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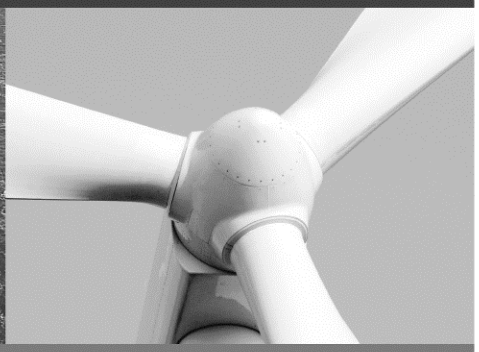
DATA SHEET





Check Synchronising Relay, CSQ-3

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

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Document no.: 4921240263H

Application

The CSQ-3 is a microprocessor-based synchronising unit. It can be used in any kind of installation where manual or semi-automatic synchronising is required.

Versions

Two versions optimised for land or marine applications exist.

Measuring principle

The unit measures the busbar (U_{BUSBAR}) and generator (U_{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 hazardous voltages are present, i.e. the unit can be programmed while running without the risk of electric shock or damage to installations.

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

Voltage difference, ΔU:
Here the allowed voltage difference between U_{GEN} and U_{BUSBAR} is set. It can be set both symmetrically and asymmetrically. Measurement is done relatively to U_{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_{GEN} and U_{BUSBAR} have 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_{BUSBAR} can be set to determine dead-bus mode. It is measured relatively to U_{GEN}.

Factory settings:
All the above-mentioned settings are preset from the factory. At any time, these factory defaults can be restored.

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 per second equals 1 Hz difference. The position of the lit red LED indicates the phase difference between U_{GEN} and U_{BUSBAR}. The circle represents a degree scale from 0-360 degrees 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_{GEN} and U_{BUSBAR} is higher than 3 Hz, the rotation of the LED circle stops. If it stops with a lit red LED at "TOO SLOW", the frequency of the U_{GEN} is lower than U_{BUSBAR}. If it stops with a lit red LED at "TOO FAST", the frequency of the U_{GEN} is higher than U_{BUSBAR}.

When the phase angle between U_{GEN} and U_{BUSBAR} is within the preset Δφ window, then the yellow LED "Δφ OK" will be lit. If the voltage difference between U_{GEN} and U_{BUSBAR} is outside the preset ΔU range, one of the two red LEDs will be lit and the SYNC relay cannot be activated. If the voltage on U_{GEN} is higher than U_{BUSBAR}, LED "U_{GEN} TOO HIGH" will be lit. If the voltage on U_{GEN} is lower than U_{BUSBAR}, LED "U_{GEN} TOO LOW" will be lit.

If both the "U_{GEN} TOO LOW" and "U_{GEN} 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 ∞, T_d can be set by the user and is included in the calculations.

If the Δφ window is set symmetrically, both underfrequency synchronising and overfrequency synchronising is possible.

Under- or overfrequency synchronising:
When the Δφ window is set asymmetrically, the following functionality is possible:

> If the Δφ window is set asymmetrically with a lower positive than negative Δφ value, only synchronising with the generator input at higher frequency than the busbar input is possible (positive slip frequency).
>
> If the Δφ window is set asymmetrically with a higher positive than negative Δφ value, only synchronising with the generator input at lower frequency than the busbar 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. When the voltage on the busbar has been restored, the CSQ-3 will remain in the dead-bus function for a period of five seconds.

Therefore, be careful when using this feature!

Technical specifications

Accuracy: ±2 electrical degrees

Resolution: 10 electrical degrees

Max. frequency difference: No limit

Frequency range: 40...70 Hz (supply)

SYNC output: 1 SPST-NO-contact

Relay contact ratings: (Gold plate silver alloy)
AC1: 8 A, 250V AC
DC1: 8 A, 24V DC
AC15: 3 A, 250V AC
DC13: 3 A, 24V DC

Mechanical life: 2×10^7

Electrical life: 1×10^5 (nominal value)

Optocoupler output:
(Only on marine version)
System status off = failure
2 wires AWG 20 (red/black)
30 mm length
Max. 40 V, 10 mA

Temperature: -25...70°C (operating)

Temp. drift: Setpoints:
Max. ±0.2% of full scale per 10°C

Shock test: 15 g – 6 times – 3 directions
50 g/6 ms
22 g/20 ms

Galv. separation: Between inputs, output and ground:
3750 V - 50 Hz - 1 min

Input range (U_N): 100...127V AC ±20%
220...240V AC ±20%
380...415V AC ±20%
440...480V AC ±20%
(Note: above 450V AC: only +10%)

Busbar input: Load: 2 kΩ/V

Generator input: (Max. 2 VA at nominal voltage)
Supply for the unit

Max. input voltage: 1.2 x U_N, continuously
Above 450 V: 1.1 x U_N, continuously
2 x U_N, for 10 sec.

