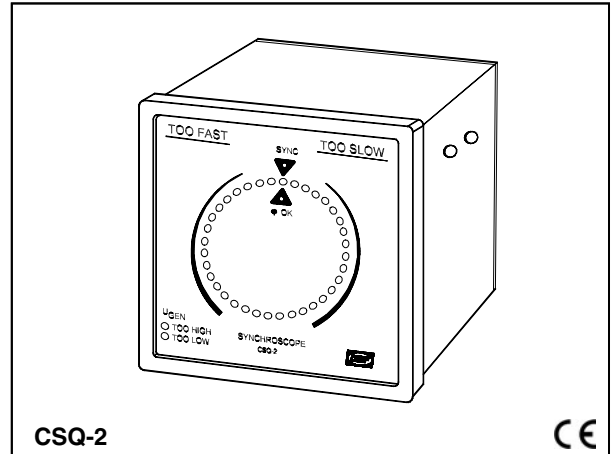


# Check Synchronising Relay

49212401851

Type CSQ-2

- **Multifunction precision LED synchronoscope**
- **Easy push-button programming of all setpoints**
- **Very high user safety**
- **High immunity to harmonic distortion**
- **Dead-bus functionality**
- **Version for marine applications**



## Application

The unit measures the busbar ( $U_{\text{BUSBAR}}$ ) and generator ( $U_{\text{GEN}}$ ) voltages and frequencies and compares these, plus compares the phase angle relationship.

## Versions

Two versions optimized for land or marine applications exist.

## Measuring principle

The unit measures the busbar ( $U_{\text{BUSBAR}}$ ) and generator ( $U_{\text{GEN}}$ ) voltages and frequencies and compares these, plus compares the phase angle relationship.

## Settings.

The unit is equipped with several user settings, hidden under the front foil. This placement gives a high degree of user safety because no hazard voltages are present, i.e. the unit can be programmed while running without the risk of electric shock or damage to installations.

## Phase window, $\Delta\phi$ :

Here the phase window for synchronisation is chosen. It can be set both symmetrically and asymmetrically.

## Voltage difference, $\Delta U$ :

Here the allowed voltage difference between  $U_{\text{GEN}}$  and  $U_{\text{BUSBAR}}$  is set. It can be set both symmetrically and asymmetrically. Measurement is done relatively to  $U_{\text{BUSBAR}}$ .

## Length of SYNC pulse, $T_R$ :

Determines the length of the SYNC pulse (SYNC relay activating time) This value must be matched to the time characteristic of the circuit breaker.

## SYNC relay delay, $T_d$ :

Determines the time  $U_{\text{GEN}}$  and  $U_{\text{BUSBAR}}$  has to be within the phase window before the SYNC relay is activated. This parameter can only be adjusted when  $T_R = \infty$  is selected.

## Dead-bus function/offset voltage, $T_R$ :

The allowed noise level voltage on  $U_{\text{BUSBAR}}$  can be set to determine dead-bus mode. It is measured relatively to  $U_{\text{GEN}}$ .

## Factory settings.

All the above mentioned settings are pre-set from the factory. At any time these factory defaults can be re-stored.

## Sealing of settings.

If necessary the settings can be sealed when the wanted functionality is obtained. This is very easy because of the placement under the front foil/cover.

## Operation.

The rotation of the red LED circle indicates the frequency difference. The faster the rotation, the larger the frequency difference. One rotation pr. second equals 1Hz difference.

The position of the lit red LED indicates the phase difference between  $U_{\text{GEN}}$  and  $U_{\text{BUSBAR}}$ . The circle represents a degree-scale from 0-360 degree with zero degree at the 12 o'clock position. With 36 LEDs the resolution on the reading is 10 degrees.

If the frequency difference between  $U_{\text{GEN}}$  and  $U_{\text{BUSBAR}}$  is higher than 3Hz, the rotation of the LED circle stops. If it stops with at lit red LED at "TOO SLOW", the frequency of the  $U_{\text{GEN}}$  is lower than  $U_{\text{BUSBAR}}$ . If it stops with at lit red LED at "TOO FAST", the frequency of the  $U_{\text{GEN}}$  is higher than  $U_{\text{BUSBAR}}$ .

