DC 24-270 V
- Housing for DIN-rail mount, 105 mm wide, installation depth 66 mm

Accessory:
Installation frame ER6 for panel mount
ZIEHL Coupling device VG1200



Technische Daten UFR1002IP

Power supply	Rated supply voltage Us	AC/DC 24-270 V, 0/40...70 Hz, <5VA DC: 20,4...297 V, AC: 20,4...297 V
	bridging at dropping Us	230 V -> 0 V: 400 ms
Relay output		3 change over contacts, see operating manual
Voltage	Measurement phase-phase	AC 15...530 V (< 5 V display 0)
	Setting range phase-phase	AC 15...520 V
	Measuring voltage phase-neutral	AC 10...310 V (< 5 V display 0)
	Setting range phase-neutral	AC 15...300 V
	Measurement method	true RMS
	Measurement accuracy	<1 % of measured value ±0,2 digit
	Measurement functions	3-phase with / without neutral
	Switching-delay (dAL)	adjustable 0,05 (± 15 ms)...300,0 s
	Switching-back-delay (doF)	adjustable 0 (ca. 200 ms)...6.000 s
Frequency	Measurement range	40...70 Hz
	Setting range	45,00...65,00 Hz
	Hysteresis	0,05...10,00 Hz
	Measurement accuracy	± 0,04 Hz ± 1 Digit
	Switching delay (dAL)	einstellbar 0,05 (± 15 ms)...300,0 s
	Switching-back-delay (doF)	einstellbar 0 (> 200 ms)...6.000 s
Vector-Shift	Measurement range	0...90,0°
	Setting range	2,0...65,0°
	Switching-delay (dAL)	< 50 ms
	Switching-back-delay (doF)	adjustable 3...240 s
	Delay at Us on	adjustable 2...20 s
ROCOF (df/dt)	Setting range	0,100...5,000 Hz/s, 4...50 cycles
Digital outputs insulated	E1/E2, Y0...Y2, In1...In3	DC 15...35 V
Test Conditions		EN 60255
	Rated impulse voltage	4000 V
	Overvoltage category	
	Pollution degree	III
	Rated Insulation voltage Ui	2
	Operating time	300 V
	Operating temperature	100 %
	Storage temperature	-20 °C...+55 °C
	Climatic conditions (IEC/EN 60721-3-3)	-25 °C...+70 °C 3K5 (except condensation and formation of ice)
	EMC - immunity	EN 61 000-6-2
	EMC - emission	EN 61 000-6-3
Housing	Design / Installation Frame	V6 / Front mounting kit type ER6, 6 TE
	Dimensions (h x w x d)	90 x 105 x 69 mm, mounting height 66 mm
	Protection housing/terminals	IP30/20
	Attachment	DIN rail 35 mm according to EN 60 715 or screws M4
	Weight	approx. 250 g

Coupling Device for Voltage Type VG1200

Measuring of voltages up to 1.200V with NA-Box UFR1200IP

Available 4th quarter 2022

VG1200

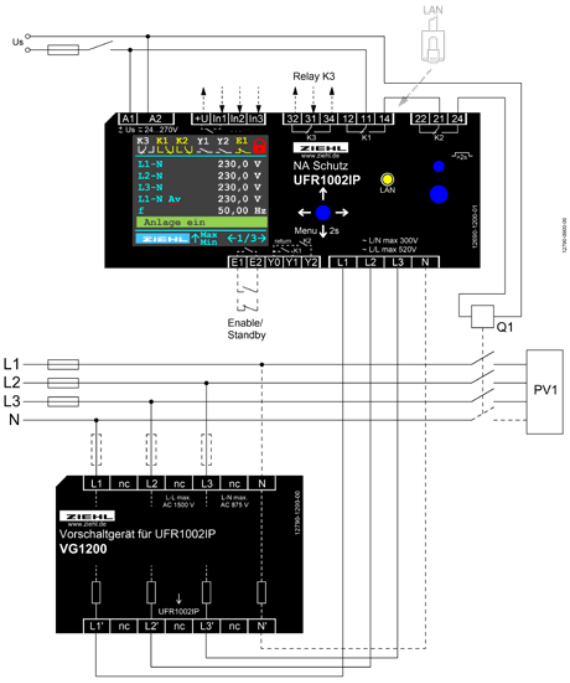
Part numbers:

VG1200	**S222312**
ER4 	**T224384**
UFR1002IP	**S222301**

In order to achieve higher efficiencies and to reduce line losses, inverters with a higher output voltage than the usual 3AC 400 V are often used in large on-site generation systems.
So that the grid and system protection can monitor this high voltage, it must be reduced. This is usually done with voltage converters.
With the VG1200IP coupling device, an ohmic voltage divider is available that takes on this task. In conjunction with the VG1200 coupling device, the UFR1002IP can measure voltages of up to 1200 V. The display in the UFR1002IP is scalable. This means that the voltages at the input of the VG1200 are displayed and the limits for protection against over- and undervoltage are set accordingly.
Both devices together meet the requirements of VDE-AR-N 4110 (feeding into the medium-voltage grid).

