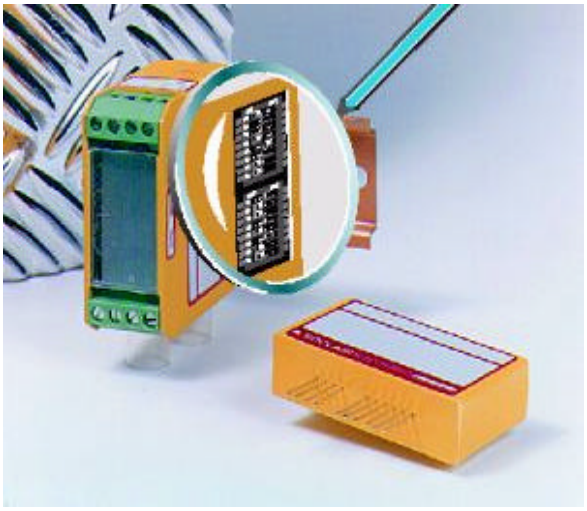
Transducer for Measurement Bridges SCM90, SIGS15



Transducer for measurement bridges for DIN-rails and for printed circuit boards.

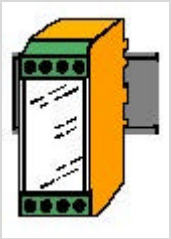
Programmable ranges and bridge supply, voltage or current bridge excitation

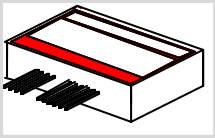
General Description

These transducers amplify the output signals of resistive measurement brides and convert them to normalised output voltages (e.g., 0-10 V) or currents (e.g., 4-20 mA). Frequency output is available as an option, max. 20 kHz. In the programmable modules (SCM 90, SIGS 15), switches are used to select the zero point (offset), measurement range, bridge supply voltage and the output. A cut-off frequency (3 Hz - 15 kHz) can also be set in the SCM 90S version.

- For pressure and force cells, strain gauges and other measurement bridges.
- Differential, high-impedance voltage input.
- High precision voltage source to supply the bridge (5 V or 10 V, max. 120 mA). Special design with current source is available on request.
- Switches for the selection of zero point (max. ±15 mV), measurement range (max. ±127 mV), bridge power supply (5/10 V), output (voltage or current).
- Option: frequency output (max. 20 kHz), galvanic isolation, can be connected to a bus.
- Interference and destruction protection: secure against short circuits and terminal reversal, up to 30 VDC overvoltage protection at all inputs, fulfils all EC-EMC standards (EN50082/IEC 801).

Overview

Modules for DIN-Rails	Type	Output	Supply	Range	Special Features
 Dimensions: 55x60x23mm	**SCM 90**	V/mA	20-30V	progr.	Constant voltage bridge supply
	SCM 90S	V/mA	20-30V	progr.	Like SCM90, adjustable bandwidth
	SCM 90I	V/mA	20-30V	progr.	Constant current bridge supply
	SCM 90IS	V/mA	20-30V	progr.	Like SCM90I, adjustable bandwidth

Modules for printed circuits	Type	Output	Supply	Range	Special Features
 Dimensions 55x32x15mm	**SIGS 15**	V/mA	20-30V	progr.	Constant voltage bridge supply
	SIGS 15S	V/mA	20-30V	progr.	Like SCM90, adjustable bandwidth
	SIGS 15I	V/mA	20-30V	progr.	Constant current bridge supply
	SIGS 15IS	V/mA	20-30V	progr.	Like SCM90I, adjustable bandwidth

Technical Data

Specifications for accuracy classes A and C (Max. values at 23°C, unless otherwise stated)

General	A	C	Unit
Linearity error, 50 mV range[1]	0.01	0.02	%
Calibration error, SCM 15/90 (0-64 mV = 0-10 V)[1]	0.05	0.1	%
3 dB-Bandwidth, SCM 15/90, typ.[2] [3]	4-15	4-15	Hz
3 dB-Bandwidth SCM 15/90S, adjustable[4]	3-15k	3-15k	Hz
Power supply influence (24 VDC), typ.	0.005	0.005	%/V

Input:	A	C	Unit
Input current, typ.	1	1	nA
Noise 0.1-10 Hz, pp RTI, typ.	0.5	1.0	µV
Error when switching range, SCM 15/90[1]	0.2	0.3	%
Common mode range	-7 to 7	-7 to 7	V

Stability of offset with:	A	C	Unit
Temperature (RTI)[1]	0.3	1	µV/K
Age, 1 year (RTI)[1]	5	10	µV
Age, 10 year (RTI)[1]	20	40	µV

Stability of gain with:	A	C	Unit
Temperature[1]	25	70	ppm/K
Age, 1 year (RTI)[1]	400	800	ppm
Age, 10 year (RTI)[1]	1200	2500	ppm

