OPERATION MANUAL

Instrumentation amplifier
Model 9250

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THE MEASUREMENT SOLUTION.

EU-Konformitätserklärung (nach EN ISO/IEC 17050-1:2010)

EU-Declaration of conformity (in accordance with EN ISO/IEC 17050-1:2010)

Name des Ausstellers: *Issuer's name:* burster präzisionsmesstechnik gmbh & co kg

Anschrift des Ausstellers: *Issuer's address:* Talstr. 1-5, 76593 Gernsbach, Germany

Gegenstand der Erklärung: *Object of the declaration:* Messverstärker-Modul für DMS, potentiometrische und DC/DC Sensoren
Amplifier module for strain gauge, potentiometric and DC/DC sensors

Modellnummer(n) (Typ): 9250
Model number / type:

Diese Erklärung beinhaltet obengenannte Produkte mit allen Optionen
This declaration covers all options of the above product(s)

Das oben beschriebene Produkt ist konform mit den Anforderungen der folgenden Dokumente:
The object of the declaration described above is in conformity with the requirements of the following documents:

Dokument-Nr. *Documents No.*	**Titel** *Title*	**Ausgabe** *Edition*
2011/65/EU	Richtlinie zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten *Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment*	2011
2014/35/EU	Richtlinie zur Harmonisierung der Rechtsvorschriften der Mitgliedsstaaten über die Bereitstellung elektrischer Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen auf dem Markt *Directive on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits*	2014
2014/30/EU	Richtlinie zur Harmonisierung der Rechtsvorschriften der Mitgliedsstaaten über die Elektromagnetische Verträglichkeit *Directive on the harmonization of the laws of the Member States relating to electromagnetic compatibility*	2014
EN 61010-1	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte – Teil 1: Allgemeine Anforderungen *Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements*	2010 + Cor.:2011
EN 61326-1	Elektrische Mess-, Steuer-, Regel- und Laborgeräte – EMV-Anforderungen – Teil 1: Allgemeine Anforderungen *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*	2013
EN 55011	Industrielle, wissenschaftliche und medizinische Geräte – Funkstörungen – Grenzwerte und Messverfahren, Gruppe 1, Grenzwertklasse A *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement, group 1, class A*	2009 + A1: 2010

Gernsbach	27.09.2018	ppa. Christian Karius
Ort / *place*	Datum / *date*	*Quality Manager*

Dieses Dokument ist entsprechend EN ISO/IEC 17050-1:2010 Abs. 6.1g **ohne Unterschrift** gültig /
According EN ISO/IEC 17050 this document ***is valid without a signature.***

Warnung! Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen.
Warning! This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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1 For your safety

The following symbols on the 9250 instrumentation amplifier and in this operation manual warn of hazards.

1.1 Symbols used in the instruction manual

1.1.1 Signal words

The following signal words are used in the operation manual according to the specified hazard classification.

DANGER	
High degree of risk: indicates a hazardous situation which, if not avoided, will result in death or serious injury.	
WARNING	
Moderate degree of risk: indicates a hazardous situation which, if not avoided, may result in death or serious injury.	
CAUTION	
Low degree of risk: indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.	
NOTICE	
Property damage to the equipment or the surroundings will result if the hazard is not avoided.	

Note: It is important to heed these safety notices in order to ensure you handle the 9250 instrumentation amplifier correctly.

IMPORTANT: Follow the information given in the operation manual.

1.1.2 Pictograms

	Electric shock hazard.
	It is vital to follow the instructions.
	Observe the advice for protecting the 9250 instrumentation amplifier.

1.2 Symbols

Symbol	Description
	See manual! It is essential that you follow the information and instructions in the operation manual for the 9250 instrumentation amplifier. Follow safety instructions - Professional servicing only.
	burster TEDS automatic sensor identification For further details, please refer to section 3.7.1 "burster TEDS automatic sensor identification" on page 16.

1.2.1 Conventions used in the instruction manual

Designation	Description
[Text]	Control buttons
"Term"	Terms used in the instrument menus

2 Introduction

IMPORTANT: Read the operation manual carefully before using the equipment, and keep for future reference.

2.1 Intended use

DANGER

- The 9250 instrumentation amplifier **must not** be used in hazardous areas.
- The 9250 instrumentation amplifier **is not intended as a substitute** for safety devices and protective equipment. Use safety devices and protective equipment.
- The 9250 instrumentation amplifier is **not** suitable for medical applications or where people are at risk.
- Do not connect voltages that are higher than those permitted in the specification.
- **Not suitable** for safety-critical applications.

The 9250 instrumentation amplifier covers numerous areas of use. Designed for use with a variety of analog sensors, the 9250 instrumentation amplifier can capture a huge range of output signals for conditioning in fixed systems.

The intended use is defined to be:

- For industrial purposes
- For use in EMC-certified control cabinets
- For use solely with grounded DIN mounting rail

Industry-compatible connection and installation technologies make it easier for the user to adapt and integrate the unit in existing mechanical and electrical environments. The outstanding measurement quality also means it is ideal for use in both development and testing.

Typical applications of the 9250 instrumentation amplifier include:

- Production automation
- Integration of measurement data in a control environment
- Deployment in test and calibration laboratories
- Measuring and control equipment

2.2 Customer service

2.2.1 Customer service department

For repair inquiries, please telephone our Service department on +49-7224-645-53, or email: service@burster.de (Germany only). If you are outside Germany, you should contact your burster agent (see also www.burster.com).

Please have the serial number to hand. The serial number is essential to establishing the definite technical status of the instrument and providing help quickly. You will find the serial number on the type plate of the instrumentation amplifier 9250.

2.2.2 Contact person

If you have any questions relating to the instrumentation amplifier 9250, please go directly to burster präzisionsmesstechnik gmbh & co. kg, or if outside Germany, please contact your burster agent (see also www.burster.com

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Germany

Phone: +49-7224-645-0
Fax: +49-7224-645-88
Email: info@burster.com

2.3 Download the test certificate

You have the option to download the test certificate for the instrumentation amplifier 9250 online. To do this, you need to register at http://www.burster.com/en/registration/. You can then download the test certificate directly by entering the serial number.

2.4 Ambient conditions

2.4.1 Storage conditions

The following requirements must be met when storing the 9250 instrumentation amplifier:

- Store at temperatures between -25°C and +70°C
- Package the 9250 instrumentation amplifier sensor in clean materials
- Store in a dry environment
- No condensation

2.4.2 Operating conditions

The following requirements must be met when operating the 9250 instrumentation amplifier:

- Always operate indoors
- Maximum height above sea level 2000 m
- Operate at temperatures between 0 °C and 60 °C
- Humidity: 80% up to +31 °C, decreasing linearly above that temperature to 50% at T_{max}, no condensation
- Class of protection: 3
- Transient overvoltage category: CAT II
- Supply voltage 11 ... 30 VDC
- The mounting rail must be connected to the protective earth

Note: Avoid condensation forming after transportation or storage.

2.4.3 Restrictions on use

DANGER

The 9250 instrumentation amplifier **is not intended as a substitute** for safety devices and protective equipment.
Use safety devices and protective equipment.

The 9250 instrumentation amplifier does not pose a hazard if used within its specification and in accordance with the safety regulations.

The manufacturer does not accept liability for any personal injury or property damage arising from misinterpretation of measurement results.

2.4.4 Cleaning

DANGER

Electrical shock hazard.
Disconnect the 9250 instrumentation amplifier from the power supply before cleaning.

Disconnect the 9250 instrumentation amplifier from the power supply and use a slightly damp cloth to clean the unit.

NOTICE

Do not immerse the 9250 instrumentation amplifier in water or hold it under running water. Do not use strong cleaning agents as these may damage the 9250 instrumentation amplifier. Use a slightly damp cloth to clean the 9250 instrumentation amplifier.

2.5 Personnel

Personnel must be familiar with the relevant regulations. They must follow these regulations. Only trained personnel who are familiar with the applicable safety regulations are permitted to operate the instrumentation amplifier 9250.

We are happy to train your staff. To find out more, please look at our range of services at www.burster.com.

2.6 Contents of pack

The following components are supplied:

- 9250 instrumentation amplifier
- Operation manual
- Warranty document
- Test certificate
- DigiVision configuration and analysis software, free-of-charge version

2.7 Unpacking

DANGER

Electrical shock hazard.
Never switch on the 9250 instrumentation amplifier if it shows signs of damage incurred in transit. Only ever use the 9250 instrumentation amplifier under the conditions specified in this operation manual.

Inspect the 9250 instrumentation amplifier for damage. If you suspect that the unit has been damaged during shipping, notify the delivery company within 72 hours.

The packaging must be retained for examination by a representative of the manufacturer and/or the delivery company.

The 9250 instrumentation amplifier must be shipped only in its original packaging or in packaging capable of providing an equivalent degree of protection.

2.8 Warranty

burster praezisionsmesstechnik gmbh & co kg provides a manufacturer's warranty for a period of 24 months after delivery.

Any repairs required during this time will be made without charge. This does not include damage arising from improper use.

Please note the following when sending the 9250 instrumentation amplifier in for repair:

- If there is a problem with the 9250 instrumentation amplifier, please attach a note to the instrument case summarizing the fault.
- Technical specifications subject to change at any time without notice.
  We also state explicitly that we do not accept liability for consequential damage.
- The instrument must always be dispatched in suitable packaging.

2.9 Conversions and modifications

Note: The warranty shall be deemed void **immediately** if you open or dismantle instrumentation amplifier 9250 during the warranty period.

The 9250 instrumentation amplifier does not contain any parts that are intended to be serviced by the user. Only the manufacturer's own qualified personnel are permitted to open the 9250 instrumentation amplifier.

It is not permitted to make any changes to the 9250 instrumentation amplifier without the written agreement of burster praezisionsmesstechnik gmbh & co kg. burster praezisionsmesstechnik gmbh & co kg does not accept liability for damages or injury if this condition is disregarded.

3 Device design

Please refer to the data sheet for the 9250 instrumentation amplifier for full details of dimensions, weight, degree of protection etc.

3.1 Range of functions

The 9250 instrumentation amplifier is intended for the acquisition and processing of sensor signals.

The 9250 instrumentation amplifier is a fully configurable single-channel module that can be configured both using buttons and via the USB port. The 9250 instrumentation amplifier is ideally suited to measuring mechanical variables such as force, torque, pressure, acceleration, displacement and angle. Acquisition and processing of strain-gage, potentiometric, TTL and standard signals is straightforward.

Signal conditioning parameters such as gain, offset, etc., which depend on the sensors used, can be custom set using the DigiVision configuration and analysis software. A high-performance A/D converter ensures accurate and high-speed acquisition of the analog sensor signals.

The DigiVision configuration and analysis software can be used to configure functions such as digital filtering, selectable integration time, tare and MIN/MAX buffers.

The 9250 instrumentation amplifier itself generates a stable and precise sensor supply voltage. The 9250 instrumentation amplifier holds the calibration and configuration data securely against loss in the event of power failure.

The 9250 instrumentation amplifier has two PLC inputs and two PLC outputs, so that the device can also work independently to perform control tasks locally and directly.

3.2 Signal processing

The instrument provides the requisite signal amplification for the nature and type of connected sensor, and uses a 24-bit analog-to-digital converter to digitize the signals. TTL signals are detected by means of a quadrature decoder.

The built-in high-performance processor controls the digital-to-analog converter, which generates the analog output signals.

3.3 Measurement quality

The measurement quality that can be achieved depends on numerous factors. Assuming that the measurement setup is correct, it holds that:

- The best possible measurement results as regards precision and noise suppression are achieved with longer integration times or, for digital filtering, with low cut-off frequencies.
- Therefore choose the longest integration time or the lowest cut-off frequency that is suitable for your measurement task.

3.4 Block diagram and potentials

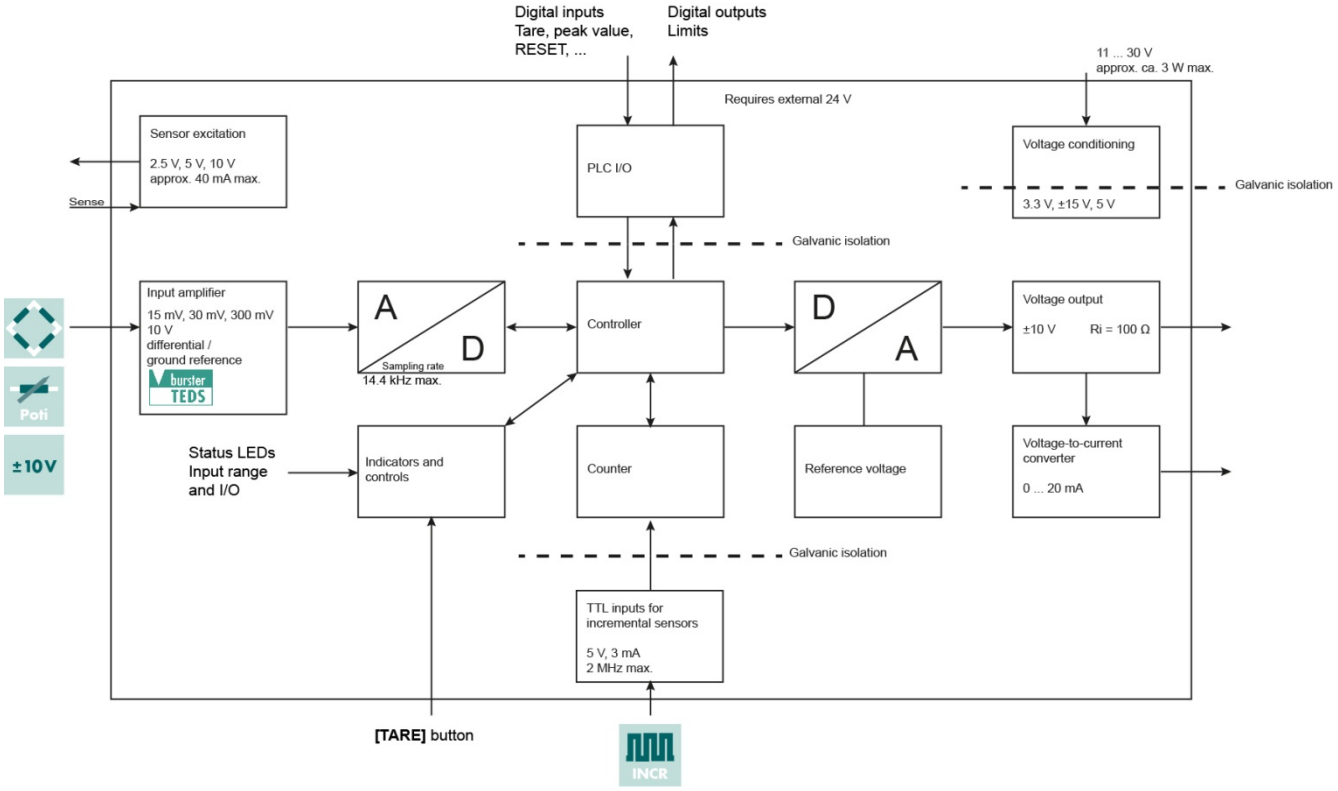


Diagram: 1 Block diagram of the 9250 instrumentation amplifier

The PLC inputs and outputs, the TTL inputs and the voltage supply are galvanically isolated from the actual instrumentation electronics and therefore have their own ground terminals. A maximum voltage of 20 V is allowed between the respective terminals and PE.

3.5 Model versions

Please refer to the data sheet for details of the different model versions. You can obtain the latest data sheet and additional information on the 9250 instrumentation amplifier from https://goo.gl/MQ27sG or simply use the QR code below:

Diagram: 2 QR code for the 9250 instrumentation amplifier

3.6 Power supply

The 9250 instrumentation amplifier can be operated with a voltage of 11 ... 30 VDC. The maximum power consumption of the 9250 instrumentation amplifier is 3 W.

3.7 Sensors suitable for use with the instrument

The 9250 instrumentation amplifier can process signals from a huge range of sensor technologies.

The 9250 instrumentation amplifier works with these sensor technologies:

Symbol	Type
	Strain-gage sensors
	Potentiometers
	Sensors with standard signal (process signal)
	Incremental sensors

3.7.1 burster TEDS automatic sensor identification

The 9250 instrumentation amplifier uses the burster TEDS (Transducer Electronic Data Sheet) to provide automatic sensor recognition, i.e. the instrument reads the relevant sensor specification from an EEPROM, fitted in the sensor plug, and can then use this data to perform the necessary channel configuration automatically. The memory chip in the sensor plug is programmed when the sensor is first ordered or subsequently calibrated.