- Measuring of voltage up to 1200 V
- Max. error 2 %
- No voltage converters required
- Display of the correct voltage on the UFR1002IP (scalable)
- No supply voltage required
- Housing V4, 70 mm wide

Accessory:
Installation frame ER4 for panel mount
ZIEHL NA-Box UFR1002IP



Technical Data

Measurement	3AC + N	
Nominal voltage Un L-N	250...690 V	
Nominal voltage Un L-L	440...1200 V	
Measuring range	0...1,25 Un (continously)	
Measurement accuracy UFR + VG	< ±2%	
Frequency range	AC 45...65 Hz	
Overvoltage category	III	
Pollution degree	2	
Protection category	II (with UFR1002IP)	
Rated impulse voltage	16 kV	
Isolation coordination	Electronics - Housing	20,0 mm reinforced isolation
	Phase-Phase	11,5 mm basic isolation
	Phase-Neutral	8,0 mm basic isolation
Internal resistance Ri	1,8 mOhm / measuring channel	
Residual current (single error)	<0,9 mA @1500 V_{L-L}	
Protection class	IP20	
Perm. ambient temperature	-20...55 °C	
Housing	Design V4 / Front mounting kit ER4, 4 TE	
Dimensions (H x B x T)	V4: 90x 70 x 58 [mm], Fitting height 55 mm	
Attachment	35 mm standard rail according EN 60 715 or screws M4	

Relay for Energy Flow EFR3000

Optimization of consumption of own energy
Zero Export Device, measuring transducer for power

EFR3000

Part number: **S225760**

Relays for energy flow EFR3000 monitor the current flow between public power grid and generating plant / consumer.
When the own power plant generates more power than actually is consumed it often is more economical to consume the excess energy self. This is especially reasonable when the difference is high between the price you pay to the grid provider and the price the provider pays for fed in energy.

Functions:
- Shift own consumption into times with high generation of energy
- Switch on consumers when you have overflow of energy
- Increase the share of consumed own energy
- intelligent control of consumers

The EFR measures the energy flow in all 3 phases and calculates the mean value.
Is sufficient own power left, the EFR3000 switches on up to three consumers and ensures that the power is consumed in the house. Potential consumers are e.g. air conditioners, boilers or battery chargers but also washing machines, dryers, etc ... .

This is relatively simple if a PV system feeds uniformly under a clear sky and consumers with constant power consumption, such as heat pumps or heating elements, are connected. Particularly suitable are consumers that consume a lot of energy and can be switched frequently, for example boilers.

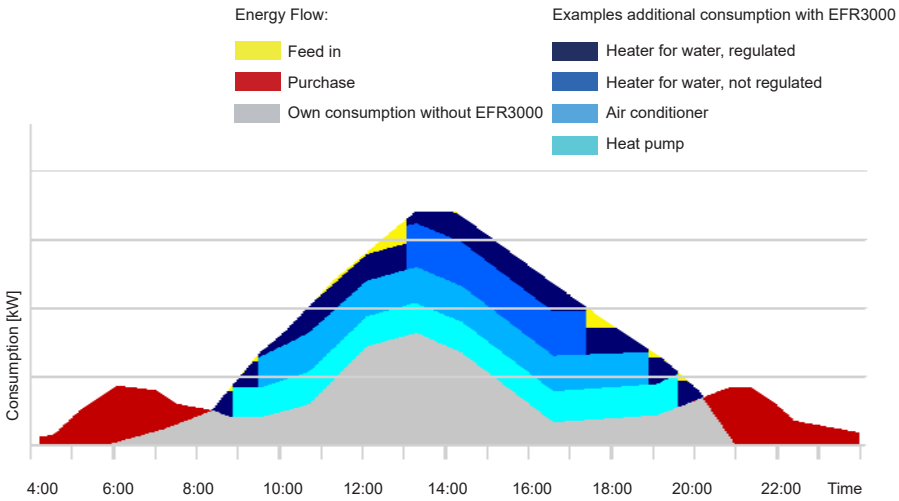
It becomes more complicated when the generation varies because of clouds before the sun and consumers do not continuously draw current as washers, dryers, irons or stoves.

