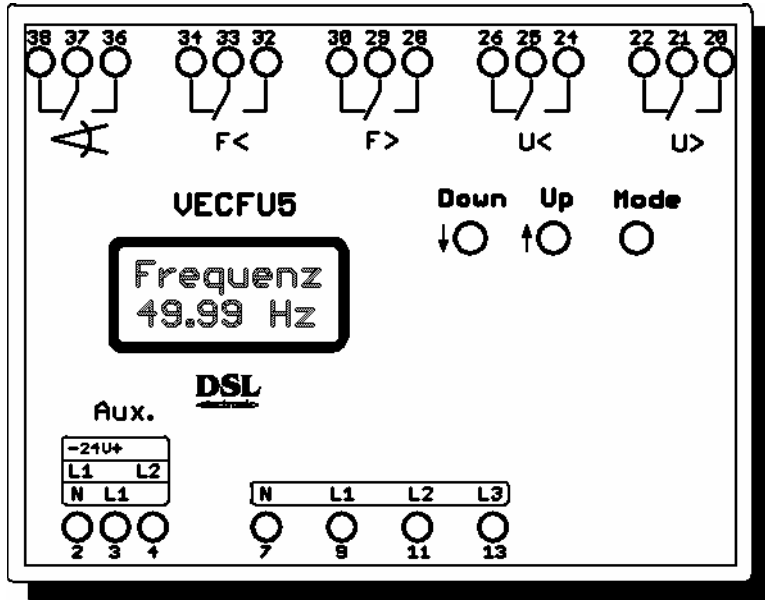


## Mains / Generator Protection Unit (Vector Jump) VECFU5 (3- / 4-wire) with under / overvoltage and under / overfrequency monitor

Release unit for self producing energy plant at low voltage mains acc. partly to  
DIN V VDE V 0126-1-1 : 2006-02 "Self switching place of disconnection"



- Constant monitoring and assessment of phase angle
- Reaction time 30 – 60ms depending on phase jump
- High-contrast LCD display with voltage and frequency display
- Settings can be called up directly
- Easy menu guidance
- Adjustments can be made during operation
- 5 output changeover contacts 250V 6A
- Watchdog monitoring

### Application

The Mains/Generator Protection Unit VECFU5 is used in particular in generator systems for parallel operation with the public network as a so-called **vector jump relay** for protecting the generator. The protection unit detects rapid phase changes or short interruptions of the mains voltage and disconnects the power switch of the generator from the DIN bar within 30 - 60ms. It is also useful for intentional mains interruptions of the interconnected networks with a duration of 200 - 300ms via which 80 - 90% of network disturbances, for example due to lightning, are eliminated. Once the mains disturbance stops the output contacts of the VECFU5 are enabled immediately. In case of phase jumping disturbance the phase output contact will yet be enabled after an adjustable mains smoothing time of for example 5 sec. has passed.

The VECFU5 also includes a precise frequency and voltage monitor which tests the "slower mains changes" for compliance with the limits. This also counts for the overvoltage protection acc. to VDE 0126 (moving average value in the voltage range of 110% – 115% across an interval of 10 minutes) who cause a disconnection from mains.

A test function of VECFU5 allows a phase jump, an under-/overfrequency and an under-/overvoltage test to be carried out realistically during operation of the aggregate (in the program, the same section is run through as with a real fault).

#### Note:

Immediately after mains failure or a phase shift of the mains voltage, the parallel generator has to supply the entire network or the differential voltage caused by the phase shift. The currents from the generator to the mains increase until they reach high values, but they do not lead to short-circuit triggering until after 100ms depending on the short-circuit protection. However, by then damage can already have been done, for example to the aggregate coupling, or the running aggregate can stall under maximum power and the continuing supply of gas or diesel to the engine can lead to deflagration. In addition to the necessary repairs, other economic damage can be the result as the generator is now no longer available for the emergency power supply or because power can no longer be fed into the mains.

These disadvantages can be avoided by using the vector jump protection unit, which disconnects the generator from the mains as soon as power failure or a phase shift occurs.

### Function

The VECFU5 detects a phase jump or a short-term phase change on the power line and switches the output relay off (which is normally on in disturbance-free operation) when the value set (1-20°) is exceeded. The unit also includes an under- and overfrequency monitor and one (3-phase) under- and overvoltage monitor with

output change-over contacts. The output relays of the underfrequency and undervoltage monitor are on in normal operation and switch off when underfrequency or undervoltage occurs after the preset delay time has passed. The output relays of the overfrequency and overvoltage switch on when the preset limits are exceeded and the preset delay time has passed.