Voltage output (SIGS 10/15, SCM 70/90)	A	C	Unit
Output impedance, typ.	50	50	Ohm
max. output current, typ.	5	5	mA
max. output voltage, typ.	10.5	10.5	V
min. output voltage, typ.	-10.2	-10.2	V

Current output	A	C	Unit
max. burden, typ.	390	390	Ohm
max. current (24 V supply voltage)	20.5	20.5	mA

Bridge supply, constant voltage (5V and 10V):	A	C	Unit
Temperature drift[1]	25	35	ppm/K
Current, max. (24 V-Supply)	120	120	mA
Deviation from nominal value (smaller errors on request)	0.5	1	%

Bridge supply, constant current (0.1mA to 10mA, order specific):	A	C	Unit
Temperature drift[1]	25	35	ppm/K
Current, max. (24 V-Supply)	5	10	mA
Deviation from nominal value (smaller errors on request)	0.5	1	%

[1] The typical error is two to four times smaller than the quoted maximum error.

[2] Second order low-pass filter. Much higher frequencies can be delivered on request (up to approx. 10 kHz).

[3] The response time (to 1% of the final value during a jump in the input signal) varies between approx. 50 ms (for 15 Hz cut-off frequency) and approx. 300ms (for 4 Hz cut-off frequency).

[4] In modules with a programmable cut-off frequency (SIGS15S, SCM 90S), the response time (1%) varies between approx. 40us (15 kHz) and 2.1 ms (330 Hz) in the upper range and between 2.1 ms (330 Hz) and approx. 300 ms (3.3 Hz) in the lower range).

Temperature range °C: recommended: 0/60, functional: -20/90

Input and Bridge Supply

- High impedance, true differential amplifier input for all resistive measuring bridges with minimum 100 Ohm resistance. Standard input range is ±127 mV.
- Constant voltage bridge supply is standard, 5 V or 10 V (selection via DIL-switch), max. 120 mA. Different voltages on request.
- Option: Constant current bridge supply. Please specify current when ordering. Max. Current is 10 mA, min. Current is 0.1 mA. Load (burden) is standard 4 V, on request up to 9 V available.

Output

- Voltage output is between -10 V and +10 V. The technical data (specs) are valid for the current output; the voltage output is usually more accurate and stable. Short circuit proof.
- Current output: standard 0-20 mA or 4-20 secure against short circuits
- Option: frequency output, max. 20 kHz, isolated. For more information see “modules with frequency output

Power Supply

- All modules are suited for unregulated, noisy industrial power supplies; nominal value is 24 VDC (min. 19 V, max. 30 V). Other supply voltages on request (e.g. 15V). Current consumption without load is approx. 28 mA.

Measurement Ranges

- The measurement range is selected via SMD switches (in steps of 1 mV, measurement range max. ±127 mV, zero point max. ±15 mV), intermediate values adjustable via potentiometer. Switchable bridge supply (5 V or 10 V). Output switchable (voltage/current), current output switchable between 0-20 mA and 4-20 mA. In the SIGS15S and SCM 90S modules, a potentiometer is used to adjust the cut-off frequency between 3 Hz and approx. 15 kHz.

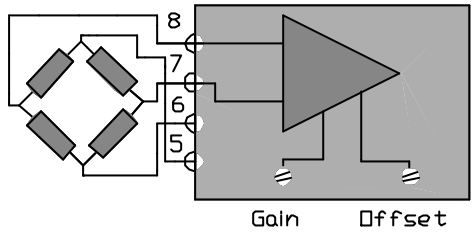
Options

- DC-DC converter (integrated in the DIN-rail module) for galvanic isolation of the power supply, 1 kV test voltage (3 kV available on request), max. bridge supply current is 20 mA.
- Programmable limit switch (integrated in the DIN-rail module), 2.8mm flat connectors on the side (for built in relay) for monitoring and control.
- Fault detection: Line break or short circuit monitoring (also for the bridge supply), output in positive saturation when fault detected.
- Constant current bridge supply, please specify the current (min. 0.1 mA, max. 10 mA)
- Frequencies output (max. 20 kHz), galvanically isolated, see "Module with Frequency Output" for more information.
- Other designs (ranges, inputs, outputs, time behaviour/filters, noise) and special versions.

When ordering, please specify:

- Module type
- Accuracy class (A, C)
- Input range (in mV) and output range (in V or mA, in Hz for frequency output) if a adjustment prior to delivery is required
- Power supply (24 V standard, 15 V or ±15 V on request)
- Current source instead of voltage source for bridge supply, specify current (min. 0.1 mA, max. 10 mA)
- Other designs (ranges, inputs, outputs, time behaviour/filters, noise) and special versions.