The analog output can regulate a consumer stepless and thus achieve a yet higher rate of own consumption. When using phase angle controls the specifications of the grid providers have to be obeyed.

Energy flow is always evaluated and displayed, as seen from a power meter for purchasing energy: purchase from public grid is positive, fed in energy reduces the bill and is therefore negative (- sign).

The EFR3000 can optimize the consumption of own energy even under difficult conditions.

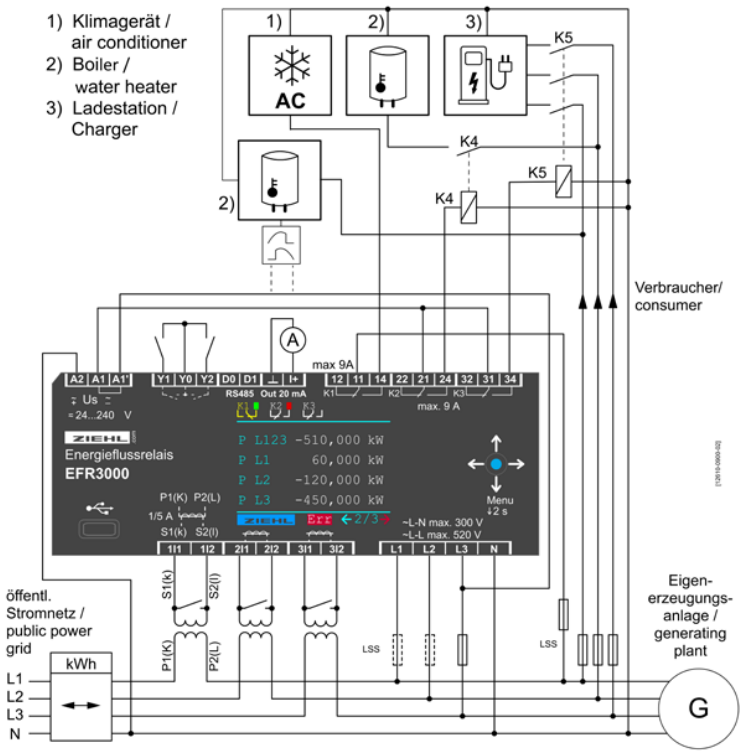
To achieve this the following parameters can be set
- Switching of up to 3 consumers: the largest consumer, ranked 1-2-3 or combination of 3 consumers (7 levels)
- Power consumption of the connected consumers
- Switch on points. At which energy flow consumers are switched on
- Switch on delay of consumers. Short lowering in consumption (by clocking consumers) or peaks in the feed does not immediately cause turn on of additional consumer
- Minimum on time. Heat pumps may not be switched on and off permanently, washing machines should be able to complete a cycle.
- Switch off delay. Short consumption peaks or reduction of the generated energy does not immediately switch off a load.
- Switch off point. At which energy flow consumers are switched off again. In practice, this value is usually slightly on the purchase side.
- Inputs for blinding out consumers when these are not available, for example when boiler has reached maximum temperature.



Cheap equipment costs ensure a short payback period:
Save € 312 * a year with the EFR3000 by switching on
- **at 200 days a year**
- **for an average 3 hours**
- **consumers with 4 kW**

in times you have a surplus of own energy.

Equipment costs (EFR 3000, 3x current transformer, if necessary contactors) are returned within less than 2 years*.
Longer / shorter switch on times and larger / smaller consumption shorten / extend the period. In addition, in the long term rising purchase prices for energy can be expected.
* Feed 12 Ct / kWh, electricity purchase price 25 Ct / kWh



Features:

- Measuring of active power
- Measuring inputs isolated from electronics
- Colored LCD display
- Intuitive handling with joystick
- 3 inputs for customary current transformers with secondary 1 or 5 A. Ratio programmable
- 3 relay outputs, 2 kW directly, higher loads with contactors
- 2 digital inputs Y1/Y2 for control signals
- Analog output for stepless regulation of a consumer
- Measuring transducer with analog output 0/4-20 mA for power L1, L2, L3 or L1+L2+L3. Measuring range can be scaled
- Micro-USB port for configuration and update
- Interface RS 485 (Modbus RTU)
- Housing 140 mm wide
- Zero Export Device. Switch off within <500 ms at inadmissible feed in that is contrary to contract

Part numbers:

S225760	**EFR3000**

Suitable current transformer (split core):

S225770	**KBR 18S**, 60/1A, Klasse 3 0,4 VA

Suitable mini current transformer:

