MICRO-EPSILON

Operating Instructions

MSC7401

Miniature sensor controller for inductive sensors

MICRO-EPSILON
MESSTECHNIK
GmbH & Co. KG
Koenigbacher Strasse 15

94496 Ortenburg / Germany

Tel. +49 (0) 8542 / 168-0
Fax +49 (0) 8542 / 168-90
e-mail info@micro-epsilon.de
www.micro-epsilon.com

Contents

1. Safety 5
1.1 Symbols Used 5
1.2 Warnings 5
1.3 Notes on CE Marking 6
1.4 Intended Use 6
1.5 Proper Environment 7

2. Functional Principle, Technical Data 8
2.1 Functional Principle 8
2.2 Design 9
2.3 Technical Data 9

3. Delivery 11
3.1 Unpacking, Included in Delivery 11
3.2 Storage 11

4. Installation and Assembly 12
4.1 Precautions 12
4.2 Controller 12
4.3 Power Supply, Sensor and Signal Output 14
4.3.1 Power Supply and Signal 17
4.3.2 Sensor 18

5. Operation 19
5.1 Initial Operation 20
5.2 Control and Display Elements 21
5.3 Setting 22
5.3.1 Automatic Sensor Recognition 23
5.3.2 Signal 23
5.3.3 Sensor Parameter 24
5.3.4 Adjustment 25

5.4 Menu Structure ... 26
5.4.1 2-Point Adjustment ... 29
5.4.2 Zero Point Search ... 30
5.4.3 Example A: Sensor Parameter Adjustment: DTA-5G8 ... 31
5.4.4 Example B: Signal Output Adjustment: 2 ... 10 V ... 32
5.4.5 Example C: Adjustment via Zero Point Search ... 33
5.4.6 Example D: Adjustment via 2-point Adjustment ... 34

6. Service, Repair ... 35

7. Liability for Material Defects ... 35

8. Decommissioning, Disposal ... 35

Appendix

A 1 Accessories ... 36

A 2 Factory Settings ... 37

A 3 Software ... 38
A 3.1 Search / Sensor Finder ... 38
A 3.2 Measurement ... 42
A 3.2.1 Basic View ... 43
A 3.2.2 Data Acquisition Start / Stop ... 43
A 3.2.3 Signal Processing ... 44
A 3.2.4 CSV Output ... 45
A 3.3 Settings ... 47
A 3.3.1 General ... 47
A 3.3.2 Output ... 49
A 3.3.3 Adjustment ... 50
A 3.3.3.1 Two Point ... 50
A 3.3.3.2 Zero Point ... 53
A 3.4 Info ... 56

1. Safety

System operation assumes knowledge of the operation instructions.

1.1 Symbols Used

The following symbols are used in these operating instructions

⚠ CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a situation that may result in property damage if not avoided.
➪	Indicates a user action.
i	Indicates a tip for users.
`Measure`	Indicates hardware or a software button/menu

1.2 Warnings

⚠ CAUTION

Connect the power supply and the display/output device according to the safety regulations for electrical equipment.
> Risk of injury

> Damage to or destruction of the controller and/or the sensor

NOTICE

Avoid shocks and impacts to the controller and the sensor.
> Damage to or destruction of the controller and/or the sensor

The supply voltage must not exceed the specified limits
> Damage to or destruction of the controller and/or the sensor

Protect the sensor cable against damage.
> Destruction of the sensor

> Failure of the measuring device

1.3 Notes on CE Marking

The following apply to the MSC7401:
- EU Directive 2014/30/EU
- EU Directive 2011/65/EU, “RoHS“ category 9

Products which carry the CE mark satisfy the requirements of the EU directives cited and the European harmonized standards (EN) listed therein. The EU Declaration of Conformity is available to the responsible authorities according to EU Directive, article 10, at:

MICRO-EPSILON MESSTECHNIK
GmbH & Co. KG
Königbacher Straße 15
94496 Ortenburg / Germany

The measuring system is designed for use in industrial environments and meets the requirements.

1.4 Intended Use

The MSC7401 measuring system is designed for use in industrial areas.

It is used to operate inductive displacement sensors based on the LVDT principle (Linear Variable Differential Transformer) and for operation with LDR displacement sensors.
- The system must only be operated within the limits specified in the technical data, see Chap. 2.3.
- The system must be used in such a way that no persons are endangered or machines and other material goods are damaged in the event of malfunction or total failure of the system.
- Take additional precautions for safety and damage prevention for safety-related applications.

1.5 Proper Environment

- Operating temperature: -40 to +85 °C (-40 to 185 °F)
- Humidity: 5 - 95 % (no condensation)
- Ambient pressure: Atmospheric pressure
- Protection class: IP 67
- Storage temperature: -40 to +85 °C (-40 to 185 °F)
- Vibration/Shock: EN 60068-2

2. Functional Principle, Technical Data

2.1 Functional Principle

The MSC7401 is a single-channel miniature sensor controller for the operation of LVDT inductive displacement sensors (full bridge) and for half-bridge sensors.

An electronic oscillator excites the primary coil with an alternating current of a constant frequency. The frequency and amplitude can be set for best operation mode of the respective sensors, see Chap. 5.

The demodulator electronics transforms the signal of the two (secondary) coils into the set output signal. With the setting possibilities for zero point and gain, see Chap. 5., the user can adapt the equipment to the task to be performed.

If the plunger is moved into the sensor, this results in an increase of the output signal, if the plunger is pulled out further, this results in a decrease of the output signal. Change the inputs sec+ and sec-, see Chap. 4.3 or adjust this accordingly in the controller, see Chap. 5.3.4, if the output signal should decrease when the plunger is moved in.