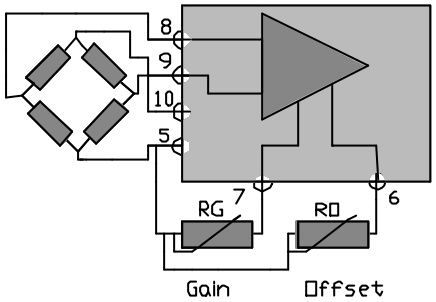
Connecting a Measurement Bridge to a DIN-Rail Module



Terminal 8: Input plus
Terminal 7: Input minus
Terminal 6: Voltage supply minus
Terminal 5: voltage supply plus

The figure shows how to connect a resistive measurement bridge to a DIN-rail module. Note that the impedance of the bridge power supply cables should be as low as possible. The voltage drops could cause a slight reduction in the bridge supply voltage, especially for larger bridge currents. If this can't be tolerated, a constant current supply should be considered.

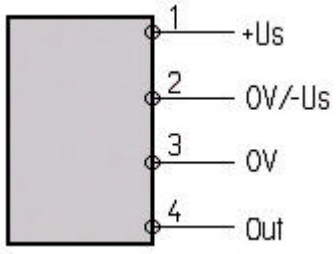
Connecting a Measurement Bridge to a Printed Circuit Board Module



Terminal 8: Input plus
Terminal 9: Input minus
Terminal 5: Voltage supply minus
Terminal 10: voltage supply plus

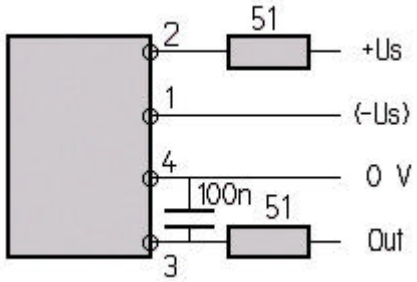
The above comments are also generally applicable to the printed circuit board modules.
Standard values for potentiometers: 1 kOhm each

Connection of Power Supply and Output (DIN-Rail Modules)



Terminal 1: Pos. power supply, nominal 24 VDC, min. 19 V
Terminal 2: Ground power supply
Terminal 3: Signal ground
Terminal 4: Signal Output (V or mA)

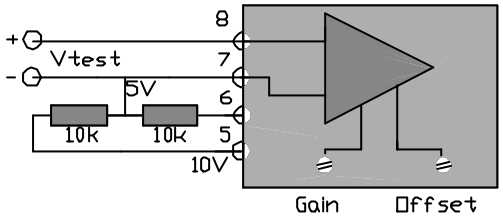
Connection of Power Supply and Output (Printed Circuit Modules)



Terminal 1: Ground power supply
Terminal 2: Pos. power supply, nominal 24 VDC, min. 16 V
Terminal 3: Signal ground
Terminal 4: Signal Output (V or mA)

If HF-noise can't be excluded, we recommend adding filters (e.g. 51 Ohm/100nF).

Testing a bridge amplifier module with fault detection



A voltage calibrator can only be connected to the modules when a DC voltage (common-mode voltage) is used to raise the signal voltage to the correct level (50% of bridge supply). This can be achieved, e.g., by connecting a second voltage source between connectors 6 (GND) and 7 (In-). Another possibility is illustrated in the neighbouring diagram. The 10 kOhm resistors reduce the bridge voltage to 5 V, which can then be used as the common-mode voltage. A similar procedure can be carried out for a printed circuit board module.

Note:

The signal inputs 7 and 8 must always have a DC path to ground (true differential amplifier). This is automatically the case when a measurement bridge (with bridge supply 5,6) is connected. Using a voltage calibrator, the DC-path can be realized by a short circuit between terminal 7 (In-) and terminal 6 (ground). If sensor fault monitoring is installed (available as an option), then a voltage equivalent to half the bridge supply voltage must be applied to connector 7 (±20%). For a test, this can, for example, be accomplished as shown in the above diagram.

Adjustment of Measurement Range and Zero Point (Offset)

Adjustment is performed using a calibrator or a calibrated sensing device. The zero point (offset) is adjusted via the "Offs" potentiometer and the full-scale value is adjusted via the "gain" potentiometer. The zero point is adjusted first and then the full scale. Where large adjustments are necessary, the procedure should be carried out several times. For additional reliability, the output value should be measured at half the measurement range (linearity test).
The output of modules with a unipolar supply voltage can't reach exactly 0. In such cases, zero point adjustment must be performed with an input value, which produces a non-zero output value.