S225780	**CTM7**, 64/1A, Klasse 1 0,5 VA

Technical Data

Rated supply voltage	DC/AC 24 – 240 V 0/50/60 Hz, <3 W, <9 VA DC 20,4 - 297 V AC 20 - 264 V
Relay outputs K1, K2, K3	3 x 1 change-over contact
Switching voltage	max. AC 300 V, DC 300 V
Conventionel thermal current Ith	max. 9 A
Switching power max cos φ=1	2000 VA
Contact service life, electr. cos φ=1	10^5 operations at 300 V / 9 A
Rated operational current	AC-15 Ie = 6 A Ue = 250 V
Measurement of voltage (RMS)	L1 / L2 / L3 towards N
Voltage phase-N	AC 35,0 … 330,0 V, 50/60 Hz
Max. error of measurement	± 0,5% of fullscale, ±1 digit
Measurement of current	Primary current max. 1.000 A
Nominal currents / resolution	AC 1/5 A / 1 mA
Max. error of measurement	± 0,5% of fullscale ±1 digit
Overload capacity	8 A continously, 25 A max. 1 s
Resistance of input	25 mΩ
Measurement of active power	± 1.000 kW, resolution 1 W
Max. error of measurement	± 1 % of fullscale ±1 digit
Analog output (GND (⊥), I+)	DC 0/4 – 20 mA for active power ± 1.000 kW, scaleable
Max. error	± 0,3 % of fullscale + error of measurement active power
Temperature factor	< 0,015 % / K
Load	≤ 500 Ω
Test conditions	see "general technical information"
Operating temperature	-20 °C ... +55 °C
Dimensions (B x H x T)	140 x 90 x 58 mm, mounting height 55 mm
Protection housing/terminals	IP 30 / IP20
Attachment	on 35 mm DIN rail or with screws M4
Weight	app. 300 g

Relay for Energy Flow EFR4000IP

Optimization of consumption of own energy
Integrated Webserver, IP-Connection, Zero Export Device, measuring transducer for power

EFR4000IP

Part numbers:

EFR4000IP	**S225761**
ER8 	**T224388**

Suitable current transormers (split core):

60/1A, class 3 0,4 VA	
KBR 18S	**S225770**
64/1A, class 1 0,5 VA	
CTM7	**S225780**

Relays for energy flow EFR4000IP monitor the current flow between public power grid and generating plant / consumer.
Operation is made comfortably via integrated webserver or directly at the device. Measured values are displayed neatly arranged at device on monitor.

When the own power plant generates more power than actually is consumed it often is more economical to consume the excess energy self. This is especially reasonable when the difference is high between the price you pay to the grid provider and the price the provider pays for fed in energy.

Functions:
- Shift own consumption into times with high generation of energy
- Switch on consumers when you have overflow of energy
- Increase the share of consumed own energy
- Control of BHKW units or inverters via integrated analog outputs
- intelligent control of consumers

Accessory: Installation frame ER8 for panel mount

The EFR measures the energy flow in all 3 phases and calculates the mean value.
Is sufficient own power left, the EFR4000IP switches on up to three consumers and ensures that the power is consumed in the house.

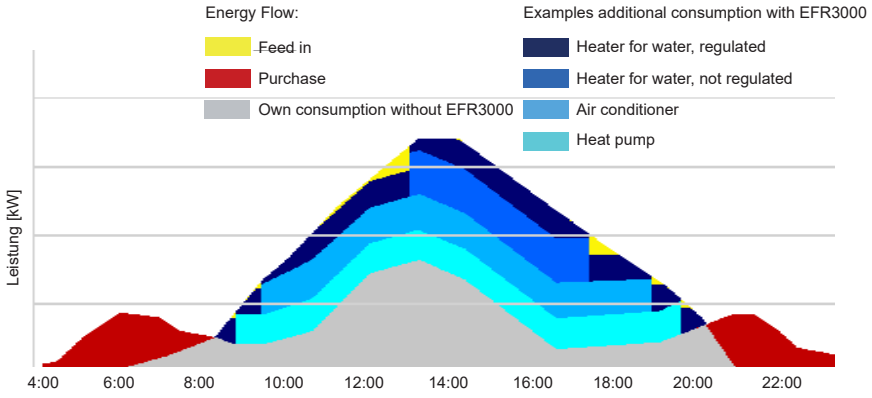
This is relatively simple if a PV system feeds uniformly under a clear sky and consumers with constant power consumption, such as heat pumps or heating elements, are connected. Particularly suitable are consumers that consume a lot of energy and can be switched frequently, for example boilers.

It becomes more complicated when the generation varies because of clouds before the sun and consumers do not continuously draw current as washers, dryers, irons or stoves.