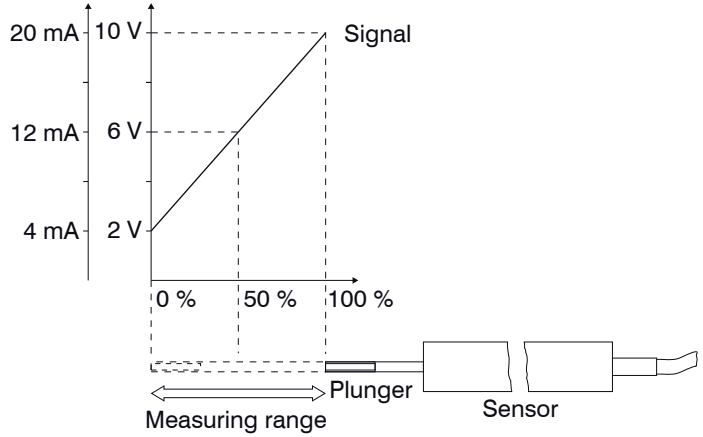


Fig. 1 Measuring principle

2.2 Design

A complete measuring channel consists of
- Sensor
- Controller
- Sensor cable
- Power supply and output cable

Any type of half-bridge and full-bridge sensors can be connected to the amplifier electronics. However, if sensors of other manufacturers are used you should check their functionality in conjunction with the controller. MICRO-EPSILON recommends the inductive displacement sensors and gauging sensors of the induSENSOR DTA and LDR series because they are optimally adjusted with the controller.

2.3 Technical Data

Model		MSC7401
Supply voltage		5 V [1] ... 14 V ... 30 V
Current consumption		< 20 mA (< 40 mA with current output)
Supply protection		Reverse-polarity and overvoltage protection
Sensors		Full bridge sensor/LVDT (series DTA) and half bridge sensor (series LDR)
Sensor excitation		550 mV_{PP}, 350 mV_{PP}, 150 mV_{PP}, 75 mV_{PP} 1, 2, 5, 10 kHz (DTA) / 9, 13, 16, 21 kHz (LDR) [2]
Input impedance Sensor		> 100 kOhm
Adjustment range	Gain	Definition by 2 points of a straight line of the output signal with respect to the target position. The distance between the two points must be greater than 10 % of the measuring range [3].
	Zero	
Output (adjustable) [4]		(0)2 ... 10 VDC / 0.5 ... 4.5 V / 0 ... 5 V (R_a > 1 kOhm) or (0)4 ... 20 mA (load < 500 Ohm)
Resolution [5]	DTA series	13 bits (0.012 % FSO) at 50 Hz 12 bits (0.024 % FSO) at 300 Hz
	LDR series	12 bits (0.024 % FSO) at 50 Hz 10 bits (0.048 % FSO) at 300 Hz

Model		MSC7401
Linearity		< 0.02 % FSO
Frequency response		300 Hz (-3 dB) [6]
Operating temperature		-40 °C ... +85 °C (-40 ... +185 °F)
Storage temperature		-40 °C ... +85 °C (-40 ... +185 °F)
Temperature stability		DTA series: ±100 ppm d.M. /K | LDR series: ±125 ppm d.M. /K
Protection class		IP 67 [7]
Weight		Approx. 200 g
Housing material		Aluminum die casting
Connection	Cable gland	Screw terminals; AWG 16 to AWG 24; with ferrule to AWG 28
	Connector	Power supply: M12x1 plug (5 poles); sensor: M9 socket; 5 poles (Binder)
Vibration		DIN EN 60068-2-6
Shock		DIN EN 60068-2-27 (40 g, 6 ms, 1000 per axis)
		DIN EN 60068-2-27 (100 g, 6 ms, 3 per axis)

FSO = Full Scale Output
1) With technical restrictions on output signal (load and signal span)
U_B = 5 V: No voltage output available; current output: max. load 100 Ω
U_B = 9 V: Voltage output: 0.5 V ... 4.5 V or 0 V ... 5 V; current output: max. load 250 Ω
U_B = 12 V: Voltage output: Load > 10 KΩ; current output: max. load 400 Ω

2) Setting via buttons; additional levels adjustable via software
3) The resolution of the system might be reduced depending on the type of sensor and the distance between the two points.
4) The output signal is limited to 21 mA for controller with current output.
5) Noise: AC RMS measurement via RC low-pass filter of the 1st order with fc = 5 kHz
6) Only adjustable via software.
7) When using suitable cables or plugs.

3. Delivery

3.1 Unpacking, Included in Delivery

1 Controller

1 Assembly instructions

- Carefully remove the components of the measuring system from the packaging and ensure that the goods are forwarded in such a way that no damage can occur.
- Check the delivery for completeness and shipping damage immediately after unpacking.
- If there is damage or parts are missing, immediately contact the manufacturer or supplier.

Optional accessories are available in the appendix, see Chap. A 1.

3.2 Storage

Storage temperature: -40 up to +85 °C (-40 to +185 °F)

Humidity: 5 - 95 % (no condensation)

4. Installation and Assembly

4.1 Precautions

NOTICE

The sensor cable and the power supply/output cable must not be exposed to sharp-edged or heavy objects.
> Damage to or destruction of the controller

➡ Check all the connectors for tightness of fit before the equipment is started.

ℹ Pay attention to careful handling during installation and operation.

4.2 Controller

➡ Fasten the controller of series MSC7401 by means of two screws M4.

The position of the mounting holes is shown in the drawing, see Fig. 2.

The tightening torque of the cover screws is 0.9 N m. The maximum tightening torque for the WS15 (M12 cable gland is 1.5 Nm) and for the WS19 (M16 cable gland it is 3 Nm).

NOTICE

Please note that less torque should be applied for cable glands with various cable sheath materials.

