OPERATION MANUAL

Amplifier Module
Model 9243

from Serial-Nr. 308628

Manufacturer:
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EG-Herstellererklärung

Certificate of manufacture Conformity

Gemäß ISO/IEC Leitfaden 22 und EN 45014 erklärt

According to ISO/IEC guidelines 22 and EN 45014 standard

Name des Herstellers: *Manufacturer*	burster präzisionsmeßtechnik gmbh & co kg
Adresse des Herstellers: *Address of the manufacturer*	Talstr. 1-7. 76593 Gernsbach
daß das Produkt **Produktname:** *Declares that the product with name*	Modul - Transmitter
Modellnummer(n) (Typ): *Model / Type*	9243
Produktoptionen: *Options*	--

mit den folgenden Produktspezifikationen übereinstimmt

is conform with following specifications of product

Sicherheit: *Safety requirements*	VDE 0100 Teil 410 Abs. 4.1+A2 (IEC 64)	Schutzmaßnahmen; Schutz gegen gefährliche Körperströme *Protection against electric shock*
	IEC 1010-1 EN 61010-03/94 VDE 0411 Teil 1	Sicherheitsbestimmungen für elektrische Meß-, Steuer-, Regel- und Laborgeräte. *Safety requirements for electrical equipment for measurement control and laboratory used*
EMC: *Electromagnetic compatibility*	DIN EN 50081-2 VDE 0839 Teil 81-2	Elektromagnetische Verträglichkeit Fachgrundnorm Störaussendung *Generic emission standard Part 2: Industrial environment*
	PR EN 50082-2 VDE 0839 Teil 82-2	Elektromagnetische Verträglichkeit Fachgrundnorm Störfestigkeit *Generic immunity standard Part 2: Industrial environment* EMC 3 V/m
	CISPR 11 DIN EN 55011 1991 VDE 0875 Teil 11 07/92 VDE 0875 Teil 211 06/93	Grenzwerte und Meßverfahren für Funkstörungen von industriellen, wissenschaftlichen und medizinischen Hochfrequenzgeräten (ISM-Geräten) *Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.*

Ergänzende Informationen :

Additional Information

Um optimale Störfestigkeit zu erreichen ist das Gerät über geschirmte Leitungen anzuschließen.

In order to reach optimal electromagnetic immunity the device has to be conducted with shielded line.

Gernsbach den 19.01.1996 *Place / Date*	Unterschrift des Herstellers oder Einführers *Signature of manufacturer or importer*	i.V. Alfred Großmann (Leitung Qualitätswesen) *Quality Manager*

Contents

5. Technical specifications

6. Appendix

1. Preparing for operation

1.1 Unpacking the device

Check the device carefully for signs of damage. If the device seems to have been damaged during transport, please notify the supplier within 72 hours. Store the packaging so that it can be examined by a representative of the supplier and/or manufacturer.

The 9243 must only be transported in its original or an equivalent packaging.

1.2 Initial commissioning

Only connect the device to power supply units which are equipped with a safety transformer complying with VDE 0551. Transmitters and other components connected in series with the 9243 and powered from the mains should also be equipped with a safety transformer complying with VDE 0511.

Important! Turn on the operating voltage only once all sensors and loads have been connected.

1.3 Supply voltage

Supply voltage: DC: 20 -36 V unregulated
AC: 14-26 V /45 Hz ... 65 Hz unregulated

The device can be operated on AC as well as DC without the need for conversion.
Power consumption: Approximately 3 VA

1.4 Terminal assignment

IMPORTANT! If possible, please use the 10 V-output (PIN6), even if you only adjust i.e to 0-5 V! If the adjustment is done at burster (order code 9243ABG), this output is always used for adjustment, if not particularly an adjustment on the current output is requested.

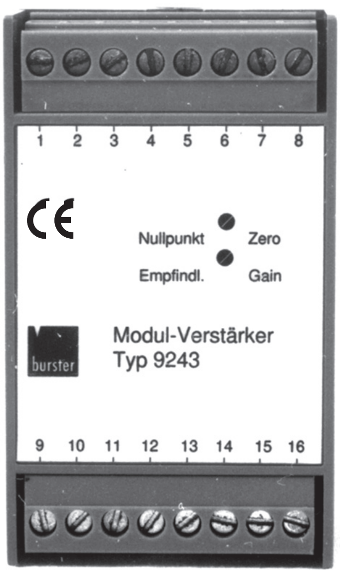
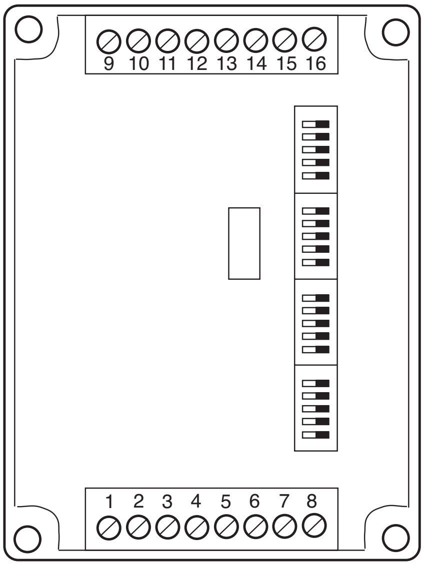


Figure 1: Front view of housing

Terminal	Function		Description
1	Input:	+ / ~	Supply voltage
2	Input:	- /~	Supply voltage
3	Output:	-	Ground for the current output
4	Output:	+	Current output
5	Output:	-	Ground for the voltage output
6	Output:	+	*10 V output
7	Output:	+	±5 V monitor output
8	Output:	+	Calibration voltage 5 mV
9	Sensor:	-	Sensor excitation, shield
10	Sensor:	-	Sense
11	Sensor:	+	Sensor excitation
12	Sensor:	+	Sense
13	Sensor:	-	Signal input
14	Sensor:	+	Signal input
15	Input:		Calibration shunt
16	Input:		Calibration shunt