The limits for phase jump, under- and overfrequency, under- and overvoltage, delay times and switching hysteresis can be adjusted by the customer as desired and saved permanently.

## Output Contacts

In off-running of VECF U5 the output changeover contacts are in same idle state as printed on front label. After starting operation of set and correct values of voltage and frequency the U< relay will be switched on (contacts 24-25 be closed), the F< relay will be switched on (contacts 32-33 be closed) and the phase jumping relay will be switched on after delay time (contacts 36-37 be closed). With a serial circuit of all closing contacts (by rated voltage and frequency) a measuring circuit will be achieved to open a power switch by one failure on mains.

## Technical Data

Type	Mains / Generator Protection Unit (Vector Jump) VECFU5
Design	Plastic housing on 35 mm DIN bar according to DIN EN 50022 / DIN 46277
Housing material	ABS with fire protection equipment UL 94 V-0
Dimensions, weight	100 x 75 x 109.5 mm (WxHxD), approx. 0.6 kg
Auxiliary power supply	231 / 400V 50-60Hz, +/-10% in each case, approx. 2.5W, other values available, option: 24VDC
Program safety	Watchdog function with automatic reset, failure of LCD display does not cause the functions to fail. Overall reset via simultaneous pressing of all 3 keys
Operating voltages	231V (L-N) / 400V (L-L), other values available
Trigger: voltage	Highest or lowest voltage value of one of the 3 phases (to N) in each case causes the output relay in question to trigger, releasing of "moving average value 110%-115% causes immediate switching of overvoltage relay
Operating frequency	45 – 70Hz, preset 50Hz
Measuring accuracy: voltage	0,5 %
Hysteresis: voltage	Adjustable Range 0,1 – 20 V in steps of 0,1 V
Trigger time: voltage	Adjustable Range 0,2 – 25 sec. in steps of 0.1 sec., Precision of time +/-0,03 sec.
Trigger measuring method	Defined AC voltage jump from V rated to limit value +1% (safe release of relay)
Accuracy of frequency	0,05 %
Hysteresis: frequency	Adjustable Range 0.01 – 2.0Hz in steps of 0.01Hz
Trigger time: frequency	Adjustable Range 0 – 25 sek. in steps of 0.1 sek.
Phase (vector) jump	Adjustable Range 2 – 22° in steps of 0.1°
Trigger time: vector jump	30 – 60 ms depending on trigger moment (zero, peak or other points of sinuswave), distance of phase variation in view of limit value and duration of phase changing ( some ms or a few sinuswave periods )
Switchover to standby	< 10V ( L-N )
LED display refresh	Approx. 1 second
Waiting time: phase	0 – 60 sec. in steps of 1 sec. (activation of the phase function after mains return or phase jump)
Contact rating	6A permanent, 250VAC, contact mat. AgSnO, alternations 10*10 <sup>6</sup> , min. switching load 500mW, 12V 10mA
Voltage insulation strength	4000V (coil-contact), 1000V (open contact)
Terminals	Strand 2.5 mm <sup>2</sup> , rigid 4mm <sup>2</sup> , torque 0.5Nm, screw size M3
Protection class	Housing IP40 (EN60529), terminals IP20
Environmental temperature	-10 °C bis +45°C, 95% humidity
Mains isolation acc. to	EN 60 742 (safety transformers)
General regulations	EN 50 178 (electrical resources in power installations)
Radio interference voltage	DIN EN 55011, Edition: 2003-08, Class B
Radio noise field intensity	DIN EN 55011, Edition: 2003-08, Class B
Noise immun. ESD (housing)	DIN EN 61000-4-2, Edition: 2001-12, Electrical dischargings, Performance criteria B
Noise imm. HF-field (hous.)	DIN EN 61000-4-3, VDE0847-4-3:2006 EMV, High frequency irradiation, Performance criteria A
Noise imm. BURST(AC pow.)	DIN EN 61000-4-4, Edition: 2005-07 EMV, Transient noise signals, Performance criteria B
Noise imm. BURST (cable)	DIN EN 61000-4-4, Edition: 2005-07 EMV, Transient noise signals, Performance criteria B
Noise imm. HF-field(AC pow.)	DIN EN 61000-4-6, Edition: 2001-12 EMV, High frequency inflow, Performance criteria A
Noise imm. HF-field (cable)	DIN EN 61000-4-6, Edition: 2001-12 EMV, High frequency inflow, Performance criteria A
Voltage dip AC power	DIN EN 61000-4-11, Edition: 2005-02 EMV, Voltage dip, Perform. criteria B (10-20ms) and C (500ms)
Short interruption AC power	DIN EN 61000-4-11, Edition: 2005-02 EMV, Short interruption 0-5 sec., Perform. Criteria C
Self operating switching point	Acc. to DIN VDE 0126-1-1 together with corresponding switch-gear
Switching duration, maint.	100% ED, maintenance-free
Installation position	As required

## Programming and Displaying of VECFU5

VECFU5 works normally at any time in its main function as Vector Jump- and Voltage / Frequency Protection Unit, even though a service is reading or during changing the standard values on display menu. After saving of changed standard values the unit works with new settings. So you are able to change the settings during running system without problems. Should only the **Standard Settings** be read, the „Mode“-Key must be push several time to get the different values on LCD-Display. In the following small table are the standard settings listed which can be changed from customer.