Diagram: 3 Label identifying burster TEDS

3.8 Fault indicators

Indication	Fault description
Status LED flashing red rapidly	Fault after power-up Sensor excitation not available Internal malfunction
Status LED solidly red	Input overdrive Output overdrive
Status LED flashing slowly alternately red and green	Stay-set mode active: analog output does not necessarily correspond to the input
Status LED flashing red rapidly and green slowly	The ADC is not providing measurements because it has been stopped by PLC input

4 Controls and connections

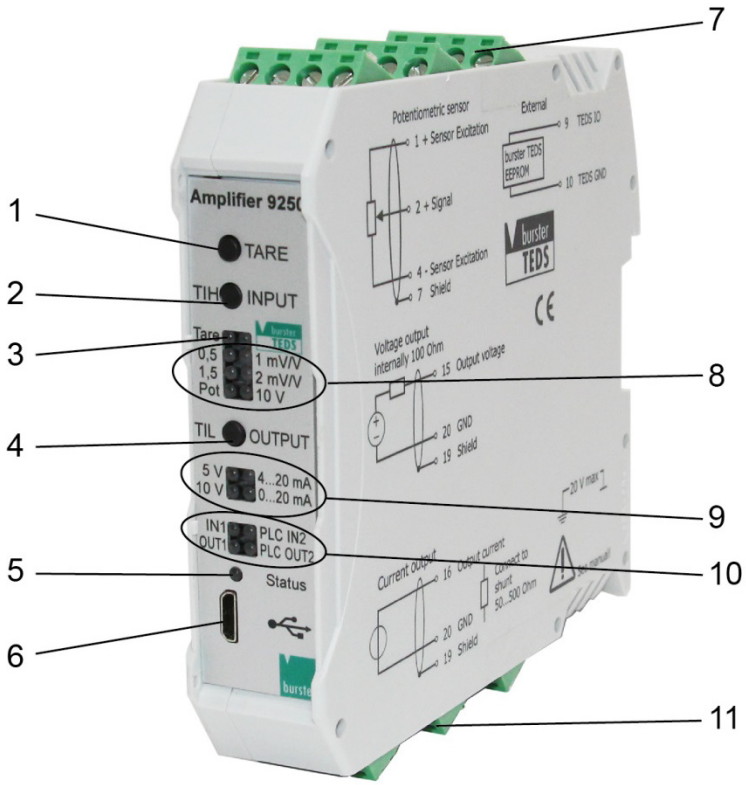


Diagram: 4 Front view

Label	Description
1	**[TARE]** button
2	**[TIH / INPUT]** button
3	Tare indicator
4	**[TIL / OUTPUT]** button
5	Status indicator
6	Micro USB socket for configuration
7	Connecting terminals for sensors, output signal and operating voltage
8	Input configuration indicator (input LEDs)
9	Output configuration indicator (output LEDs)
10	Digital I/O indicator
11	Connecting terminals for sensors and supply voltage

4.1 LEDs

LEDs	Description
Flashing	Lamp test on power-up
"Status" LED	Status LED, dual green and red LED
"PLC" LEDs	Two LEDs for PLC-IN show the detected status of the two PLC inputs. Two LEDs for PLC-OUT show the control state of the two PLC outputs.
"Output" LEDs	Four LEDs indicate the currently set analog output mode (0 ... ±5 V, 0 ... ±10 V, 0 ... 20 mA, 4 ... 20 mA)
"Input" LEDs	Seven LEDs show the configuration presets made using the control buttons. These LEDs remain off if the 9250 instrumentation amplifier was configured via the interface and the settings do not match any of the configuration presets.
"Tare" LED	Indicates whether the 9250 instrumentation amplifier is currently working with a tare (illuminated) or without a tare (off).

4.2 Status LED (normal operation)

Indication	Description
Status LED solidly red	Boot phase lasting about 3 seconds
Status LED flashing green slowly	Normal measurement mode
Status LED flashing red rapidly	Input amplifier or output DAC in overdrive
Status LED flashing red slowly	Sensor excitation voltage too low (current limiting, test during power-up)
Status LED flashing slowly alternately red and green	Stay-set mode active: analog output does not necessarily correspond to the input
Status LED flashing red rapidly and green slowly	The ADC is not providing measurements because it has been stopped by PLC input

4.3 Control buttons

4.3.1 TARE button

The tare function can be used to correct for static offsets on the sensor channels. For instance you can correct for a static background load caused by a tool changeover system by running the tare function before every measurement. The **[TARE]** button initiates the taring process. For further information on how to use this button, please see section 6.6 "Tare function" on page 41.

4.3.2 TIH / INPUT button

You can use the **[TIH / INPUT]** button to configure the input to the 9250 instrumentation amplifier.

Possible options are: 0.5 mV/V, 1.0 mV/V, 1.5 mV/V, 2.0 mV/V, potentiometer, 10 V, burster TEDS.

For further information on how to use this button, please see section 6.1 "Quick configuration – manual configuration using buttons" on page 31.

4.3.3 TIL / OUTPUT button

You can use the **[TIL / OUTPUT]** button to select the analog output.

Possible options are: analog output 0 ... 5 V, analog output 0 ... 10 V, analog output 0 ... 20 mA, analog output 4 ... 20 mA.

For further information on how to use this button, please see section 6.1 "Quick configuration – manual configuration using buttons" on page 31.

4.4 Grounding and shielding

The 9250 instrumentation amplifier sensor must be grounded via the mounting rail.

Use suitable connecting cables for connecting sensors and communication interfaces and for the PLC I/O signal control lines. Ideally you should connect sensors using burster connecting cables and with a minimum possible length of cable.

We strongly recommend the following:

- As a general rule, keep sensor connecting leads as short as possible.
- When using control lines from remote PLC systems, make sure all the system components are suitably grounded.
- When using detachable extension leads, make sure the shielding is continuous.
- Keep signal lines spaced apart from supply lines.

4.5 Compatible sensors / inputs

4.5.1 Full-bridge strain-gage sensors

There are three measuring ranges to choose from:

- 0 ... ±15 mV
- 0 ... ±30 mV
- 0 ... ±300 mV

The inputs are differential inputs with no ground reference.

The following settings for the sensor excitation voltage are possible:

- OFF
- 2.5 V
- 5 V
- 10 V

The maximum output current is approximately 40 mA. The sensor excitation voltage is protected against short-circuit.

4.5.2 Potentiometric sensors

- The excitation voltage has a fixed value of 5 V
- The measuring range is 0 ... ±5 V

The maximum output current is approximately 40 mA. The sensor excitation voltage is protected against short-circuit. The negative input is connected internally to ground; an external connection is not needed.

4.5.3 Voltage measurement / transmitter with voltage output

- The measuring range is 0 ... ±10 V
- The sensor excitation voltage is disabled
- The negative input is connected internally to ground; an external connection is not needed
- Transmitters with a voltage output up to ±10 V can be connected like a voltage source
- The transmitters must have a separate power supply

4.5.4 TTL incremental sensors

- Any TTL signal source that is able to sink at least 3 mA can be connected.
- The signals are galvanically isolated from the rest of the electronics by optocouplers.

The incremental counter consists of a 32-bit counter and can therefore count from -2,147,483,648 to +2,147,483,647. If the incremental counter reaches the end of the range, an overflow occurs and the counter continues counting from the opposite end of the range. You should therefore avoid an overflow. The 9250 instrumentation amplifier works with 4-edge sampling, i.e. one signal period on the A-line or B-line produces 4 counter increments.

The following incremental modes are available:

- **Totalizing counter**
  The pulses are counted until overflow. The analog output signal represents the count. The "Tare" function (**[TARE]** button) can be used to reset the counter.
- **Angle measurement mode**
  By specifying the number of pulses per revolution, the angle from incremental rotary encoders can be converted into an analog value or scale value. The output value is automatically reset from e.g. 360° back to 0° when an overflow occurs. The "Tare" function (**[TARE]** button) can be used to reset the counter.
- **Speed measurement mode**
  The pulses are counted in three selectable time windows (10 ms, 100 ms, 1 s).
  The count reached in the time window is therefore proportional to the speed, and the analog output signal reflects the count. The "Tare" function (**[TARE]** button) can be used to reset the counter.

4.6 Outputs

4.6.1 Analog outputs

The 9250 instrumentation amplifier has a configurable voltage output and a current output. The following base configurations are possible:

- 0 ... ±5 V
- 0 ... ±10 V
- 0 ... 20 mA
- 4 ... 20 mA

Note: Only one of the outputs at a time is active and calibrated.

For instance, if the voltage output is enabled, the current output continues to operate alongside without being calibrated, and vice versa. The outputs can be configured largely to suit, and are not galvanically isolated from the instrumentation electronics.

4.7 PLC inputs

The 9250 instrumentation amplifier has two mutually separate PLC inputs that can be assigned different functions. Possible options here are:

- Tare/Reset the counter
- Reset the tare
- Reset the MIN/MAX value
- Reset the limit buffer 1 or 2
- HOLD function

Note: The PLC inputs are galvanically isolated from the instrumentation electronics but not from the PLC outputs.

4.8 PLC outputs

The 9250 instrumentation amplifier has two mutually separate PLC outputs that can be assigned different functions.

Possible options here are:

- Operation of the upper/lower dynamic limit threshold:
  The output is set while the measurement is above/below the threshold. Once this condition is no longer met, the output is cleared again (dynamic behavior).
- Operation of the upper/lower static limit threshold:
  The output is set while the measurement is above/below the threshold, and remains set even when this condition is no longer met. It can only be cleared again by a suitable RESET signal at the PLC input.
- Operation of window mode:
  The output is set while the measurement signal lies between a lower and upper limit threshold. Once the signal has left this range, the output is cleared. If the signal subsequently satisfies this condition again, the output is set again (dynamic behavior).

Note: The PLC outputs are galvanically isolated from the instrumentation electronics but not from the PLC inputs.

4.9 Reading burster TEDS data

The 9250 instrumentation amplifier supports burster TEDS for strain-gage, potentiometric and high-level sensors. Change the input to the 9250 instrumentation amplifier over to burster TEDS (please see section 6.1 "Quick configuration – manual configuration using buttons" on page 31). The 9250 instrumentation amplifier then reads the TEDS chip for the connected sensor and configures its own parameters accordingly.

Note: If there is no (valid) sensor with TEDS chip connected, you are not able to select burster TEDS for the input. If it is found when reading the data that it is not possible to set a sensible set of device parameters from the available information, the process is terminated and the previous settings are retained.

4.10 MIN and MAX value

The 9250 instrumentation amplifier has a buffer for the MIN value and MAX value. The value recorded for the live maximum measured value (MAX value) remains at the highest value reached so far, even if the measurement signal has since fallen. The MAX value is overwritten as soon as a new measurement signal exceeds the latest MAX value. You can reset the MAX value using a RESET signal at the PLC input. The same behavior applies to the MIN value when the measurement signal falls below this value.

4.11 Connections

Terminal assignments for the screw terminals on the 9250 instrumentation amplifier:

Number	Designation
1	+ sensor excitation
2	+ signal
3	- signal
4	- sensor excitation
5	+ sense
6	- sense
7	shield
8	TTL GND
9	TEDS IO
10	TEDS GND
11	supply voltage 11 ... 30 VDC
12	supply voltage GND
13	TTL input A
14	TTL input B
15	voltage output 0 ... ±10 V
16	current output 0 ... 20 mA
17	PLC supply GND
18	+24 V PLC supply
19	shield
20	analog output GND
21	PLC input 1
22	PLC input 2
23	PLC output 1
24	PLC output 2

4.11.1 Connecting strain-gage sensors

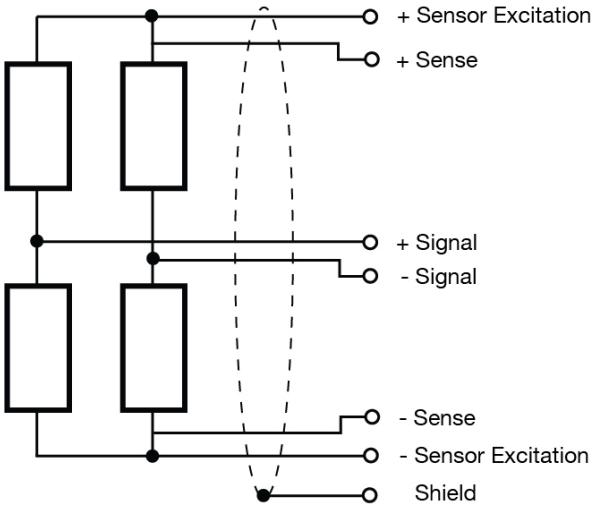


Diagram: 5 Strain-gage connection method

You can connect strain-gage sensors, with or without sense leads, to the 9250 instrumentation amplifier. Sense lines are used for correcting losses in the cable in order to obtain optimum results regardless of the cable length.

If the strain-gage sensors are equipped with sense-lead terminals, sense leads should be used, and if using extension leads, these should also include sense lines.

If you are using strain-gage sensors that have no sense-lead terminals, you can still connect these sensors directly to the 9250 instrumentation amplifier. If extension leads are needed, these should include sense leads. In this case, make a connection between +sense and +excitation and between -sense and -excitation at the extension cable end closest to the strain-gage sensor.

Connecting strain-gage sensors without sense leads

Connect strain-gage sensors without sense leads as follows:

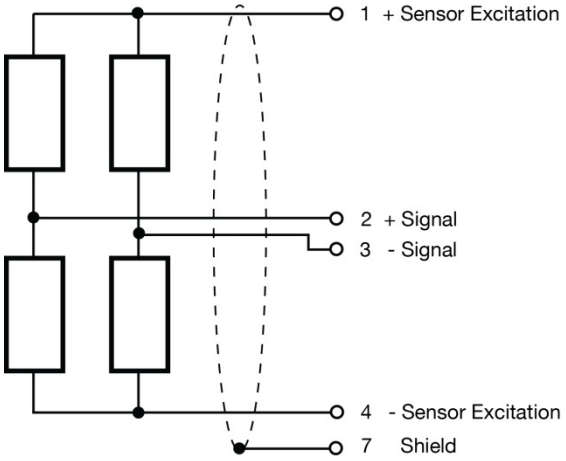


Diagram: 6 Strain-gage sensors without sense leads

Connecting strain-gage sensors fitted with sense leads

Connect strain-gage sensors fitted with sense leads as follows:

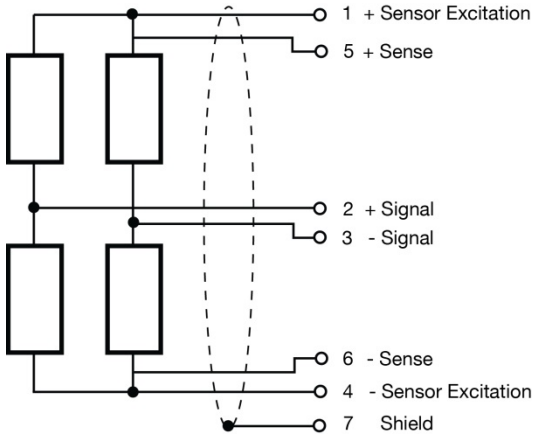


Diagram: 7 Strain-gage sensors with sense leads

4.11.2 Connecting potentiometric sensors

Connect potentiometric sensors as follows:

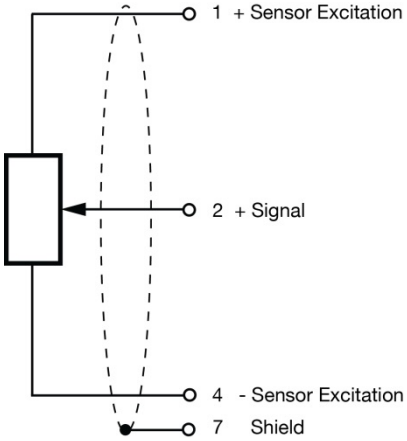


Diagram: 8 Potentiometric sensors

4.11.3 Connecting transmitters that have a voltage output

Connect the transmitters as follows:

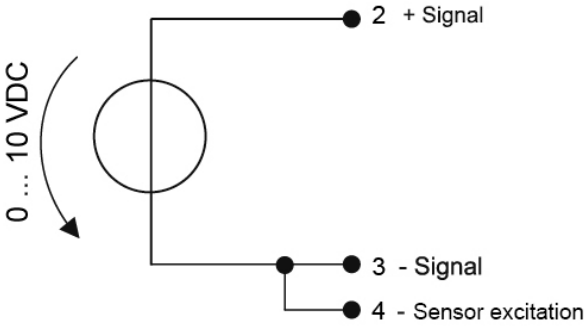


Diagram: 9 Transmitter with voltage output

The input range is 0 ... ±10 V.

Note: The 9250 instrumentation amplifier does not provide any excitation voltages for transmitters.

4.11.4 Connecting incremental sensors

Connect incremental sensors as follows:

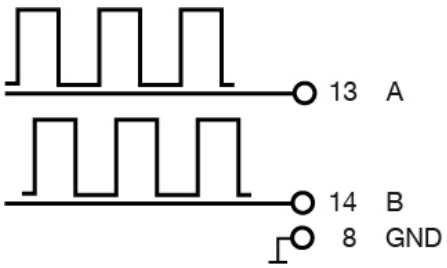


Diagram: 10 Incremental sensors

4.11.5 burster TEDS connection

Applies to all sensors equipped with the burster TEDS option.

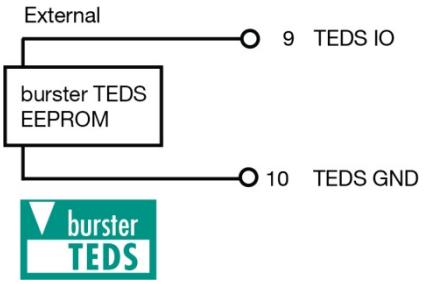


Diagram: 11 burster TEDS connection

4.11.6 Voltage output

Terminal assignment for the voltage output:

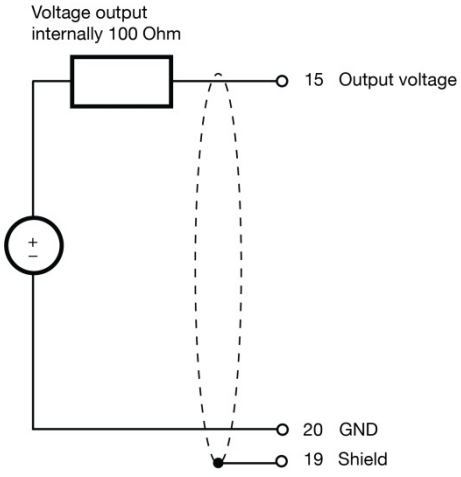


Diagram: 12 Terminal assignment for the voltage output

4.11.7 Current output

Terminal assignment for the current output:

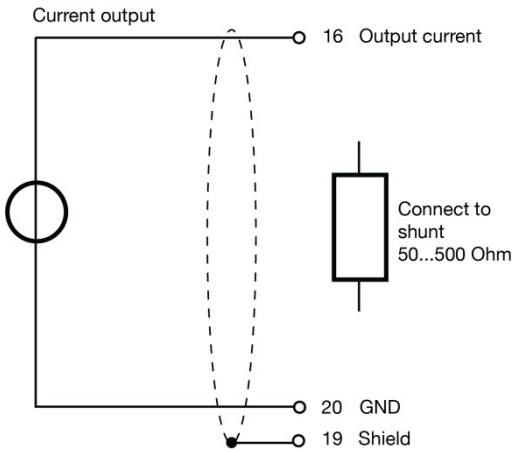


Diagram: 13 Terminal assignment for the current output

4.11.8 USB port

The USB port complies with the USB 2.0 standard and has the standard pin assignment. The built-in connector on the 9250 instrumentation amplifier is a "USB 2.0 Micro-B" plug.