Table 1: Terminal assignment

1.4.2 Terminal assignment IP 65-version



Terminal	Function		Description
1	Input:	+ / ~	Supply voltage
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3	Output:	-	Ground for the current output
4	Output:	+	Current output
5	Output:	-	Ground for the voltage output
6	Output:	+	*10 V output
7	Output:	+	±5 V monitor output
8	Output:	+	Calibration voltage 5 mV
9	Sensor:	-	Sensor excitation, shield
10	Sensor:	-	Sense
11	Sensor:	+	Sensor excitation
12	Sensor:	+	Sense
13	Sensor:	-	Signal input
14	Sensor:	+	Signal input
15	Input:		Calibration shunt
16	Input:		Calibration shunt

Table 2: Terminal assignment

1.5 Grounding and potential binding

The device is ungrounded. The measurement inputs and outputs are isolated from the supply voltage (**only applicable to low rated voltages**).
Observe the potential binding between the sensor, cable shield and downstream-connected electronics.

1.6 Installation

On a DIN EN mounting rail.

1.7 Storage

Store the device under dry conditions at a temperature of 0...60°C. The device should not be exposed to moisture. Special measures for commissioning following storage are not required.

2. Operating controls

2.1 Front panel

The front panel contains two bores for accessing the potentiometers for fine adjustment of the zero point and the gain.

2.2 Rear panel

The rear panel contains two bores for accessing the potentiometers for fine adjustment of the sensor feed voltage and the 5-mV calibration source. The sensor feed voltage only requires calibration by the customer after it has been switched from the factory default setting (5 V) to a different value. In this case, the feed voltage can deviate by up to 0.2% from the setpoint value.

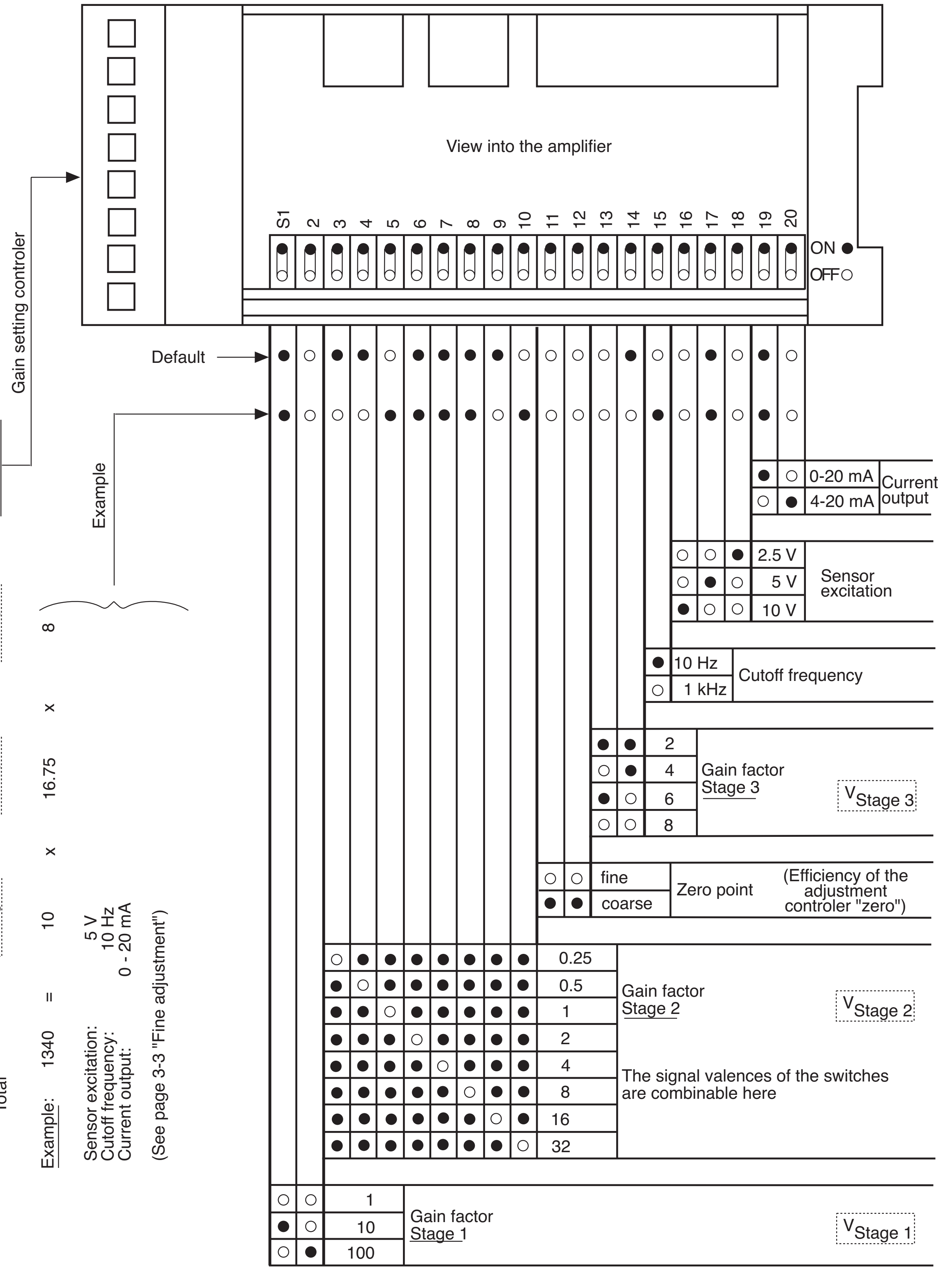
2.3 Description of the DIP switches
(see the rear panel 2.2)

DIL switches are located underneath a flap on top of the housing. The device can be parametrized and configured fully by means of these switches.

The switch settings are described in detail on Page 2.2.

2.3.1 Mounting rail version

Important ! The switch numbers indicated on the printed circuit board are valid.