> Damage to the cable sheath

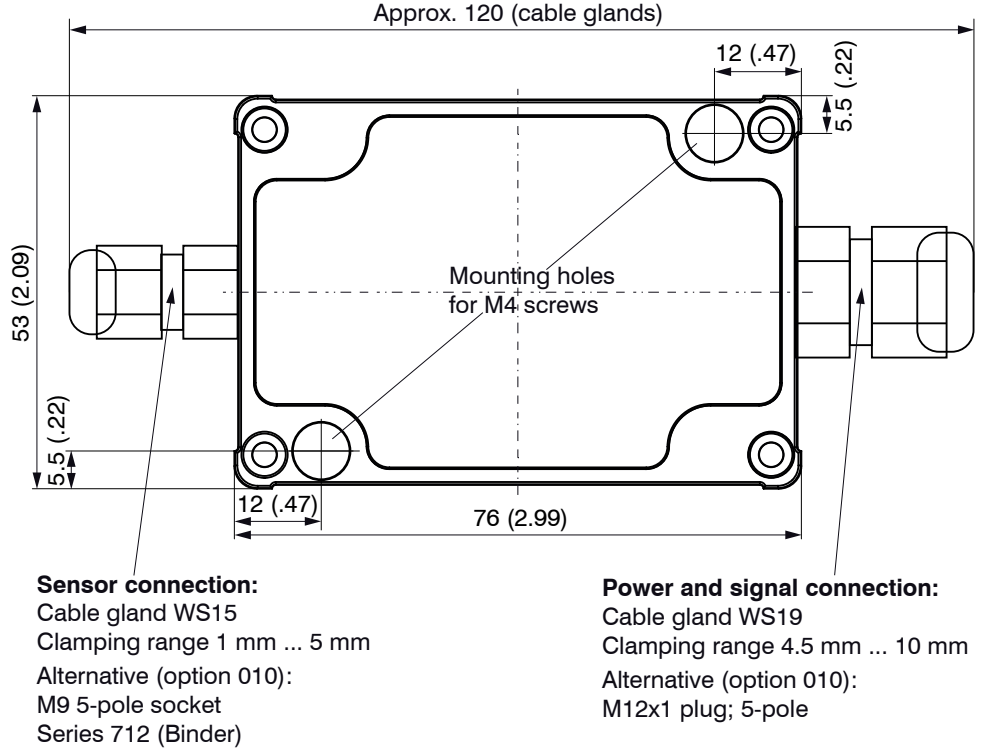


Fig. 2 Dimensions of the controller, dimensions in mm (inches), not to scale

4.3 Power Supply, Sensor and Signal Output

The minimum bending radius of the PC710-6/4 and PC5/5-IWT power supply and output cables (available as accessories, see Chap. A 1) is ten times the cable diameter. All of the connections for the power supply/ sensors/signal output are on the controller, see Fig. 2.

Connections

- Power supply / output side:
  - Cable gland: WS19; clamping range 4.5 mm ... 10 mm
    Connection screw terminals; AWG 16 up to AWG 24; up to AWG 28 with ferrule
  - alternatively: Connector M12x1, 5-pole, A-coded
- Sensor side:
  - Cable gland: WS15; clamping range 1 mm ... 5 mm
    Connection screw terminals; AWG 16 up to AWG 24; up to AWG 28 with ferrule
  - alternatively: Female connector M9; 5-pole, series 712, Co. Binder

Fig. 3 View with cable gland, MSC 7401

Fig. 4 View with plug-in connectors, MSC 7401 (option 010)

Wiring

The housing has to be opened in order to connect the sensors, see Chap. 4.3.2, and wire the output and supply cable, see Chap. 4.3.1.

- Loosen the screws.
- Pass the sensor and signal cables through the cable glands.
- Connect the cables to the screw terminals according to the pin assignments.

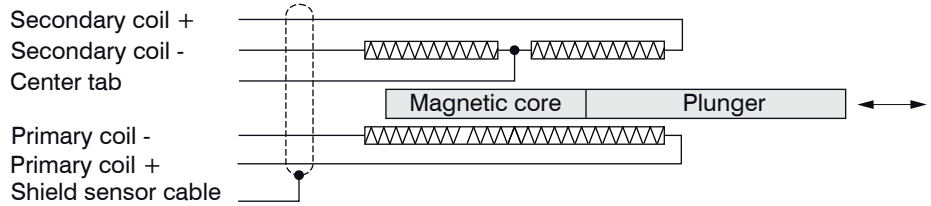


Fig. 5 Pin assignment for sensor on the terminal block X2, full bridge

Terminal block X2		Coil	Cable [1] DTA-x-CA-x DTA-x-CR-xC701-x	Wire [1] DTA-x-LA-x	Solder pin [1] DTA-x-TA-x	Cable [1] DTA-xG8-x
Secondary coil +	Pin 3	Secondary	white	white	1	black
Secondary coil -	Pin 4		brown	black	2	white
Center tap	Pin 2		gray	gray	5	gray
Primary coil -	Pin 6	Primary	yellow	yellow	4	brown
Primary coil +	Pin 5		green	green	3	blue
Shield sensor cable	Pin 1		Shield			Shield

Fig. 6 Table for the pin assignment for the sensor at the terminal block X2, full bridge

1) The colors and pins listed apply to MICRO-EPSILON displacement sensors.

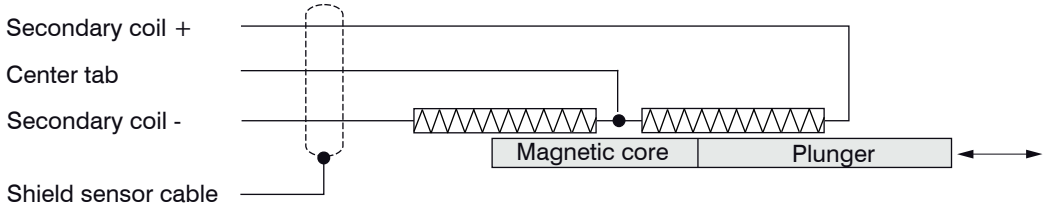


Fig. 7 Pin assignment for sensor on the terminal block X2, half bridge

Terminal block X2		Coil	Cable [1] LDR-x-CA LVP-25-Z20-x	Connector LDR-x-SA	Sensor cable [1] C7210-x
Secondary coil +	Pin 3	Secondary	white	1	brown
Secondary coil -	Pin 4		brown	3	blue
Center tap	Pin 2		green	4	black
Primary coil -	Pin 6	Primary	-	-	
Primary coil +	Pin 5		-	-	
Shield sensor cable	Pin 1			-	-

Fig. 8 Table for the pin assignment for the sensor at the terminal block X2, half bridge

You will find the pin assignment for the terminal block in the table, see Fig. 9, see Fig. 10, see Fig. 11.

1) The colors and pins listed apply to MICRO-EPSILON displacement sensors.