The analog output can regulate a consumer stepless and thus achieve a yet higher rate of own consumption. When using phase angle controls the specifications of the grid providers have to be obeyed.
Energy flow is always evaluated and displayed, as seen from a power meter for purchasing energy: purchase from public grid is positive, fed in energy reduces the bill and is therefore negative (- sign).

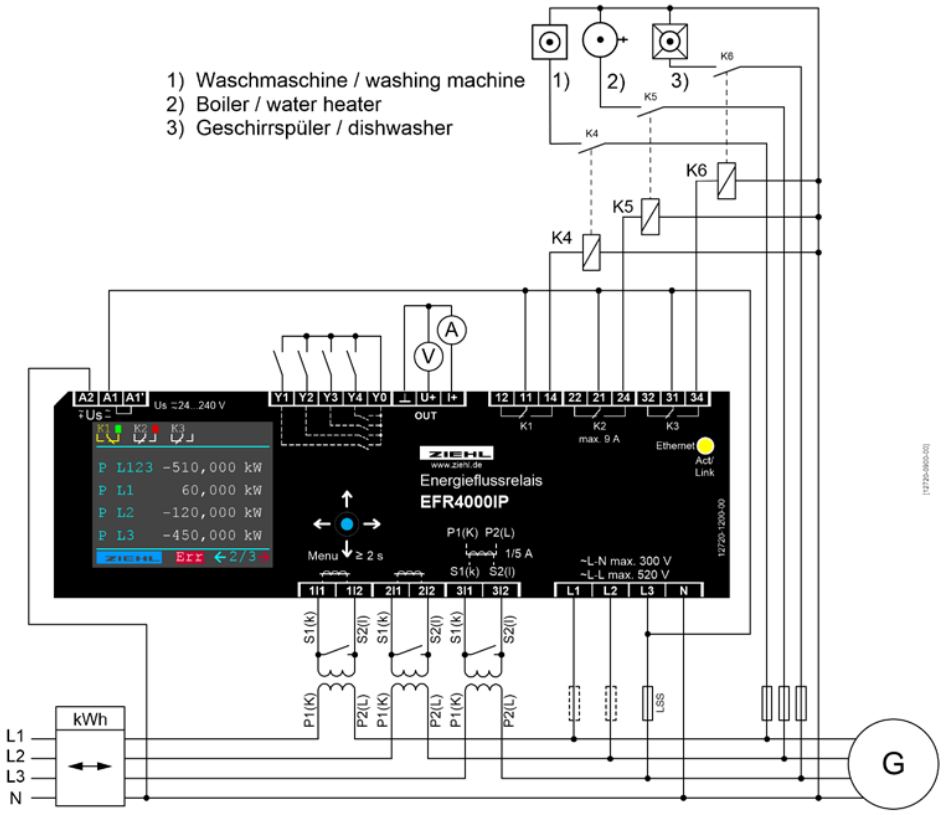
The EFR4000IP can optimize the consumption of own energy even under difficult conditions.

Features and functions:
- Switching of up to 3 consumers: the largest consumer, ranked 1-2-3 or combination of 3 consumers (7 levels)
- Power consumption of the connected consumers
- Switch on points. At which energy flow consumers are switched on
- Switch on delay of consumers. Short lowering in consumption (by clocking consumers) or peaks in the feed does not immediately cause turn on of additional consumer
- Minimum on time. Heat pumps may not be switched on and off permanently, washing machines should be able to complete a cycle.
- Switch off delay. Short consumption peaks or reduction of the generated energy does not immediately switch off a load.
- Switch off point. At which energy flow consumers are switched off again. In practice, this value is usually slightly on the purchase side.
- Inputs for blinding out consumers when these are not available, for example when boiler has reached maximum temperature.



Features:

- Measuring of active power
- Counters for power (feed in and consumption) and switched on consumers (calculated)
- IP-conntection, integrated web-server
- Operation at device with color display (LCD) and joystick
- 3 inputs for customary current transformers with secondary 1 or 5 A. Ratio programmable
- 3 relay outputs
- 4 digital inputs Y1-Y4 for control signals
- Analog outputs for stepless regulation of a consumer. Zero adjustable 0-10 mA / 0-5 V for charging only when enough power is available
- Measuring transducer for power DC 0/2-10 V, 0/4-20 mA for active power up to ± 1000 kW, scaleable
- Housing 140 mm wide
- Zero Export Device and limiter. Switch off within <500 ms at inadmissible feed in that is contrary to contract



