

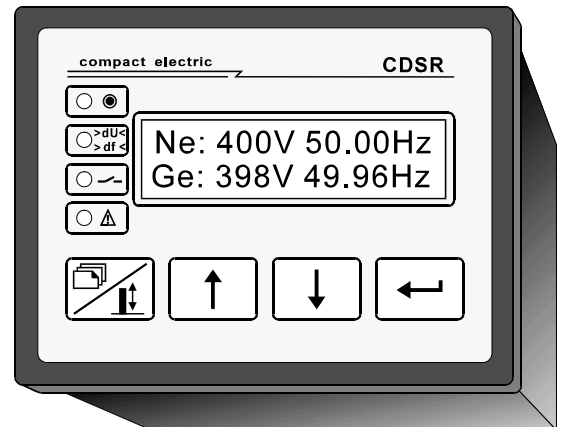
Device.....: CDSR-31 „Sync-control relay“

Functions .....: - Synchronization-monitoring of two power networks and circuit breaker control.  
- Voltage and frequency control signals for generator synchronization.  
- Blackstart mode – coupling a dead bus (voltage-free power network) to a hot- or another dead bus.

Line voltage.....: 400 VAC or 100 / 110VAC, one line-to-line voltage per power network.

Power supply ....: 24 - 220 VDC, 100 - 230 VAC

Case.....: 96 x 72 mm for panel- or DIN rail-mounting



## Description

The sync control relay CDSR-31 is used to detect the synchronous state of two power networks and provides control signals ( $U_{\uparrow}$ ,  $U_{\downarrow}$ ,  $f_{\uparrow}$  and  $f_{\downarrow}$ ) for the generator synchronization via SPC/PLC or manually. If a predetermined synchronous condition is reached, the device will provide a control signal for the circuit breaker. The control signal can be defined as a pulse or as a static signal.

The synchronization can be locked via the external control input B1. The CDSR-31 has two operating modes (sync control and black start) that can be selected via the external control input B2.

### Mode 1: Sync-control function

The synchronous state of the two power networks is determined by using a microcontroller, which is comparing the voltage, frequency and phase of the two corresponding line-to-line voltages. It controls the following synchronous conditions:

- The voltages and frequencies of both power networks must be within the set minimum and maximum values.
- The voltage and frequency difference of the two power networks must be within the set limits, where  $-df$  and  $+df$  can be adjusted separately.
- The phase difference must be within the standard range (depending on the parameters, the sync signal can be triggered at the first or second zero crossing).

The control signal for the power switch (circuit breaker) is output K1. The output timing of K1 is taking into account the power switch operating time and the frequency difference (slip), so that the sync condition is perfectly fulfilled at the time of closing the power switch contact.

### Control signals

To control the generators into a synchronous condition, the device uses relays K2 to K5 as control signals for "voltage higher/lower" or "frequency higher/lower" until the respective difference values are within the range set.

The signals can be defined as static signals or pulses with adjustable pulse/pause time.

In order to further increase the generators frequency while it is within the tolerance range, the user can adjust "kick-pulses" on K2 ( $f_{\uparrow}$ ).

### Mode 2: Blackstart

The device includes a second operating mode, the blackstart, which couples a dead bus to a hot- or another dead bus. The control signals ( $U_{\uparrow}$ ,  $U_{\downarrow}$ ,  $f_{\uparrow}$  and  $f_{\downarrow}$ ) are also active during the blackstart mode.

The enable signal for the power switch is issued when the following conditions are met:

- The residual voltage of the dead bus must be within the set "zero voltage range".
- The voltage and frequency of the hot bus must be within the set minimum and maximum values for blackstart.
- The device must be enabled via the control input B1 (contact B1-M closed), the blackstart mode must first be enabled in the configurations and can then be externally enabled via the control input B2 (contact B2-M closed).
- From the attainment of the above conditions to the output of the enable signal K1, an adjustable delay time will be observed. The conditions must also be met throughout the delay time.

### Display- and control panel

The following operating states are displayed by LEDs (LED sequence from top to bottom):

- LED1: Power on indicator.
- LED2: The current synchronous state is displayed by flashing or static light.
- LED3: The sync enable signal K1 can be indicated by this LED.
- LED4: Signaling an external blocking by control input B1 or a device malfunction

The display shows the current values of the two power networks by default. The user can switch between three displaying variants with the left button:

- a) 1st line: Ne: Mains voltage and frequency  
2nd line: Ge: Generator voltage and frequency
- b) 1st line: Ne: Mains voltage and frequency  
2nd line: ΔG: Difference values of the voltages and frequencies
- c) 1st line: Info: „phase angle difference“  
2nd line: ΔP: Phase angle difference in [degrees]

The configuration of the device is done via a menu-selection system. The language can be changed between German and English. The configurations can be locked with a three-digit code to prevent unauthorized modification.

### Special functions

- Test program to measure the circuit breaker operating time on site.
- Reliable data security by checksum.