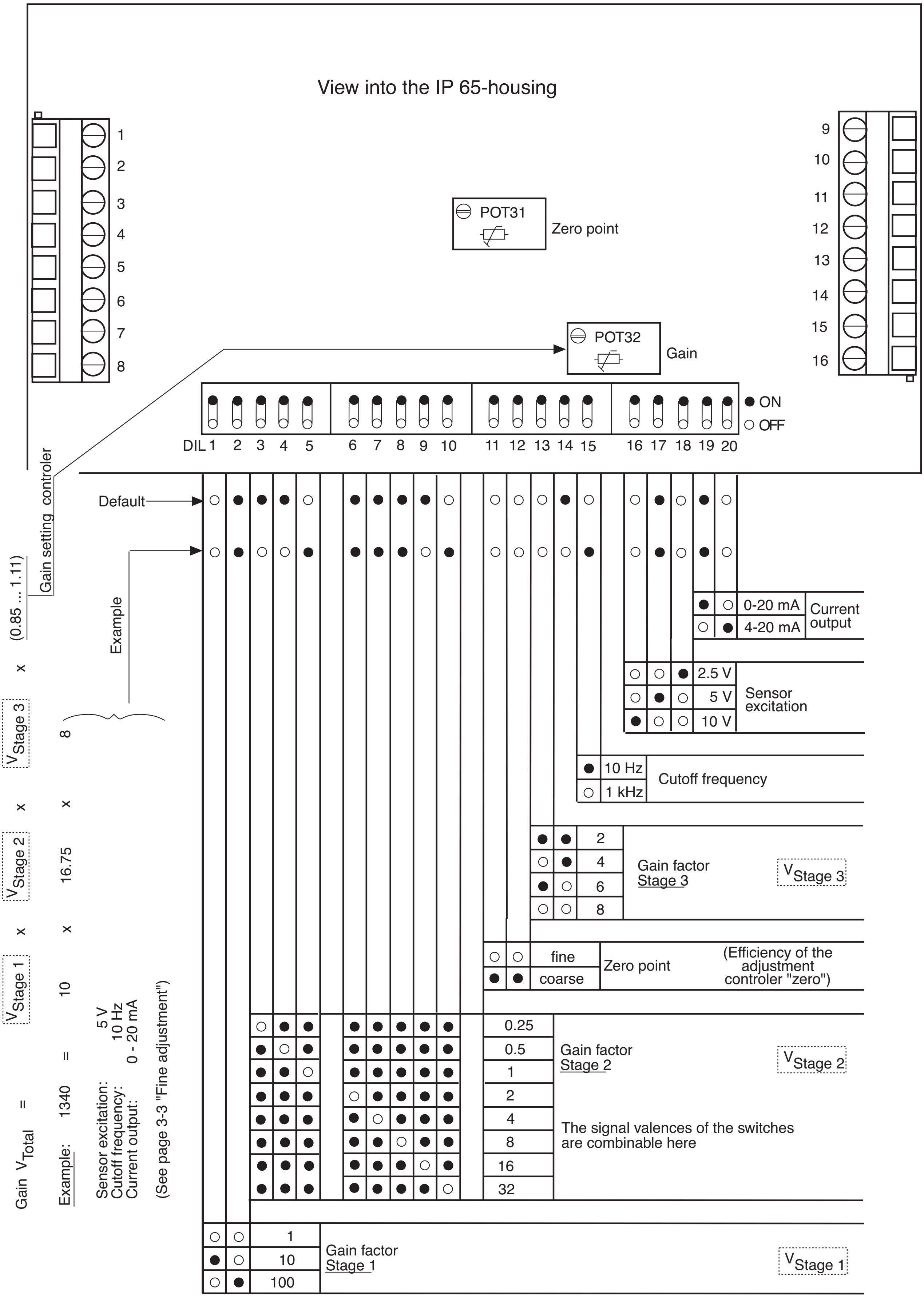
Gain V_{Total} = $V_{Stage\,1}$ x $V_{Stage\,2}$ x $V_{Stage\,3}$ x (0.85 ... 1.11)

Example: 1340 = 10 x 16.75 x 8

Sensor excitation: 5 V
Cutoff frequency: 10 Hz
Current output: 0 - 20 mA

(See page 3-3 "Fine adjustment")

2.3.2 IP 65 version



3. Setting the amplifier

3.1 Sensor excitation

The sensor excitation voltage is asymmetric and referenced to ground. This also allows the shield of the sensor cable to be connected to the negative sensor feed.

The excitation voltage is supplied via a 4-wire cable. This means that the voltage drops in the excitation lines can be compensated, provided that appropriate sensors are in use and the probe lines are connected. Only use 6-wire extension cables. The excitation lines and probe lines in the plug on a 4-wire sensor are bridged in each case. In the case of a 6-wire sensor, the two sensor lines are generally routed directly to the sensor element, so that bridging is not required.

The following excitation voltages can be set:

2.5 V, 5 V and 10 V

The default excitation voltage of 5 V can be used to operate most sensors. If 2.5 V or 10 V are selected, the device needs to be readjusted. The sensor excitation voltage is short-circuit proof; the maximum current consumption is 35 mA.

3.2 Zero point

The zero point is adjusted with a potentiometer (zero) which can be accessed via a bore in the front panel.

The adjustment range of the potentiometers can be set with 2 DIL switches. The switch settings are described in Chapter 2.3 titled 'Description of the DIP switches' (Page 2.2). If both switches are OFF, the adjustment range is smallest. If both switches are ON, the adjustment range is largest. The switches can be set in any required combination, so that asymmetric adjustment ranges are also possible.

The zero point is adjusted between the second and third amplification stages. If the adjustment range is too small, the gain can be decreased in stage 2 and increased in stage 3. If the adustment range is too large, the gain can be increased in stage 2 and decreased in stage 3 (refer to the block diagram in the appendix).

3.3 Gain setting

3.3.1 Coarse adjustment

The gain is adjusted coarsely on three amplification stages (stages 1 - 3). DIL switches are assigned to each amplification stage. Multiplying the gain factors set on each stage results in the total coarse gain V_{Total} (also refer to Page 2.2).