Pin	Name
1	+ 5 V
2	data -
3	data +
4	ID (unassigned)
5	GND

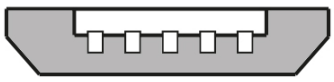


Diagram: 14 USB Micro-B [mm]

The connector fitted on the supplied cable is a “type A USB” plug.

Pin	Name
1	+ 5 V
2	data -
3	data +
4	GND

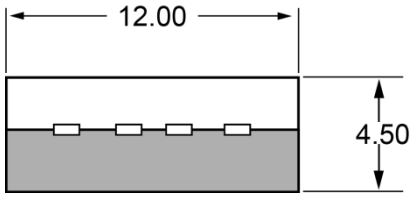


Diagram: 15 USB A [mm]

5 Using the instrument for the first time

DANGER

Electrical shock hazard.

- Never switch on the 9250 instrumentation amplifier if it shows signs of damage incurred in transit. Only ever use the 9250 instrumentation amplifier under the conditions specified in this operation manual.
- The 9250 instrumentation amplifier must not be used in hazardous areas.
- Do not connect voltages that are higher than those in the specification. The ranges supported are listed in the data sheet for the 9250 instrumentation amplifier.

5.1 Installation / Removal

WARNING

Install the 9250 instrumentation amplifier only on a grounded mounting rail in a grounded control cabinet.

The 9250 instrumentation amplifier is intended to be fitted on a grounded DIN EN 60715 mounting rail in a grounded control cabinet.

Installation

This is how it works

1. Place the top edge of the fastening mechanism on the mounting rail.
2. From the front, press the 9250 instrumentation amplifier against the mounting rail until you can hear the fixing clip engage.
3. Pull the 9250 instrumentation amplifier gently forward to check that it is held securely.

Removal

This is how it works

1. Use a screwdriver to release the fixing clip on the bottom edge of the 9250 instrumentation amplifier from the mounting rail.
2. Tilt the 9250 instrumentation amplifier slightly upwards and lift it off the mounting rail by its top edge.

6 Configuring the unit

6.1 Quick configuration – manual configuration using buttons

6.1.1 Important information

IMPORTANT: If you want to operate the 9250 instrumentation amplifier solely via the quick configuration facility then it will use a default sampling rate of 1200 measurements/s with digital filter disabled. Settings that you make via the USB port will be overwritten.

6.1.2 Selecting the input

A button is provided for choosing between full-bridge strain-gage sensors with rated outputs of 0.5 mV/V, 1.0 mV/V, 1.5 mV/V, 2.0 mV/V, potentiometric sensors, a ±10 V voltage input or sensors equipped with burster TEDS.

This is how it works

1. Press the **[TIH / INPUT]** button briefly to activate Input mode for making your selection. The LED for the option currently selected starts to flash.
2. Press the **[TIH / INPUT]** button briefly to activate the next available option. All available options are offered in a cycle.

Note: You can only use the burster TEDS option if the 9250 instrumentation amplifier has detected that a sensor equipped with burster TEDS is connected.

3. If you do not press the **[TIH / INPUT]** button for a second time within 3 seconds, the selection LED stops flashing and no change is made to the settings.
4. To adopt the currently made selection, press and hold the **[TIH / INPUT]** button for about 3 seconds.

6.1.3 Selecting the analog output

You can choose from: analog output 0 ... ± 5 V, analog output 0 ... ± 10 V, analog output 0 ... 20 mA, analog output 4 ... 20 mA.

This is how it works

1. Press the **[TIL / OUTPUT]** button briefly to activate Input mode for making your selection. The LED for the option currently selected starts to flash.
2. Press the **[TIL / OUTPUT]** button briefly to activate the next available option. All available options are offered in a cycle.
3. If you do not press the **[TIL / OUTPUT]** button for a second time within 3 seconds, the selection LED stops flashing and no change is made to the settings.
4. To adopt the currently made selection for the analog output, press and hold the **[TIL / OUTPUT]** button for about 3 seconds.

6.1.4 Performing sensor teach-in

This is how it works

1. Press the **[TIH / INPUT]** button and the **[TIL / OUTPUT]** button simultaneously for about 3 seconds. This activates calibration mode. The input LEDs show a light moving towards "TIL" (Teach-In Low).
2. Press the **[TIL / OUTPUT]** button briefly to perform the teach-in for the lower point of the two-point calibration first. 0 % of the analog output range (e.g. 0 V, 0 mA, 4 mA) will subsequently be output for this value. Press any other button to cancel the process.
3. Once the teach-in has been performed, the 9250 instrumentation amplifier confirms the selection by making all the input LEDs flash.
4. Press the **[TIH / INPUT]** button briefly to teach the upper point of the two-point calibration next. 100 % of the analog output range (e.g. 5 V, 10 V, 20 mA) will subsequently be output for this value. Press any other button to cancel the process.
5. The 9250 instrumentation amplifier uses the teach-in measurements to calculate the rescaling calibration, which it then saves. A short run of lights moving in the opposite direction indicates that the calculation has been completed successfully. The unit can then be used with the new calibration.

6.2 Additional settings via DigiVision

6.2.1 System requirements

Operating systems	Windows 7, Windows 8, Windows 10
Processor:	Pentium 1200 MHz minimum, Pentium 2.0 GHz recommended
Graphics card:	At least VGA 800 x 600, minimum 256 colors
Memory:	At least 1024 MB RAM
Hard disk:	Approx. 500 MB free space
Input devices:	MS-compatible mouse, standard keyboard
Font setting:	Small fonts

6.2.2 Software installation

IMPORTANT: To install the DigiVision configuration and analysis software, the user needs to be logged on as an administrator.

This is how it works

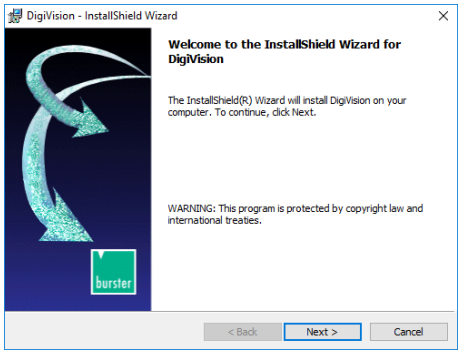
1 To start installing the DigiVision configuration and analysis software, insert the supplied CD-ROM in the CD-ROM drive.

2 Choose your language.

3 Click “Sensor Electronics” and choose “9250”.

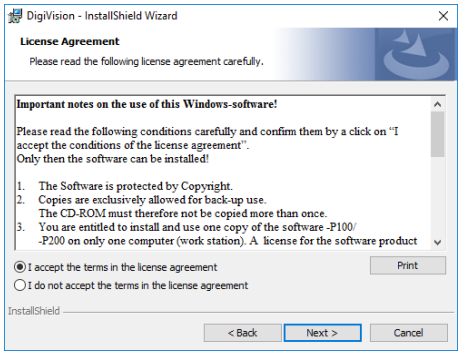
Note: If Microsoft .NET Framework 4.0 is not already installed on the PC, it is installed automatically.

4 Click “Next”.

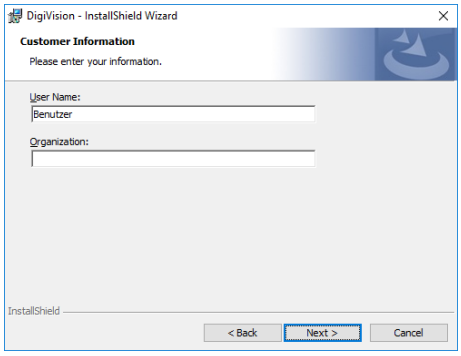


5 Accept the license agreement then click "Next >". The installation will terminate if you do not accept the license agreement.

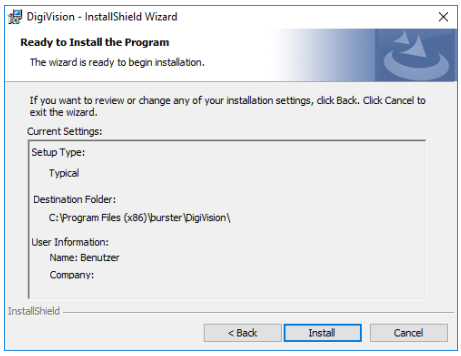
Note: The next installation screen lets you review all the relevant information about the software version you are installing. After installation, you can also view this information in the "readme.txt" file.



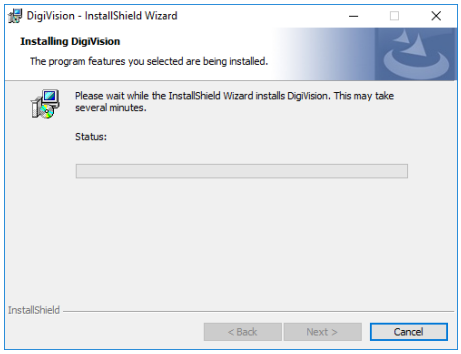
6 Click "Next >". Enter a user name and the name of your organization or company.



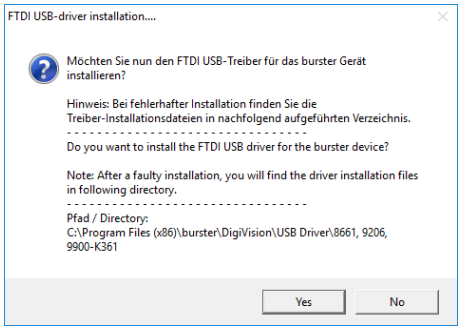
7 Choose a folder and click “Next >”. Check your chosen information and click “Install”.



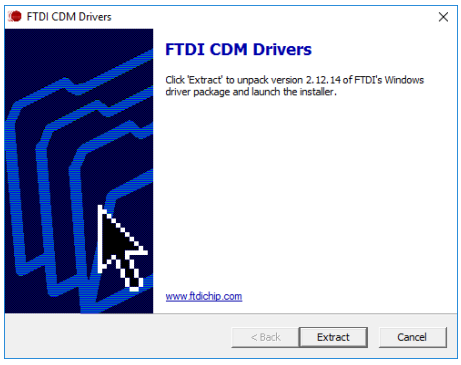
8 The installation may take several minutes.



9 Click “Yes” to install the instrument driver.

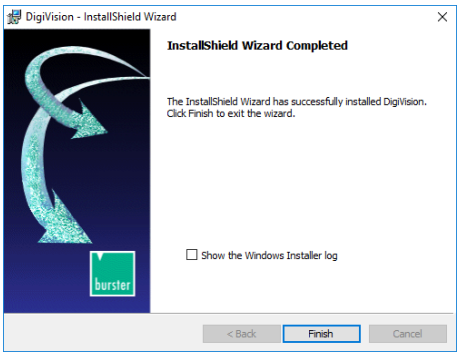


10 Click “Extract” to unpack the driver package and launch the installer.



11 Follow the instructions of the Device Driver Installation Wizard.

12 The DigiVision configuration and analysis software has been successfully installed on your system. Click the "Finish" button to close the Setup wizard.

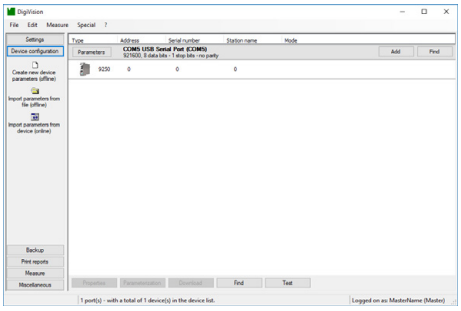


6.3 Device list

You can use the device finder facility to detect and display all the connected 9250 instrumentation amplifiers automatically.

This is how it works

1. Run the DigiVision configuration and analysis software.
2. Click "Find". You are shown a list of all available serial ports, and a search is carried out for any connected 9250 instrumentation amplifiers. All the connected 9250 instrumentation amplifiers that have been found are listed under the ports.

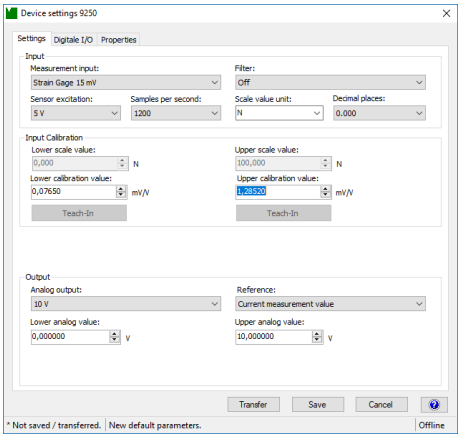


6.4 Device settings

Once the devices have been identified, you can configure the 9250 instrumentation amplifiers via the device list.

This is how it works

1. Select the port you want to configure by clicking on it.
2. Click "Parameters". This opens the Device settings window.



6.4.1 Device settings

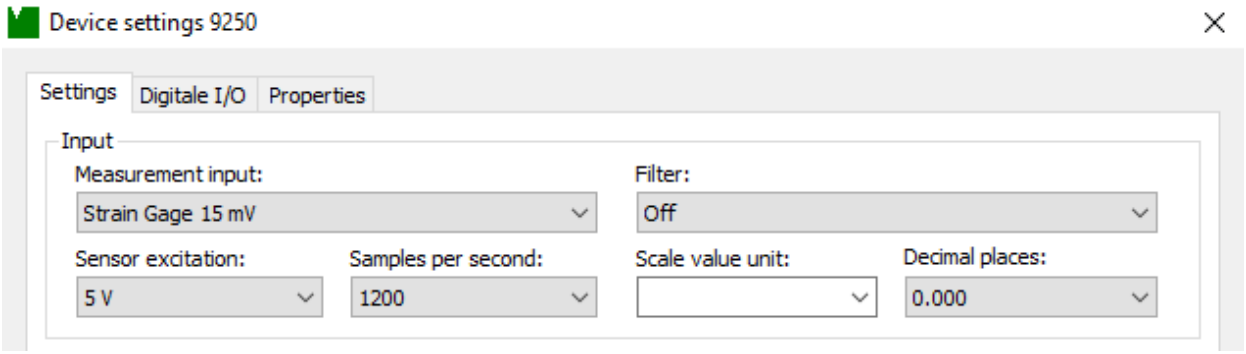


Diagram: 16 Device settings 9250

Measurement mode

In order to be able to use 100% of the measurement range of the connected sensor, the selected input range must be ≥ the sensor rated output.

The following input measurement ranges are possible:

- 0 ... ±15 mV
- 0 ... ±30 mV
- 0 ... ±300 mV
- Potentiometer
- 0 ... ±10 V
- TTL increments

Decimal places

The setting for decimal places refers to the measured value. The number of decimal places can range from 0 to 6. The number of decimal places is permanently set to four for calibration values. If the connected sensor supports less than four decimal places, trailing zeros can be added to fill the remaining places.

The option to set the number of decimal places is only available for the bus model.

Unit

Set here the physical units required for the measurement. If the units that you require are not included in the list, you can also enter these by hand.

For rescaling with sensors, please refer to section 7 "Rescaling in order to calibrate the 9250 instrumentation amplifier with sensors" on page 42.

The option to set the units is only available for the bus model.

Sensor excitation voltage

The following sensor excitation voltages can be chosen:

- OFF
- 2.5 V
- 5 V
- 10 V

The correct value for the sensor excitation voltage is listed in the relevant data sheet or in the test and calibration certificate.

Filter

A filter is available for filtering certain measurement signals. The filter cut-off frequency can be selected in steps between 4 and 700 Hz. When set to "Off", the measurement signals are processed without filtering.

Samples per second

Enter here the measurement rate at which you want the measurement to run at the input amplifier and at the output. The measurement rate applies to both sides. The maximum measurement rate available as standard is 1200 measurements/s. Optionally, up to 14,400 measurements/s are possible.

6.4.2 Configuring the analog output

The 9250 instrumentation amplifier has a configurable voltage output and a current output. The following base configurations are possible:

- 0 ... ±5 V
- 0 ... ±10 V
- 0 ... 20 mA
- 4 ... 20 mA

Only one of the analog outputs at a time is active and calibrated. For instance, if the voltage output is enabled, the current output continues to operate alongside without being calibrated, and vice versa.

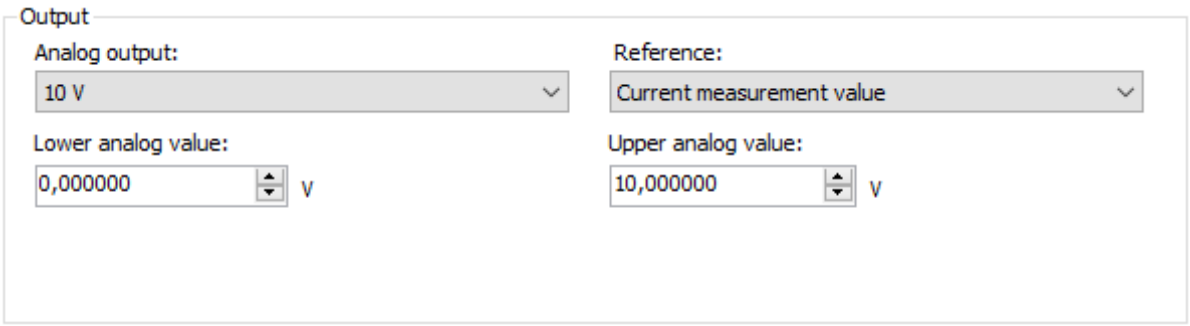


Diagram: 17 Configuring the analog output

The lower analog value always relates to the lower calibration value, and the upper analog value to the upper calibration value.

