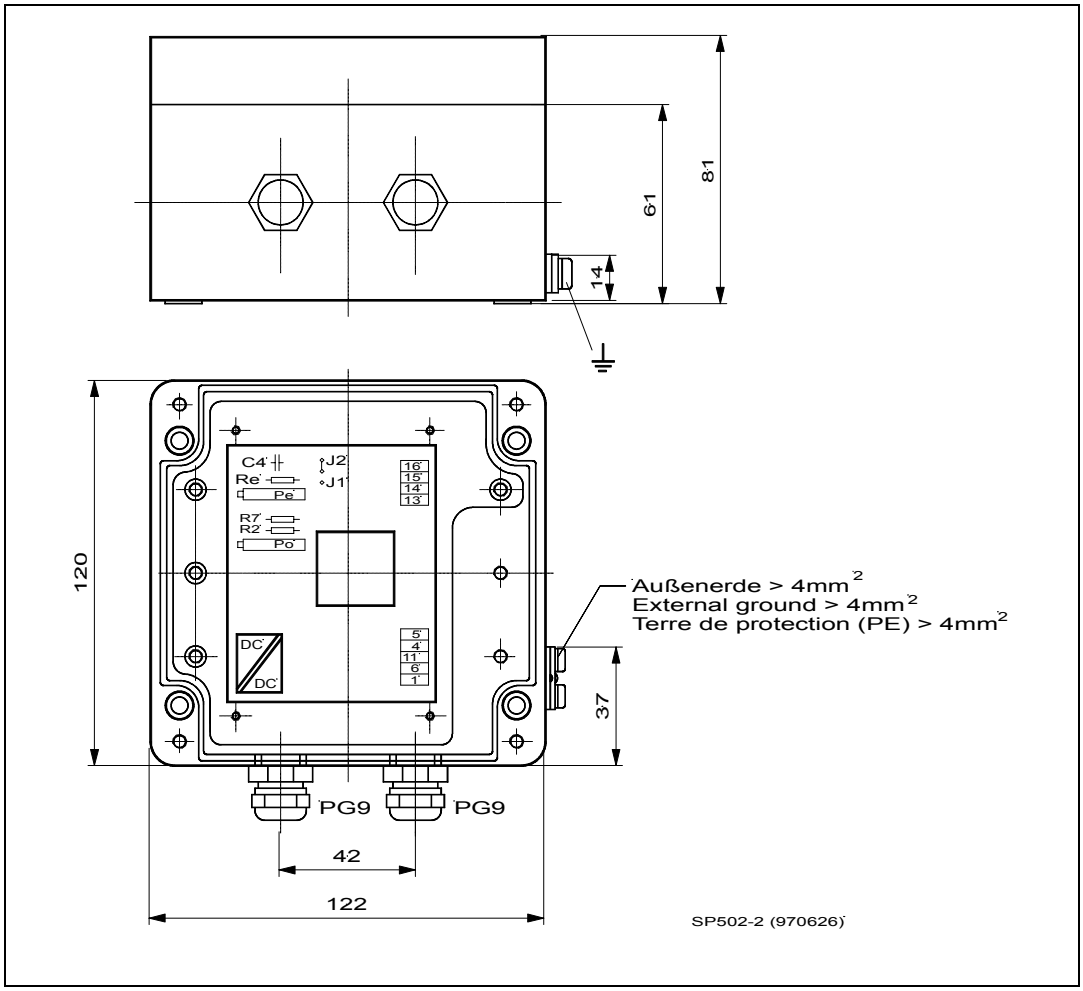
SP - 502

Measuring Amplifier for Connection of Inductive Measuring Sensors Type WT-0xx



1 Operating Principle

Carrier Frequency Measuring Amplifier SP-502 is designed to generate the supply voltage for the connected inductive measuring sensor and to evaluate ist measuring voltage.

Measuring sensor is connected using screw-type terminals.

Zero-value, zero-value shift and sensitivity settings can be adjusted on PCB front panel with the aid of trimmers, with no need to dismount PCB for adjustment work.