### Accessories (included):

- fixing clips for panel mounting
- adapter for DIN rail mounting

### Technical specifications

Rated line voltage.....	Model 400 V AC
	Model 100V/110V AC
Line frequency.....	45 - 65 Hz
Power supply.....	AC : 100V -230V [70V - 300V]
(AC/DC wide range)	DC : 24 V -220V [19V - 250V]
Power consumption.....	3 VA
Ambient operating temp. ....	-20 °C to +60 °C
Display contrast.....	-5 °C to +50 °C

### Output contact specifications:

Max. switching voltage .....	250 V AC / 250 V DC
Max. switching current.....	8 A (250 V AC / 30 V DC)
	0,4 A (230 V DC)
Max. switching power .....	2000 VA / 240 W
Electrical life .....	10 <sup>5</sup> operations

### Insulation:

Line inputs - power supply.....	2,5 kV
Line inputs - output contacts ....	4 kV

### Safety standard:

Safety .....	EN 61010
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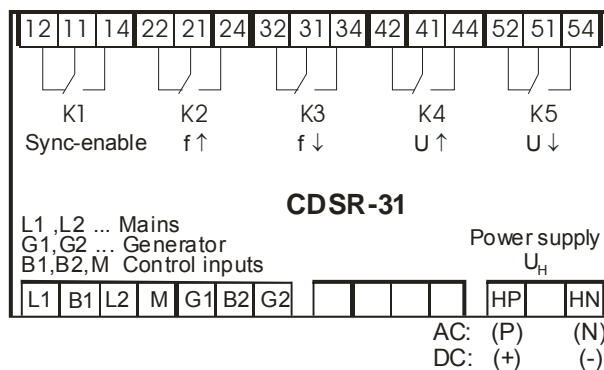
### EMC:

Noise emission.....	EN 50081-2 (Industry)
Noise immunity.....	EN 50082-2 (Industry)

### Mechanical specifications:

Case DIN43700.....	96 x 72 x 90 mm
Panel cutout .....	92 x 68 mm
Material.....	Noryl
Protection degree .....	Front IP50 / Rear IP30
Rear connection terminals.....	2.5 mm <sup>2</sup> , plug-in

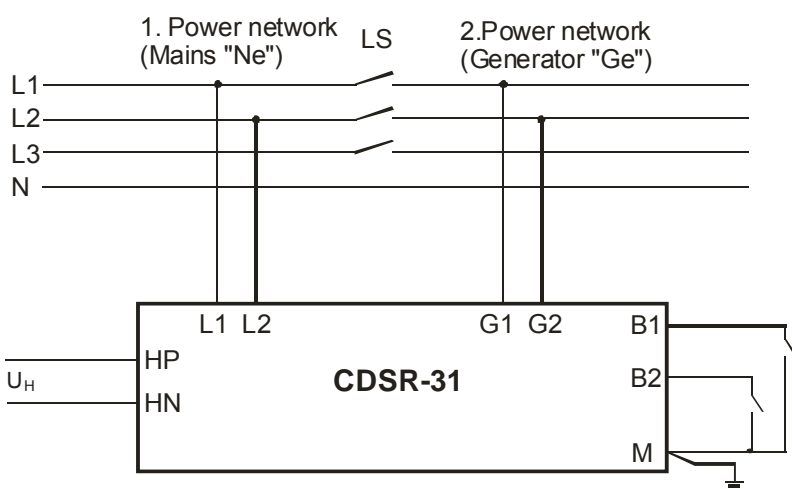
Subject to technical changes.