The reference for the output signal from the analog output can be chosen. The analog output is then referred to the selected option.

- Current measurement value (default)
- MIN peak-value buffer
- MAX peak-value buffer

Example:

A tension and compression load cell is meant to span a current range of 4 to 20 mA in both load directions. In this case, the zero point of the sensor must be set to 12 mA in order to be able to output both load directions. The lower analog value is set to 4 mA and the upper analog value to 20 mA.

6.4.3 Configuring the PLC I/O - Digital inputs / Limits

You have the option on the 9250 instrumentation amplifier to configure two outputs and two inputs.

For the outputs, when setting the limits, you can specify whether the value is entered as a scale value or analog output value. Two limits are entered if one of the window modes is selected.

6.4.4 Device settings - Limits

The following selection options are available:

- Dynamically limit value exceeding
- Dynamically limit value underrun
- Statically limit value exceeding (limit buffer)
- Statically limit value underrun (limit buffer)

Window mode

- Above lower limit AND below upper limit, dynamic
- Above upper limit OR below lower limit, dynamic
- Above upper limit OR below lower limit, static

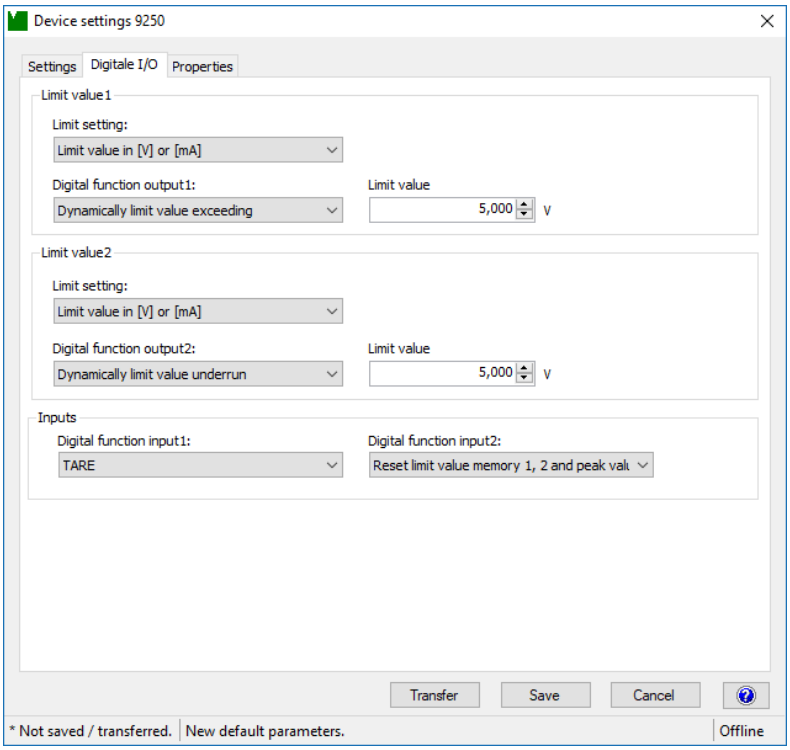


Diagram: 18 Configuring the limits

6.4.5 Configuring the digital inputs

The following selection options are available:

- TARE
- TARE reset
- Peak-value memory MIN/MAX
- Reset limit value memory 1
- Reset limit value memory 2
- Reset limit value memory 1 and 2
- Reset limit value memory 1, 2 and peak-value memory MIN/MAX
- HOLD

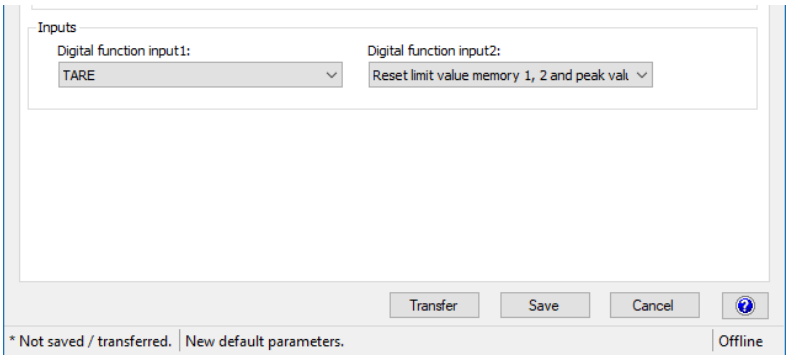


Diagram: 19 Configuring the digital inputs

6.4.6 Device settings - Properties

You can make or view the following settings under Device settings 9250 > Properties (“Properties for ...”):

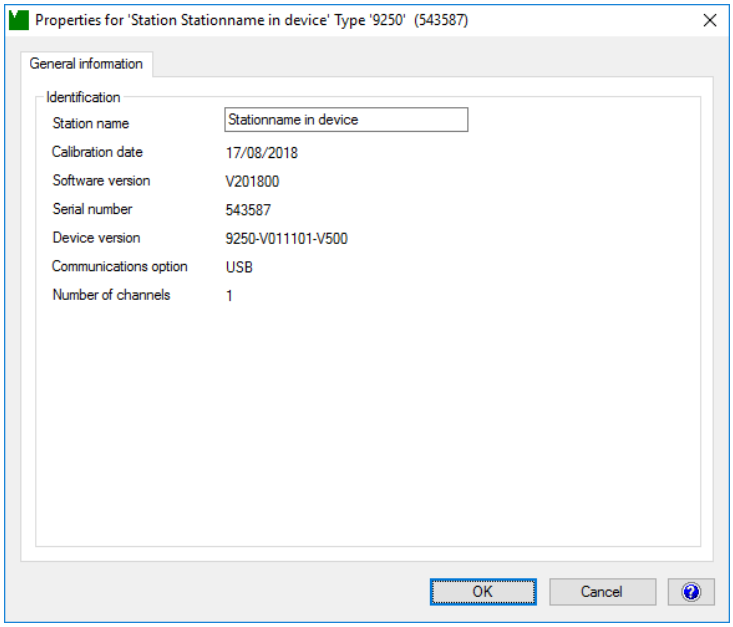


Diagram: 20 Device settings ("Properties for ...")

- **Station name**
  You can enter any device name of your choice in this field.
- **Calibration date**
  The calibration date is updated with the date and time whenever new calibration data is transferred to the 9250 instrumentation amplifier.
- **Software version**
  Shows the current version of the software in the 9250 instrumentation amplifier.
- **Serial number**
  Shows the serial number of the connected 9250 instrumentation amplifier.
- **Device version**
  Shows the device version of the connected 9250 instrumentation amplifier.

This is how it works

1. Run the DigiVision configuration and analysis software.
2. Double click the 9250 instrumentation amplifier. The “Properties for ...“ window will be opened.

6.5 Tare function

The tare function can be used to correct for static offsets on the sensor channels. For instance you can correct for a static background load caused by a tool changeover system by running the tare function before every measurement. The **[TARE]** button initiates a taring process.

This is how it works

1. Press the **[TARE]** button briefly. The Tare LED will start flashing.
2. Press and hold the **[TARE]** button for about 3 seconds while the Tare LED is flashing. The Tare LED is your indication that "Taring" is active.
3. If you do not press the **[TARE]** button for a second time within 3 seconds, the Tare LED stops flashing and no action has been initiated.
4. Releasing the **[TARE]** button activates or deactivates the tare function.

7 Adjustment in order to calibrate the 9250 instrumentation amplifier with sensors

Calibration in the form of adjustment is needed in order to define the relationship between the electrical signals measured by the connected sensors and the measured values that will be displayed.

7.1 Adjustment with strain-gage sensors

The 9250 instrumentation amplifier can be calibrated by a choice of rescaling techniques:

- Adjustment using a physical variable
- Adjustment using data entered from the test and calibration certificate for the strain-gage sensor

The following sections describe in greater detail the different calibration and rescaling options.

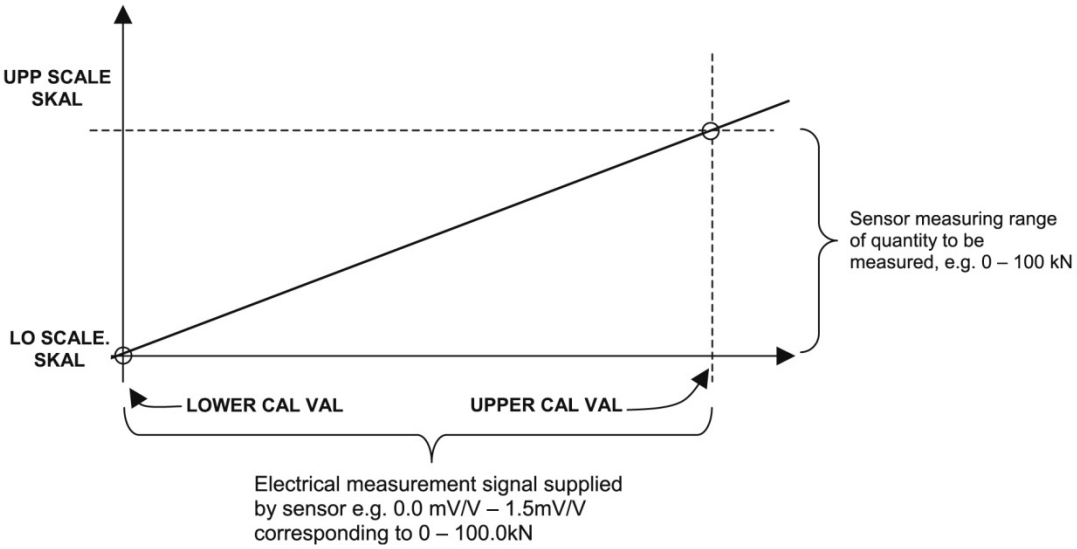


Diagram: 21 Characteristic sensor curve

The relationship between the electrical measurement signal from the connected strain-gage sensor (lower calibration value, upper calibration value) and the measured value to be displayed (lower scale value, upper scale value) is set out below. It is a simple two-point calibration.

The values are related as follows:

Lower scale value ←→ Lower calibration value

Upper scale value ←→ Upper calibration value

The lower calibration value is the electrical signal from the strain-gage sensor when the “load” given by the lower scale value is applied (usually the zero point of the strain-gage sensor). Since the zero point of a strain-gage sensor tends to shift from the origin as a result of the way the sensor is mounted (components used to transfer the force exert a pre-load themselves) or material aging, the electrical value specified under "zero point" in the test and calibration certificate rarely tallies with the value actually measured. We therefore advise that you always perform a teach-in for this value.

Other terms:

Rated load → upper scale value or upper analog value

Zero signal → zero point, zero signal without assembly parts, lower calibration value

Rated output → output signal at rated load, rated output in preferential measurement direction, upper calibration value

7.1.1 Rescaling using a physical variable by the teach-in method

The teach-in method involves two-stage online "training" of the 9250 instrumentation amplifier using sensor data, in which two teach-in states are applied sequentially. The first teach-in state is the zero point under no load (lower scale value or lower analog value), and the second teach-in state is the upper limit (upper scale value or upper analog value).

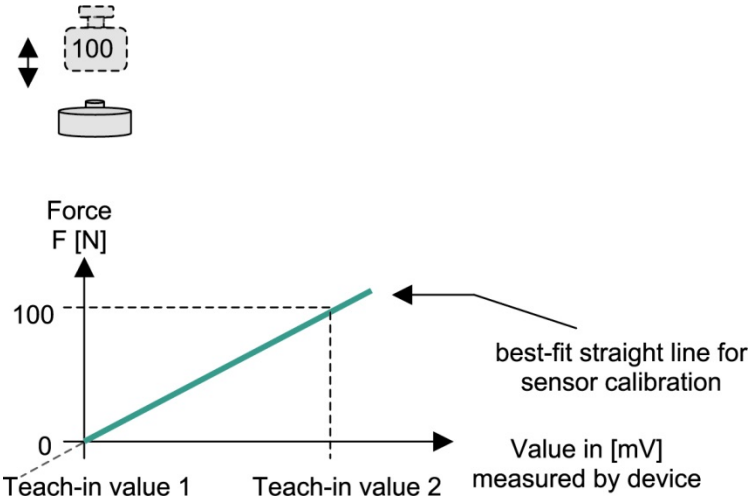


Diagram: 22 Characteristic sensor curve

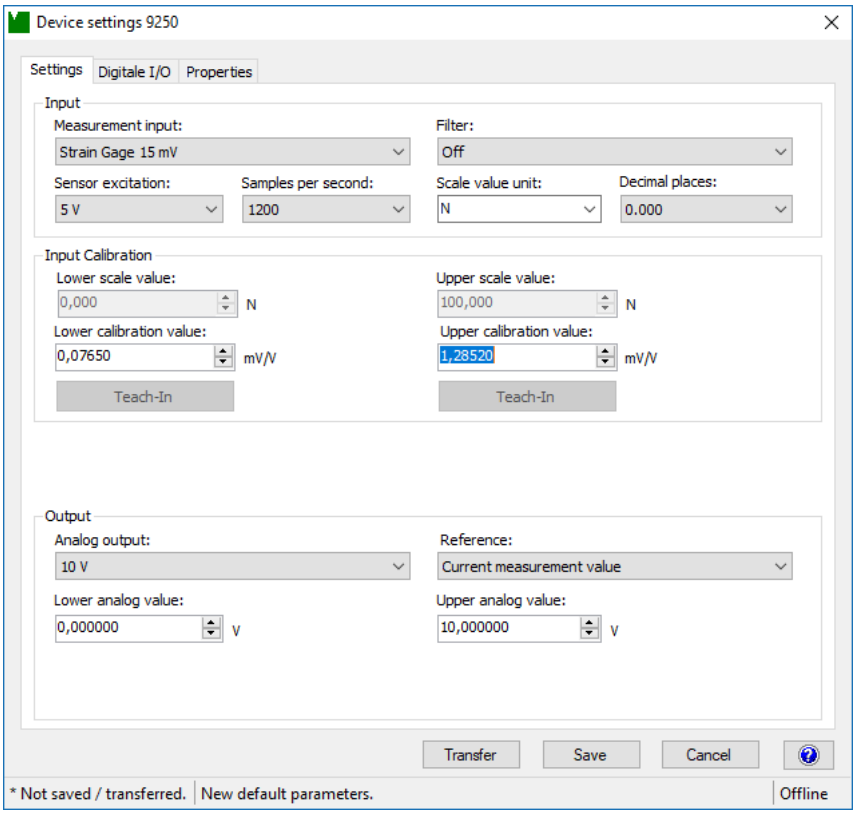
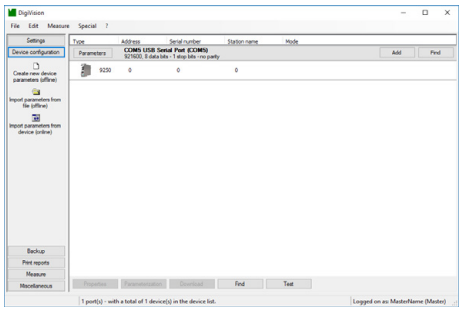


Diagram: 23 Device settings 9250

This is how it works

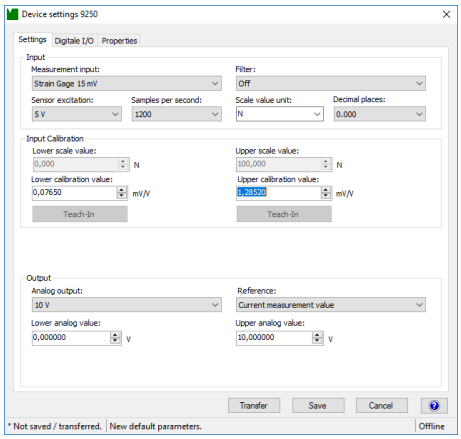
1 Start the DigiVision configuration and analysis software and make sure that the 9250 instrumentation amplifier is connected correctly and appears in the device list.

2 Click in the left-hand menu bar on "Import parameters from device (online)". The DigiVision configuration and analysis software will then import the parameter data held in the 9250 instrumentation amplifier for the strain-gage sensor.
It is this strain-gage parameter data that can now be obtained by the teach-in procedure.



3 Remove any load from the strain-gage sensor and adjust the zero point F = 0 N (lower scale value or lower analog value).

4 Enter the lower scale value or lower analog value of the measuring range for the strain-gage sensor. This is normally "0".

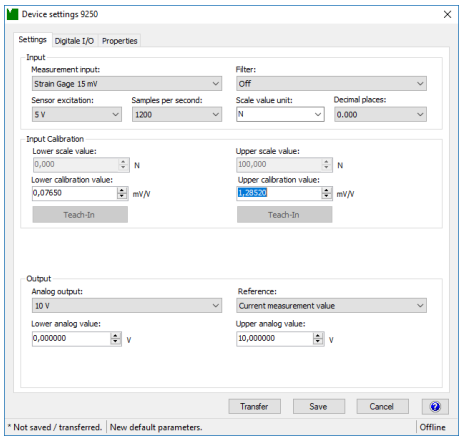


5 Then click the **[Teach-In]** button under "Lower calibration value" and confirm with "OK". The lower calibration value appears in the field (e.g. 0.0765).
The lower calibration value is the electrical signal from the strain-gage sensor under the "load" given by the lower scale value or lower analog value (usually the zero point of the strain-gage sensor).

Note: The option to adjust the scale value is only available for the bus model.

