Data Sheet

M Series

Analog Meters for Phase Comparison Synchronoscopes

SY 96 S
SY 144 S

WEIGEL
Application

The synchronoscopes SY 96/144 S (M series) are used to measure phase difference of two AC voltages, 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 clockwise 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 synchronoscopes

1 Hz for single-phase synchronoscopes

Movements

The synchronoscopes SY 96 S and SY 144 S are supplied with an ironless electrodynamical quotient movement.

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

Principle Circuit Diagrams

For voltages 100/110 V

For voltages 230/400/500 V

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)
- **terminals**: hexagon studs, M3 screws and wire clamps C6
- **connector blades**: 6.3 x 0.8 for protective wire
- **terminal protection against accidental contact**: full-sized terminal cover (SY 96 S) / protective sleeves SW6 (SY 144 S) included
- **position of use**: vertical ±5°
- **dimensions**:
  - SY 96 S: case details 96 mm, case 90 mm, depth 119 mm, panel cutout 92+0.8 mm, panel thickness 1...15 mm, panel fixing 4 pieces WEIGEL screw clamps acc. to DIN 43 835
  - SY 144 S: case details 144 mm, case 137 mm, depth 117 mm, panel cutout 138-1 mm, panel thickness 1...40 mm, panel fixing 2 pieces type B screw clamps
  - **weight**: approx. 1.0 kg

Electrical Data

- **measuring unit**: phase angle of two sinusoidal AC voltages
- **Measuring Ranges**
  - **frequency**:
    - rated value: 50 Hz
    - frequency range: 48.5...51.5 Hz (multi-phase)
    - \(49 \ldots 51\) Hz (single-phase)
  - **voltage**:
    - rated voltage \(U_N\): 60: 100; 110 V
    - operating voltage: 300 V
    - 200: 400; 415 V
    - 300 V
    - 400 V
    - 440 V
    - 500 V
  - **power consumption**: approx.
    - at rated voltage: generator side 0.7 VA, mains side 4.0 VA
    - 110 V
    - 230 V
    - 400 V
    - 500 V
  - **operating range**: \(U_N \pm 10\%\)
  - **overload capacity**: \(U_N + 20\%\)
  - **measurement category**: CAT III
  - **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

\(\dagger\) also refer to "Options"
Analog Meters for Phase Comparison Synchronoscopes

Environmental

- climatic suitability: climatic class 2 according to VDE/VDI 3540, sheet 2
- operating temperature range: –10 ... +40°C
- storage temperature range: –25 ... +65°C
- relative humidity: ≤ 75% annual average, non-condensing
- shock resistance: 15 g, 11 ms
- vibration resistance: 2.5 g, 5 ... 55 Hz
- stray magnetic field: 0.5 mT

Rules and Standards

- DIN 43 718: Measurement and control; front-frames and frontpanels 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
- DIN EN 60 529: Enclosure codes by housings (IP-code)
- DIN EN 61 010-1: Safety requirements for electrical measuring, control and laboratory equipment – Part 1: General requirements
- DIN EN 61 326-1: Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
- DIN IEC 61 554: Panel mounted equipment – Electrical measuring instruments – Dimensions for panel mounting
- VDE/VDI 3540: Reliability of measuring and control equipment (classification of climates)

Options

- electrical data
  - frequency: 16 ⅔ Hz, 16 ⅓ ... 17 Hz, 60 Hz, 58.5 ... 61.5 Hz
  - voltage: rated voltage $U_N$: 60 V, 415 V, 440 V others (≥24 V ... ≤500 V) on request
  - voltage range: 100 ... 120 V, ±√3
  - 100 ... 120 V
  - 208 ... 230 V
  - 380 ... 400 V
- case
  - window: non-glaring glass
  - colour of bezel: gray (similar to RAL 7037)
  - position of use: on request 15 ... 165°

Connections

Note: The rotation direction depends on connection.

Dimensions

- SY 96 S
  - a: 96
  - b: 92
  - c: 100
  - d: 5
  - e: 6.5
  - f: 19 *)
  - g: –
- SY 144 S
  - a: 144
  - b: 138
  - c: 103
  - d: 8
  - e: 3
  - f: –
  - g: 14

*) Including cover for external series resistor
### Ordering Information

| Type | SY
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Front dimensions</strong></td>
<td></td>
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<tr>
<td>96 S</td>
<td>96 mm x 96 mm</td>
</tr>
<tr>
<td>144 S</td>
<td>144 mm x 144 mm</td>
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</tbody>
</table>
| **Rated voltage** | 60 V
| | 100 V |
| | 110 V |
| | 230 V *) |
| | 400 V |
| | 415 V |
| | 440 V |
| | 500 V |
| | others 2) (≥24 V ... ≤500 V) |
| **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) |
| **Mechanical loads** | shock 15 g, vibration 2.5 g 1) |
| | shock 30 g, vibration 5 g |
| **Climatic suitability** | class 2, –10 ... +40°C 1) |
| | class 3, –10 ... +55°C 1) |
| | "limited use in the tropics", –25 ... +55°C |
| **Marine application** | none 1) |
| | non–certified |
| **Enclosure code** | IP 52 1) |
| | IP 54 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** | WEIGEL 1) |
| | none |
| | OEM logo 2) |

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

**Ordering example**

SY 96 S, rated voltage AC 230 V, rated frequency 50 Hz, window non–glaring glass, no logo

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– specifications subject to change without notice; date of issue 12/10 –