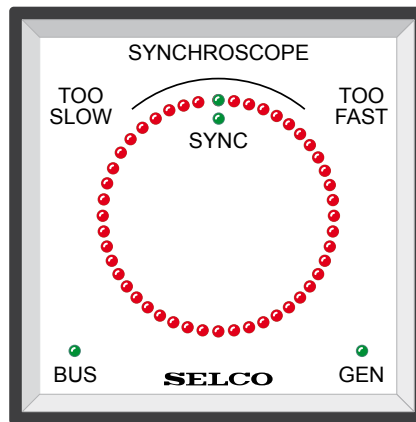


# M8100 Synchroscope

- Same accuracy as pointer synchrosopes
- Illuminated indication of phase and frequency difference on 38 LEDs
- Visual indication of bus voltage, generator voltage and phase accordance
- Fully isolated voltage inputs
- Optional built-in check synchronizer relay
- Optional Dead Bus closure function
- 50 hours burn-in before test
- Ambient temperature range: -20°C to +70°C
- Certified by major marine classification societies
- Flame retardant enclosure
- Flush mounted unit



## Application

The M8100 Synchroscope provides illuminated indication of the phase and frequency difference between voltages on two separate AC systems, e.g. a generator and a busbar. The M8100 will also indicate whether or not the two systems are on voltage.

The M8100 is also available in a version with a built-in relay for automatic closure of the circuit breaker. The voltage and frequency are adjusted by the operator to roughly match the values required, and the unit will provide a closing signal to the circuit breaker at phase accordance.

The M8100 is part of the SELCO series of modular units for protection, control and monitoring of generators, both in marine and land-based applications. The M8100 is type approved by major marine classification societies.

## Function

The M8100 Synchroscope provides illuminated indication of the actual phase difference between generator voltage and bus voltage. If the vector and the light spot turn clockwise, the generator frequency is too high and must be reduced. The light spot turning anti clockwise indicates a lower generator frequency, and consequently it must be increased. From the time it takes to turn one cycle the frequency difference  $\Delta$  can be calculated from the following:

$$\frac{1}{t} = \Delta f$$

Example: It takes 5 sec. for one cycle clockwise.

$$\frac{1}{5} = 0.2 \text{ Hz}$$

The frequency difference  $\Delta f = 0.2 \text{ Hz}$  and if the bus frequency is 50 Hz, the generator frequency is 50.2 Hz.

When phase accordance has been obtained, the two green LEDs at 12 o'clock will be lit and the generator circuit breaker can be closed.

The M8100 has separate measuring transformers for each voltage input, which provides complete galvanic isolation between the two systems.

## Trouble shooting

1. It is important that the green LED (12 o'clock) is on when the circuit breaker is closed. If the 6 o'clock LED is on, the connection to terminals 1 or 2 should be interchanged with the connection to terminal 3.
2. If other LEDs than mentioned above are on, the bus connection and the generator connection are not referring to the same phase on both sides of the

main contacts of the circuit breaker.

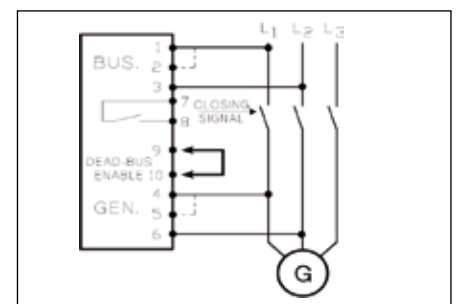
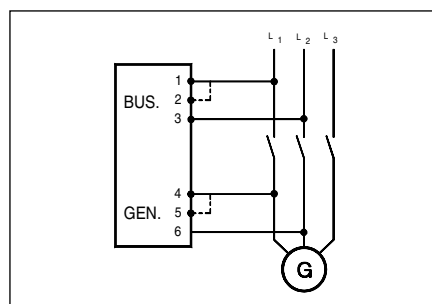
3. If the light spot is turning the wrong direction, the bus and the generator supply are interchanged.