Stage 1 The gain here can be set with DIL switches S1 - S2.
1
10
100

Only factors of 1, 10 and 100 are available here. It is not possible to combine these factors, for example, to obtain 110.

Stage 2 The gain here can be set with DIL switches S3 - S10.
0.25
0.5
0.75
1
2
4
8
16
32

The gain factor here can be adjusted with a resolution of 0.25. The switches can be set in any required combination to obtain, for example, a gain of 33.25.

Stage 3 The gain here can be set with DIL switches S13 - S14.
2
4
6
8

Only factors of 2, 4, 6 and 8 are available here. Combinations are not possible.

The specified gain factors always refer to the 10-V output. The 5-V output and current output are derived from the 10-V output and are available simultaneously. During subsequent fine adjustment, only the output requiring the highest degree of precision is observed. The maximum deviation at the remaining outputs is then 0.2%.
The switch settings are described in detail in Chapter 2.3.

The effective gain factor is approx. 50000. This applies to the following general relationship:

$$U_I = \frac{U_O}{V_{Total}}$$

U_I = Input signal
U_O = Output signal
V_{Total} = Gain

This results in a minimum input signal of 0.2 mV for the module amplifier.

3.3.2 Fine adjustment

The gain is adjusted finely with the corresponding control on the front panel.

$$v_{Total} = v_{Stage1} \times v_{Stage2} \times v_{Stage3} \times (0.85 \ldots 1.11)^*$$

* Fine adjustment

3.3.3 Calculating the gain

When calculating the gain, always use U_O = 10 V as the reference, even if the 5-V output is required.

Example:

Given:	Strain-gauge sensor	350 ohms
	Rated characteristic value	1.5 mV/V
	Sensor excitation voltage	5 V
	Required output voltage U_O from the amplifier	10 V
Wanted:	Total gain	v

The amplifier input voltage U_I generated by the sensor is determined as follows:

U_I = Rated characteristic value *x* reference excitation voltage

The relationship

$$v_{Total} = \frac{U_O}{U_I} = \frac{10\ V}{7.5\ mV}$$

results in a gain factor v = 1333 in this example. The fine adjustment covers 85 -111% of the gain adjusted coarsely in stages 1 - 3. In this example, the theoretical gain factor therefore lies between v = 1133 (85% of 1333) and v = 1480 (111% of 1333).

Calculated total gain:	v =1333	(Stage 1 x Stage2 x Stage3)
Set total gain:	v =1300	(100 x 6.5 x 2)
Fine adjustment range:	v =1105...1443	(0.85 x1300 to 1.11x1300)

3.4 Input reference point

The signal amplifier acts as a differential amplifier. This means that the negative signal output is not connected to ground. If a ground connection is required, it must be established externally.

3.5 Cutoff frequency

Using DIL switches, the cutoff frequency can be switched between 10 Hz and 1 Hz (-3dB). The switch settings are described in Chapter 2.3 (Page 2.2)

3.6 Calibration source

The 9243 is equipped with a 5.000 mV precision voltage source for the purpose of calibration. This voltage source is referenced to ground and must be connected externally when calibration is required. Observe the following procedure for this:

1. Disconnect the sensor
2. Connect pin 13 with pin 9
   Connect pin 14 with pin 9
3. Adjust "0 V" at the voltage output
4. Connect pin 14 with pin 8
5. adjust the calculated voltage output
6. (by large deviation) repeat the points 2 ... 5
7. connect the sensor
8. adjust the zero point

Example

Given:	Strain gauge sensor	350	ohms
	Rated characteristic value	1.5	mV/V
	Sensor excitation voltage	5	V
	Required output voltage U_O from the amplifier	10	V

Wanted: The amplifier output voltage U_{OCAL} to be set for a calibration excitation voltage U_{ICAL} = 5.000 mV

1st step Calculate and set the gain for 1.5 mV/V as described in the example in Chapter 3.

When rough changes should be a repetition starting from stepp 2.

2nd step Calculate the amplifier output U_{OCAL} (to be fine-adjusted) when U_{ICAL} = 5.000 mV is applied instead of the input voltage U_I supplied by the sensor (7.5 mV in this example) :

$$U_{OCAL} = \frac{U_o \times U_{ICAL}}{U_I} = \frac{10\ V \times 5\ mV}{7.5\ mV} = 6.666\ V$$

U_I = Output of the sensor x excitation voltage
U_O = Output of the amplifier with U_I
U_{ICAL} = 5.000 mV calibration voltage
U_{OCAL} = Output of the amplifier with U_{ICAL}

In this example, a voltage of 6.666V needs to be set at the amplifier output.

Needless to say, an external calibration source can also be used for this technique of calibration. Suitable devices (e.g. Model 4405, Model 4422) are listed in Section 4.4. of the burster catalog.

3.7 Calibration shunt

A calibration shunt can be connected directly between terminals 15 and 16. Such a shunt is generally used to tune a strain-gauge bridge according to requirements. The strain-gauge sensor must be connected for this purpose. If the value of the calibration shunt and the tuning step generated by it are known, then this technique can be used to calibrate the measuring chain. The specification sheets of most strain-gauge sensors state the value of the calibration resistance and the related tuning step as a percentage of the rated characteristic value or directly in mV/V.

Example

Given:	Strain-gauge sensor	350 ohms
	Rated characteristic value	1.5 mV/V
	Tuning step	1.2 mV/V
	Calibration shunt	100 kohms
	Sensor excitation	5 V
	Required output voltage U_I from the amplifier	10 V

Wanted: The amplifier output voltage U_{OCAL} to be set if a 100-kohm calibration shunt has been connected.

1st step Calculate and set the gain v for 1.5 mV/V as described in the example in Chapter 3.