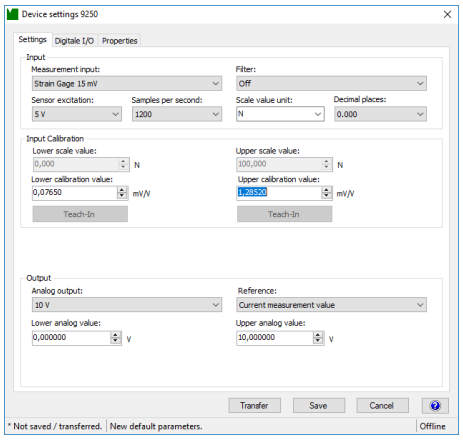
Note: The zero point of a strain-gage sensor may shift from the origin as a result of the way the sensor is mounted (load application components, couplings, adapters etc., which themselves can exert a pre-load) or material aging. This means that the electrical value specified under "Zero output" in the test and calibration certificate for the strain-gage sensor will differ from the measured zero point. This is why we recommend always using the teach-in process to set the zero point of the strain-gage sensor.

6 Enter the upper scale value or upper analog value of the measuring range for the strain-gage sensor. For load cells, this is usually the rated load of the sensor. In our example the rated load (nominal force) equals 100 N.



7 Then apply a known reference load to the strain-gage sensor e.g. F = 100 N (upper scale value or upper analog value) to set the upper limit.

8 Then click the **[Teach-In]** button under "Upper calibration value" and confirm with "OK".

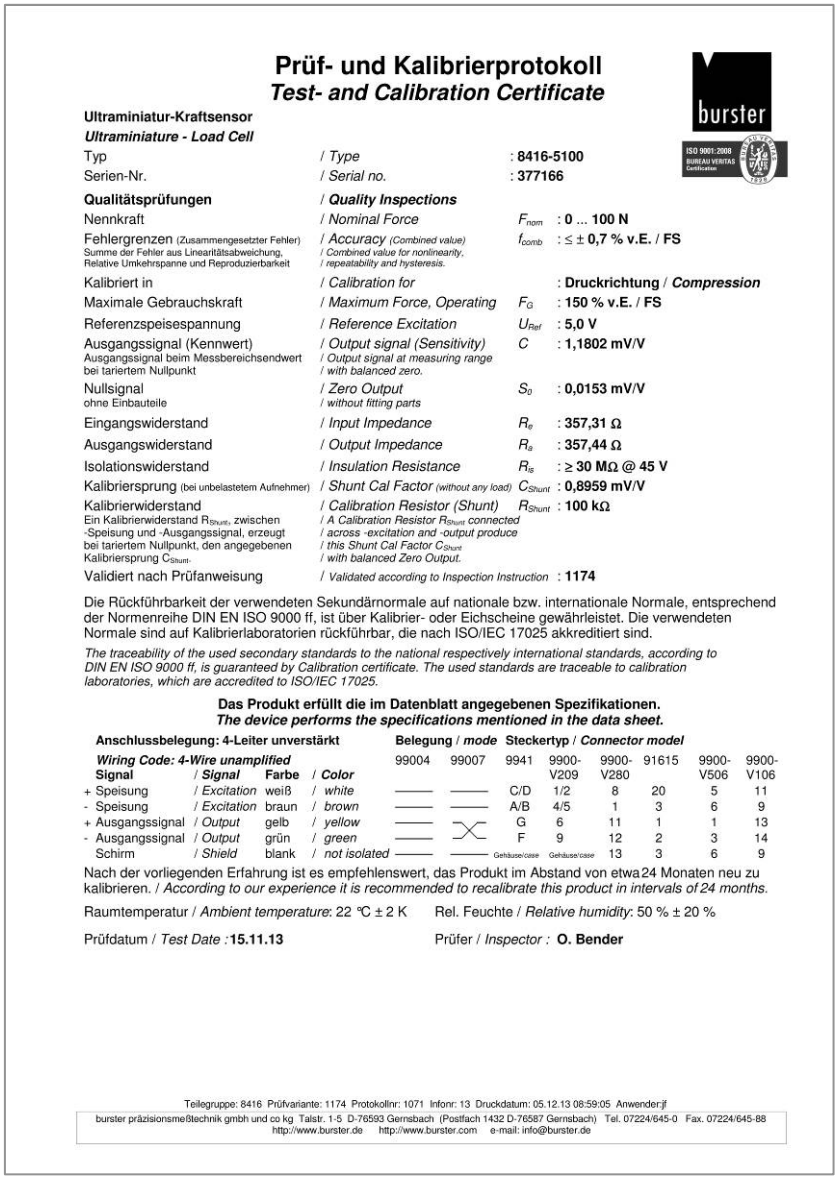


9 Click "Transfer". This completes the teach-in method.

10 If you wish, you can also save the parameter data for the strain-gage sensor in a file.

7.1.2 Adjustment using the test and calibration certificate

This method involves a two-point calibration in which you enter the necessary data directly in the 9250 instrumentation amplifier. You can obtain all the necessary rescaling data from the test and calibration certificate for the strain-gage sensor.



Prüf- und Kalibrierprotokoll
Test- and Calibration Certificate

burster
ISO 9001:2008 BUREAU VERITAS Certification

Ultraminiatur-Kraftsensor
Ultraminiature - Load Cell

Typ	/ *Type*	: **8416-5100**
Serien-Nr.	/ *Serial no.*	: **377166**

Qualitätsprüfungen	/ ***Quality Inspections***		
Nennkraft	/ *Nominal Force*	F_{nom}	: **0 ... 100 N**
Fehlergrenzen (Zusammengesetzter Fehler) Summe der Fehler aus Linearitätsabweichung, Relative Umkehrspanne und Reproduzierbarkeit	/ *Accuracy (Combined value)* / *Combined value for nonlinearity, / repeatability and hysteresis.*	f_{comb}	: ≤ ± **0,7 % v.E. / FS**
Kalibriert in	/ *Calibration for*		: **Druckrichtung / *Compression***
Maximale Gebrauchskraft	/ *Maximum Force, Operating*	F_G	: **150 % v.E. / FS**
Referenzspeisespannung	/ *Reference Excitation*	U_{Ref}	: **5,0 V**
Ausgangssignal (Kennwert) Ausgangssignal beim Messbereichsendwert bei tariertem Nullpunkt	/ *Output signal (Sensitivity)* / *Output signal at measuring range / with balanced zero.*	C	: **1,1802 mV/V**
Nullsignal ohne Einbauteile	/ *Zero Output* / *without fitting parts*	S_0	: **0,0153 mV/V**
Eingangswiderstand	/ *Input Impedance*	R_e	: **357,31 Ω**
Ausgangswiderstand	/ *Output Impedance*	R_a	: **357,44 Ω**
Isolationswiderstand	/ *Insulation Resistance*	R_{is}	: **≥ 30 MΩ @ 45 V**
Kalibriersprung (bei unbelastetem Aufnehmer)	/ *Shunt Cal Factor (without any load)*	C_{Shunt}	: **0,8959 mV/V**
Kalibrierwiderstand Ein Kalibrierwiderstand R_{Shunt}, zwischen -Speisung und -Ausgangssignal, erzeugt bei tariertem Nullpunkt, den angegebenen Kalibriersprung C_{Shunt}.	/ *Calibration Resistor (Shunt)* / *A Calibration Resistor R_{Shunt} connected / across -excitation and -output produce / this Shunt Cal Factor C_{Shunt} / with balanced Zero Output.*	R_{Shunt}	: **100 kΩ**
Validiert nach Prüfanweisung	/ *Validated according to Inspection Instruction*		: **1174**

Die Rückführbarkeit der verwendeten Sekundärnormale auf nationale bzw. internationale Normale, entsprechend der Normenreihe DIN EN ISO 9000 ff, ist über Kalibrier- oder Eichscheine gewährleistet. Die verwendeten Normale sind auf Kalibrierlaboratorien rückführbar, die nach ISO/IEC 17025 akkreditiert sind.

The traceability of the used secondary standards to the national respectively international standards, according to DIN EN ISO 9000 ff, is guaranteed by Calibration certificate. The used standards are traceable to calibration laboratories, which are accredited to ISO/IEC 17025.

Das Produkt erfüllt die im Datenblatt angegebenen Spezifikationen.
The device performs the specifications mentioned in the data sheet.

Anschlussbelegung: 4-Leiter unverstärkt				**Belegung / *mode***		**Steckertyp / *Connector model***					
Wiring Code: 4-Wire unamplified				99004	99007	9941	9900-V209	9900-V280	91615	9900-V506	9900-V106
Signal	/ ***Signal***	**Farbe**	/ ***Color***								
+ Speisung	/ *Excitation*	weiß	/ *white*	——	——	C/D	1/2	8	20	5	11
- Speisung	/ *Excitation*	braun	/ *brown*	——	——	A/B	4/5	1	3	6	9
+ Ausgangssignal	/ *Output*	gelb	/ *yellow*	——	X	G	6	11	1	1	13
- Ausgangssignal	/ *Output*	grün	/ *green*	——	X	F	9	12	2	3	14
Schirm	/ *Shield*	blank	/ *not isolated*	——	——	Gehäuse/case	Gehäuse/case	13	3	6	9

Nach der vorliegenden Erfahrung ist es empfehlenswert, das Produkt im Abstand von etwa 24 Monaten neu zu kalibrieren. / *According to our experience it is recommended to recalibrate this product in intervals of 24 months.*

Raumtemperatur / *Ambient temperature*: 22 °C ± 2 K Rel. Feuchte / *Relative humidity*: 50 % ± 20 %

Prüfdatum / *Test Date* :**15.11.13** Prüfer / *Inspector* : **O. Bender**

Teilegruppe: 8416 Prüfvariante: 1174 Protokollnr: 1071 Infonr: 13 Druckdatum: 05.12.13 08:59:05 Anwender:jf

burster präzisionsmeßtechnik gmbh und co kg Talstr. 1-5 D-76593 Gernsbach (Postfach 1432 D-76587 Gernsbach) Tel. 07224/645-0 Fax. 07224/645-88
http://www.burster.de http://www.burster.com e-mail: info@burster.de

Diagram: 24 Test and calibration certificate for a strain-gage sensor (specimen)

With two-point calibration you enter two points in succession. The first point, for example, is the zero point under no load (lower scale value or lower analog value), and the second point is the upper limit (upper scale value or upper analog value).

Note: It need not necessarily be the zero point and upper limit; in theory any two value pairs will do.

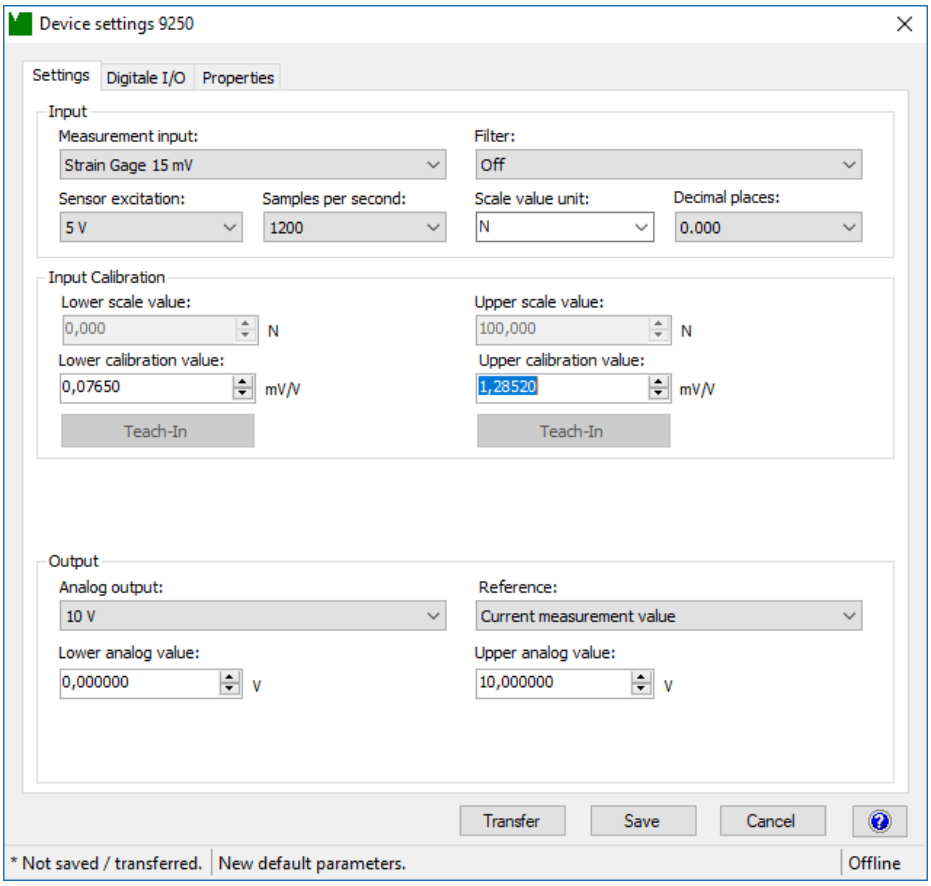
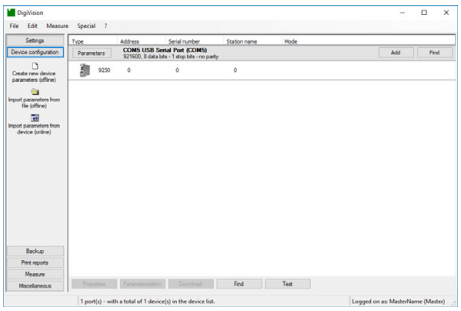


Diagram: 25 Device settings 9250

This is how it works

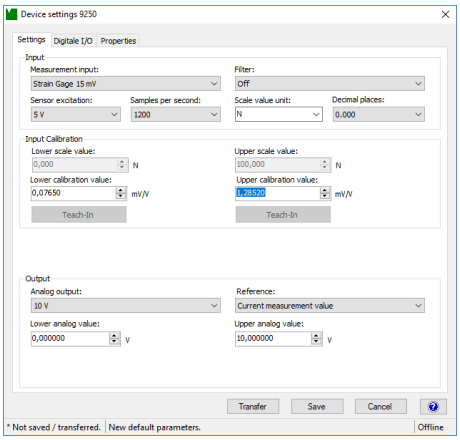
1 Start the DigiVision configuration and analysis software and make sure that the 9250 instrumentation amplifier is connected correctly and appears in the device list.

2 Click in the left-hand menu bar on "Import parameters from device (online)". The DigiVision configuration and analysis software will then import the parameter data held in the 9250 instrumentation amplifier for the strain-gage sensor.
The strain-gage parameter data can be entered here.



3 Remove any load from the strain-gage sensor and adjust the zero point F = 0 N (lower scale value or lower analog value).

4 Enter the lower scale value or lower analog value of the measuring range for the strain-gage sensor. This is normally "0".

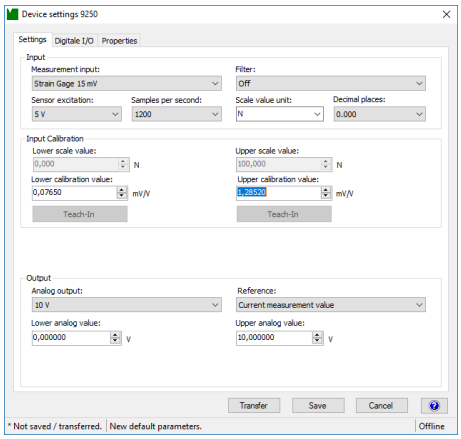


5 Then click the **[Teach-In]** button under "Lower calibration value" and confirm with "OK". The lower calibration value appears in the field (e.g. 0.0765).
The lower calibration value is the electrical signal from the strain-gage sensor under the "load" given by the lower scale value or lower analog value (usually the zero point of the strain-gage sensor).

Note: The option to adjust the scale value is only available for the bus model.

Note: The zero point of a strain-gage sensor may shift from the origin as a result of the way the sensor is mounted (load application components, couplings, adapters etc., which themselves can exert a pre-load) or material aging. This means that the electrical value specified under "Zero output" in the test certificate for the strain-gage sensor will differ from the measured zero point. This is why we recommend always using the teach-in process to set the zero point of the strain-gage sensor.

6 Enter the upper scale value or upper analog value of the measuring range for the strain-gage sensor. For load cells, this is usually the rated load of the sensor. In our example the rated load (nominal force) equals 100 N.



7 Now you need to enter a corrected value for the rated output of the strain-gage sensor in the preferential measurement direction. Add the teach-in value for the lower calibration value (0.0765 in our example) to the full-scale output of the strain-gage sensor.
The full-scale output for the strain-gage sensor is given in the test and calibration certificate under Output signal (e.g. 1.1802). Type in the corrected value (1.1802 + 0.0765 = 1.2567) under "Upper calibration value".

