

SERVICE MANUAL

E K22.480.850

SYNCHROSCOPE

**SQ0204, SQ0214
and
SQ0104, SQ0114**

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1. SAFETY SECTION


This Safety Section should be read before commencing any work on the equipment.


1.1. Health and safety

The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section.

1.2. Explanation of symbols and labels

The meaning of symbols and labels that may be used on the equipment or in the product documentation is given below.

 **Caution:** refer to product documentation

 Double isolation

 Functional earth terminal

NOTE - this symbol may also be used for a protective/safety earth terminal if that terminal is a part of a terminal block or sub-assembly eg. power supply.

1.3. Warnings, regular information and remarks referring to CE-marking

In this manual installations and service instructions for the Synchroscope (SQ) SQ0204, SQ0214, SQ0104 and SQ0114 can be found. Installation as well as use of the SQ will involve working with dangerous currents and voltages. Professionals must handle these areas. ISKRA Sistemi, d.d. does not take any responsibility for the use and installation. If any doubt comes up concerning the installation or use of the system, on which the SQ is to be used, the person responsible for the power installation should be contacted.

The SQ is CE-marked according to the EMC-directive for industrial environment and for housing and light industry.

The SQ is CE-marked according to low-voltage directive for up to 400V phase to ground voltage, installation category III and pollution degree 2.

Before energising the equipment, the following should be checked:

Correct U_{GEN} and U_{BB} voltage connection.

Correct voltage and connection of STATUS open-collector output (if SQ has this functionality)

Warning: Improper voltage can cause irregular operation or permanent damage to the SQ.

Disposal

It is recommended that incineration and disposal to watercourses is avoided. The product should be disposed of in a safe manner.

2. SETTING SPECIAL FUNCTIONS

2.1. Disassembling and assembling the SQ

Pictures and photos will show models SQ0204 and SQ0214. Models SQ0104 and SQ0114 are similar only front part of the housing is in size 144 x 144 mm.

To set special functions, SQ has to be disassembled.

- disconnect all terminals. **⚠ Caution:** risk of electric shock.
- remove a cover from the top of all three buttons at the SQ rear side
- unscrew and remove all three buttons (see figure 1)
- remove a front panel frame (see figure 2)
- remove a front panel (see figure 3)

After special functions are set, SQ has to be assembled.

- put a front panel together with the rest of the SQ (see figure 3)
- put on a front panel frame (see figure 2)
- turn all three potentiometers to the uttermost left end
- put on all three buttons at the SQ rear side (do not fasten the buttons at this point yet)
- turn a button pointer to the uttermost left line
- fasten the buttons with a screw and put on the button covers (see figure 1)
- set the button positions to a desired value
- connect all terminals

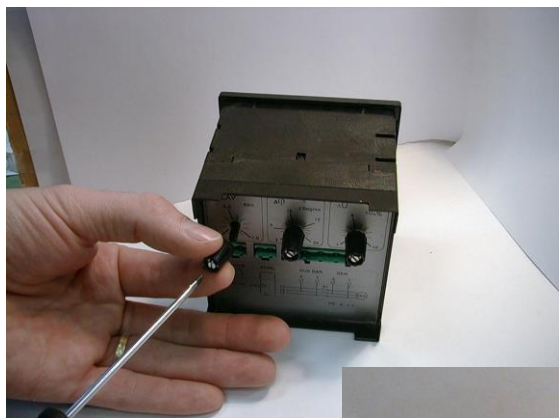
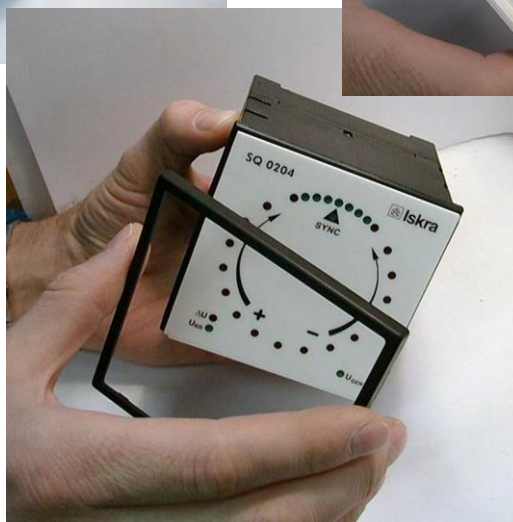


figure 1: Buttons removal



figure 3: Front panel removal



2.2. Setting proper special function jumper ^{figure 2: Front panel frame removal}

Special functions are set with three jumpers (see figure 4)