4.3.1 Power Supply and Signal

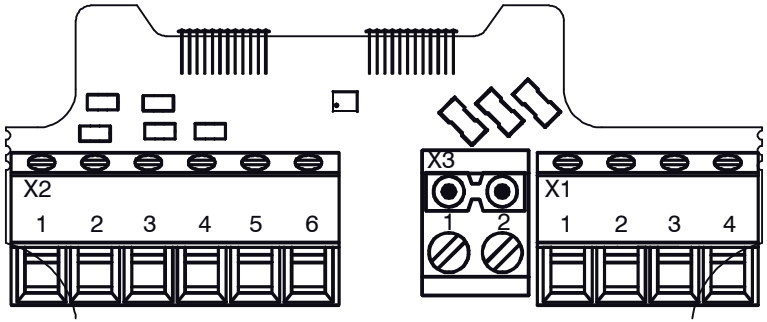
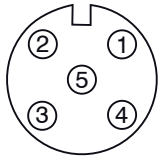


Fig. 9 Pin assignment on terminal blocks X2, X1, X3 for power supply and signal

	Terminal block X2: Sensor connection	**Terminal block X3: Digital interface RS485**	**Terminal block X1: Power supply and signal**
Pin	**Description**	**Description**	**Description**
1	Housing/Shield	RS485 A	Output signal
2	Center tap	RS485 B	Power supply
3	Secondary coil +		Power supply / signal ground
4	Secondary coil -		Housing/Shield
5	Primary coil +		
6	Primary coil -		

Fig. 10 Pin assignment terminal blocks

Pin assignment power supply and signal	
Pin	**Description**
1	Power supply
2	Analog output channel 2 (if available)
3	Power supply and signal ground
4	Analog output channel 1
5	Not used



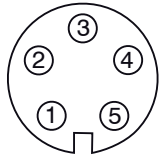
View on connector side

Fig. 11 Pin assignment power supply and signal, connector M12x1; 5 pole; A coded

4.3.2 Sensor

If the plunger is moved into the sensor, this results in an increase of the output voltage, if the plunger is pulled out further, this results in a decrease of the output signal. Change the inputs sec+ and sec- if the output signal should decrease when the plunger is moved in.

Pin assignment Sensor	
Pin	**Description**
1	Secondary +
2	Secondary -
3	Primary +
4	Primary -
5	Secondary medium tab



View on solder pin side

Fig. 12 Pin assignment sensor, female connector M9, 5 -pole. series 712, Fa. Binder

5. Operation

Let the controller and the sensor connected warm up for approx. 2 minutes when the power supply is switched on before you perform any measurement or setting.

Observe the operating instructions of the sensors used.

If a sensor is replaced, the channel must be re-parameterized and readjusted.

5.1 Initial Operation

- Connect the sensor before starting the controller, see Chap. 4.3.2.
- Ensure that the wiring of the sensor connections, signal cable and power supply connections are correct before connecting the controller to the power supply and turning it on, see Chap. 4.
- Then switch on the power supply.
- Set the controller to its basic setting, see Chap. 5.3.

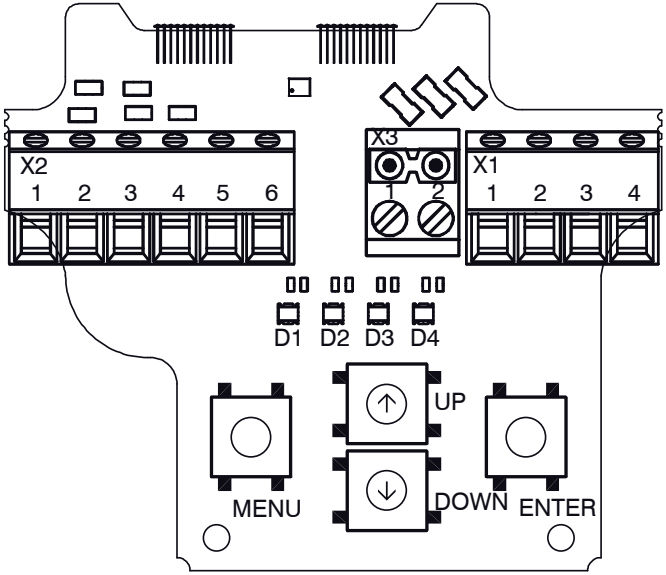
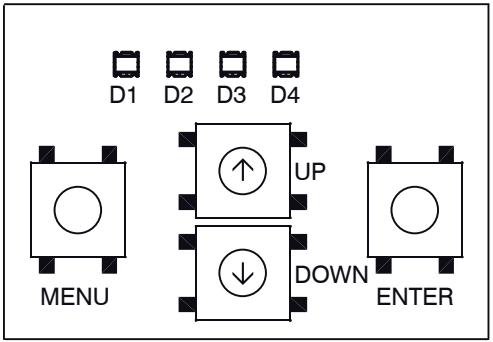


Fig. 13 Controller

5.2 Control and Display Elements



Button / LED	Function	Description
MENU button	Enter menu level	
ENTER button	Confirmation	
↑ and ↓ button	Parameter selection	
D1 LED	Display Channel	The LED Channel indicates the current channel, with ↑ and ↓ the channel can be changed (red and green). Channel 1: green, channel 2: red Flashes in corresponding color, if channel is not parameterized.
D2 LED	Display E1 menu level	The LED E1 and E2 show the current position in the menu or the corresponding settings.
D3 LED	Display E2 menu level	
D4 LED	Display Value	The LED Value indicates the current value of the selected parameter.

Fig. 14 Control and Display Elements

5.3 Setting

The menu of the MSC7401 is designed for fast, mainly automated commissioning as well as for individual application-specific settings. It is divided into four function blocks, see Fig. 15. The 4 LEDs show the current position in the menu and the corresponding setting value at any time, see Chap. 5.4. Alternatively, the software SensorTool, see Chap. A 3, can be used.