Technical Data

Rated supply voltage	DC/AC 24 – 240 V 0/50/60 Hz, <3 W, <9 VA DC 20,4 - 297 V AC 20 - 264 V
Relay outputs K1, K2, K3	3 x 1 change-over contact
Switching voltage	max. AC 300 V, DC 300 V
Conventionel thermal current Ith	max. 9 A
Switching power max cos φ=1	2000 VA
Contact service life, electr. cos φ=1	10^5 operations at 300 V / 9 A
Rated operational current	AC-15 Ie = 6 A Ue = 250 V
Measurement of voltage (RMS)	L1 / L2 / L3 towards N
Voltage phase-N	AC 40,0 … 330,0 V, 50/60 Hz
Max. error of measurement	± 0,5% of fullscale, ±1 digit
Measurement of current	Primary current max. 1.000 A
Nominal currents / resolution	AC 1/5 A / 1 mA
Max. error of measurement	± 0,5% of fullscale ±1 digit
Overload capacity	8 A continously, 25 A max. 1 s
Resistance of input	25 mΩ
Measurement of active power	± 1.000 kW, resolution 1 W
Max. error of measurement	± 1 % of fullscale ±1 digit
Analog outputs (GND (⊥), I+,U+)	DC 0/4/1-10...20 mA, DC 0/2/0-5...10 V
Max. error	± 0,3 % of fullscale + error of measurement active power
Temperature factor	< 0,015 % / K
Load	≤ 500 Ω
Test conditions	see "general technical information"
Operating temperature	-20 °C ... +55 °C
Housing / Installation Frame	Design V8 / Front mounting kit ER8, 8 TE
Dimensions (B x H x T)	140 x 90 x 58 mm, mounting height 55 mm
Protection housing/terminals	IP 30 / IP20
Attachment	on 35 mm DIN rail or with screws M4
Weight	app. 300 g

Relay for Energy Flow EFR4001IP

Optimization of self-consumption of self-generated energy
Zero Export Device

Available 3rd quarter 2022

EFR4001IP

Part numbers:

EFR4001IP	**S225762**
ER8 	**T224388**

Suitable current transormers:
(split core)

60/1A, Klasse 3 0,4 VA :
KBR 18S **S225770**
(not possible for Pav,e)

64/1A, Klasse 1 0,5 VA
CTM7 **S225780**

Relays for energy flow EFR4001IP monitor the current flow between public power grid and generating plant / consumer. Operation is made comfortably via integrated webserver or directly at the device. Measured values are displayed neatly arranged at device on monitor.
When the own power plant generates more power than actually is consumed it often is more economical to consume the excess energy self. This is especially reasonable when the difference is high between the price you pay to the grid provider and the price the provider pays for fed in energy.

