SQ96/1w - SQ144/1w

ANALOG METERS FOR PHASE COMPARISON SYNCHRONOSCOPES

Application

The synchronoscopes SQ96/1w and SQ144/1w are used to measure phase difference of two ACvoltages, e.g. those of a generator and the mains.

The dial carries a zero marker, a red arrow marked with "+" and a black arrow marked with"-"

When the frequencies of the two voltages differ less than approximately 1.5 Hz[1)], they can be compared approximately:

The pointer rotates accordIng to frequency ratio (and to meter connection) clockwise or anticlockwise. The pointer stands still when the frequencies get equal. The pointer rests at the zero marker when the phases coincide also; the AC voltages can be connected to each other.

The connection of the meter can be chosen so that the pointer rotates clock-wise or counterclockwise when the frequency f_1 (e.g. generator) is higher.

When the meter is not in work, the pointer cannot be seen.

The instruments are suitable to be mounted in generating sets, power supply control panels, switchboards or mosaic panels.

1) 1.5 Hz for multi -phase synchronoscope /1 Hz for single-phase synchronoscopes

Movements

The synchronoscopes SQ96/1w and SQ144/1w are supplied with an iron-less electrodynamical quotient movement.

The pointer is able to rotate over 360 degrees in both directions.

Mechanical Data

Case details	square case suitable to be mounted in switchboards or mosaic grid panels, stackable
Material of case	pressed steel
Material of window	glass
Colour of bezel	black (similar to RAL 9005)
Position of use	vertical ±5°
Terminals	hexagon studs, M3 x 6 screws and wire clamps C6 connector blades 6.3 x 0.8 for protective wire
Terminal protecction against accidental contact (included)	full-sized terminal cover (SQ96/1w) protective sleeves SW6 (SQ144/1w)
position of use	vertical ± 5°

Dimensions	**SQ96/1w**	**SQ144/1w**
Bezel	96mm	144 mm
Case	90mm	137 mm
Depth	119mm	117 mm
Panel cutout	$92^{+0.8}$ mm	138^{+1} mm
Panel thickness	1..15mm	1..40mm
Panel fixing	4 pieces screw clamps	2 pieces type B (screw clamps) acc to DIN 43 835
Weight approx.	1.0kg	1.1 kg

Electrical Data

Measuring unit: phase angle of two sinusoidal AC vdtages

Measuring Ranges

Frequency	rated value	frequency range
	50 Hz	48.5 ...51.5 Hz (multi-phase)
		49...51 Hz (single-phase)
voltage	rated voltage U_N	operating voltage
	60; 100; 110V	300 V
	230; 400; 415 V	300 V
	400 V	300 V
	440; 500 V +	300 V

power consumption approx.

at rated vdtage	generator side	mains side
110V	0.7 VA	4.0 VA
230 V	1.5 VA	5.3 VA
400 V	3.2 VA	4.8 VA
500 V	3.5 VA	6.7 VA

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Operating range	U_N±10%
Overload capadty	U_N +20%
Measurement category	CAT II
Operating voltage	refer to Measuring Ranges
Pollution level	2
Enclosure code	IP 52 case front side
	IP 00 for terminals without protection against accidental contact
	IP 20 for terminals protected against accidental contact

Scaling

Pointer	bar pointer
Pointer deflection	360°
Zero	triangle on dial top
Accuracy class	1 according to DIN EN 60 051

Environmental

Climatic suitability	climatic class 2
	according to VDEA/DI 3540
Operating temperature	-10...40°C
Storage temperature	-25... 65°C
Relative humidity	≤ 75% annual average, non-condensing
Shock resistance	15 g, 11 ms
Vibration resistance	2.5g, 5...55Hz

Rules and Standards

DIN 43 718	Measurement and control; front-frames and front panels of measurement and control equipment; principal dimensions
DIN 43 802	Line scales and pointers for indicating electrical measuring instruments; general requirements
DIN 16 257	Nominal positions and position symbols used for measuring instruments
DIN EN 60 051	Direct acting indicating analogue electrical measuring instruments and their accessories
-1	Part 1: Definitions and general requirements common to all parts
-5	Part 5: Special requirements for phase meters, power factor meters, and synchronoscopes
-9	Part 9: Recommended test methods
DIN 60 529	Enclosure codes by housings (IP-code)
DIN 61 010-1	Safety requirements for electrical measuring, control and laboratory equipment
	Part 1: General requirements
DIN 61 326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements
	Part 1: General requirements
DIN 61 554	Panel mounted equipment -Electrical measuring instruments -Dimensions for panel mounting
VDE/VDI 350Sheet 2	Reliability of measuring and control equipment (classification of climates)

Options

Electrical data

Frequency	rated frequency	frequency range
	16 2/3 Hz	16 1/3 Hz...17Hz
	60Hz	58.5...61.5Hz
Voltage	rated voltage U_N; 60V, 415V, 440V	
	others (≥24V...≤500V) on request	
Voltage range	100...120V : √3	
	100...120V	
	208...230V	
	380...400V	