2nd step Calculate the step in the input signal caused by the shunt

U_{ICAL} = Tuning step x excitation voltage

In this example: 6.000 mV

3rd step Calculate the amplifier output voltage U_{OCAL} (to be fine-adjusted) when U_{ICAL} (= 6.000 mV in this example) is applied instead of the input voltage U_I supplied by the sensor (7.5 mV in this example) :

$$U_{OCAL} = \frac{U_o \times U_{ICAL}}{U_I} = \frac{10\ V \times 0.006\ V}{0{,}0075\ V} = 8.000\ V$$

U_I = Output of the sensor x excitation voltage
U_O = Output of the amplifier with U_I

In this example, 8.000 V are to be set at the amplifier output.

The switch settings are described in Chapter 2.3.

3.7.1 Adjustment and calibration

The 9243 can be calibrated using several different techniques. The device settings must be checked following adjustment.

3.7.1.1 Adjustment with a physical variable

Application: For all sensors.

Function: Using a scale as an example: Adjust the zero point with the scale in the unladen state. Then load the scale with a known, reference weight and set the final value.

Note: The entire measuring chain is calibrated in this case.

3.7.1.2 Adjustment with a high-precision voltage source (also refer to Chapter 3.6)

Application: For all sensors which generate voltages.

Function: The sensor is simulated by a high-precision voltage source. The integrated calibration source (5.000 mV) or an external source can be used.

Note: In the case of strain-gauge full-bridge sensors and potentiometeric sensors, the feed voltage influences the measurement results. If you want to verify the functionality of the device with voltage sources, you must measure the sensor feed voltage with a high-precision digital voltmeter and then calculate the calibration voltage.

This method cannot be used to check whether the sensor functions properly.

Suitable calibration devices (e.g. Model 4405, Model 4422) are listed in Section 4.4. of the burster catalog.

3.7.1.3 Adjustment with a strain-gauge simulator

In situations where strain-gauge sensors cannot be loaded in accordance with specific parameters, due to an absence of suitable weights, for example, the required measuring signal must be generated by a strain-gauge simulator. The irregular characteristic values exhibited by many strain-gauge sensors can usually not be set precisely by a simulator. In such cases, the simulator sets the next lower characteristic value. The corresponding voltage at the amplifier output is calculated as shown in the following example:

Given: A type 8438-100 kN sensor is to be simulated. According to the sensor specifications, its rated characteristic value is 1.678 mV/V. The required voltage at the amplifier output for a rated load of 100 kN is U_O = 10 V.

Wanted: The amplifier output voltage U_{Osim} to be set after a strain-gauge simulator has been connected.

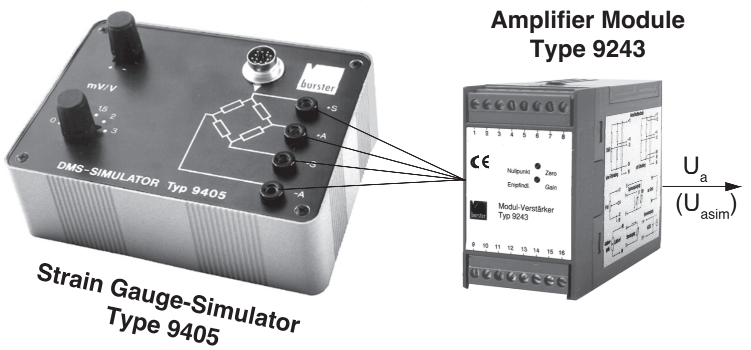
1st step: Set the strain-gauge simulator to the next lower characteristic value, in this case 1.5 mV/V.

2nd step: Calculate the amplifier output voltage to be set if only 1.5 mV/V are supplied by the simulator instead of 1.678 mV/V by the sensor. Remember:
The 1.678 mV/V from the sensor should generate U_O=10 V at the amplifier output.

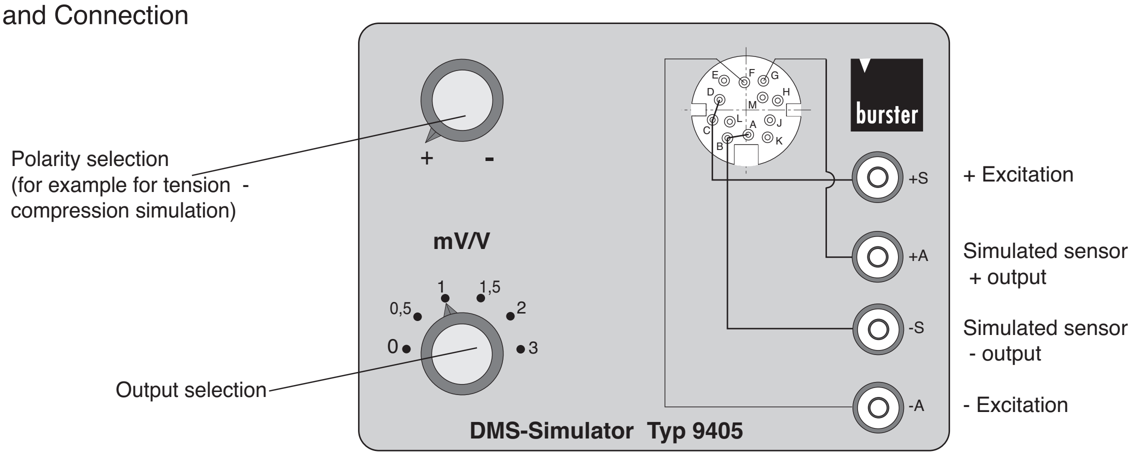
$$U_{Osim}\,[V] = \frac{U_O \times C_{sim}}{C_{sens}} = \frac{10 \times 1.5}{1.678} = 8.939$$

U_{Osim} = *The voltage at the amplifier output when the simulator is connected*
U_O = *The required amplifier output voltage with the rated sensor load*
C_{sim} = *The characteristic value set on the strain-gauge simulator*
C_{sens} = *The characteristic value of the sensor to be simulated*

Once the strain-gauge simulator has been connected and the characteristic value has been set to 1.5 mV/V, set the amplifier output to 8.939 V.