Remark: The settings can also be changed when only the auxiliary voltage (231V on terminals 2-3 or 400V on 2-4) be connected. Failure announcements on LCD-display are to be ignored. After changing the settings a check of the settings with the „Mode“-key will be recommended.

### Display Functions with “Mode”

In normal running of VECFU5 (mode key not activated) the display shows all 2 seconds one after another the voltage values **L1-N, L2-N, L3-N** and the **frequency**. With continuing pushing of **down** key the displaying point of value stops and the changes of values can be watched continuously.

With pushing of „**Mode**“-key the LCD-Display shows first the last event **E**: with information of back time **T**: in minutes. With next pushing of **mode** the display of the 10-minutes voltage average values acc. to VDE0126 of L1, L2 and L3 follows respectively. After this the service menu follows for changing of settings with edition of password (see later). After another pushings of **mode** the following settings are shown on display.

U-System	L-N Min	L-N Max	HysterLx	Verz. U	Hz Min.	Hz Max.	Hyster F	Verz. F	Grad Max	Pause PH	DAC_Out	Mittelw.
L - N	219,5V	242,5V	2,0V	1 sek	48,0Hz	52,0Hz	0,2Hz	1 s	8 °	5 sek	Hz	110%

When the unit shall display the voltage values of 400V System(L-L) instead on 231V (L-N) the standard values must be changed. This is done in side the menu-point “**U-System**”. Here the figure L – L must be set to the lower line and with “zurück” (back) and “sichern” (save) the display will be changed to L-L.. Every time a switching back to L-N is possible. Remark: With switching of L-N to L-L several times failures on last digit are possible. The setting of “HysterLx” (Hysteresis U) has to be change manually in setup-menu because it will not be change by L-N to L-L switching.

## Programming of Settings

### Preliminary Remark:

During programming inside the menu the choosing of the next menu follows the point on the lower line of LCD-display. That means, with Up or Down you set the chosen menu point to the lower line and enter with „Mode“-key. Then maybe another branching are necessary. When the flashing values are achieved they have to be changed with Up or Down.

The keys have been holding pushed for appr. 1 second in any menu. This avoids changing of values by mistake.

During operating inside the menu the display changes back to normal display when no changing was made within 30 seconds.

### Programming:

With „Mode“-key 5 x (at a time 1 Sec.) pushing until display **Service**: obtained. **Up**-key 2 x pushing, until value becomes 2 (=key-figure) and then enter with **Mode**-key. You are now reaching the main menu, with the menu points **Test** (Test functions for chosen relay-output), **Setup Lx** (Voltage settings), **Setup Fq** (Frequency settings), **Setup Ph** (Phase settings), **U-System** (switch over to L-L) and **DAC Out** (configuration of analog output, option).

Choosing of wanted menu point to lower line, enter with „Mode“ or branch into further menus until the chosen value is flashing.

### Trimming and saving of settings:

The flashing value can be changed with Up or Down keys. After setting of the new value enter with „Mode“ key, now the menu changes to upper menu-point. Now you either you go back with “**Zurück**” (back) or branch into other points (You are allowed to change several values at a time)

At the end of settings you go back to „**Sichern**“ (save, also for test-function) or „**Abbruch**“ (break). With „Sichern“ standing on lower line the changed values will be saved after entering the „Mode“-key (hold on 1 second). After this moment the unit works with the changed operating values. It is recommend to check the values in the displaying menu with the „Mode“-key.

## Displaying of Events

After 1 x pushing of menu-key the display shows the last events with their lasting time in minutes. The display shows a 2-figured code for the type of event.