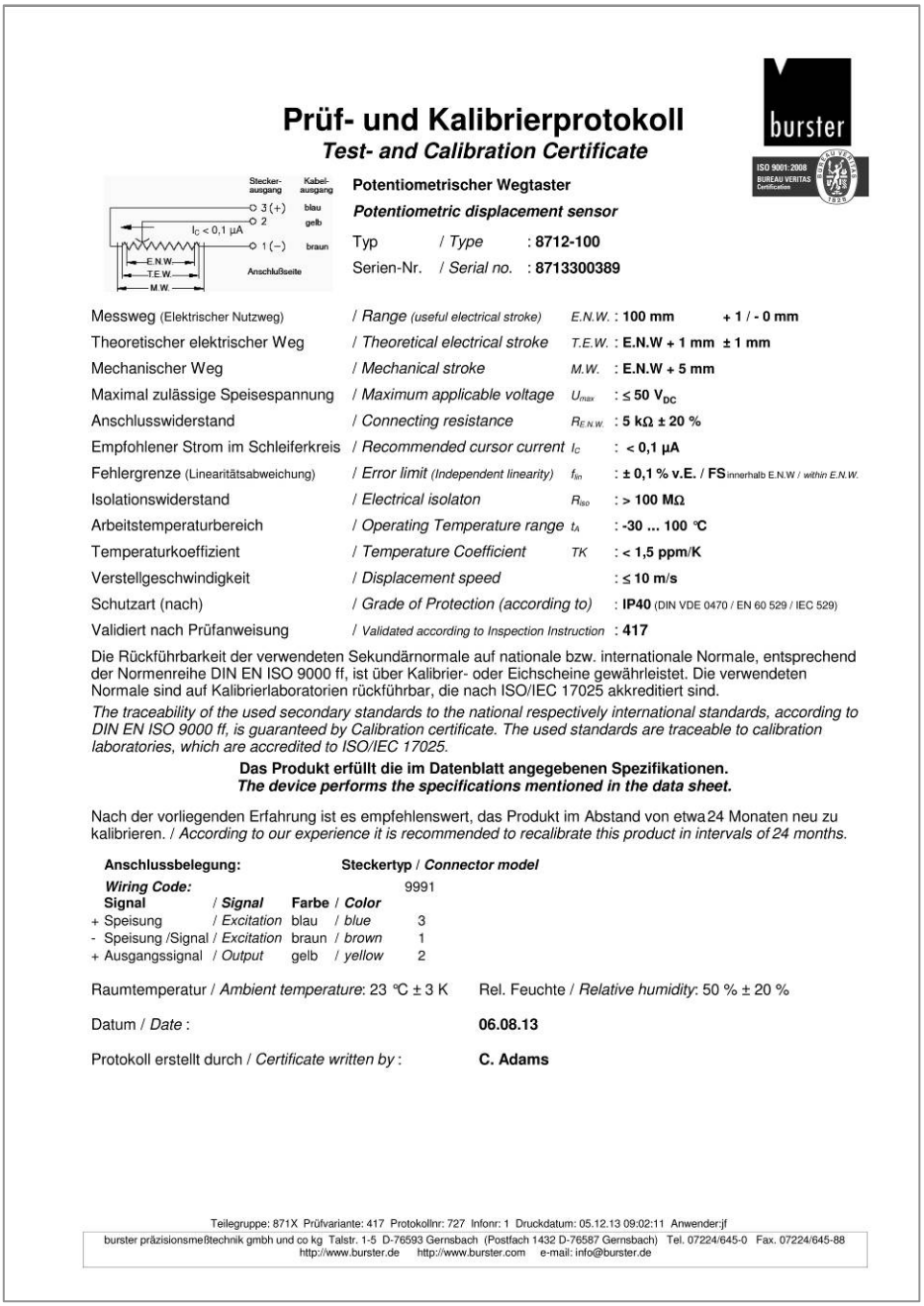
8 Click "Transfer". This completes the adjustment using the test and calibration certificate.

9 If you wish, you can also save the parameter data for the strain-gage sensor in a file.

7.2 Adjustment with potentiometric displacement sensors using the teach-in method

The teach-in method involves two-stage online "training" of the 9250 instrumentation amplifier using sensor data, in which two teach-in states are applied sequentially. The first teach-in state is the zero point under no load (lower scale value or lower analog value), and the second teach-in state is the upper limit (upper scale value or upper analog value). You can obtain all the necessary adjustment data from the test and calibration certificate for the potentiometric displacement sensor.

Measurements using a calibrated gage block have proved to be the most straightforward and practical way of adjustment systems that measure position and length (such as potentiometric displacement sensors). Potentiometric angular position sensors can also be connected.



Prüf- und Kalibrierprotokoll

Test- and Calibration Certificate

Potentiometrischer Wegtaster

Potentiometric displacement sensor

Typ / *Type* : **8712-100**

Serien-Nr. / *Serial no.* : **8713300389**

Messweg (Elektrischer Nutzweg)	/ *Range (useful electrical stroke)*	*E.N.W.*	: **100 mm** **+ 1 / - 0 mm**
Theoretischer elektrischer Weg	/ *Theoretical electrical stroke*	*T.E.W.*	: **E.N.W + 1 mm** **± 1 mm**
Mechanischer Weg	/ *Mechanical stroke*	*M.W.*	: **E.N.W + 5 mm**
Maximal zulässige Speisespannung	/ *Maximum applicable voltage*	U_{max}	: **≤ 50 V_{DC}**
Anschlusswiderstand	/ *Connecting resistance*	$R_{E.N.W.}$	: **5 kΩ ± 20 %**
Empfohlener Strom im Schleiferkreis	/ *Recommended cursor current*	I_C	: **< 0,1 µA**
Fehlergrenze (Linearitätsabweichung)	/ *Error limit (Independent linearity)*	f_{lin}	: **± 0,1 % v.E. / FS** innerhalb E.N.W / *within E.N.W.*
Isolationswiderstand	/ *Electrical isolaton*	R_{iso}	: **> 100 MΩ**
Arbeitstemperaturbereich	/ *Operating Temperature range*	t_A	: **-30 ... 100 °C**
Temperaturkoeffizient	/ *Temperature Coefficient*	*TK*	: **< 1,5 ppm/K**
Verstellgeschwindigkeit	/ *Displacement speed*		: **≤ 10 m/s**
Schutzart (nach)	/ *Grade of Protection (according to)*		: **IP40** (DIN VDE 0470 / EN 60 529 / IEC 529)
Validiert nach Prüfanweisung	/ *Validated according to Inspection Instruction*		: **417**

Die Rückführbarkeit der verwendeten Sekundärnormale auf nationale bzw. internationale Normale, entsprechend der Normenreihe DIN EN ISO 9000 ff, ist über Kalibrier- oder Eichscheine gewährleistet. Die verwendeten Normale sind auf Kalibrierlaboratorien rückführbar, die nach ISO/IEC 17025 akkreditiert sind.

The traceability of the used secondary standards to the national respectively international standards, according to DIN EN ISO 9000 ff, is guaranteed by Calibration certificate. The used standards are traceable to calibration laboratories, which are accredited to ISO/IEC 17025.

Das Produkt erfüllt die im Datenblatt angegebenen Spezifikationen.
The device performs the specifications mentioned in the data sheet.

Nach der vorliegenden Erfahrung ist es empfehlenswert, das Produkt im Abstand von etwa 24 Monaten neu zu kalibrieren. / *According to our experience it is recommended to recalibrate this product in intervals of 24 months.*

Anschlussbelegung: **Steckertyp / *Connector model***

Wiring Code: 9991

Signal / ***Signal***	**Farbe / *Color***	
+ Speisung / *Excitation*	blau / *blue*	3
- Speisung /Signal / *Excitation*	braun / *brown*	1
+ Ausgangssignal / *Output*	gelb / *yellow*	2

Raumtemperatur / *Ambient temperature*: 23 °C ± 3 K Rel. Feuchte / *Relative humidity*: 50 % ± 20 %

Datum / *Date* : **06.08.13**

Protokoll erstellt durch / *Certificate written by* : **C. Adams**

Teilegruppe: 871X Prüfvariante: 417 Protokollnr: 727 Infonr: 1 Druckdatum: 05.12.13 09:02:11 Anwender:jf

burster präzisionsmeßtechnik gmbh und co kg Talstr. 1-5 D-76593 Gernsbach (Postfach 1432 D-76587 Gernsbach) Tel. 07224/645-0 Fax. 07224/645-88
http://www.burster.de http://www.burster.com e-mail: info@burster.de

Diagram: 26 Test and calibration certificate for a potentiometric displacement sensor (specimen)

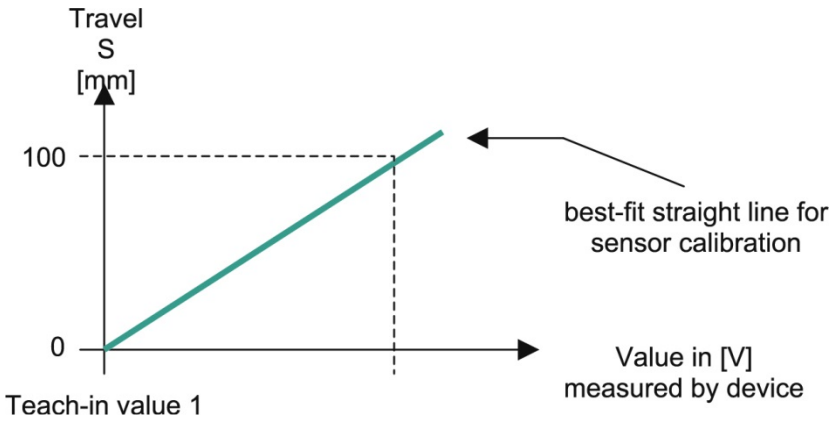


Diagram: 27 Characteristic sensor curve

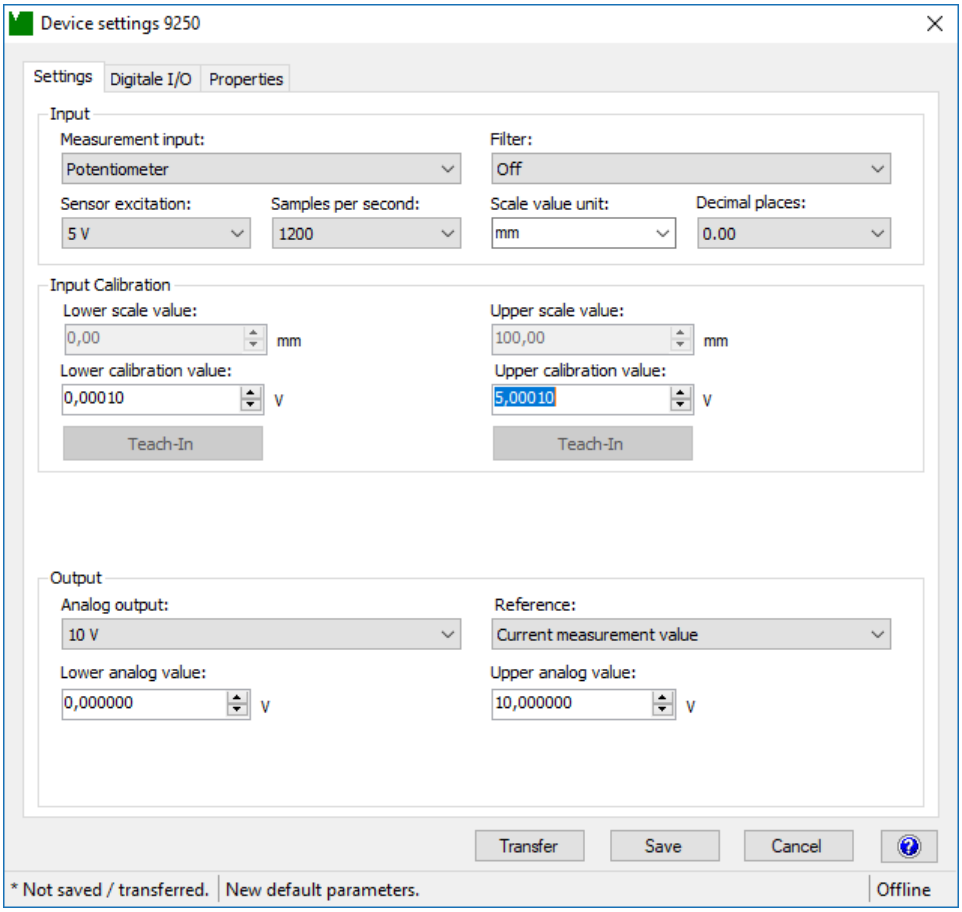
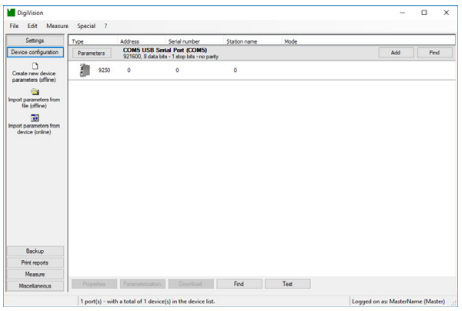


Diagram: 28 Device settings 9250

This is how it works

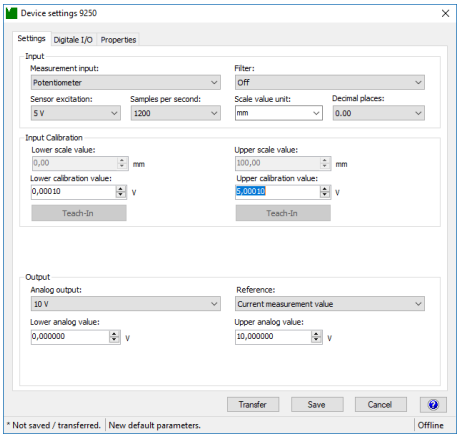
1 Start the DigiVision configuration and analysis software and make sure that the 9250 instrumentation amplifier is connected correctly and appears in the device list.

2 Click in the left-hand menu bar on "Import parameters from device (online)". The DigiVision configuration and analysis software will then import the parameter data held in the 9250 instrumentation amplifier for the potentiometric displacement sensor.
It is this parameter data for the potentiometric displacement sensor that can now be obtained by the teach-in procedure.



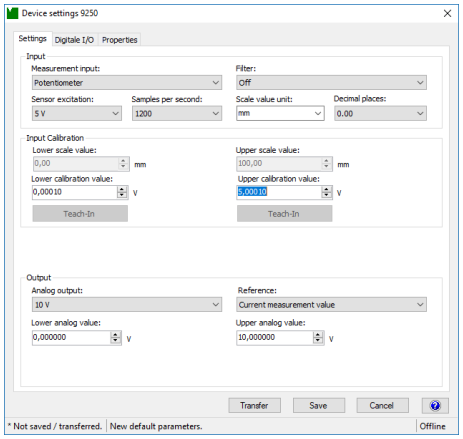
3 Position measurement using the example of a potentiometric displacement sensor of type 8712-100:
Set the potentiometric displacement sensor to the zero position (0.00 mm). Usually this is when the sliding shaft of the sensor is fully pushed in, but there may be slight differences between the mechanical and electrical zero points.

4 Enter the lower scale value or lower analog value of the measuring range for the potentiometric displacement sensor. Usually this is the lower range value of the sensor, e.g. 0.00 mm.



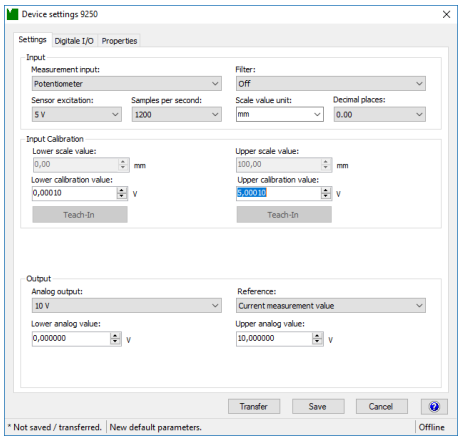
5 Then click the **[Teach-In]** button under "Lower calibration value" and confirm with "OK". The lower calibration value appears in the field.

6 Enter the upper scale value or upper analog value of the measuring range for the potentiometric displacement sensor, for instance 100.00 mm.



7 Now move the sliding shaft using a calibrated gage block to s = 100 mm to set the upper scale value.

8 Then click the **[Teach-In]** button under "Upper calibration value" and confirm with "OK". In our example we have specified "2" decimal places.



9 Click "Transfer". This completes the teach-in method.

10 If you wish, you can also save the parameter data for the potentiometric displacement sensor in a file.

Note: The option to adjust the scale value and set the number of decimal places is only available for the bus model.

Note: The maximum permitted sensor excitation voltage for the potentiometric displacement sensors is given in the test and calibration certificate. To enable practical measurements, choose the 5 V excitation voltage. The maximum measurement signal output from potentiometric displacement sensors is always the excitation voltage.

7.3 Adjustment with transmitters or sensors having a standard signal output

7.3.1 Adjustment with transmitters with voltage output by the teach-in method

The teach-in method involves two-stage online "training" of the 9250 instrumentation amplifier using sensor data, in which two teach-in states are applied sequentially. The first teach-in state is the zero point under no load (lower scale value or lower analog value), and the second teach-in state is the upper limit (upper scale value or upper analog value).