Functions and Connection



Preparing for use | Operating controls | Adjustment of the Amplifier | Maintenance and customer service | Technical Data | Appendix

3.8 Current output

Two voltage outputs and one current output are available simultaneously, but only one of them can be finely adjusted. The adjustment accuracy of the remaining outputs can deviate by up to 0.2%.

The current outputs are derived from the 10-V voltage output. A range of 0...20 mA or 4...20 mA can be selected.

There is a mathematical relationship between the current and voltage outputs: 0 V correspond to 0 or 4 mA, while 10 V correspond to 20 mA.

Note that only positive voltages can be converted to equivalent currents. Negative voltages result in a current of zero.

When calculating the gain and setting the zero point of the device, proceed as though the 10-V range needs to be calibrated, but measure the current output by the device. If an ammeter is not available, you can alternatively measure the voltage at the 10-V output and then convert it into a current value.

Calibration and adjustment are performed basically as in the case of the voltage output.

The switch settings are described in Chapter 2.3.

4. Maintenance and customer service

4.1 Maintenance

The 9243 does not require any maintenance by the user. Any required repairs must be performed only by the manufacturer.

4.2 Customer service

Enquiries

Please accompany all technical enquiries to the manufacturer with the serial number. Only this allow determination of the technical version and prompt assistance.

Shipping notes

If the device needs to be send in for repairs, please observe the following as regards its packaging and shipping: Attach a slip of paper to the housing of the device outlining the faults exhibited by the device.

If you include your name, department, fax number and telephone number, this will accelerate the handling of your complaints.

Cleaning

Please do not use any cleaning agents containing organic solvents or strong inorganic constituents. A slightly damp cloth is sufficient for this purpose.

Factory warranty

burster präzisionsmesstechnik gmbh & co kg guarantees reliable operation of the device for a period of 12 months following delivery.

Any repairs required within this time period will be performed free-of-charge. Damage caused by improper handling of the device is not covered by the terms of the warranty.

Technical specifications are subject to alteration without notice at any time.

Furthermore, we will assume no responsibility whatsoever for consequential damage.

5. Technical specifications

5.1 Connectable sensors

5.1.1 Strain-gauge

Bridge resistance	350 to 1 kOhm
Connection technique	4- and 6-wire
Characteristic value	> 0,1mV/V ... 100 mV/V
Supple voltage	2,5V, 5V, 10V
Supple current	35mA max.

5.1.2 Potentiometer

Track resistance	1kOhm - 5kOhm
Connection technique	5-wire
Measurement signal	0 - 5V
Supple voltage	5V
Supple current	35 mA max.
Zero offset	wählbar über DIP-Schalter

5.1.3 Transmitter or DC/DC

Measurement signal	2.5 mV - 10V
Supple voltage	external or 2.5 V / 5V / 10V
Supple current	35 mA max.

5.2 Sensor excitation

Voltage	2.5V, 5V, 10V via DIP switches
Current	35 mA max.

5.3 General amplifier data

Amplification	1 - 56000 (using DIP switches and a potentiometer)
Measurement error	0.05%
Temperature coeffizient	< 50 ppm / K
Residual ripple	5 uVeff or 20 uAeff
Frequency range	0 - 10Hz / 0 - 1000Hz (using DIP switches)
Potential seperation	Input and output on the supply side
Auxiliary power	20 - 36 V DC 14 - 26 V AC 3 V A

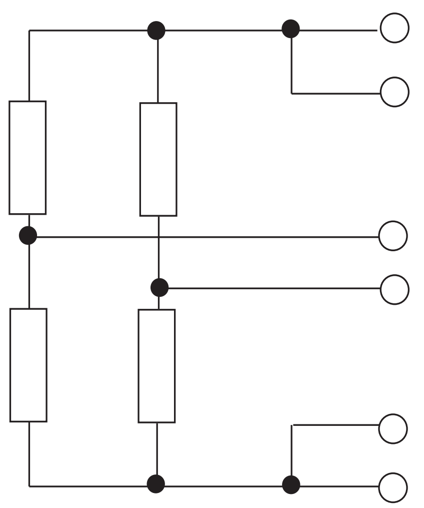
5.4 Housing

Protective system	IP20
Dimensions (WxHxD)	45x75x105
Connection	Snap-in plug connectors, 2 x 8 terminals
Weight	approx. 250g
Installation	EN 50022 mounting rail

6. Appendix

6.1 Sample connections

6.1.1 Strain-gauge full-bridge sensors



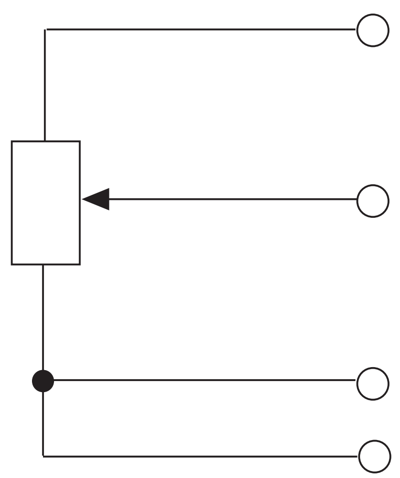
Sensor	Amplifier terminal	Description
+U	11	+ Excitation
+F	12	+ Sense
-	13	- Output
+	14	+ Output
-F	10	- Sense
-U	9	- Excitation

Figure: Strain-gauge full-bridge

Extension cable:

Even in the case of sensors without sense, use a 6-pole cable and bridge the sense lines of the extension cable with the excitation lines in the sensor plug.