### CDSR-31 Terminal assignment

## Settings and setting range:

Value	Setting range	Resolution	
Synchronization range: Max. voltage difference	dU max. Diff	0 - 20 %Un	1 V
Synchronization range: Max. negative frequency difference	-df max. Diff	0,0 - 0,5 Hz	0,01 Hz
Synchronization range: Max. positive frequency difference	+df max. Diff	0,0 - 0,5 Hz	0,01 Hz
Synchronization range: Max. phase difference	Phase-Diff	1-25°	1°
Synchronization range: Min. voltage	U<	Un= 400 V: [280 V - 440 V] Un=100/110 V: [70 V-110 V]	1 V
Synchronization range: Max. voltage	U>	Un= 400 V: [360 V - 520 V] Un=100/110 V: [90 V-143 V]	1 V
Synchronization range: Min. frequency	f<	45 - 65 Hz	0,01 Hz
Synchronization range: Max. frequency	f>	45 - 65 Hz	0,01 Hz
Synchronization at 1st or 2nd phase-zero-crossing	PZP-Number	1/2	-
Control range tolerance (control signal): for voltage difference	dU tolerance	0 - 20% Un	1 V
Control range tolerance (control signal): for frequency difference	df tolerance	0,0 - 0,5 Hz	0,01 Hz
Synchronous release signal to K1:	static / pulse	0/1	-
Synchronous release signal pulse duration to K1:	pulse-time	60 - 2000 ms	10 ms
Control signal on K2 and K3 (f ↑ and f ↓):	static / pulse	0/1	-
Control signal on K2 and K3 (f ↑ and f ↓):	pulse-time	0,1 - 10 s	0,1 s
Control signal on K2 and K3 (f ↑ and f ↓):	dead-time	0 - 60 s	1 s
Control signal on K4 and K5 (U ↑ and U ↓):	static / pulse	0/1	-
Control signal on K4 and K5 (U ↑ and U ↓):	pulse-time	0,1 - 10 s	0,1 s
Control signal on K4 and K5 (U ↑ and U ↓):	dead-time	0 - 60 s	1 s
Blackstart Mode: OFF (=0), G->N (=1), N->G (=2), G<->N (=3)		0, 1, 2	-
Blackstart-range: min. voltage	U<	Un= 400 V: [280 V - 440 V] Un=100/110 V: [70 V-110 V]	1 V
Blackstart-range: max. voltage	U>	Un= 400 V: [360 V - 520 V] Un=100/110 V: [90 V-143 V]	1 V
Blackstart-range: min. frequency	f<	45 - 65 Hz	0,01 Hz
Blackstart-range: max. frequency	f>	45 - 65 Hz	0,01 Hz
Blackstart: Sync-enable delay		0 - 10 s	1 s
Derivative time (closing time of the circuit breaker)		0 - 500 ms	10 ms
Dead bus max. voltage		0 - 30 % Un	1 V
Retrigger logic (after one sync-enable on K1, a further resynchronization is enabled manually through control input B1 or automatically)		0/1	-
Combination lock (access code for settings changes)		000 - 999	-
Language settings German / English for displayed text		0/1	-



External control inputs:

B1: Sync-enable signal:  
open = blocked  
closed = enabled

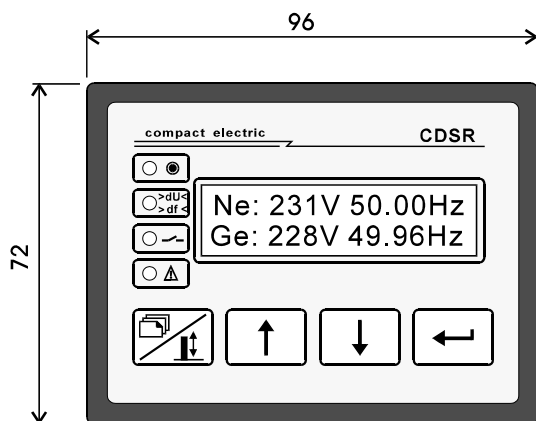
B2: Mode selection:  
open = SYNC-CONTROL  
closed = BLACKSTART

M: reference potential  
to be grounded

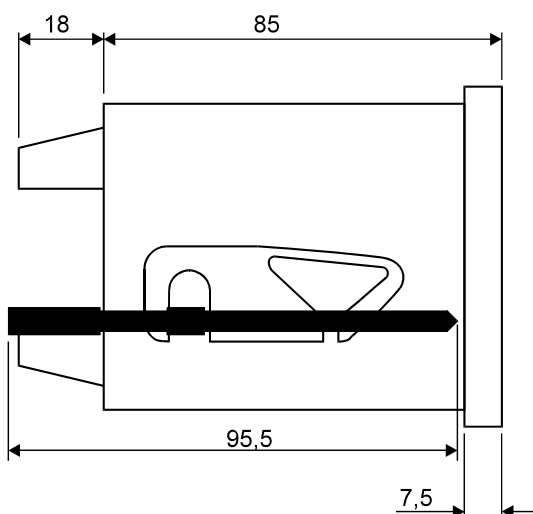
EMC- wiring note:

Wire length for terminals "B1", "B2" and "M" max. 3m.

### CDSR-31 Wiring diagram

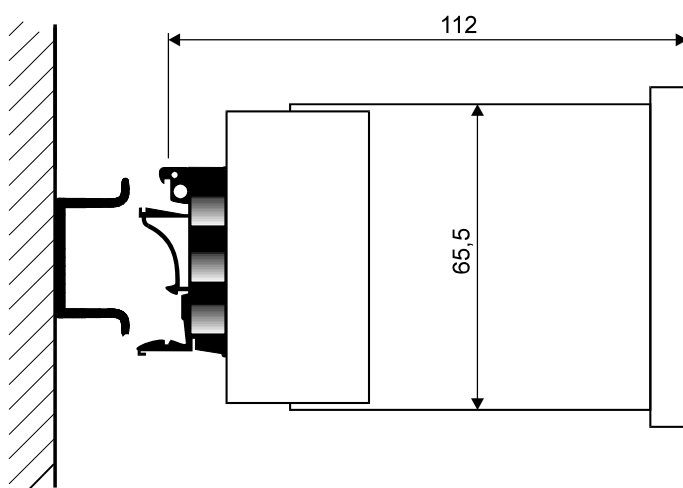


**Mechanical Dimensions:**



Panel mounting with  
fixing clips

Panel-cutout:  
92 x 68 mm (WxH)



DIN rail mounting

Installation width  
with rail adapter: 115 mm