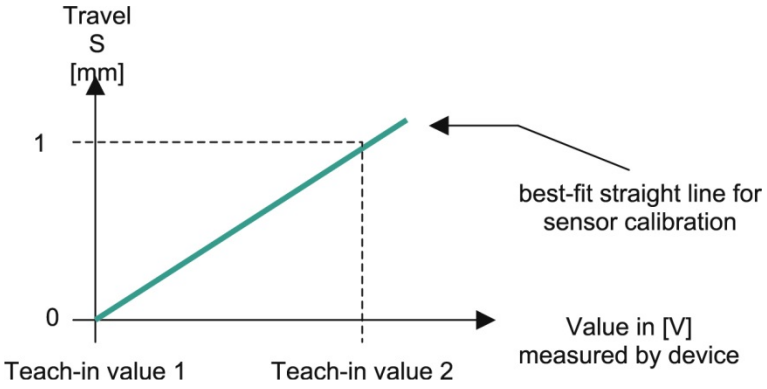


Diagram: 29 Characteristic sensor curve

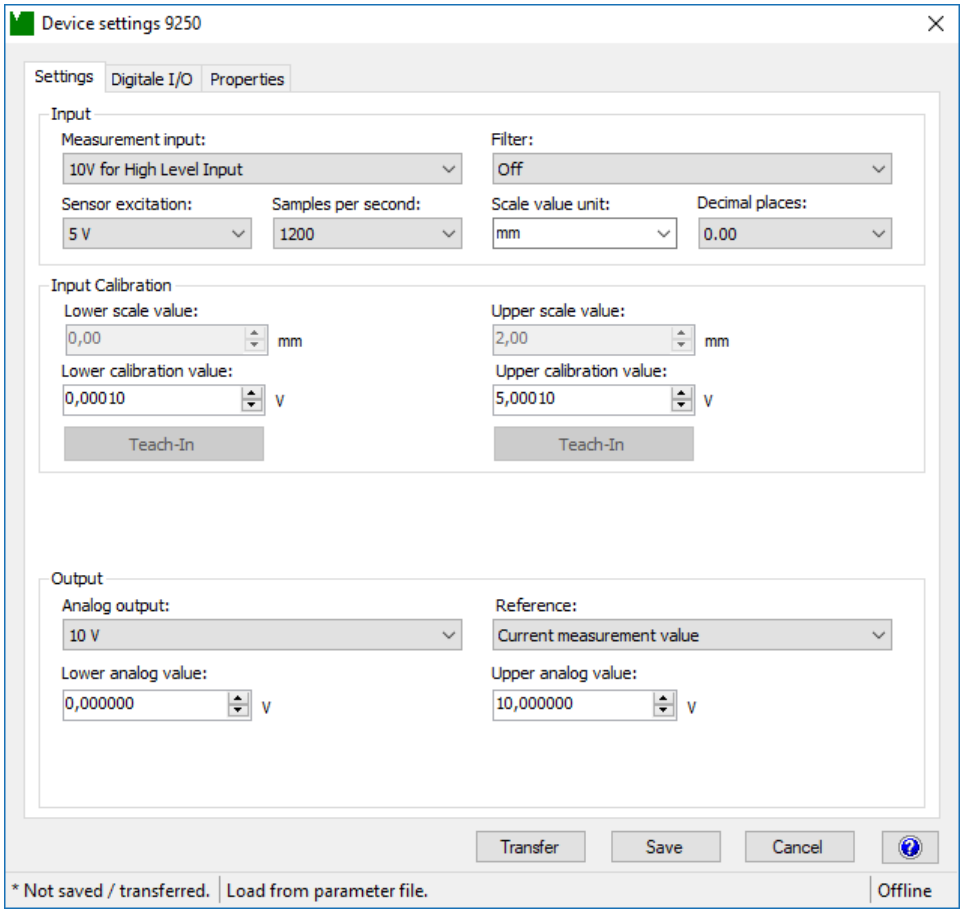
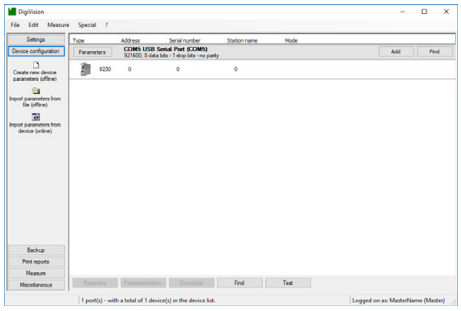


Diagram: 30 Device settings 9250

This is how it works

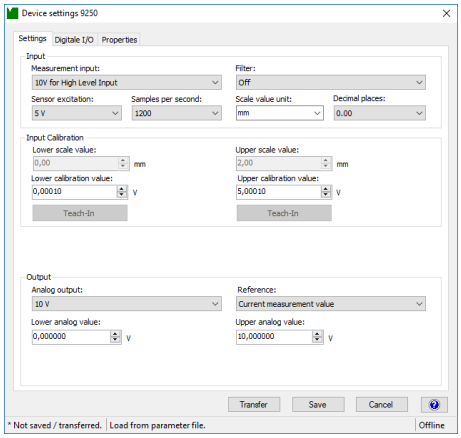
1 Start the DigiVision configuration and analysis software and make sure that the 9250 instrumentation amplifier is connected correctly and appears in the device list.

2 Click in the left-hand menu bar on "Import parameters from device (online)". The DigiVision configuration and analysis software will then import the sensor parameter data held in the 9250 instrumentation amplifier.
It is this sensor parameter data that can now be obtained by the teach-in procedure.



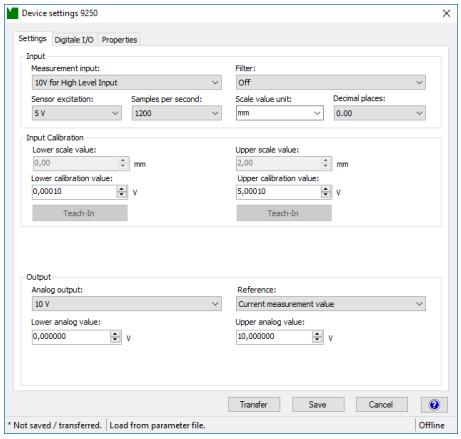
3 Position measurement using the example of an inductive displacement transducer of type 8740-5001:
Set the displacement transducer to the zero position (0.00 mm). Usually this is when the sliding shaft of the sensor is fully extended, but there may be slight differences between the mechanical and electrical zero points.

4 Enter the lower scale value or lower analog value of the measuring range for the inductive displacement transducer. Usually this is the lower range value of the sensor, e.g. 0.00 mm.



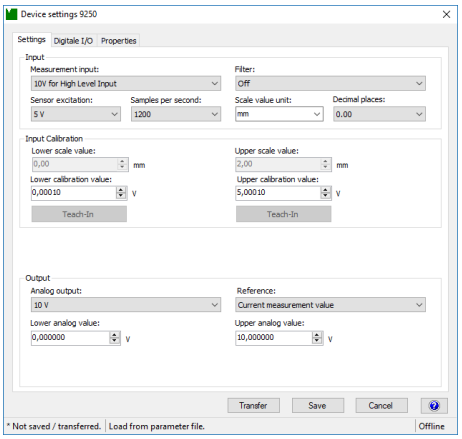
5 Then click the **[Teach-In]** button under "Lower calibration value" and confirm with "OK". The lower calibration value appears in the field.

6 Enter the upper scale value or upper analog value of the measuring range for the inductive displacement transducer, for instance 2.00 mm.



7 Now move the sliding shaft using a calibrated gage block to s = 2.00 mm to set the upper scale value.

8 Then click the **[Teach-In]** button under "Upper calibration value" and confirm with "OK". In our example we have specified "2" decimal places.



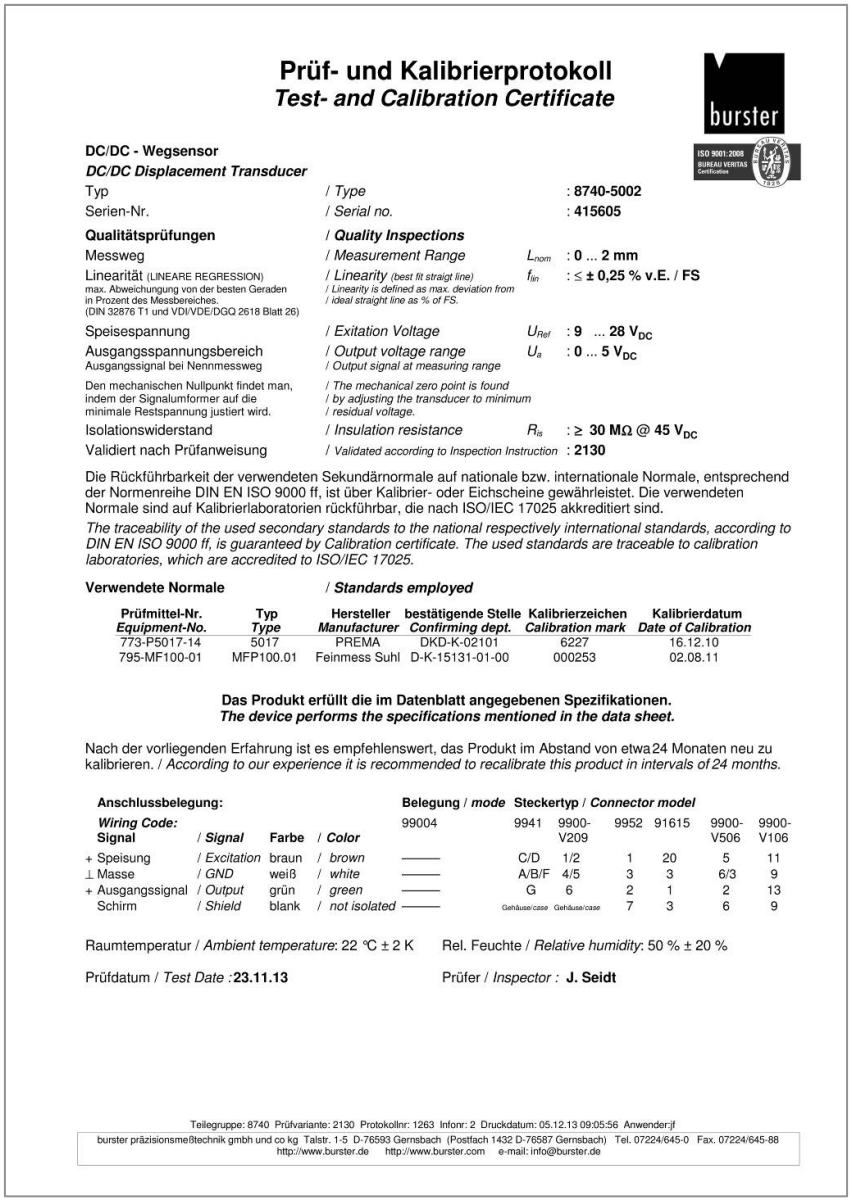
9 Click "Transfer". This completes the teach-in method.

10 If you wish, you can also save the sensor parameter data in a file.

Note: The option to adjust the scale value and set the number of decimal places is only available for the bus model.

7.3.2 Rescaling using the test and calibration certificate

This method involves a two-point calibration in which you enter the necessary data directly in the 9250 instrumentation amplifier. You can obtain all the necessary rescaling data from the test and calibration certificate for the transmitter or sensor with standard-signal output.



Prüf- und Kalibrierprotokoll
Test- and Calibration Certificate

burster
ISO 9001:2008 BUREAU VERITAS Certification

DC/DC - Wegsensor
DC/DC Displacement Transducer

Typ	/ *Type*		: **8740-5002**
Serien-Nr.	/ *Serial no.*		: **415605**
Qualitätsprüfungen	/ ***Quality Inspections***		
Messweg	/ *Measurement Range*	L_{nom}	: **0 ... 2 mm**
Linearität (LINEARE REGRESSION) max. Abweichungung von der besten Geraden in Prozent des Messbereiches. (DIN 32876 T1 und VDI/VDE/DGQ 2618 Blatt 26)	/ *Linearity (best fit straigt line)* / *Linearity is defined as max. deviation from* / *ideal straight line as % of FS.*	f_{lin}	: ≤ **± 0,25 % v.E. / FS**
Speisespannung	/ *Exitation Voltage*	U_{Ref}	: **9 ... 28 V_{DC}**
Ausgangsspannungsbereich Ausgangssignal bei Nennmessweg	/ *Output voltage range* / *Output signal at measuring range*	U_a	: **0 ... 5 V_{DC}**
Den mechanischen Nullpunkt findet man, indem der Signalumformer auf die minimale Restspannung justiert wird.	/ *The mechanical zero point is found* / *by adjusting the transducer to minimum* / *residual voltage.*		
Isolationswiderstand	/ *Insulation resistance*	R_{is}	: ≥ **30 MΩ @ 45 V_{DC}**
Validiert nach Prüfanweisung	/ *Validated according to Inspection Instruction*		: **2130**

Die Rückführbarkeit der verwendeten Sekundärnormale auf nationale bzw. internationale Normale, entsprechend der Normenreihe DIN EN ISO 9000 ff, ist über Kalibrier- oder Eichscheine gewährleistet. Die verwendeten Normale sind auf Kalibrierlaboratorien rückführbar, die nach ISO/IEC 17025 akkreditiert sind.

The traceability of the used secondary standards to the national respectively international standards, according to DIN EN ISO 9000 ff, is guaranteed by Calibration certificate. The used standards are traceable to calibration laboratories, which are accredited to ISO/IEC 17025.

Verwendete Normale / ***Standards employed***

Prüfmittel-Nr. *Equipment-No.*	Typ *Type*	Hersteller *Manufacturer*	bestätigende Stelle *Confirming dept.*	Kalibrierzeichen *Calibration mark*	Kalibrierdatum *Date of Calibration*
773-P5017-14	5017	PREMA	DKD-K-02101	6227	16.12.10
795-MF100-01	MFP100.01	Feinmess Suhl	D-K-15131-01-00	000253	02.08.11

Das Produkt erfüllt die im Datenblatt angegebenen Spezifikationen.
The device performs the specifications mentioned in the data sheet.

Nach der vorliegenden Erfahrung ist es empfehlenswert, das Produkt im Abstand von etwa 24 Monaten neu zu kalibrieren. / *According to our experience it is recommended to recalibrate this product in intervals of 24 months.*

Anschlussbelegung:				**Belegung** / ***mode***	**Steckertyp** / ***Connector model***					
Wiring Code: **Signal**	/ ***Signal***	**Farbe**	/ ***Color***	99004	9941	9900-V209	9952	91615	9900-V506	9900-V106
+ Speisung	/ *Excitation*	braun	/ *brown*	———	C/D	1/2	1	20	5	11
⊥ Masse	/ *GND*	weiß	/ *white*	———	A/B/F	4/5	3	3	6/3	9
+ Ausgangssignal	/ *Output*	grün	/ *green*	———	G	6	2	1	2	13
Schirm	/ *Shield*	blank	/ *not isolated*	———	Gehäuse/case	Gehäuse/case	7	3	6	9

Raumtemperatur / *Ambient temperature*: 22 °C ± 2 K Rel. Feuchte / *Relative humidity*: 50 % ± 20 %

Prüfdatum / *Test Date* : **23.11.13** Prüfer / *Inspector* : **J. Seidt**

Teilegruppe: 8740 Prüfvariante: 2130 Protokollnr: 1263 Infonr: 2 Druckdatum: 05.12.13 09:05:56 Anwender:jf

burster präzisionsmeßtechnik gmbh und co kg Talstr. 1-5 D-76593 Gernsbach (Postfach 1432 D-76587 Gernsbach) Tel. 07224/645-0 Fax. 07224/645-88
http://www.burster.de http://www.burster.com e-mail: info@burster.de

Diagram: 31 Test and calibration certificate (sample)

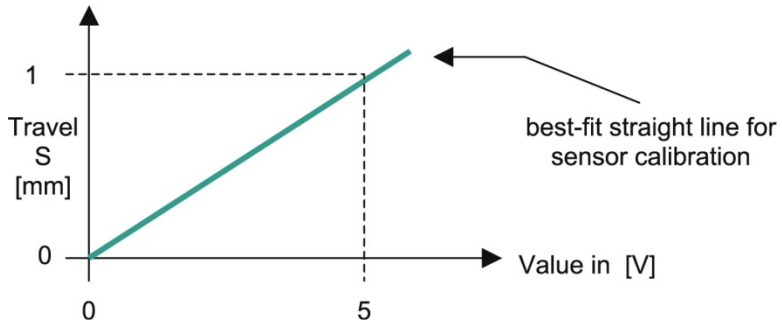


Diagram: 32 Characteristic sensor curve

With two-point calibration you enter two points in succession. The first point is the zero point under no load (lower scale value or lower analog value), and the second point is the upper limit (upper scale value or upper analog value).

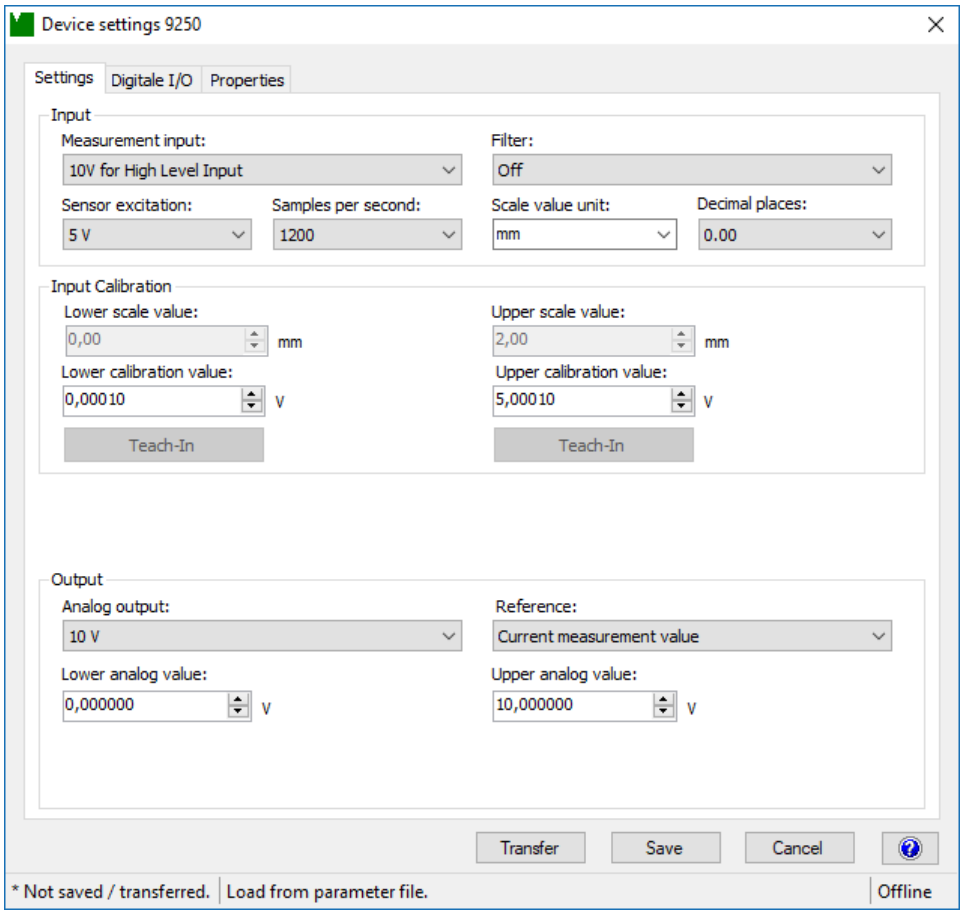


Diagram: 33 Device settings 9250

The adjustment was performed as follows:

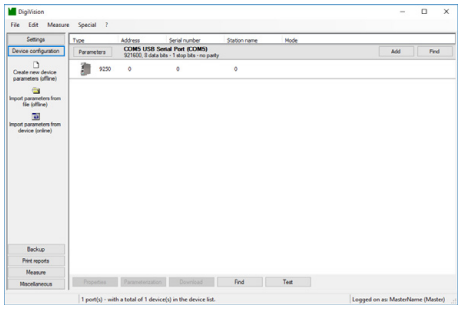
Output voltage range of 0 ... 10 V ≡ **measured displacement** 0 ... 2 mm.