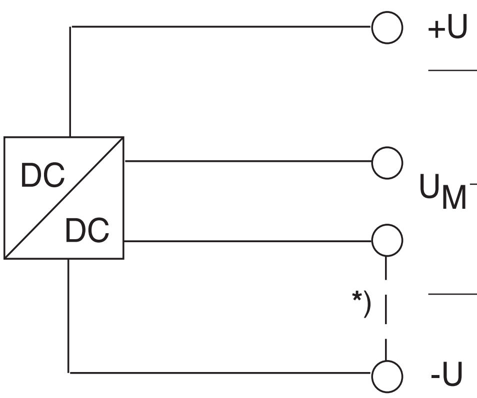
6.1.2 Potentiometric sensors



Sensor	Amplifier terminal	Description
+U	11	+ Excitation
$+U_M$	14	+ Output
⊥	13	- Output
	9	- Excitation, shield

Figure: Potentiometric sensors

6.1.3 DC/DC sensors



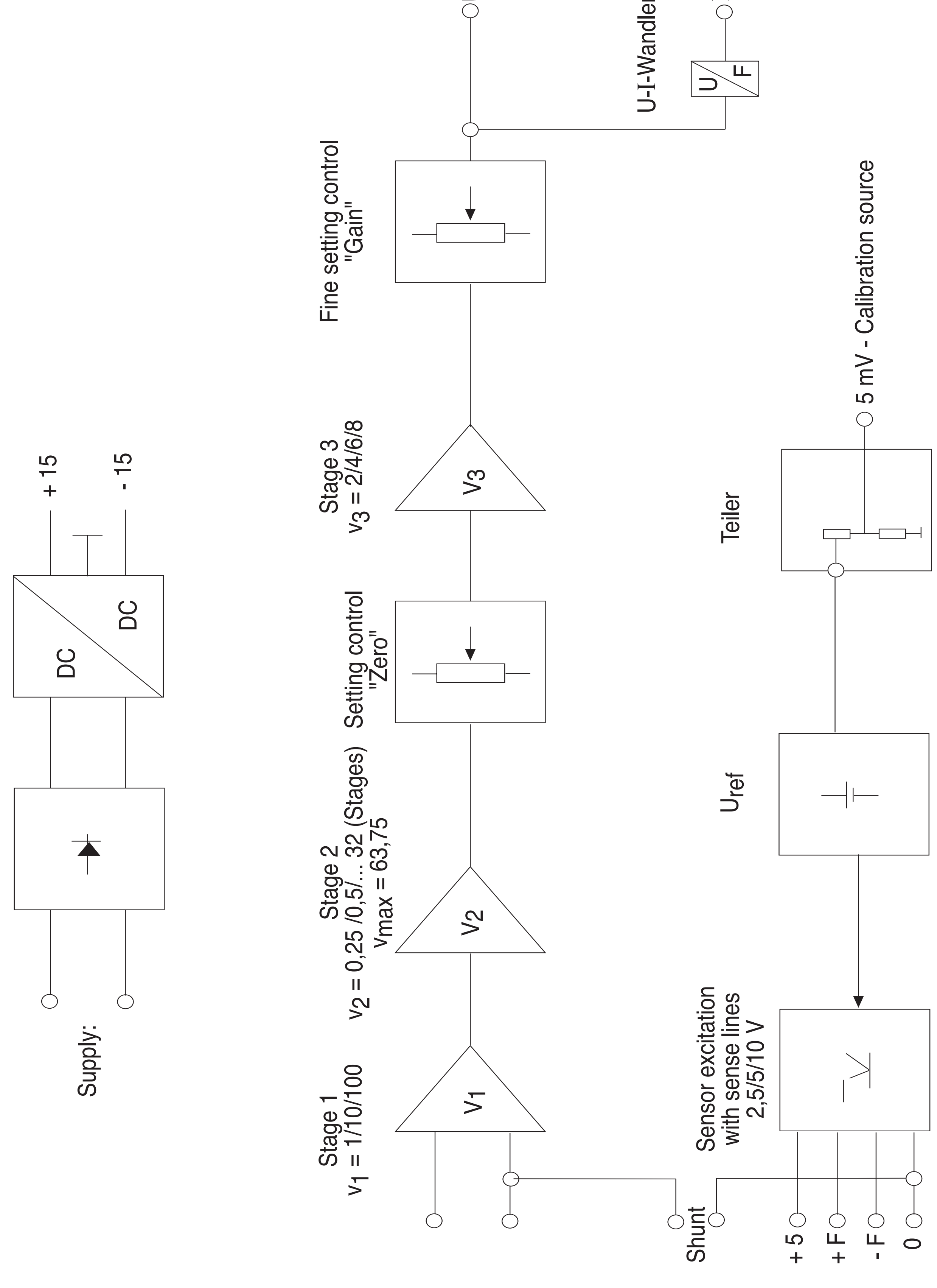
Sensor	Amplifier terminal	Description
+U	11	+ Excitation
UM	14	+ Output
UM	13	- Output
-U	9	- Excitation

Figure: DC-DC sensors

*) If there is not an electrical connection between exitation and output of the sensor please realize a bridge between clamp 9 and 13.

Assumption: The sensor is operated on 10 V (other voltages are external).

6.2 Block schematic



6.3 Output of the sensor

An important criterion for determining the gain is the measuring voltage supplied by the sensor in use. In this respect, the sensor specification format usually varies from one manufacturer to another.

A strain-gauge full-bridge sensor can have the following specifications, for example:

- Excitation 5 V
  Output 2 mV/V
- Sensor excitation 10 V
  Output voltage 10 mV
- Reference voltage 5 V
  Sensitivity 2 mV/V

In all 3 examples, the sensor output voltage at full deflection is 10 mV.

6.4 Parallel connection of sensors

For certain weighing applications, it is expedient to operate several strain-gauge full-bridge sensors connected in parallel. For this purpose, the feed lines, measuring lines and sensor lines are connected in parallel in each case. The sensors then act as a single electrical unit.

A prerequisite here is that all sensors should be completely identical in terms of their:

- Characteristic value
- Input resistance
- Output resistance

If this is not the case, then this technique could give rise to errors. Ensure that the maximum permissible current is not exceeded.

Voltage	Number of 350 Ω sensors
2,5 V	4
5 V	2
10 V	1

Table 6: Parallel-connected sensors

Note: This does not apply to sensors in conjunction with safety barriers.