Case

Window	non-glaring glass
Colour of bezel	gray (similar to RAL 7037)
Position of use	15°...165° on request
Increased mechanical	shock 30g, 11ms
Loads	vibration 5 g, 5 ... 55 Hz
Climaty suitability	climatic class 3 according to VDEA/DI 3540
Operating temperature	-10...+55°C
Relative humidity	≤ 75% annual average, non-condensing)
Climatic suitability	"limited use jn the tropics"
Operating temperature	-25 ... +55°C
Relative humidity	< 75% annual average, non-condensing)
	non-certified
Enclosure code	IP 54 splash-water protected front connector
Terminals	blades 6.3 x 0.8
Terminals protecction against accidental contact	rubber nozzles

Dial

Logo on dial	none or request

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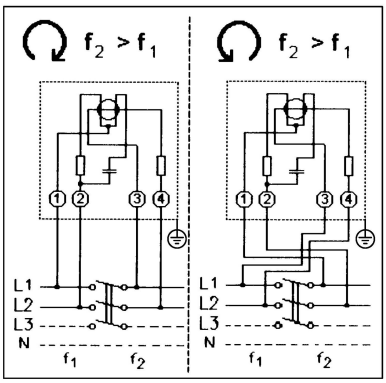
Connections:

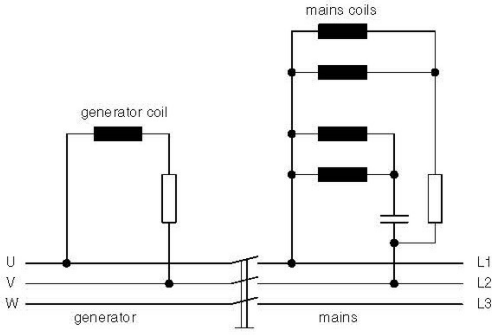
Note: The rotation direction depends on connection.



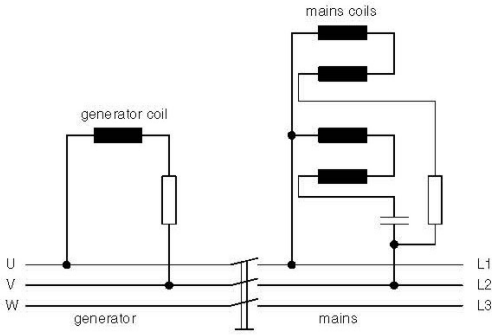
See also meter label

Principle circuit diagrams:

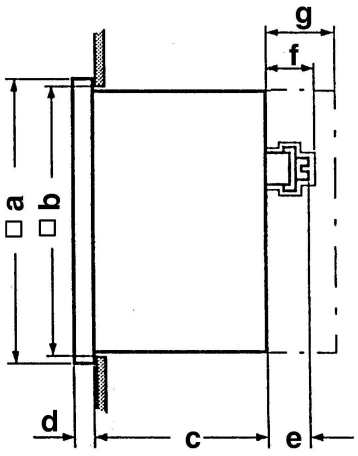
for voltages 100/110 V

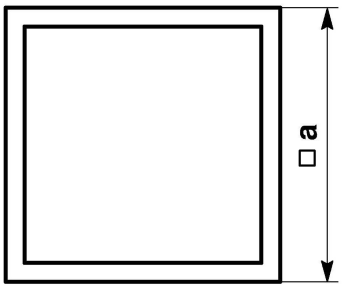


for voltages 230/400/500 V



Dimensions:





dimensions (in mm)	SQ96/1w	SQ144/1w
a	96	144
b	92	138
c	100	103
d	5	8
e	6.5	3
f	19*	-
g	-	14

*including cover for external series resistor

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Ordering Information	
Type SQ.../1w	Synchronoscopes
Front dimensions 96 144	 96mm x 96mm 144mm x 144mm
Rated Voltage	60V 100V 110V 230V [1] 400V 415V 440V 500V others [2] (≥24V...≤500V)
Rated Frequency	16 [2/3]Hz 50 Hz[1] 60 Hz
Window	glass [1] non-glaring glass
Colour of bezel	black (similar to RAL 9005) [1] gray (similar to RAL 7037)
Position of use	vertical[1] on request 15...165°[2])
Increased mechanical loads	shock 15g, vibration 25.g[1] shock 30g, vibration 5g
Climatic suitability	class 2, -25...+40°C [1] class 3, -10...+55°C "limited use in tropics", -25°...+55°C
Marine application	none [1] non-certified
Enclosure code	IP52 [1] IP54 splash-water protected front
Terminals	screws M3 x 6 and wire clamps [1] connector blades 6.3 x 0.8 additional lettering on request [2]
Logo	Celsa[1] none OEM logo[2]

1) Standard
2) Please clearly add the desired specifications.

Ordering example:

SQ96/1w, rated voltage AC 230V, rated frequency 50Hz, window non-glaring glass, no logo.

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