This adjustment data must now be transferred to the 9250 instrumentation amplifier; if required it can also be saved.

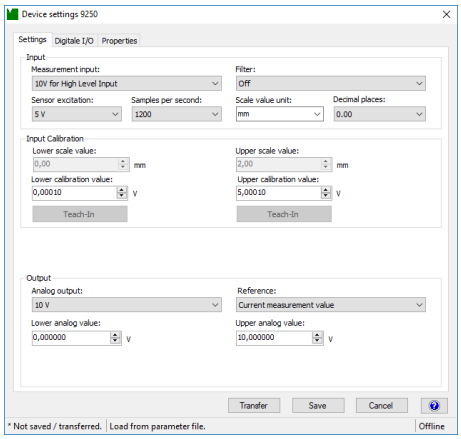
This is how it works

1 Start the DigiVision configuration and analysis software and make sure that the 9250 instrumentation amplifier is connected correctly and appears in the device list.

2 Click in the left-hand menu bar on "Import parameters from device (online)". The DigiVision configuration and analysis software will then import the sensor parameter data held in the 9250 instrumentation amplifier.
The sensor parameter data can be entered here.



3 Enter the Lower scale value, the Lower calibration value, the Upper scale value and the Upper calibration value from the test and calibration report for the sensor.



Note: The option to adjust the scale value is only available for the bus model.

4 Click "Transfer". This completes the adjustment using the test and calibration certificate.

5 If you wish, you can also save the sensor parameter data in a file.

7.4 Adjustment of the counter input

The 9250 instrumentation amplifier optionally includes a 32-bit counter, which can be operated and configured in 3 different modes.

7.4.1 Totalizing counter

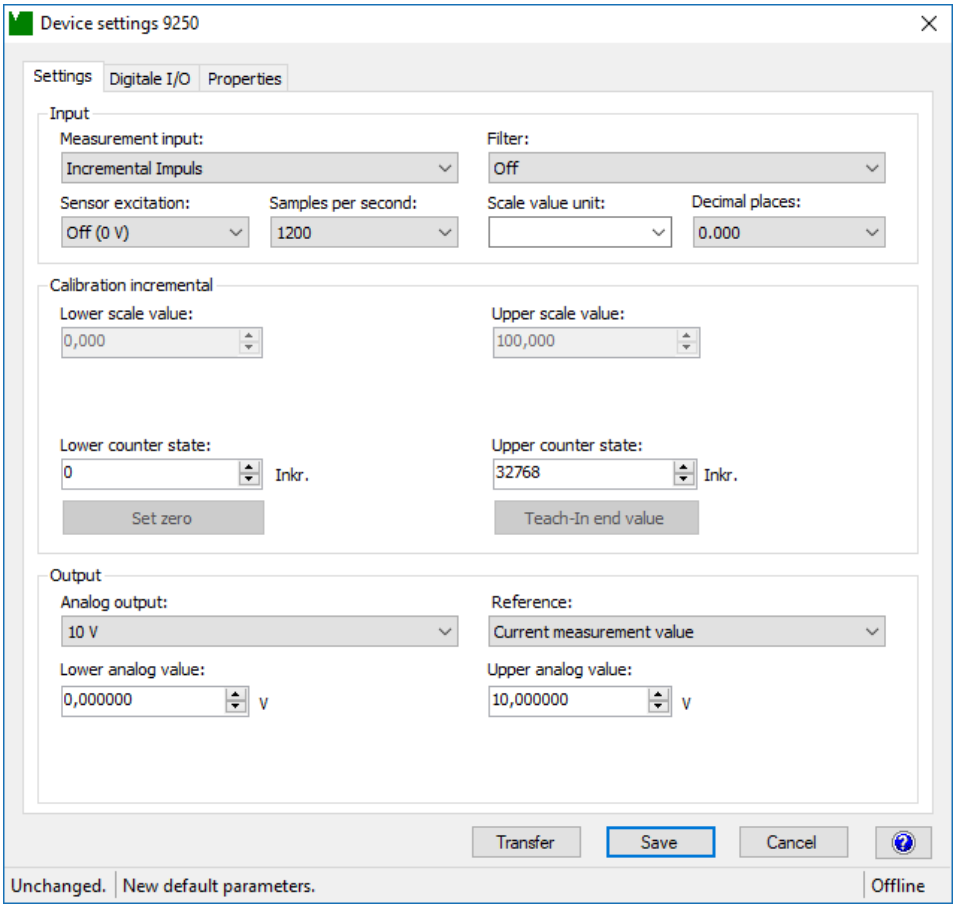
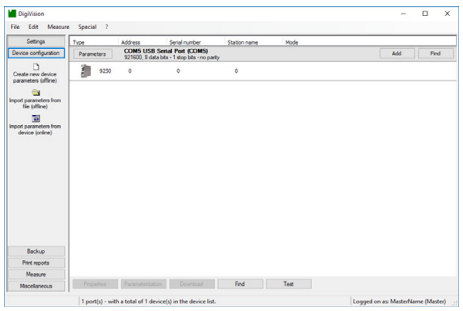


Diagram: 34 Device settings for the totalizing counter (Incremental Impuls mode)

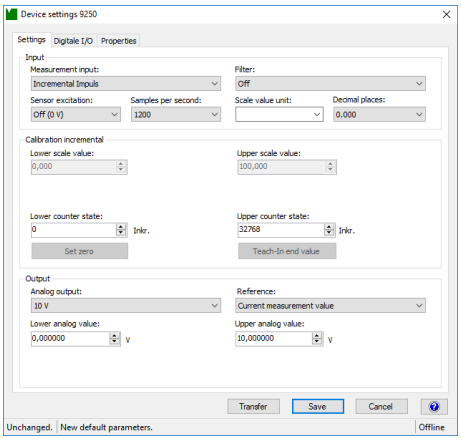
This is how it works

1 Start the DigiVision configuration and analysis software and make sure that the 9250 instrumentation amplifier is connected correctly and appears in the device list.

2 Click in the left-hand menu bar on "Import parameters from device (online)".
The parameter data can be entered here.



3 Set the "Lower counter state" at which the lower scale value or lower analog output is output. This is usually 0.



4 Set the "Upper counter state" at which the upper scale value or upper analog output is output. Alternatively, you can use the teach-in option to obtain this value. Click **[Teach-In end value]** if you want to obtain the upper counter state by the teach-in method. The decimal places have been set to "3" in our example.

5 Click "Transfer". This completes data entry.

6 If you wish, you can also save the parameter data in a file.

Note: The option to adjust the scale value and set the number of decimal places is only available for the bus model.

7.4.2 360° angle of rotation

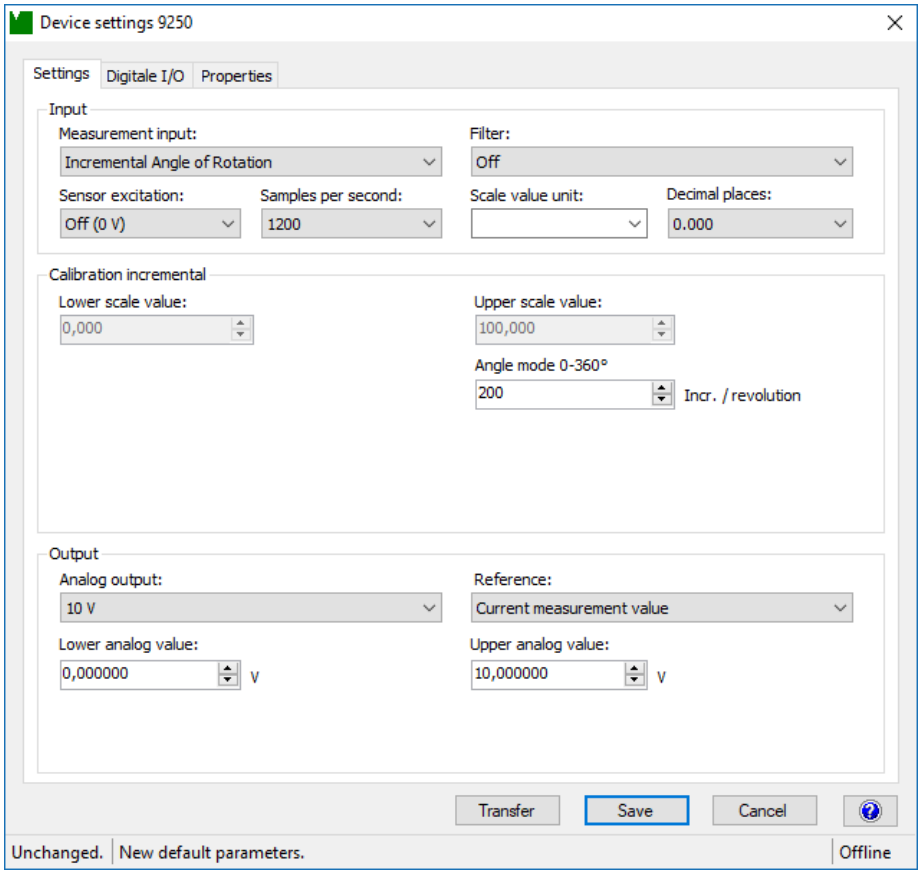
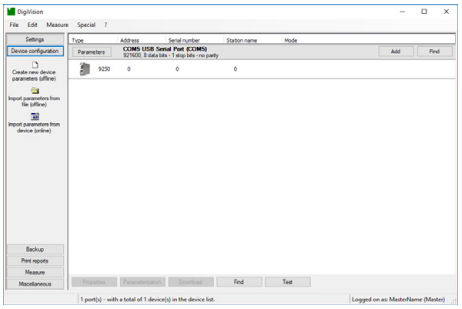


Diagram: 35 Device settings for 360° angle of rotation (Incremental Angle of Rotation mode)

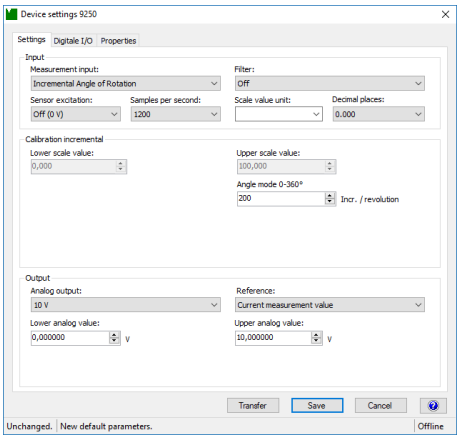
This is how it works

1 Start the DigiVision configuration and analysis software and make sure that the 9250 instrumentation amplifier is connected correctly and appears in the device list.

2 Click in the left-hand menu bar on "Import parameters from device (online)".
The parameter data can be entered here.



3 Enter the number of increments per revolution that your rotary encoder outputs.



4 Set the lower scale value or lower analog value, and the upper scale value or upper analog value. The decimal places have been set to "3" in our example.

5 Click "Transfer". This completes data entry.

6 If you wish, you can also save the parameter data in a file.

Note: The option to adjust the scale value and set the number of decimal places is only available for the bus model.

7.4.3 Rotational speed

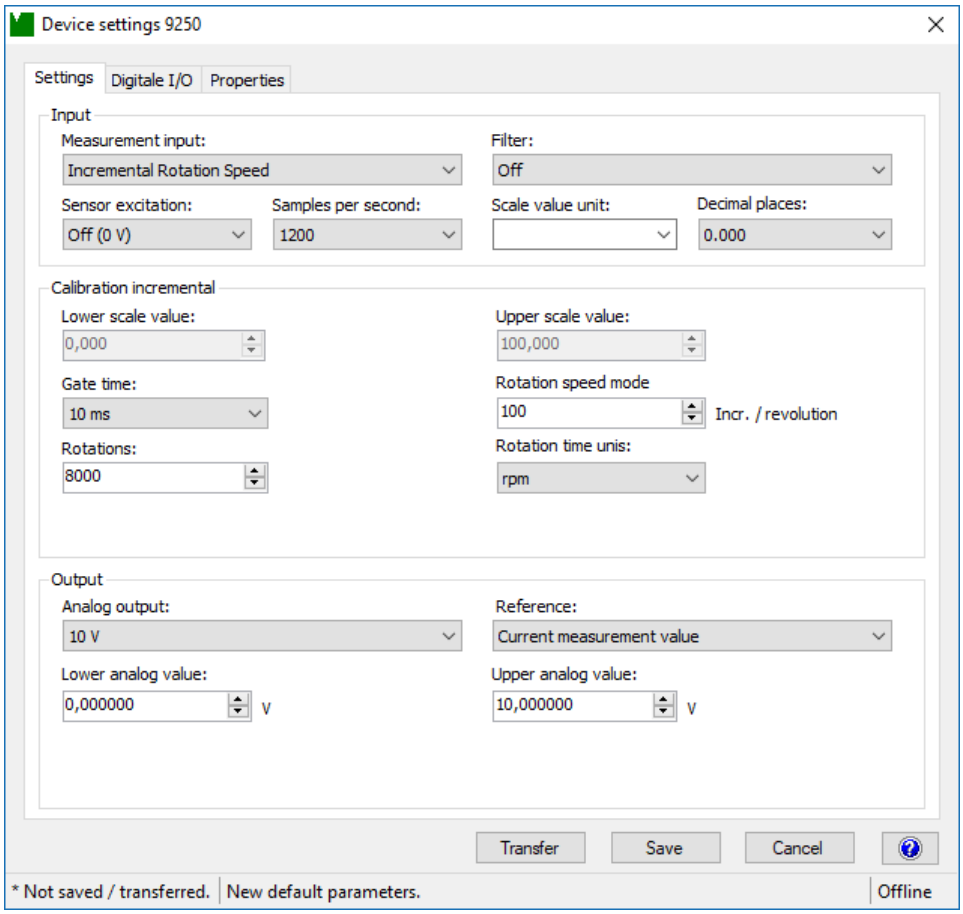
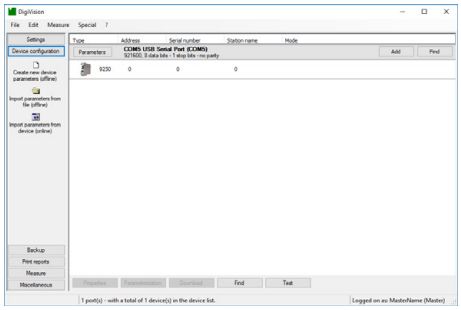


Diagram: 36 Device settings for rotational speed (Incremental Angle of rotation mode)

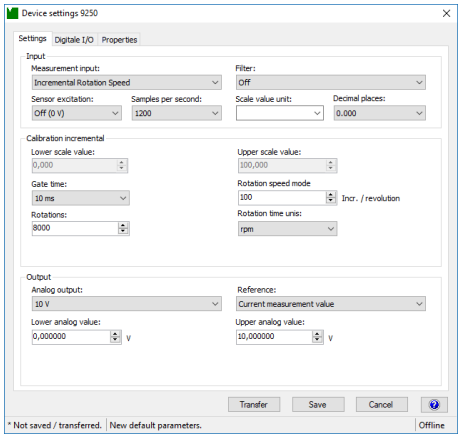
This is how it works

1 Start the DigiVision configuration and analysis software and make sure that the 9250 instrumentation amplifier is connected correctly and appears in the device list.

2 Click in the left-hand menu bar on "Import parameters from device (online)".
The parameter data can be entered here.



3 Enter the number of increments per revolution that your rotary encoder outputs.



4 Set the lower scale value or lower analog value, and the upper scale value or upper analog value. The decimal places have been set to "3" in our example.

5 Set the “Gate time” (the time over which counting is performed). A longer gate time makes sense for slow speeds.

6 Specify whether the output is in revolutions/min or revolutions/s.

7 Click "Transfer". This completes data entry.

8 If you wish, you can also save the parameter data in a file.

Note: The option to adjust the scale value and set the number of decimal places is only available for the bus model.

8 Customer Services for your 9250 instrumentation amplifier

To complement the 9250 instrumentation amplifier package you have purchased, burster präzisionsmesstechnik gmbh & co kg offers the following customer services:

- On-site support for preparing the instrument for use
- Product training (in-house training at burster's premises or on-site training at customer's premises)
- Initial calibration and recalibration, including sensors

To inquire about our customer services for your 9250 instrumentation amplifier, please telephone our Service department on (+49) 07224-645-53, or email: service@burster.de (Germany only). If you are outside Germany, you should contact your burster agent (see also www.burster.com).

9 Technical data

The data sheet for the 9250 instrumentation amplifier contains the detailed technical specification. You can obtain the latest data sheet and additional information on the 9250 instrumentation amplifier from https://goo.gl/MQ27sG or simply use the QR code below:

Diagram: 37 QR code for the 9250 instrumentation amplifier product page

9.1 Electromagnetic compatibility

9.1.1 Interference immunity

Interference immunity in compliance with EN 61326-1:2013

Industrial environment

9.1.2 Interference emission

Interference emission in compliance with EN 61326-1:2013

10 Accessories available

The data sheet for the 9250 instrumentation amplifier contains details of the accessories available. You can obtain the latest data sheet and additional information on the 9250 instrumentation amplifier from https://goo.gl/MQ27sG or simply use the QR code below:

Diagram: 38 QR code for the 9250 instrumentation amplifier product page

11 Disposal

Battery disposal

In Germany, the end user is legally obliged to return all used batteries, and it is illegal to dispose of batteries in the household waste. This law may also affect you as purchaser of the instrument described here. Please dispose of your used batteries properly and in accordance with national statutory regulations. Either take them to the relevant collection point in your organization or to the collection points provided by your local authority, our company or any battery retail outlet.

Instrument disposal

If your instrument is no longer usable, please comply with your legal obligations by disposing of the instrument described here in accordance with statutory regulations. You will then be helping to protect the environment!