When the phase angle between  $U_{\text{GEN}}$  and  $U_{\text{BUSBAR}}$  is within the preset  $\Delta\phi$  window, then the yellow LED "Δφ OK" will be lit.

If the voltage difference between  $U_{\text{GEN}}$  and  $U_{\text{BUSBAR}}$  is outside the preset  $\Delta U$  range, one of the two red LEDs will be lit and the SYNC relay cannot be activated. If the voltage on  $U_{\text{GEN}}$  is higher than  $U_{\text{BUSBAR}}$  LED "U<sub>GEN</sub> TOO HIGH" will be lit. If the voltage on  $U_{\text{GEN}}$  is lower than  $U_{\text{BUSBAR}}$ , LED "U<sub>GEN</sub> TOO LOW" will be lit.

If both the "U<sub>GEN</sub> TOO LOW" and "U<sub>GEN</sub> TOO HIGH" LEDs are lit simultaneously, it indicates an overvoltage error at the input.

## Normal synchronising.

The unit automatically calculates the synchronising parameters to check if there is the required space for the synchronising signal inside the preset phase window. These calculations compare the frequency difference with  $T_R$  and the size of the phase window. When  $T_R$  is set to  $\infty$ ,  $T_d$  can be set by the user and is included in the calculations.

If the  $\Delta\phi$  window is set symmetrically, both under-frequency synchronising and over-frequency synchronising is possible.

## Under- or over-frequency synchronising.

When the  $\Delta\phi$  window is set asymmetrically, the following functionality is possible:

If the  $\Delta\phi$  window is set asymmetrically with a lower positive than negative  $\Delta\phi$  value, only synchronising with the generator input at higher frequency than the bus-bar input is possible (positive slip frequency).

If the  $\Delta\phi$  window is set asymmetrically with a higher positive than negative  $\Delta\phi$  value, only synchronising with the generator input at lower frequency than the bus-bar input is possible (negative slip frequency).

## Dead-bus function.

When activated, the dead-bus function enables the SYNC relay to be activated, when no busbar voltage is present (i.e. during a power failure). When the generator voltage is within 80% of nominal level and the busbar voltage is under the preset busbar-offset level, the SYNC relay will be activated, regardless of all other parameters.

*Therefore, be careful when using this feature!*

## Type CSQ-2

### Technical specifications

<b>Accuracy:</b>	±2 electrical degrees
<b>Resolution:</b>	10 electrical degrees
<b>Max. freq. difference:</b>	No limit
<b>Frequency range:</b>	40...70Hz (supply)
<b>SYNC output:</b>	1 SPST-NO-contact
Relay contact ratings: (Gold plate silver alloy)	AC1: 8A, 250V AC DC1: 8A, 24V DC AC15: 3A, 250V AC DC13: 3A, 24V DC
<b>Life mechanical:</b>	2 x 10 <sup>7</sup>
<b>Life electrical:</b>	1 x 10 <sup>5</sup> (nominal value)
<b>Optocoupler output:</b>	(Only on marine version) System status off = failure 2 wires AWG 20 (red/black) 30 mm length Max. 40V, 10mA
<b>Temperature:</b>	-25...70°C (operating)
<b>Temperature drift:</b>	Set points: Max. ±0.2% of full scale per 10°C
<b>Shock test:</b>	15g – 6 times – 3 directions 50g/6ms 22g/20ms
<b>Galvanic separation:</b>	Between inputs and output: 2200V - 50Hz - 1 min
<b>Input range (U<sub>n</sub>):</b>	100...127V AC (115V AC) ±20% 220...240V AC (230V AC) ±20% 380...415V AC (400V AC) ±20% 440...450V AC (450V AC) ±20% (Above 450V AC: +10% only)
Busbar input:	Load: 2kΩ/V
Generator input:	(Max. 3.5VA at nominal voltage) Supply for the unit
<b>Max. input voltage:</b>	1.2 x U <sub>N</sub> , continuously 2 x U <sub>N</sub> , for 10 sec.
<b>Climate:</b>	HSE, to DIN 40040
<b>EMC:</b>	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3
<b>Safety:</b>	To EN 61010-1. Installation cat. III, 300V. Pollution degree 2
<b>Connections:</b>	Max. 2.5 mm <sup>2</sup> (single-stranded) Max. 1.5 mm <sup>2</sup> (multi-stranded)
<b>Materials:</b>	All plastic parts are self-extinguishing to UL94 (V0)
<b>Protection:</b>	Front: IP52. Terminals: IP20, to IEC 529 and EN 60529
<b>Type approval:</b>	For current approvals see www.deif.com or contact DEIF A/S