2 Technical Data

Suitable Measurement Value Sensors

Type series	Inductive mesuring sensors WT - 0xx

Voltage Supply and Output

Operating voltage	-24 V DC
Consumption	max. 2 W
Rated output	0 ... 10 V max 15 mA (Option 4 ... 20 mA, Load 500 Ω)

Oscillator

Carrier frequency	5 kHz ± 10 % (sinusoidal)
Bridge supply-voltage	approx. 2 V_{eff}
Supply current	max. 12 mA_{eff}

Measuring Amplifier

Linearity error	< 0,1 %
Zero-Value temperature coefficient	< 0,1 % / 10 K at 100 mV/V pick-up sensitivity < 0,15 % / 10 K at 20 mV/V pick-up sensitivity
Sensitivity temperature coefficient	< 0,05 % / 10 K at 100 mV/V pick-up sensitivity < 0,15 % / 10 K at 20 mV/V pick-up sensitivity
Operation temperature range	0 °C ... + 60 °C
Storage temperature range	-25 °C ... + 85 °C
Noise level (residual carrier votage)	< 2 mV_{eff}
Input resistance	approx. 200 kΩ
Output current	max. 6 mA
Zero-value shift	approx. ± 10 % of nominal range by trimmer up to 100 % nominal range by resistor
Measuring signal cut-off frequency (-3 dB)	200 Hz

General Data

Zero-value adjustment	fine; by trimmer P_o coarse; by resistor $R_2 + R_7$
Sensitivity adjustment	fine; by trimmer P_E coarse; by resistor R_E

EMC

The following standards apply:

• Suppression od radio disturbance	EN 55011 : 1991
• Conducted interference	EN 61000-3-2 : 1996-03 and EN 61000-3-3 : 1996-03
• Interference immunity	EN 50082-2 : 1996-02

3 Commissioning

3.1 Housing Installation

Remove housing cover and fix lower part with 4 socket head screws M6. Mounting position can be selected at will. However, accessibility for wiring and adjustment work should be provided.

Use in water jet hazardous rooms

Housing electronics is protected from water jets IP 65 (DIN 40050). If housing is mounted in water jet hazardous areas, ensure that cable glands are arranged downward.

3.2 Connections

General Hints

- Inductive measuring pick-up connecting cable can be extend ed by shielded low-capacitiy cable (4 ... 8 mm outer diameter).
- Ensure that sensor cable is not routed parallel to high power or control cables. Avoid electromagnetic fields of motors, transformers and thyristor lines. Pay heed to regulations for electrical installations (in Germany: VDI/VDE 3551.
- Appropriate routing of sensor cable permits a distance of up to 250 m between sensor and amplifier.
- Perform amplifier setting at operating temperature, with sensor installed.
- Do not apply external voltages to a current output in order to avoid destruction.
- Before performing soldering work, safely disconnect device from mains.
- Resistors used for adjustment should have a low temperature coefficient.

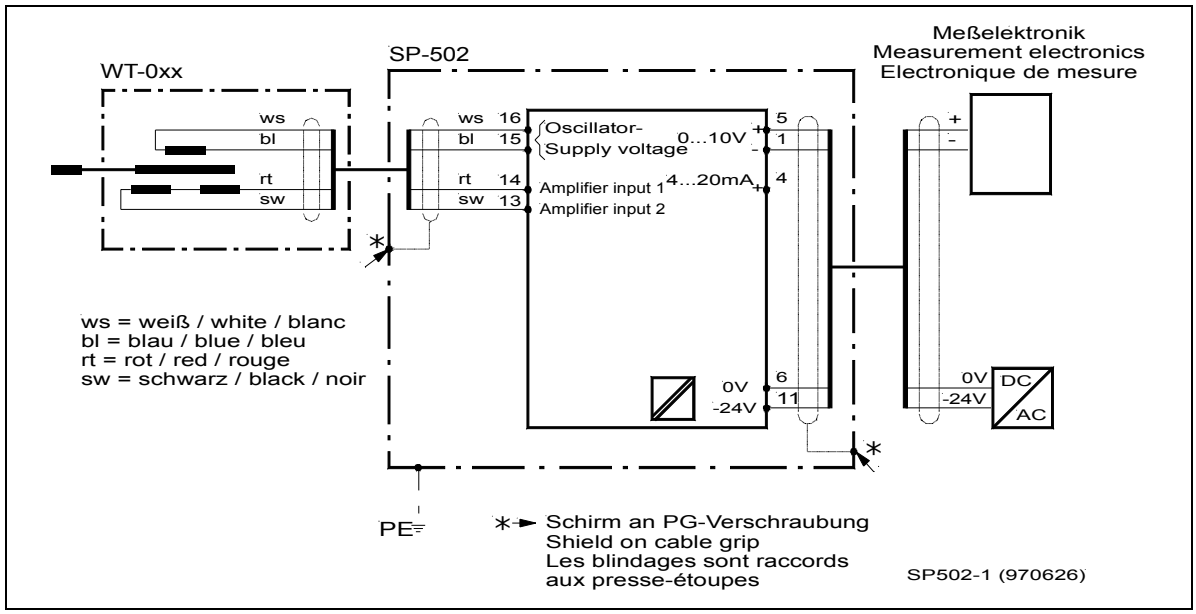
If grounding, shielding, EMC and reference potential are not matter-of-course to you, read „General Grounding Hints“ before connecting measuring chain.