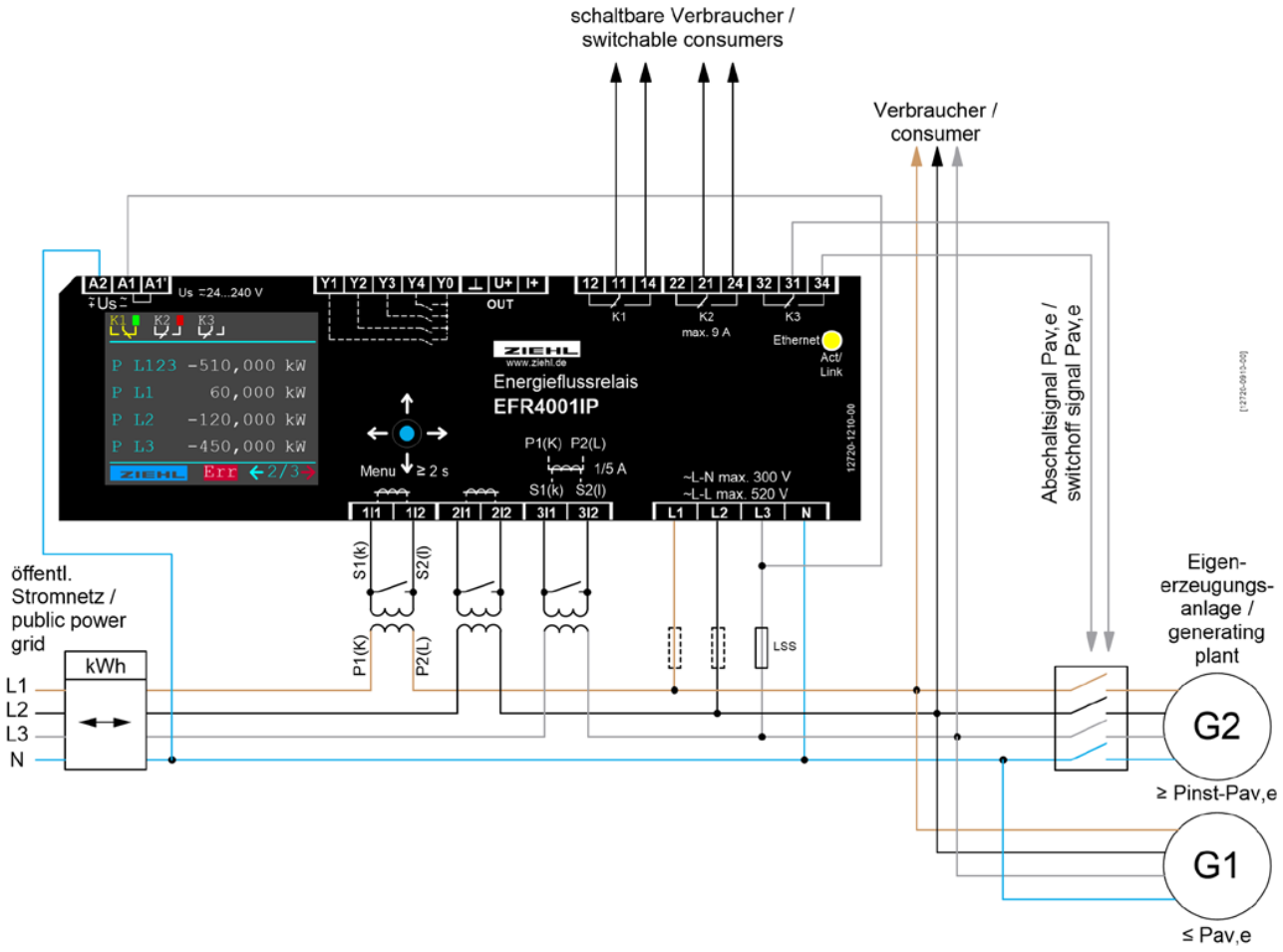
Many areas suitable for photovoltaics could not be used so far, since only a limited amount of power can be fed in at the grid connection point.
In Germany new standards allow exceeding this value by up to 2/3 (66.6%) installed capacity. The prerequisite for this is that the overbuilt power is consumed and not fed into the grid. In order to still ensure the stability of the system, this must be monitored.
The same applies to zero export, when no energy at all may be fed into the grid. In this case, the device can be used as an energy flow direction sensor (EnFluRi). The EFR4001IP has been optimized for these functions.

Zero-Export-Device or limiter:
- Switching off the power generation system or parts of it if the permissible feed-in power is exceeded with relay K3
- Switching on consumers or reducing generators before it comes to that by means of regulating with an analogue output or switching loads with relays K1 and K2
- Energy flow direction sensor (EnFluRi sensor) and feed-in limitation < 0.1s

Functions
- Switching of up to 3 consumers: the largest consumer, ranked 1-2-3 or combination of 3 consumers (7 levels))
- Switch on and off points. At which energy flow consumers are switched on and off again
- Switch on and off delay of consumers, minimum on time.
- Control of heat pumps (SG-ready), battery chargers, inverters

Features:
- Measuring of active power 1- or 3-phase up to 1.000 kW (more with factor)
- Counters for power (feed in and consumption)
- Operation at device with color display (LCD) and joystick
- 3 inputs for customary current transformers with secondary 1 or 5 A.
- 3 relay outputs
- 4 digital inputs Y1-Y4 for control signals, e.g. relay on or off
- IP-connection, integrated webserver
- Analog outputs as measuring transducer and for stepless regulation of a consumer
- Switch gear housing 140 mm wide

Accessory: Installation frame ER8 for panel mount



Technische Daten

Rated supply voltage	DC/AC 24 – 240 V 0/50/60 Hz, <3 W, <9 VA DC 20,4 - 297 V AC 20 - 264 V
Relay outputs K1, K2, K3	3 x 1 change-over contact
Switching voltage	max. AC 300 V, DC 300 V
Conventionel thermal current Ith	max. 9 A
Switching power max cos φ=1	2000 VA
Contact service life, electr. cos φ=1	10^5 operations at 300 V / 9 A
Rated operational current	AC-15 Ie = 6 A Ue = 250 V
Measurement of voltage (RMS)	L1 / L2 / L3 towards N
Voltage phase-N	AC 15,0 … 330,0 V
Max. error of measurement	± 0,5% of fullscale, ±1 digit
Measurement of current	with transformers (scaleable up to 1.000 A)
Nominal currents / resolution	AC 1/5 A / 1 mA
Max. error of measurement	± 0,5% of fullscale ±1 digit
Overload capacity	8 A continously, 25 A max. 1 s
Resistance of input	60 mΩ
Measurement of active power	± 1.000 kW, resolution 1 W
Max. error of measurement	± 1 % of fullscale ±1 digit
Analog outputs (GND (⊥), I+,U+)	DC 0/4/1-10...20 mA, DC 0/2/0-5...10 V
Max. error	± 0,3 % of fullscale + error of measurement active power
Temperature factor	< 0,015 % / K
Load	≤ 500 Ω
Test conditions	see "general technical information"
Operating temperature	-20 °C ... +55 °C
Housing / Installation Frame	Design V8 / Front mounting kit ER8, 8 TE
Dimensions (B x H x T)	140 x 90 x 58 mm, mounting height 55 mm
Protection housing/terminals	IP 30 / IP20
Attachment	on 35 mm DIN rail or with screws M4