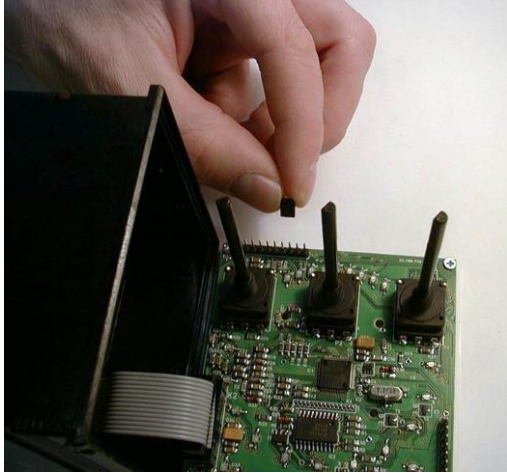


figure 4: Position of jumpers on a SQ PCB

SQ is equipped with three special functions:

- DEAD BUS-BAR OR GENERATOR SYNCHRONISING
- OVER AND UNDER FREQUENCY SYNCHRONISING
- ADJUSTABLE LENGTH OF A SYNC PULSE

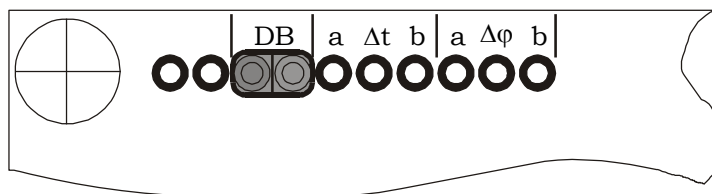
2.2.1. Dead bus-bar or generator synchronisation

When this function is set, the synchronising relay will be activated and the SYNC LED will be lit, when the

**(UGEN > 80% UNOM) AND (UBB < preset UBB noise level) or
(UBB > 80% UNOM) AND (UGEN < preset UGEN noise level)**

The allowed UBB / UGEN voltage noise level is set in factory in range from 10% to 40% of nominal voltage.

WARNING: Detection of dead bus bar or generator is done by a single-phase or phase-to-phase measurement L-L synchronisation. Additional check of other phases is essential before using that function.



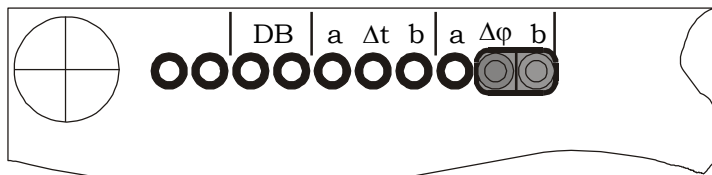
Dead bus-bar or generator synchronisation jumper position (see also figure 4)

2.2.2. Over and under frequency synchronising

If a jumper for over and under frequency synchronising is not set, $\Delta\phi$ window of LED display is set symmetrically around 0° . $\Delta\phi$ setting button is used to set $\Delta\phi$ difference from $+20^\circ$ to -20° thus synchronising with $f_{\text{GEN}} < f_{\text{BUS}}$ and $f_{\text{GEN}} > f_{\text{BUS}}$ is possible.

UNDER FREQUENCY SYNC

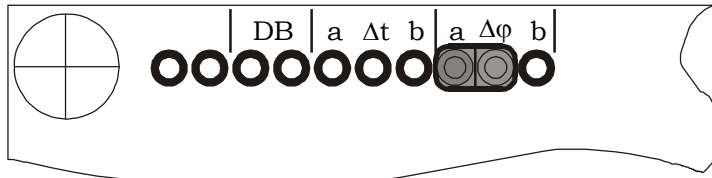
- $\Delta\phi$ window of LED display is set asymmetrically.
- only synchronising with $f_{\text{GEN}} < f_{\text{BUS}}$ is possible
- $\Delta\phi$ setting button is used to set $\Delta\phi$ difference from -2° to -20°



Under frequency synchronising jumper position (see also figure 4)

OVER FREQUENCY SYNC

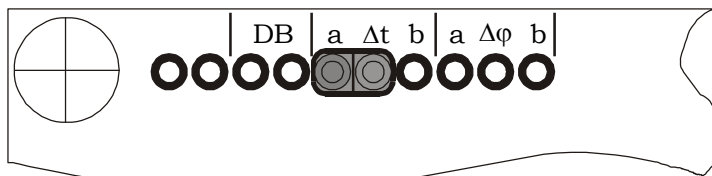
- $\Delta\phi$ window of LED display is set asymmetrically.
- only synchronising with $f_{\text{GEN}} > f_{\text{BUS}}$ is possible
- $\Delta\phi$ setting button is used to set $\Delta\phi$ difference from $+2^\circ$ to $+20^\circ$