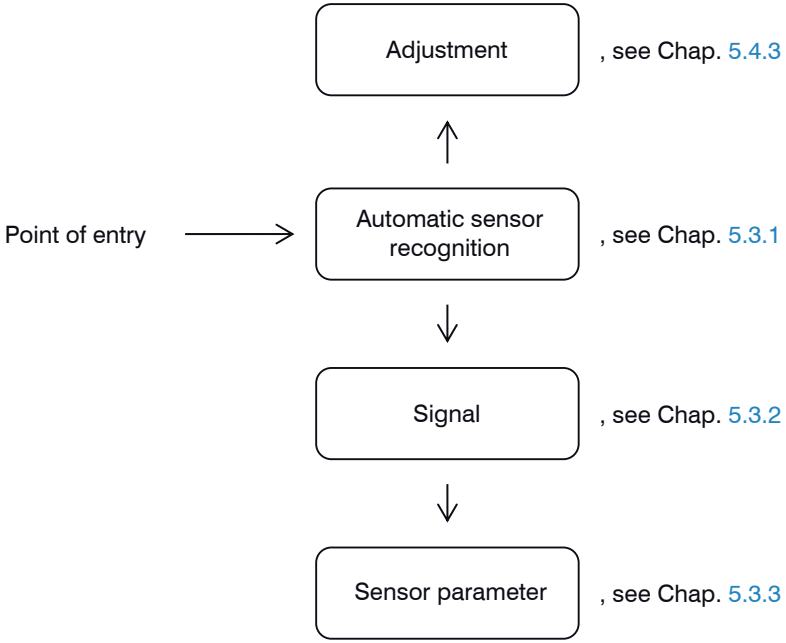


Fig. 15 Menu structure (simple), details, see Chap. 5.4

5.3.1 Automatic Sensor Recognition

The first menu item is the automatic sensor recognition.

LED D2 = red

The automatic sensor recognition checks the connected sensor and determines the succeeding parameters for the common MICRO-EPSILON sensors:

- Sensor model (half bridge or full bridge (LVDT))
- Excitation frequency and
- Excitation amplitude

After the automatic sensor recognition has been completed, the LEDs confirm the status.

D3/D4 = green	Sensor recognition successful	After successful recognition, the sensor is ready for use. The output signal is preset according to the factory setting; rough adjustment of the measuring signal
D3/D4 = red	Automatic sensor recognition not succesful	The parameters must now be set manually according to the respective instruction manuals of the used sensor. An automatic jump to the menu item `Sensor parameter` is done, see Chap. 5.3.3.

5.3.2 Signal

LED D2 = orange

This function allows you to adjust the type of output signal, e.g. 2 ... 10 V or 4 ... 20 mA.

Automatic recognition is available. For a load at the output of:

> 1 kOhm, voltage output 2 ... 10 V is set,

< 1 kOhm, current output 4 ... 20 mA is set.

5.3.3 Sensor Parameter

LED D2 = red flashing

With this function, you can set the parameters
- Sensor model
- Excitation frequency and
- Excitation amplitude,

if the automatic recognition is not successful, or for special areas of use other settings may be necessary. These depend on the used sensor model. After manual setting of the sensor parameters, the adjustment of the system is recommended, see Chap. 5.3.4.

Sensor model		Measuring range	Sensor type	Frequency	Amplitude
DTA-1x		±1 mm	LVDT	5 kHz	550 mV
DTA-3x		±3 mm		5 kHz	
DTA-5x		±5 mm		5 kHz	
DTA-10x		±10 mm		2 kHz	
DTA-15x		±15 mm		1 kHz	
DTA-25x		±25 mm		1 kHz	
LDR-10		10 mm	LDR	21 kHz	
LDR-25		25 mm		13 kHz	
LDR-50		50 mm		9 kHz	
LDR-14	with 8 mm drawbar	14 mm		tbd	
	with 10 mm drawbar			tbd	
LVP-25	with 8 mm drawbar	25 mm		tbd	
	with 10 mm drawbar			16 kHz	

Fig. 16 Sensor models and sensor parameters

5.3.4 Adjustment

LED D2 = green

At the menu item adjustment, you can use either a 2-point adjustment or a zero point search. In this menu the controller can also be reset to the factory settings.

2-point adjustment	Here you can set any 2 points within the measuring range and the corresponding signal values.
Factory settings	The controller can be reset to the parameters stored by default, see Chap. A 2.
Zero point search	This is a special case of a 2-point adjustment and provides the best performance for the measuring system. The first of the two points is the electrical zero point at which a differential sensor shows the highest stability on principle.

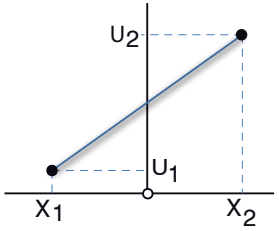


Fig. 17 Graphic 2-point adjustment

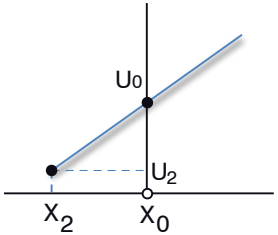


Fig. 18 Graphic Zero point search

5.4 Menu Structure

Legend menu structure [1]	
	LED orange
	LED orange flashing
	LED green
	LED green flashing
	LED red
	LED red flashing
	LED off
SMR	Start of measuring range
MR	Midrange
EMR	End of measuring range

Fig. 19 Legend menu structure

1) To pages 26 to 33

D1: Channel		D2: E1			D3: E2				D4: Value							Next menu
G		G	Adjustment	ENTER	↑↓	R	2-point adjustment	ENTER	Go to the adjustment modes 2-point adjustment, see Fig. 21 (page 28) or zero point search, see Fig. 22 (page 29).						ENTER	E1 level
			↑			G	Factory settings									
						O	Zero point search									
	MENU (3 sec.)	R	Automatic sensor recognition	ENTER		G	Successful		G	Successful						E1 level
						R	Failed		R	Failed						Sensor parameter
						G	Manually set		□	Manually set						Only display
			↓													
		O	Signal	ENTER	↑↓	G	Automatic	ENTER			O	Voltage			ENTER	E1 level
											R	Current				
						O	Voltage		Voltage	↑↓	G	0 ... 10 V				
											O	2 ... 10 V				
											R	0 ... 5 V				
											R	0.5 ... 4.5 V				
						R	Current		Current	↑↓	G	4 ... 20 mA				
											O	0 ... 20 mA				
											R	0 ... 10 mA				