Current-Relay SolarYes

Monitoring of Function at Photovoltaic Systems, Detection of Failure at Inverters, 8 inputs

SolarYes AC

Part number: **S225535**

ER4  **T224384**

The SolarYes monitors outputs of inverters in PV-systems. Its output-relays (2 potential-free contacts) switch, when there has been no current during the last 24 hours in one of up to 8 monitored lines. Thus the failure of an inverter or a fuse is detected and reported. The operator can initiate repair immediately and saves downtime.
The SolarYes is a simple, easily understandable and economical solution, that protects PV-systems from downtimes.

The device is mounted in a switch cabinet or a distribution box. The current is measured contactless with simple and solid current transformers, that are mounted over the line at any position, e.g. near the fuses. A subsequent installation in an existent system is possible.
Over the course of 24 hours occurring minimal currents (at night there can be wattles currents, caused by interference suppression capacitors in the inverter) are automatically measured and faded out in the evaluation.
The minimum response limit of 0,3 A allows measuring of low current-levels. The limit can de reduced by leading the monitored line multiple times through the transformer (Ø 11 mm).
In case of false alarms, e.g. with snow on the solar modules, the monitoring interval can be extended to up to 8 days or the alarm can be suppressed with a switch.
The 2 output-relays can switch alarm-lamps or electroacoustic transducers. The connection of an alarm system or another monitoring unit also is possible.

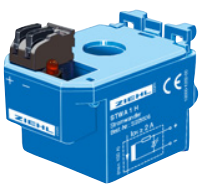
Function

Inputs:
- 8 inputs for current transformers STWA1 or STWA1H (max. 100 A)
- Not connected inputs disconnectible
- Sensitivity adjustable AC 0,3…2,4 A (lower values by leading the monitored line multiple times through the transformer)
- Autocalibration of inputs
- Enable-input

Displays and Controls:
- 8 LEDs for inputs
- 8 LEDs for alarms
- 4 LEDs for display of state and programming
- 2 LEDs for relays
- 1 LED enable-input
- 3 pushbuttons

Other features:
- 2 change-over contacts, nc and no individually programmable
- Autocalibration for easy startup
- Power-saving (Eco-Mode), disconnectible
- Power consumption <0,5 W, <1,2 VA
- Universal supply-voltage AC/DC 24-240 V
- Housing for DIN-rail mount, 70 mm, mounting height 55 mm
- Accessory: Installation frame ER4 for panel mount

Current transformers STWA1 and STWA1H



Part numbers:
S225201 STWA1
S225506 STWA1H

For measuring the current, current transformers STWA1 and STWA1H are used, one for every monitored line.
The STWA1 consist of a climate-proven sealed-in coil with 2 x 1 m cable.

The STWA1H can be fixed on a DIN-rail or mounted with 2 screws. The electrical connection is made via pluggable terminals. A built-in LED lights up at currents > app. 2 A.
The inner diameter of both current transformers is 11 mm, the maximum current is 100 A.

Technical Data SolarYes

Rated Supply Voltage	AC/DC 24-240 V, 0/45...65 Hz DC: 20,4...297 V, AC: 20,4...264 V
Power Consumption	< 0,5 W, < 1,2 VA
Relay-Output	2 Change-over contact (CO) type 2, see general technical hints
Measuring Inputs	1-8 Current transformers STWA 1 or STWA 1 H Sensitivity adjustable AC 0,3 - 2,4 A ± 30% max. 100 A continously, 300 A / 10 s
Function	Monitoring interval adjustable 1-8 days
Test Conditions	see general technical hints
Rated ambient temperature range	-20°C...+65°C
Housing / Installation Frame	Design V4 / Front mounting kit type ER4
Dimensions (w x h x d)	70 x 90 x 58 mm, mounting height 55 mm
Protection housing/terminals	IP 30 / IP 20
Attachment	DIN-rail 35 mm or screw-mount M4
Weight	approx. 180 g