6.5 Tables for setting amplification stages

6.5.1 Settings for strain-gauge sensors

Applicable to all output voltage and current ranges

Sensor excitation [V]	Output [mV/V]	Calculated bridge voltage [mV]	Output (reference) [V]	Calculated gain	Stage 1 Set gain (decimal)	Stage 2 Set gain (0.25...63)	Stage 3 Set gain (2/4/6/8)
2.5	0.1	0.25	10	40.000.00	100	50	8
2.5	0.2	0.5	10	20.000.00	100	50	4
2.5	0.5	1.25	10	8.000.00	100	20	4
2.5	1	2.5	10	4.000.00	100	10	4
2.5	1.25	3.125	10	3.200.00	100	16	2
2.5	1.5	3.75	10	2.666.67	100	13.25	2
2.5	1.75	4.375	10	2.285.71	100	11.5	2
2.5	2	5	10	2.000.00	100	10	2
2.5	2.5	6.25	10	1.600.00	100	8	2
2.5	3	7.5	10	1.333.33	10	66	2
2.5	4	10	10	1.000.00	10	50	2
2.5	5	12.5	10	800.00	10	40	2
2.5	10	25	10	400.00	10	20	2
2.5	15	37.5	10	266.67	10	13.25	2
2.5	20	50	10	200.00	10	10	2
2.5	25	62.5	10	160.00	10	8	2
2.5	30	75	10	133.33	10	6.75	2
2.5	35	87.5	10	114.29	1	57	2
2.5	40	100	10	100.00	1	50	2
2.5	45	112.5	10	88.89	1	44.5	2
2.5	50	125	10	80.00	1	40	2
2.5	60	150	10	66.67	1	33.25	2
2.5	65	162.5	10	61.54	1	30.75	2
2.5	70	175	10	57.14	1	28.5	2
2.5	75	187.5	10	53.33	1	26.75	2
2.5	80	200	10	50.00	1	25	2
2.5	85	212.5	10	47.06	1	23.5	2
2.5	90	225	10	44.44	1	22.25	2
2.5	95	237.5	10	42.11	1	21	2
2.5	100	250	10	40.00	1	20	2

Sensor excitation [V]	Output [mV/V]	Calculated bridge voltage [mV]	Output (reference) [V]	Calculated gain	Stage 1 Set gain (decimal)	Stage 2 Set gain (0.25...63)	Stage 3 Set gain (2/4/6/8)
5	0.1	0.5	10	20.000.00	100	50	4
5	0.2	1	10	10.000.00	100	50	2
5	0.3	1.5	10	6.666.67	100	33.25	2
5	0.4	2	10	5.000.00	100	25	2
5	0.5	2.5	10	4.000.00	100	20	2
5	0.6	3	10	3.333.33	100	16.75	2
5	0.7	3.5	10	2.857.14	100	14.25	2
5	0.8	4	10	2.500.00	100	12.5	2
5	0.9	4.5	10	2.222.22	100	11	2
5	1	5	10	2.000.00	100	10	2
5	1.1	5.5	10	1.818.18	100	9	2
5	1.3	6.25	10	1.600.00	100	8	2
5	1.4	7	10	1.428.57	10	35.75	4
5	1.5	7.5	10	1.333.33	10	33	4
5	1.6	8	10	1.250.00	10	62.5	2
5	1.7	8.5	10	1.176.47	10	58.75	2
5	1.8	8.75	10	1.142.86	10	57	2
5	1.9	9.5	10	1.052.63	10	52.5	2
5	2	10	10	1.000.00	10	50	2
5	2.25	11.25	10	888.89	10	44.5	2
5	2.5	12.5	10	800.00	10	40	2
5	2.75	13.75	10	727.27	10	36.25	2
5	3	15	10	666.67	10	33	2

Sensor excitation [V]	Output [mV/V]	Calculated bridge voltage [mV]	Output (reference) [V]	Calculated gain	Stage 1 Set gain (decimal)	Stage 2 Set gain (0.25...63)	Stage 3 Set gain (2/4/6/8)
10	0.1	1	10	10.000.00	100	50	2
10	0.2	2	10	5.000.00	100	25	2
10	0.5	5	10	2.000.00	100	10	2
10	1	10	10	1.000.00	100	5	2
10	1.25	12.5	10	800.00	100	4	2
10	1.5	15	10	666.67	10	33.25	2
10	1.75	17.5	10	571.43	10	28.5	2
10	2	20	10	500.00	10	25	2
10	2.5	25	10	400.00	10	20	2
10	3	30	10	333.33	10	16.75	2

Table 3: Gain setting for strain-gauge full-bridge sensors

6.5.2 Settings for potentiometers and transmitters

Applicable to all output voltage and current ranges

Sensor	Meas. model	Excitation [V]	Sensor voltage [V]	Internal reference [V]	Calculated gain	Stage 1	Stage 2	Stage 3	Fine adjust-ment
Potentio.		Internal 5 V	5	10	2	1	0.25	8	1.00
Potentio.	50 % Offset	Internal 5 V	2.5 (2.5 V Offset)	10	4	1	0.5	8	1.00
Voltage		Internal or external	1	10	10.00	1	5	2	1.00
Voltage		Internal or external	2	10	5.00	1	2.25	2	1.11
Voltage		Internal or external	3	10	3.33	1	1.5	2	1.11
Voltage		Internal or external	4	10	2.50	1	1.25	2	1.00
Voltage		Internal or external	5	10	2.00	1	1	2	1.00
Voltage		Internal or external	6	10	1.67	1	0.25	6	1.11
Voltage		Internal or external	7	10	1.43	1	0.75	2	0.95
Voltage		Internal or external	8	10	1.25	1	0.75	2	0.8333
Voltage		Internal or external	9	10	1.11	1	0.5	2	1.11
Voltage		Internal or external	10	10	1.00	1	0.5	2	1.00

Table 4: Gain setting for high-level sensors