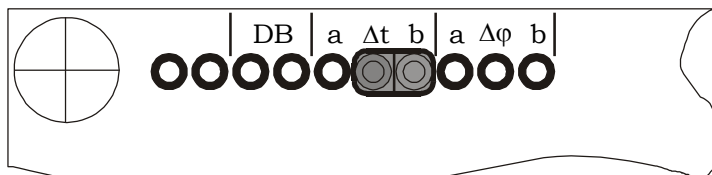
Over frequency synchronising jumper position (see also figure 4)

2.2.3. Length of a SYNC pulse

If a jumper for the length of a SYNC pulse is not set, the synchronisation relay will be active as long as synchronisation conditions are set (continuous). This function also applies when a dead bus-bar function is set.



100 ms
Synchronisation pulse length jumper position (see also figure 4)



300 ms
Synchronisation pulse length jumper position (see also figure 4)

3. SETING PROGRAMABLE PARAMETERS

3.1. Disassembling and assembling the SQ

See section 2.1.

3.2. Connecting SQ to a PC

In order to set programmable parameters on a SQ, it has to be connected to a PC via special communication adapter MIPack® (for details about MIPack® see MIPack® user's manual)

NOTE – Beware, **wrong connection can cause device damage**. Connect Pin1 on the adapter with Pin1 on the board (See figure 5).

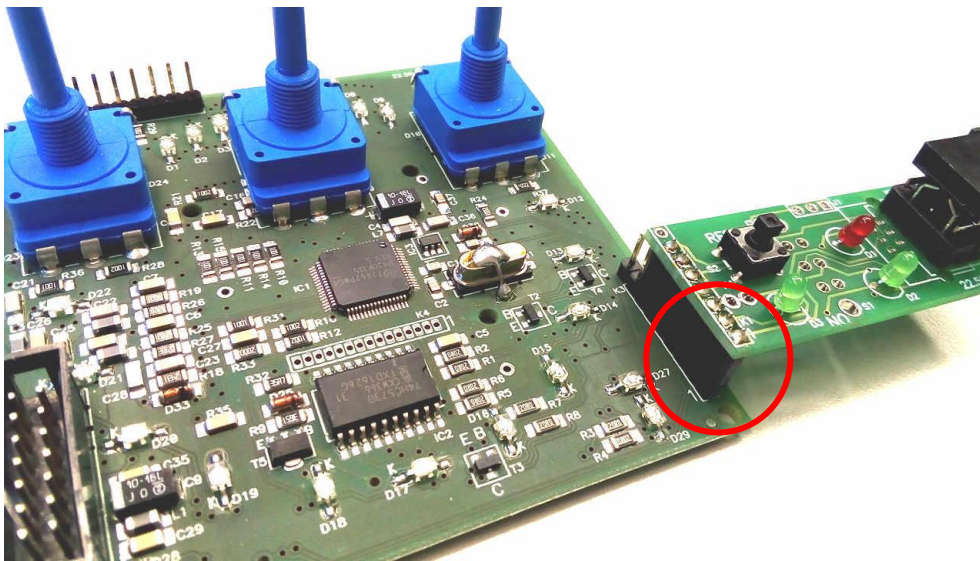


figure 5: Connecting a communication adapter MIPack® to the SQ

3.3. Using SQset program

Minimum hardware and system requirements:

- Intel PENTIUM 90Mhz and compatible with at least 16Mb RAM
- 5Mb of free disk space
- 1 free serial port
- WINDOWS 95

Parameters are set with SQset program.

NOTE - SQ has to be turned on in order to set programmable parameters.

⚠ Caution: risk of electric shock. Only authorised personnel should perform following procedures

Parameters that can be set with SQset program are:

1. Required voltage on LCD display when $U_{NOMINAL}$ is applied (SQ0214 and SQ0114 only)
2. Dead bus bar or generator offset level
3. Variable length of a SYNC pulse

When SQset program is launched, a window in figure 6 appears. In order to start setting parameters, a proper serial port and communication properties have to be set.

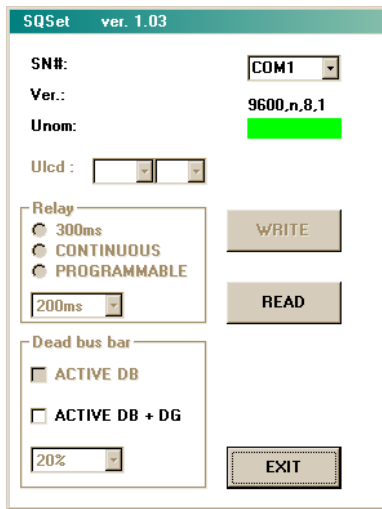


figure 6: SQset start-up window



figure 7: Communication error warning. Check if communication adapter is connected to the SQ and the SQ is turned on

To start setting parameters, first press READ button.