Connections for

- Measuring amplifier supply voltage
- Measuring sensor signal input
- Measuring electronics output signal

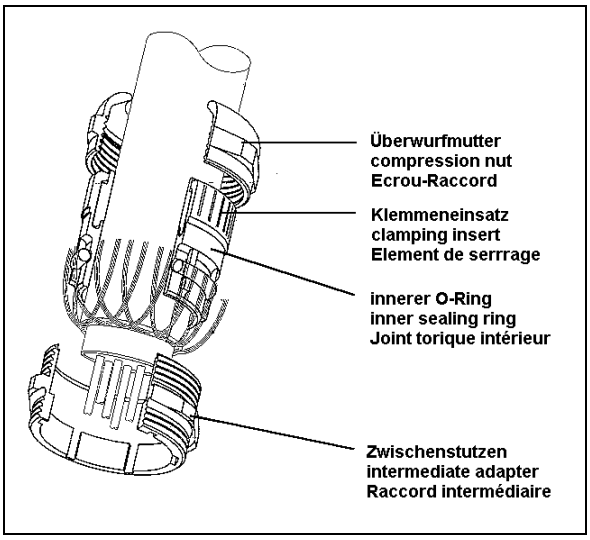
are led to screw-type terminals on PCB via two 4-core cables, e.g. AC-112, through PG-9 stuffing box screwings. Cable outer diameter 4 ... 8 mm.

For terminal connections, see wiring diagram.



Shielding

All cables connected with electronics require to be shielded. Shields are applied to PG screwings as shown below.



Housing Grouding

Housing is grounded by PE ground connector with $\geq 4\ mm^2$.

As shields are applied to housing via PG screwings, all shields are duly connected with PE line.

4 Installation Instructions

Across amplifier output, inductive measuring sensor supplies a signal of 0 - 10 V; optionally, 4 - 20 mA. Range of travel can be read off from millimeter scale on pick-up head.

- 5 V or 12 mA, corresponds to range of travel „center“
- 0 V or 4 mA, corresponds to range of travel „0“ (pick-up head retracted up to last division).
- 10 V or 20 mA, corresponds to range of travel „max.“ (pick-up head extended up to last).
- By interchanging 13 and 14, measuring signal output can be reversed (0 V ... 10 V / 10 V ... 0 V).

Visible range of millimeter scale indicates the range of travel still available. Measuring pick-up head has to be positively tied to measuring object over entire range of travel.

To match range of travel to measuring signal, you can effect the following adjustments:

Zero-Value Fine Adjustment

Zero-value fine adjustment is made on trimmer P_o in the scope of eligible adjustment range. If range is too small, increase by using resistor R_2 od, if still too small, shift using resistor R_7.

Setting Zero-Value Adjustment Range

Size of adjustment range is determined by resistor R_2.

Shifting Zero-Value Adjustment range

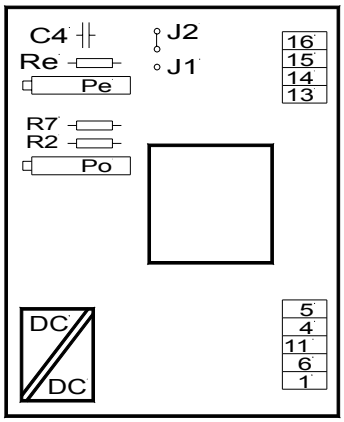
Size of range shift within measuring span is determined by resistor R_7.

Sensitivity Fine Adjustment

Sensitivity fine adjustment is made via trimmer P_E.

Sensitivity Coarse Adjustment

Sensitivity coarse adjustment is determined by resistor R_E.



SP502-3 (970429)

P_o	Trimmer for zero-value fine adjustment
$R_{2;\ 100\ K}$	Resistor for setting adjustment range
$R_{7;\ 30\ K}$	Resistor for shifting adjustment range
P_E	Trimmer for sensitivity fine adjustment
$R_{E;\ 120\ K}$	Resistor for sensitivity coarse adjustment

4.1 Setting Inductive Measuring Sensor

Prerequisites

Displacement measuring chain (inductive measuring sensor and measuring amplifier) is ready to operate. Voltmeter, or ammeter, is connected to measuring amplifier analog output.

