SQ 0x04, SQ 0x14 - Synchronoscopes

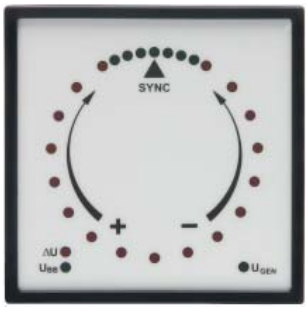


Figure 19: SQ 0204

Figure 20: SQ 0214

Features

- measurement of phase difference between bus bar and generator
- five instruments in one (SQ 0x14)
- circular display of $\Delta\varphi$ phase difference
- magnified display of phase difference $\Delta\varphi$ = +-20 degree
- microprocessor processing
- simple synchronisation conditions setting
- output relay for synchronisation (pulse or permanent contact)
- “dead busbar” functionality
- power supply from bus bar or generator
- standard 96x96 mm or 144x144 mm din housing
- lcd with backlight for voltage, frequency and/or $\Delta\varphi$ monitoring (SQ 0x14 only)
- flash memory
- high immunity to emc disturbances
- special functions set with three jumpers inside the instruments
- status output
- green led for indication of both voltages
- lloyd’s and hrb certificates (SQ 0204, SQ 0214)

Application

SQ 0204 and SQ 0x14 are microprocessor controlled synchronoscopes. They are availiable with or without LC-Display or output relay and can be used for manual or semi-automatic synchronisation processes. The internal output relay is activated, as soon as the prior adjustes synchronisation conditions are fulfilled. In addition the SQ0x14 provides a LCD, which shows bus bar voltage U_{BB} and generator voltage U_{GEN}, as well as both frequencies f_{BB} and f_{GEN} or bus bar frequency f_{BB} and phase difference $\Delta\varphi$. Hence the SQ0x14 can replace two serperate voltmeters and two frequeny meters.

Description

The meter consists of 24 circular arranged LEDs, which show the actual phase difference $\Delta\varphi$ with a resolution of 20°. Within the synchronisation range (between -20° and +20°) the resolution is higher (5° el. Grad). A frequency difference between the input voltages (U_{GEN} and U_{BB}) of more than 3 Hz is indicated through 3 blinking LEDs either in the FAST-range ($f_{GEN} > f_{BB}$) or in the SLOW-range ($f_{GEN} < f_{BB}$). When the synchronsiation conditions are fulfilled, the green SYNC-LED is lit. A red ΔU-LED is lit, when the voltage difference is exceeding the predefined value. Three potentiometers adjusting of the synchronisation conditions can be found on the back of the meter:

- permissible phasen difference $\Delta\varphi$
- permissible voltage difference ΔU
- switching delay for the relay

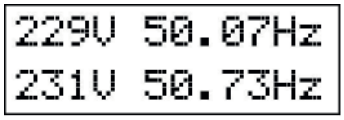
The relay is fired (impulse or permanent contact), when the phasedifference and the voltage difference remain within the defined values for the duration of the defined switching delay. As soon as one value exeeds the conditions, the permanent contact is open immediatly. the activation of the relay is indicated by the SYNC-LED on the meter.

The synchronoscopes are availiable:

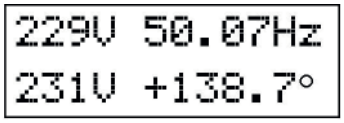
- **without relay**
- **with relay** (impulse- or permanent contact)
- **with “dead bus bar”-function**
  The output relay can additionally be activated, when the generator voltage is higher than 80% of the nominal voltage U_N and the bus bar voltage U_{BB} is below the defined offset value. The default offset value is 20% of the nominal value.
- **with „dead bus bar" and "dead generator“-function**
  The relais can additionally be activated, when one if the voltages (U_{BB} or U_{GEN}) is higher than 80% of the nominal voltage U_N and the according other voltage(U_{BB} or U_{GEN}) is lower than the defined offset value.
- **with status output (optional)**
  The status output (open collector) monitors the microprocessor system. In case of an micro processor error this output has a high resistance.

The SQ 0x14 shows on its display two voltages (U_{BB}, U_{GEN}) and two frequencies (f_{BB}, f_{GEN}). If the difference between f_{BB} and f_{GEN} is less than 0.02 Hz, the phase difference $\Delta\varphi$ will be displayed.

SQ 0x04, SQ 0x14 - Synchronoscopes



system voltage U_{BB} and system frequence f_{BB}
generator voltage U_{GEN} and generator frequency f_{GEN}



system voltage U_{BB} and system frequence f_{BB}
generator voltage U_{GEN} and phase difference $\Delta\varphi$

In order to enable a correct synchronisation, the correct connection of the input voltages U_{BB} and U_{GEN} (according to model, phase-phase or phase-neutral) has to be ensured. unballanced net loads and inverted connections can lead to malfunctions.