Climate: HSE, to DIN 40040

EMC: CE-marked according to EN 50081-1/2, EN 50082-1/2 and IEC 255-3

Safety: To EN 61010-1. Installation cat. III, 600 V. Pollution degree 2

Connections: Max. 2.5 mm² (single-stranded)
Max. 1.5 mm² (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V0)

Protection: Front: IP52. Terminals: IP20, to IEC 529 and EN 60529

Type approval: For current approvals see www.deif.com or contact DEIF A/S

UL listing: On request, the instrument can be delivered according to UL listing: UL508, E230690

Settings

Setting of		Range
$\Delta\varphi$	Phase difference	±5...20° in 1° step or ±10...40° in 2° step
ΔU	Voltage difference	±1...10% in 1% step
T_R	Length of SYNC pulse	0...1 sec. in 0.1 sec. step or ∞
T_d	SYNC relay delay	0...1 sec. in 0.1 sec. step
U_{OFFSET}	Dead-bus offset voltage	Off or 4 levels of noise suppression

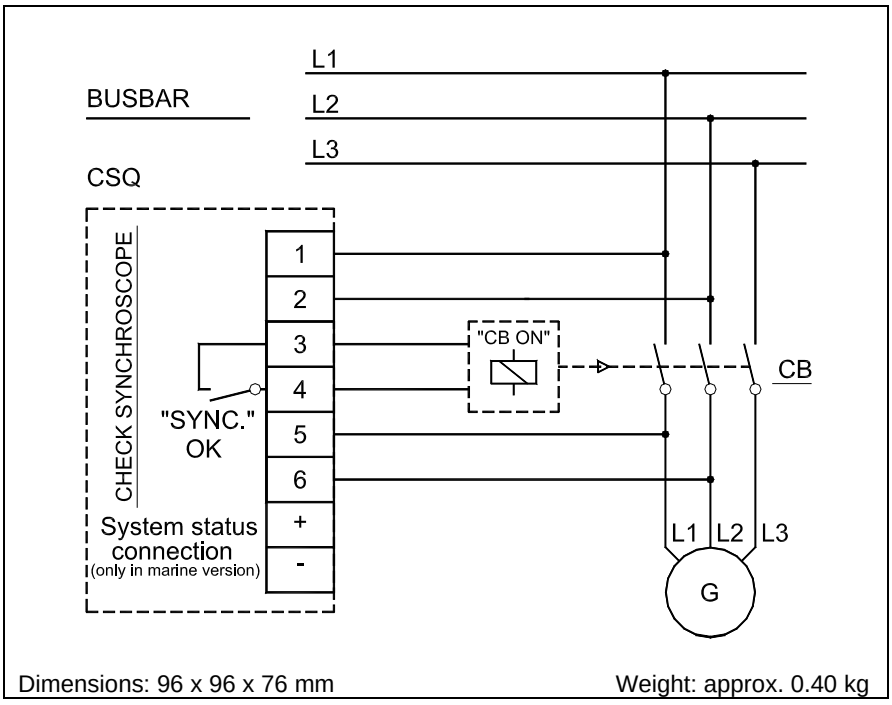
Indication

LEDs	Light
SYNC	Green, when the SYNC relay is activated
$\Delta\varphi$ 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
$U_{G\ TOO\ LOW}$	Red, when outside the ΔU level
$U_{G\ TOO\ HIGH}$	Red, when outside the ΔU level
$U_{G\ TOO\ LOW}$ $U_{G\ TOO\ HIGH}$	When both are red simultaneously, there is an overvoltage error on the input

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

For more information about the product, a User's manual (document no. 4189340263) is available at www.deif.com.

Connections



Dimensions: 96 x 96 x 76 mm Weight: approx. 0.40 kg

Available variants

Item no.	Variant no.	Variant description
2918030010	01	CSQ-3 for land-based installations. All measuring voltages
2918030010	02	CSQ-3 for marine-based installations. All measuring voltages

Order specifications

Variants:

Mandatory information					Additional options to the standard variant
Item no.	**Type**	**Variant no.**	**Version**	**Measuring voltage**	**Option**

Example:

Mandatory information					Additional options to the standard variant
Item no.	**Type**	**Variant no.**	**Version**	**Measuring voltage**	**Option**
2918030010-01	CSQ-3	01	Land	400V AC	No options available
2918030010	CSQ-3	02	Marine	440V AC	No options available
2918030010-01	CSQ-3	01	Land UL Listed	230V AC	No options available

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

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