Setting Mechanical Zero-Value

Use measuring sensor millimeter scale to set mechanical zero-value. To do so, loosen measuring sensor in mounting support (see measuring sensor data sheet) and shift towards measuring object until zero position is reached. Fix inductive measuring sensor in this position.

4.2 Checking and Re-Adjusting Electrical Zero-Value

Note:

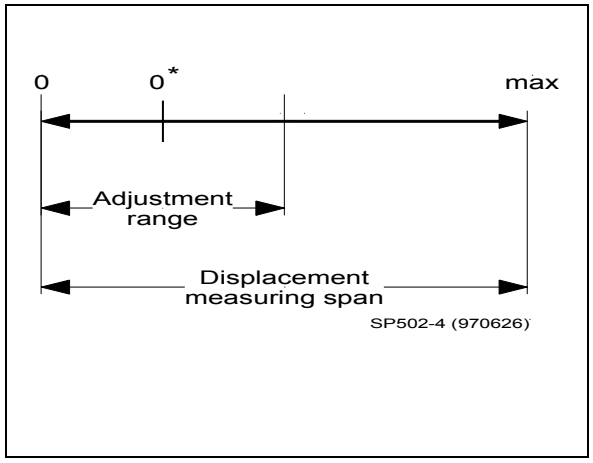
Inductive measuring sensors is preset as follows:

- 5 V or 12 mA, corresponds to range of travel „center“
- 0 V or 4 mA, corresponds to range of travel „0“ (pick-up head retracted up to last division).
- 10 V or 20 mA, corresponds to range of travel „max.“ (pick-up head extended up to last division).
- By interchanging connectors 13 and 14, you can reverse measuring signal output (0 V ... 10 V / 10 V ... 0 V).

Checking Electrical Zero-Point - Trimmer P_o

- Set mesuring sensor to mechanical „0“.
- Read off output voltage, or output current, from connected voltmeter, or ammeter.
- In case of deviation, output signal can be set to desired voltage value (within adjustment range) on trimmer P_o.

4.3 Setting Zero-Value Adjustment Range - Resistor R_2

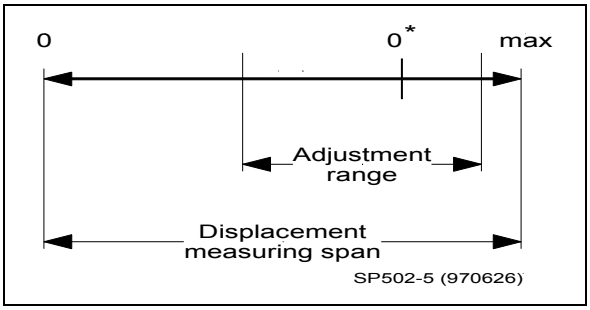


Initially, electrical and mechanical zero-value are identical. If electrical zero-value is to be shifted as against mechanical value, e.g. to enable asymmetrical displacement measurement, change, or replace, resistor R_2.

Resistor value determines the size of the range within which electrical zero-value can be shifted. Shifting is made using trimmer P_o (example shows zero-value 0*).

To acquire resistor value R_2, replace R_2 by a resistor decade connected in soldering terminals.

4.4 Shifting Adjustment Range within Measuring Range - Resistor R_7



If zero-value adjustment range is too small, range can be shifted within measuring span. Shifting is done by changing, or replacing, resistor R_7.

To determine resistor R_7, replace R_7 by a resistor decade connected in soldering terminals.

4.5 Checking and Re-Adjusting Sensitivity

Checking Sensitivity - Trimmer P_E

Check sensitivity by presetting mechanical range of travel and checking electrical signal on voltmeter, or ammeter (voltage, or current, change per mm of displacement). For correction, use trimmer P_E.

4.6 Changing Sensitivity - Resistor R_E

If only a part of the available measuring span is to be utilized and resolved to maximum number of divisions, adjust sensitivity to partial range by replacing resistor R_E.

To determine resistor R_E, dismount by soldering.

Connect resistor decade at foot of capacitor C4. With 100 kΩ, adjust measuring amplifier to measuring sensor electrical zero-value using trimmer P_o.

Determine resistor with which desired output signal is reached at full scale value. Solder resistor 10 to 30 % smaller than acquired value.

If acquired resistor is ≥ 150 kΩ, jumper J1 and redetermine resistor R_E.