Programming the SIGS 15 and SCM 90 Modules

The programmable switches 1a to 8a and 1b to 8b are located inside the module on the back of the printed circuit board. Carefully remove the plexiglas cover. The printed circuit board can now be removed by pulling gently on the screw terminals.

Bridge Supply	Switch 1a
10 V/120 mA max.	on
5 V/100 mA max.	off

Output (conn. 4)	Switch 2a	Switch 3a
0 – 10 V	on	off
0 - 20 mA	off	off
4 - 20 mA	off	on

Range of cut-off frequency	Switch 4a
3 Hz to 340 Hz	on
330 Hz to 15 kHz	off

Switch 4a is only active in the versions with a selectable cut-off frequency (SIGS 15S and SCM 90S).

Zero point correction	Switch
-15 mV	5a on
+8 mV	6a on
+4 mV	7a on
+2 mV	8a on
+1 mV	1b on

The start of the measurement range (zero point) is set using switches 5a - 8a, 1b. Switch 5a shifts the measurement range by -15 mV and switches 6a, 7a, 8a, 1b by +8 mV, +4 mV, +2 mV, +1 mV respectively (all values are relative to the input signal). Example: for a shift of the starting point of 10 mV, switches 6a and 8a must be on, for a measurement range starting at -2 mV, switches 5a, 6a, 7a, 1b must be on (-15 +8 +4 +1 = -2 mV).
The switches can also be used for a correction of an input offset error. Please note that in order to compensate for a positive offset at the input one must subtract the corresponding negative offset (e.g. 8a on for –2mV offset).

Measurement range	Switch
64 mV	2b on
32 mV	3b on
16 mV	4b on
8 mV	5b on
4 mV	6b on
2 mV	7b on
1 mV	8b on

The measurement range is set using switches 2b - 8b. A simple binary code is used (see table). Example: for a measurement range of 10 mV, switches 5b and 7b (8 + 2 = 10 mV) must be on.

Setting the cut-off frequency of the SIGS 15S and SCM 90S modules

The cut-off frequency is set using a small SMD potentiometer located next to switch b. There are two test holes directly underneath the switch, between which the resistance of the potentiometer can be measured using an ohmmeter. This simplifies the setting of the cut-off frequency. The table below shows the relationship between the cut-off frequency and the potentiometer resistance for the upper range (15 kHz - 330 Hz, switch 4a "off") and for the lower range (340 Hz - 3 Hz, switch 4a auf "on").
The response time (to 1% of the final value by a jump in the input signal) varies in the upper range between approx. 40 us (15 kHz) and 2.1 ms (330 Hz) and in the lower range between 2.1 ms (340 Hz) and approx. 300 ms (3.3 Hz).

kOhm	0	5	20	50	100
Frequency in kHz	15	4.7	1.6	0.66	0.33

Ohm	0	5	20	50	100
Frequency in Hz	340	70	22	7	3.3

Distortions in the output signal at high frequencies (SCM90S, SIGS15S)

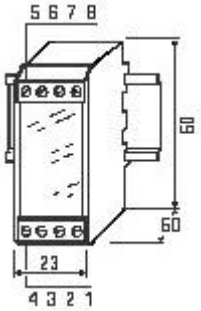
a) Voltage output

A sine curve will be amplified without distortion over the entire range (-10 V to +10 V) up to around 2 kHz. Above this frequency, distortions occur around the zero point and at approx. ±0.8 V (with respect to the output voltage). At larger output amplitudes (> 1 V) the sine shape can also be distorted. A load resistor of between 1k and 10k can practically eliminate the distortions when the output amplitude is not too large. Note, however, the output impedance of approx. 50-70 Ohm.

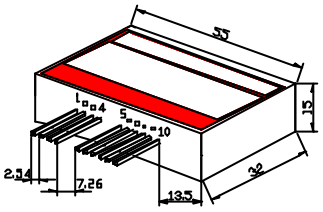
b) Current output

There is no distortion up to 20 kHz for output current > 2mA (range 0-20 mA) or > 6 mA (range 4-20 mA). At around 2 or 6 mA, respectively, the distortion is limited to a few percent.

Dimensions and Connectors

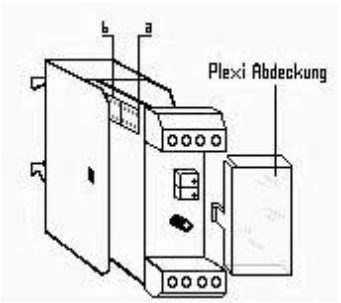


DIN-Rail-Module

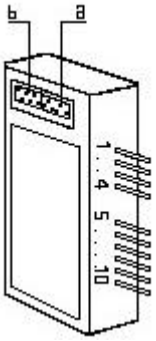


Printed Circuit Module

Location of range switches



DIN-Rail-Module



Printed Circuit Module

Important note:

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