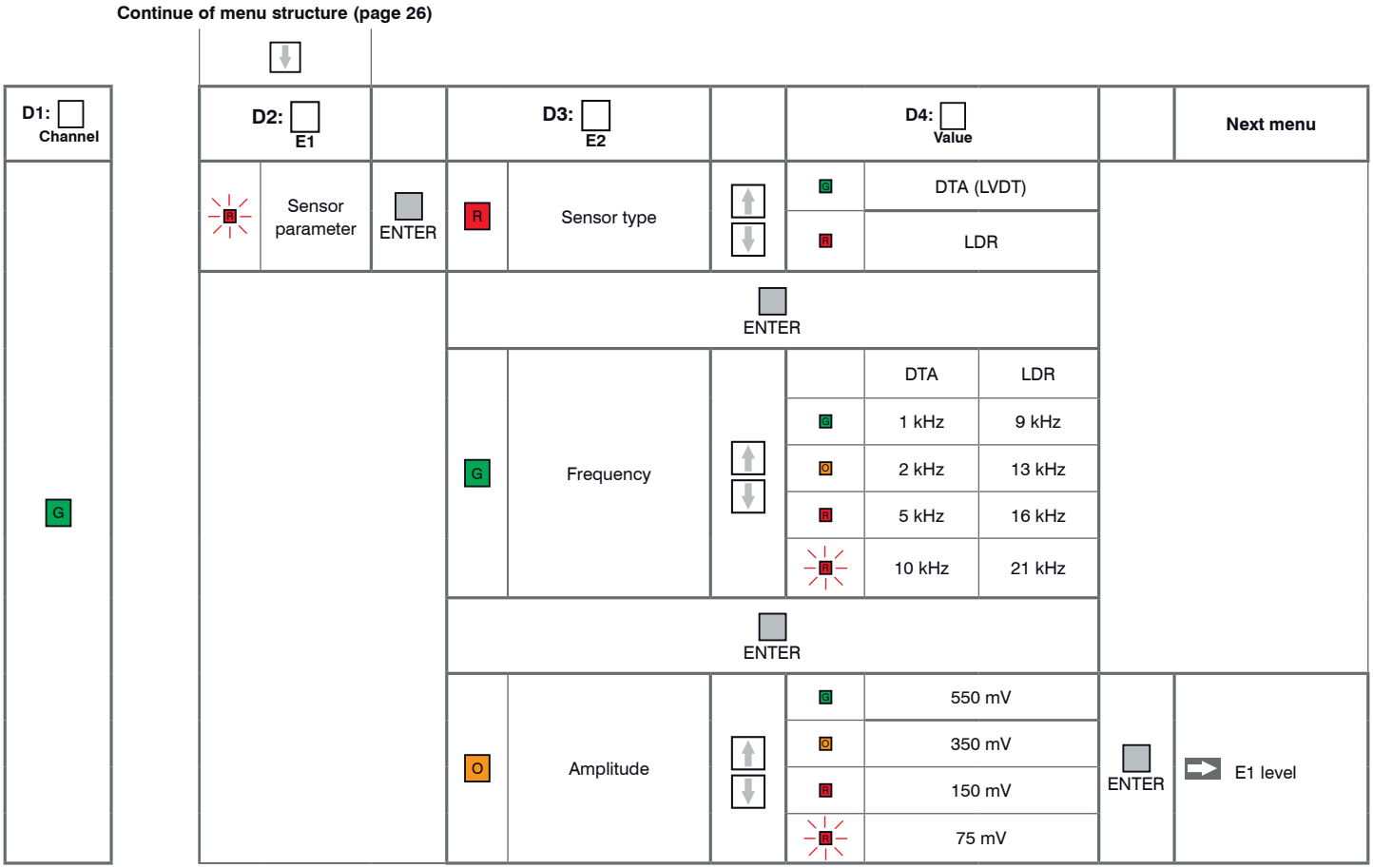


Fig. 20 Menu structure Controller MSC 7401

5.4.1 2-Point Adjustment

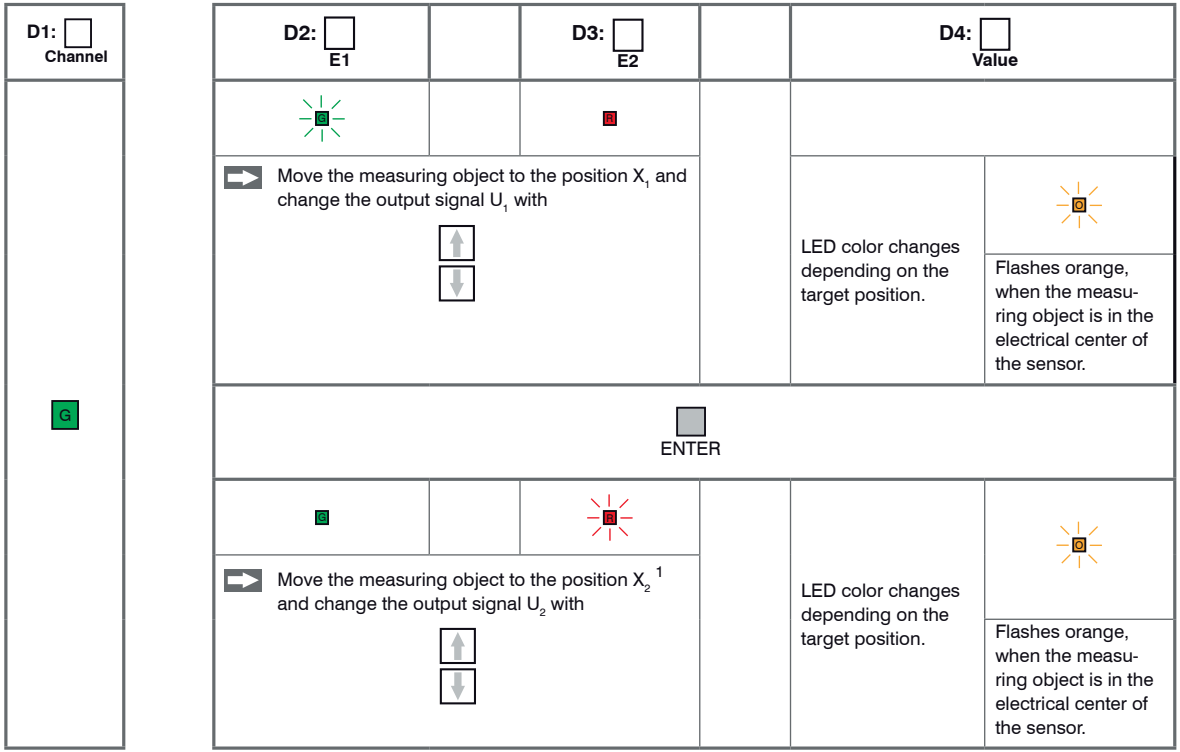
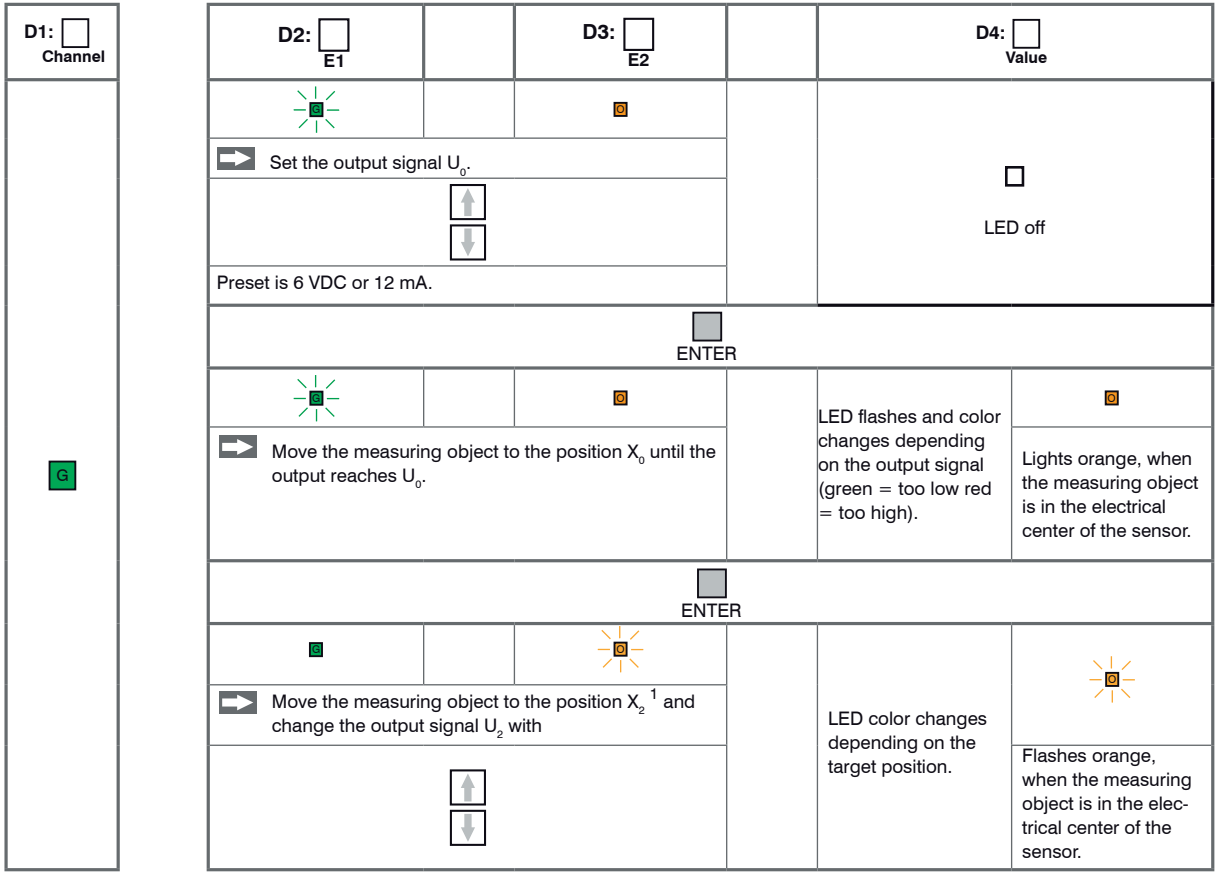


Fig. 21 Menu structure controller MSC 7401, Adjustment mode: 2-point adjustment

1) Position X_2 must be > 10 % of the measuring range from X_1.

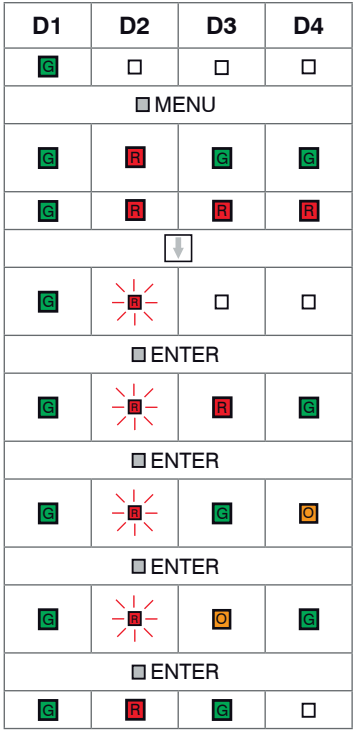
5.4.2 Zero Point Search



1) Position X_2 must be > 10 % of the measuring range from X_1.

Fig. 22 Menu structure controller MSC 7401, adjustment mode: Zero point search

5.4.3 Example A: Sensor Parameter Adjustment: DTA-5G8



➡ Press the MENU button for 3 seconds.