Following Display means

<b>E:</b>	<b>FL</b>	Frequency low
<b>T:</b>	<b>100</b>	100 Minutes ( Event 100 minutes before )

### Event code:

<b>0:</b> no Event	<b>PA:</b> Parameter changed	<b>1L:</b> L1-N Low (Undervoltage L1-N)
<b>1H:</b> L1-N High (Overvolt. L1-N)	<b>2L:</b> L2-N Low (Undervoltage L2-N)	<b>2H:</b> L2-N High (Overvoltage L2-N)
<b>3L:</b> L3-N Low (Undervolt. L3-N)	<b>3H:</b> L3-N High (Overvoltage L3-N)	<b>FL:</b> Frequency Low
<b>FH:</b> Frequency High	<b>PH:</b> Phase High (Phase jump)	<b>AV:</b> exceeding of 10 minutes average value

Also some events for the manufacturer purpose, could be helpful for repairing.

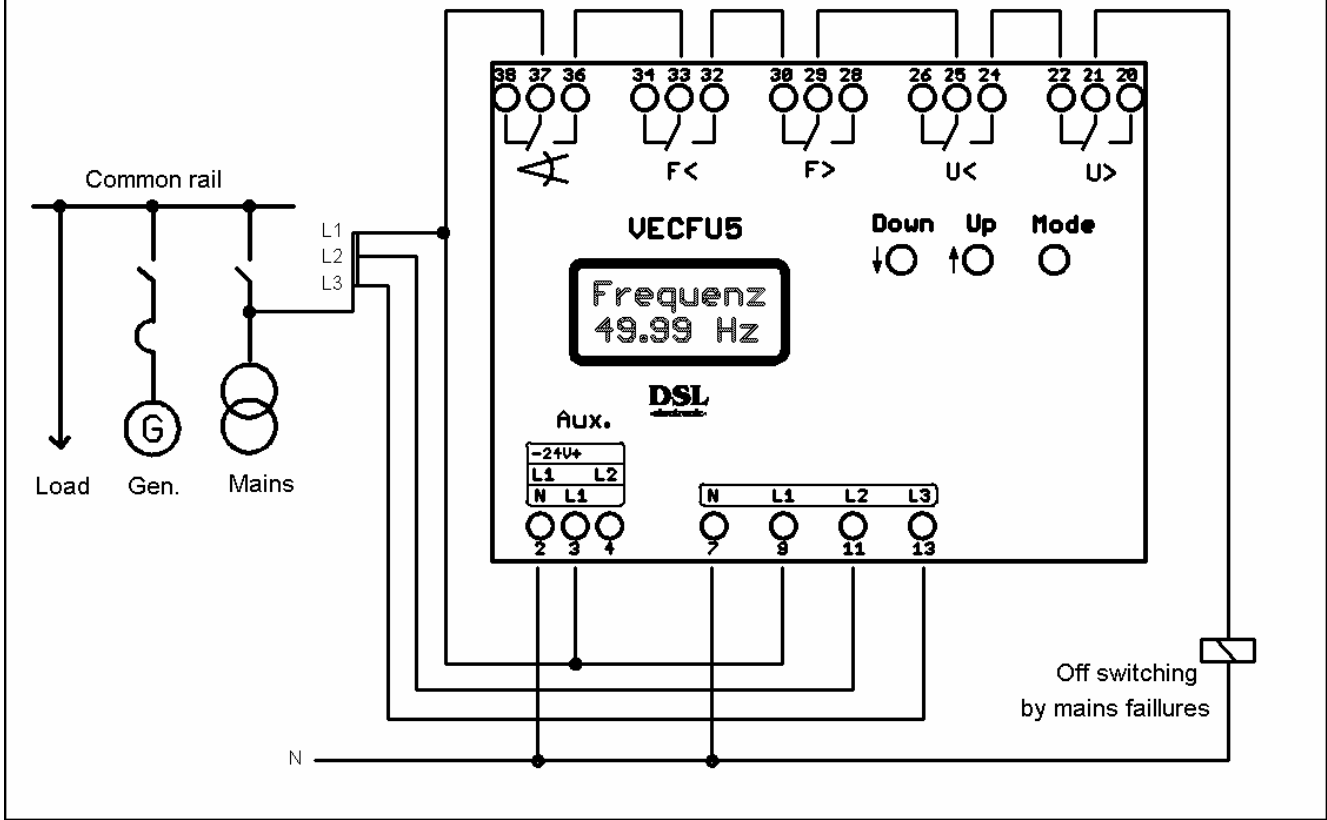
### Other Funktionen

Should of any reason a failure arise (program crash) a **reset** is possible with pushing all 3 keys at a time. After reset the display shows short times “DSL-electronic” and the unit works immediately. A **full reset** is obtained with off and on switching of auxiliary voltage. A failure only on display do not lead to failures of controlling functions.

# Wiring Diagram

EAVECFU5.BRD

Circuit example of VECFU5 for paralleling operation



# Menustruktur VECFU5