Technical Data

Input Voltage

- nominal voltage U_n: 57, 63, 100, 110, 230, 400, 500, 120, 220, 380, 415, 440, 600, 690 V with U_{L-N} max = 400V
- voltage range: U_n ± 20 %
- frequency range: 40 ... 70 Hz
- consumption (network): < 4 VA
- overload: 1.2 x U_n permanent, 2 x U_n up to 3 s

LED-Indicators

- resolution of phase difference indicators: 20 °el. Grad
- magnifier range: ±20 °el. Grad
- resolution within magnifier range: 5 °el. Grad
- accuracy at $\Delta\varphi = 0$: ±3 °el. Grad

LCD Accuracy (SQ 0x14)

- voltage U_n, U_{gen}: 1,5
- frequency f_n, f_{gen}: 0,5
- phase difference betw. U_n and U_{gen}: ±3 °el. Grad

Synchronisation Settings

- voltage difference range: 1 ... 10 %
  accuracy: ±2,5
- phase difference range: 2 ... 20 ° el. Grad
  accuracy: ±3 °el. Grad
- synchronisation delay range: 0,1 ... 1 s
  accuracy: ±10

Relay

- switching function: permanent contact (standard), impulse 100ms, 200ms, 300ms or different (100ms … 1s)
- contact rating of the relay: 250 V, 1A, 50 Hz, 250 VA

Housing

- material: PC/ABS non-flamable, according to **UL 94 V-0**
- enclosure protection: housing IP 52, Terminals IP 20 (with protection cover) according to **EN 60529**: 1989
- operating position: vertical
- safety: according to EN 61010-1, 400V CAT III, degree of pollution 2
- Weight: ≤ 0,6kg

Connection Diagram

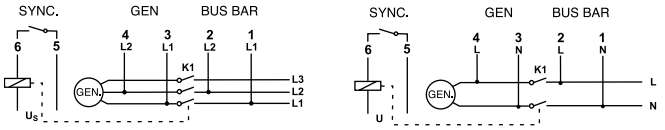


Figure 21: connection diagram SQ 0x04, SQ 0x14

Terminals

Terminals for input voltage U_{BB} and U_{GEN} as well as for relay output SYNC can be found at the back of the meter. The potentiometer for setting of the synchronisation delay(0,1...1s), phase difference $\Delta\varphi$ (±2...20 el. Grad) and voltage difference ΔU (±1...10% of nominal value) can also be found on the back of the meter.

Dimensions

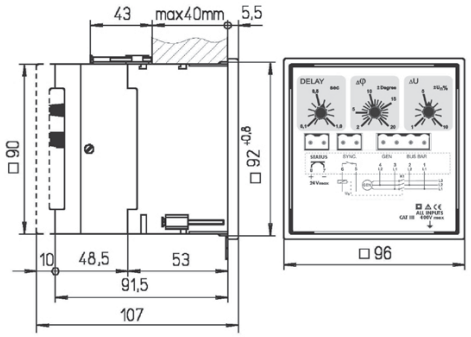


Figure 22: Dimensions SQ 02x4 (mm)

Ordering Code

Ordering example:
Size 96 synchronoscope with LCD, phase to phase voltage 400V, relay output with 300ms impulse duration, "dead bus bar"-function with Offset of 20%U_N, $\Delta\varphi$ range +/- 2...20 el, with status output and display value of 28kV at 400V input voltage
= **SQ0214 LL400P300DA2+-20SR 28kV/400V**

SQ0204 LL 057 P100 DA2 +-20SR 120kV/57V

SQ0204 | LL | 057 | P100 | DA2 | +-20 | SR | 120kV/57V

Type
SQ 0104 (144x144mm front, without Display)
SQ 0114 (144x144mm front, with Display)
SQ 0204 (96x96mm front, without Display)
SQ 0214 (96x96mm front, with Display)

Type of connection
LL - phase to phase
LN - phase to neutral

Voltage input
057 - 57 V (100V/√3)
063 - 63 V (110V/√3)
100 - 100V
110 - 110V
230 - 230V
400 - 400V
500 - 500V
X - different voltage (please state when ordering)

Output relay settings
W000 - without relay
P100 - 100 ms impulse
P300 - 300 ms impulse (standard)
PXXX - different impulse duration (100 ms < x < 1000 ms)
please state when ordering, see ordering sample
CCCC - permanent contact

"dead bus bar" and "dead generator" (with relay only)
D00 - without

DA only "dead bus bar"-function	"dead bus bar" + "dead generator"-funktion
DA1 - 10% Un	DB1 - 10% Un
DA2 - 20% Un (standard)	DB2 - 20% Un
DA3 - 30% Un	DB3 - 30% Un
DA4 - 40% Un	DB4 - 40% Un

Potentiometer for setting $\Delta\varphi$
+-20 - default value +/- 2...20 el. (Standard)
+20 - setting range +2...+20 el
-20 - setting range -2...-20 el.

Status output (ship version option)
S0 - without
SR - status relay (open collector 24V/100mA)

Display (SQ 0x14 only)
0 - default (displayed value equal to voltage input)
X - other displayed value - to be specified with order, see ordering example