After switching on, the sensor is automatically identified. If the recognition was successful, this color code is displayed and you can skip example A.

Output situation: sensor is not automatically recognized.

➡ Press the button twice.

Menu point Sensor parameter, see Chap. 5.3.3.

➡ Confirm by pressing the ENTER button.

Sensor type: LVDT; with ↑ ↓ the selection can be changed here.

➡ Confirm by pressing the ENTER button.

Frequency: 5 KHz; with ↑ ↓ the selection can be changed here.

➡ Confirm by pressing the ENTER button.

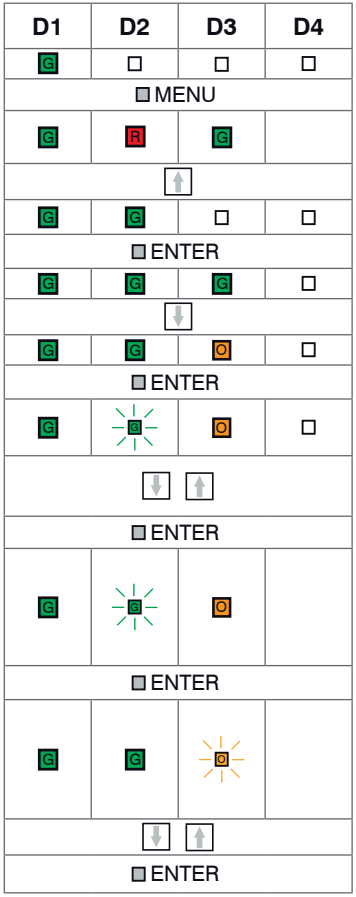
Excitation voltage: 550 mV; with ↑ ↓ the selection can be changed here.