### Settings

Setting of	Range
Δφ Phase difference	±5...20° in 1° step or ±10...40° in 2° step
ΔU Voltage difference	±1...10% in 1% step
T <sub>R</sub> Length of SYNC pulse	0...1 sec. in 0.1 sec. step or ∞
T <sub>d</sub> SYNC relay delay	0...1 sec. in 0.1 sec. step
U <sub>OFFSET</sub> Dead-bus offset voltage	Off or 4 levels of noise suppression

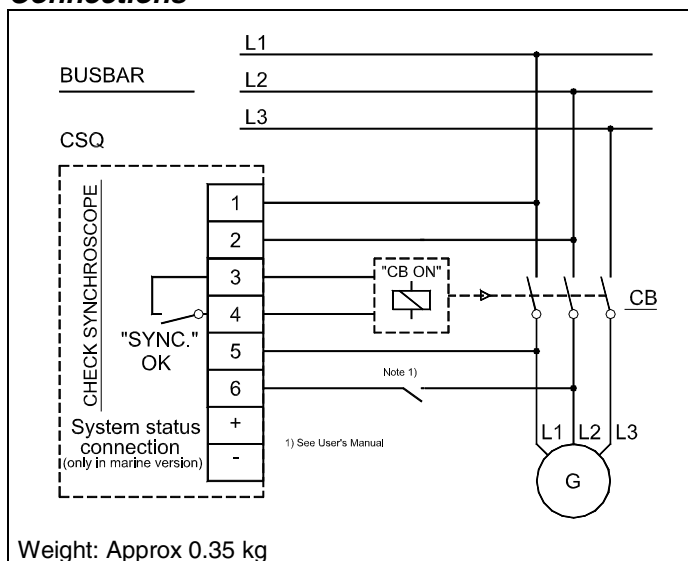
### Indication

LEDs	Light
SYNC	Green, when the SYNC relay is activated
Δφ OK	Yellow, when inside the phase window
TOO FAST	Red LED stopped . Frequency difference too high. GEN too high
TOO SLOW	Red LED stopped . Frequency difference too high. GEN too low
U <sub>G</sub> TOO LOW	Red, when outside the ΔU level
U <sub>G</sub> TOO HIGH	Red, when outside the ΔU level
U <sub>G</sub> TOO LOW U <sub>G</sub> TOO HIGH	When both are red simultaneous, there is an overvoltage error on the input

Once the relay has been mounted and adjusted, the front cover may be sealed, preventing unwanted change of the setting.

For more information about the product a User's manual (Item: 4189340218) is available on [www.deif.com](http://www.deif.com).

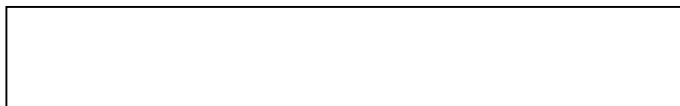
### Connections



### Order specifications

Type - Input voltage - Version		
Example: CSQ-2	230V AC	Land
CSQ-2	230V AC	Marine

Due to our continuous development we reserve the right to supply equipment which may vary from the described.



DEIF A/S, Frisenborgvej 33  
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615

E-mail: [deif@deif.com](mailto:deif@deif.com), URL: [www.deif.com](http://www.deif.com)