If communication adapter is not connected to the SQ or the SQ is not turned on or a communication port is false, a communication error warning is displayed (see figure 7).

Program reads serial number, program version and all parameters currently written in SQ (see figure 8). At this point, writing parameters is disabled. Writing is disabled as long as parameters are unchanged (see figure 8).

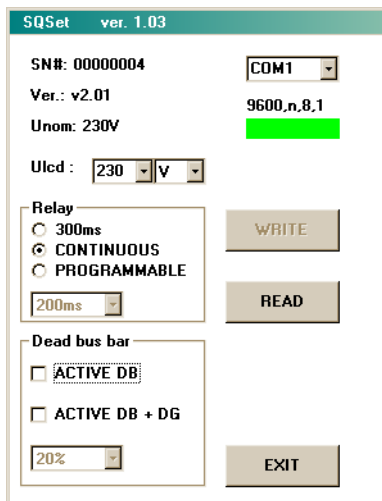


figure 8: Reading parameters currently written in SQ

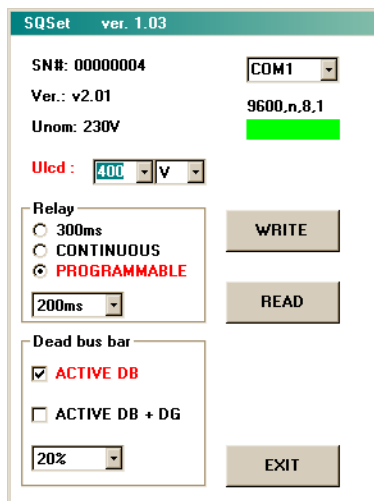


figure 9: Changed parameters are marked with red colour

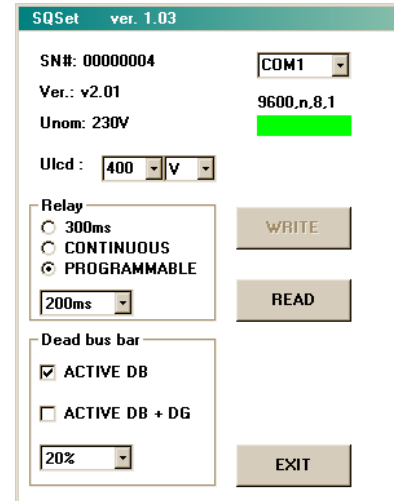


figure 10: Changed parameters are saved and active

When a parameter is changed, it is marked with a red colour and WRITE button is enabled (see figure 9).

NOTE - some parameters have additional setting beside check-box (relay set to programmable, Dead bus bar).

When all parameters are set as required, press the WRITE button.

Besides setting parameters, SQset program checks if jumpers are set according to required functionality and if chosen voltage range for a LCD display is regular.

If jumper is set/reset incorrectly, a warning is displayed and a program waits until jumper is reset/set (see figure 11 for example).

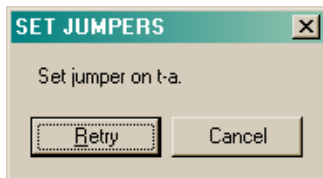


figure 11: Some parameters require correct jumper setting.

The highest voltage set in U_{LCD} dropdown list is 800V, or 800kV. (If, for example, 900V is to be displayed when nominal voltage is measured, one should set 0.90kV in U_{LCD} dropdown list). Otherwise warning will be displayed (see figure 12).

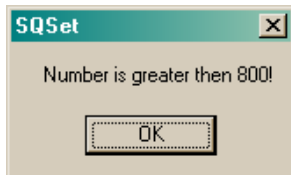


figure 12: Incorrect U_{LCD} voltage set warning.

The lowest U_{LCD} voltage that can be set is 30V. If less than that is set, warning will be displayed (see figure 13).

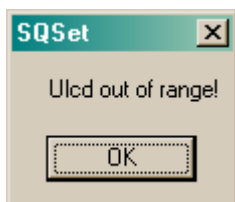


figure 13: U_{LCD} voltage too low warning.

As fast as the write sequence is complete, changed parameters are no longer marked with a red colour. It means that parameters are now saved and active (see figure 10). WRITE is again disabled as long as parameters are unchanged.

To set parameters to another SQ, SQset need not to be restarted. When communication adapter is connected to new SQ and it is turned on, first press READ and then set required parameters as described.

4. FLASH UPGRADE

In case if flash upgrade will be required, software and documentation will be delivered. Hardware is the same as for setting programmable parameters (Mipack).



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