## M8100 with check synchronizer relay

In addition to the normal synchroscope function, this unit contains a circuit for automatic closing of the generator circuit breaker. A normally open output contact on terminals 7 and 8 is activated when phase accordance appears. On the rear side is a button for combined adjustment of limits for voltage difference, phase difference and frequency difference. These limits are related together to obtain maximum operational performance. For further explanation, please refer to datasheet for the SELCO T5000 Paralleling Relay.

In the minimum position the voltage difference is  $\pm 10\%$ , the phase difference is  $\pm 6^\circ$  and the frequency difference is 0.15Hz. In the maximum position the voltage difference is  $\pm 20\%$ , the phase difference is  $\pm 12^\circ$  and the frequency difference is 0.3Hz.

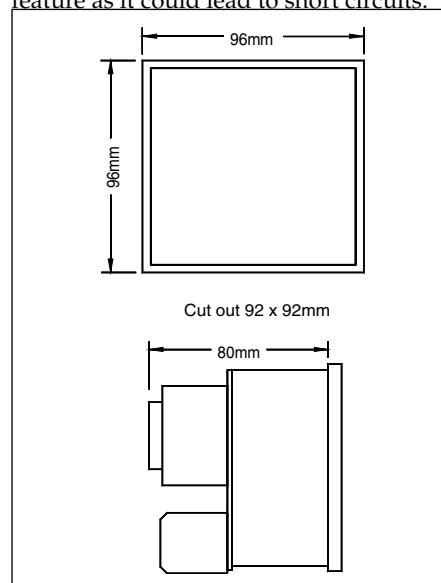
For further explanation, please refer to M8100 Manual. An optional dead bus closure function can be activated by



bridging terminals 9 and 10.

This function enables the check synchronizer relay to close the generator breaker to a dead busbar e.g. during a power failure. Condition for this function is that the unit has detected the generator to be within voltage limits and the busbar voltage below the busbar voltage offset level. All other parameters will be disregarded.

**Warning:** Be carefull when using this feature as it could lead to short circuits.



Dimensions.

### Type Approvals and Certificates

The M8100 has been designed and tested for use in harsh environments. The unit is based on standard components, providing long term durability.

The M8100 carries the CE label and has been approved by the following marine classification societies:



Bureau Veritas  
Germanischer Lloyd  
Romanian Register of Shipping  
Russian Maritime Register of Shipping

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DK-4000 Roskilde  
Denmark  
Phone: + 45 7026 1122  
Fax: + 45 7026 2522  
e-mail: selco.dk@selco.com  
www.selco.com

# Specifications

## M8100 Synchroscope

<b>Max. Voltage</b>	660V
<b>Voltage range</b>	70 - 110%
<b>Consumption</b>	2 x 3VA max.
<b>Frequency range</b>	35 - 70Hz
<b>Pull in / drop out diff. frequency</b>	±9Hz
<b>Operating temperature</b>	-20°C to +70°C
<b>EMC</b>	CE according to EN50081-1, EN50082-1, EN50081-2, EN50082-2
<b>Approvals</b>	Certified by major classification societies
<b>Burn-in</b>	50 hours before final test
<b>Enclosure material</b>	Flame retardant
<b>Weight</b>	0.7kg
<b>Dimensions</b>	96 x 96 x 80mm (H x W x D)
<b>Panel cut out</b>	92 x 92mm (H x W)

### Unit with check sync. relay

<b>Voltage difference</b>	10 - 20%	} Combined setting
<b>Frequency difference</b>	0.15 - 0.3Hz	
<b>Phase difference</b>	6 - 12°	
<b>Dead bus delay</b>	1s – 5s	
<b>Dead bus voltage offset</b>	20% - 40%	
<b>Min. generator voltage for DB closure</b>	80% of nominal voltage	
<b>Contact rating</b>	CE according to EN50081-1, EN50082-1, EN50081-2, EN50082-2	

The specifications are subject to change without notice.

### Type Selection Table

Type	Terminals		Function
	1-3 4-6	2-3 5-6	
M8100.0010	450V	400V	
M8100.0020	230V		
M8100.0030	480V	415V	
M8100.0040	110V	100V	
M8100.0050	450V	400V	With check synchronizer relay
M8100.0060	230V		With check synchronizer relay
M8100.0070	480V	415V	With check synchronizer relay
M8100.0080	110V	100V	With check synchronizer relay

Other voltages on request.

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