➡ Confirm by pressing the ENTER button.

5.4.4 Example B: Signal Output Adjustment: 2 ... 10 V

D1	D2	D3	D4	
G	□	□	□	
MENU				➡ Press the MENU button for 3 seconds, if you are not yet in the menu.
G	R	G		Output situation: The sensor parameters are already set; depending on the approach, LED D4 is green or switched off.
↓				
G	O	G		Menu point: Signal, see Chap. 5.3.2; in delivery state, the electronics works with automatic load recognition; depending on the output load, the LED D4 is red (4 ... 20 mA) or orange (2 ... 10 V). If the automatic settings suits you, you can cancel example B here.
ENTER				➡ Confirm by pressing the ENTER button.
G	O	G	□	
↓				
G	O	O	□	Voltage output
ENTER				➡ Confirm by pressing the ENTER button.
G	O	O	O	2 ... 10 V; with ↑ ↓ the selection can be changed here.
ENTER				➡ Confirm by pressing the ENTER button.
G	R	G		Output situation: The sensor parameters are already set; depending on the approach, LED D4 is green or switched off.

5.4.5 Example C: Adjustment via Zero Point Search



➡ Set the sensor parameters according to example A and connect the output signal according to example B.

➡ Press the MENU button for 3 seconds, if you are not yet in the menu.

Output situation: The sensor parameters are already set; depending on the approach, LED D4 is green or switched off.

➡ Go to the menu Adjustment, see Chap. 5.3.4.

➡ Confirm by pressing the ENTER button.

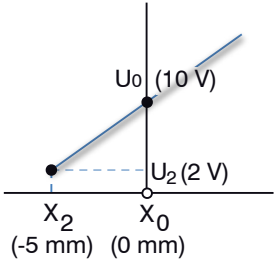


Fig. 23 Example Zero Point Search

➡ Select Zero point search.

➡ Confirm by pressing the ENTER button.

➡ Now use the arrow buttons to set the voltage in such a way that the measuring device displays 6.00 V (U_0).

➡ Confirm by pressing the ENTER button.

➡ Now move the measuring object to the zero point (X0, MMR), where the measuring device again displays the above set 6.00 V (U_0).

For better orientation, LED D4 changes the color depending on the plunger position. Near the zero point, LED D4 flashes orange.

➡ Confirm by pressing the ENTER button.

➡ Now move the measuring object from X_0 5.000 mm towards the beginning of the measuring range (X_2) and use the arrow buttons to set 2.00 V (U_2).

For better orientation, LED D4 changes the color depending on the plunger position. Near the zero point, LED D4 flashes orange.

➡ Confirm by pressing the ENTER button.

5.4.6 Example D: Adjustment via 2-point Adjustment

D1	D2	D3	D4
G	□	□	□
MENU			
G	R	G	
↑			
G	G	□	□
ENTER			
G	G	G	□
↑			
G	G	R	□
ENTER			
G	G	R	
↓ ↑			
ENTER			
G	G	R	
↓ ↑			
ENTER			
G	R	G	

➡ Set the sensor parameters according to example A and connect the output signal according to example B.

➡ Press the `MENU` button for 3 seconds, if you are not yet in the menu.

Output situation: The sensor parameters are already set; depending on the approach, LED `D4` is green or switched off.

➡ Go to the menu `Adjustment, see Chap. 5.3.4`.

➡ Confirm by pressing the `ENTER` button.

➡ Select `2-point adjustment`.

➡ Confirm by pressing the `ENTER` button.

➡ Now move the measuring object to the desired position start of measuring range (X_1).

➡ Use the arrow buttons to set 2.00 V (U_1).

➡ Confirm by pressing the `ENTER` button.

➡ Now move the measuring object 6.000 mm towards the end of the measuring range (X_2).

➡ Use the arrow buttons to set 10.000 V (U_2).

➡ Confirm by pressing the `ENTER` button.

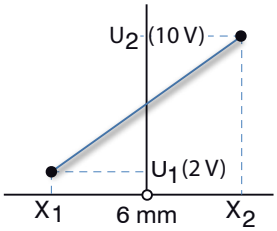


Fig. 24 Example 2-point Adjustment

6. Service, Repair

If the controller or sensor is defective, please send us the effected parts for repair or exchange.
If the cause of a fault cannot be clearly identified, please send the entire measuring system to:

MICRO-EPSILON MESSTECHNIK
GmbH & Co. KG
Königbacher Str. 15
94496 Ortenburg / Germany

Tel. +49 (0) 8542/ 168-0
Fax +49 (0) 8542/ 168-90
info@micro-epsilon.de
www.micro-epsilon.com

7. Liability for Material Defects

All components of the device have been checked and tested for functionality at the factory. However, if defects occur despite our careful quality control, MICRO-EPSILON or your dealer must be notified immediately.

The liability for material defects is 12 months from delivery.

Within this period, defective parts, except for wearing parts, will be repaired or replaced free of charge, if the device is returned to MICRO-EPSILON with shipping costs prepaid. Any damage that is caused by improper handling, the use of force or by repairs or modifications by third parties is not covered by the liability for material defects. Repairs are carried out exclusively by MICRO-EPSILON.

Further claims can not be made. Claims arising from the purchase contract remain unaffected. In particular, MICRO-EPSILON shall not be liable for any consequential, special, indirect or incidental damage. In the interest of further development, MICRO-EPSILON reserves the right to make design changes without notification.

For translations into other languages, the German version shall prevail.

8. Decommissioning, Disposal

➡ Remove the power supply and output cable from the controller.

Incorrect disposal may cause harm to the environment.

➡ Dispose of the device, its components and accessories, as well as the packaging materials in compliance with the applicable country-specific waste treatment and disposal regulations of the region of use.

Appendix

A 1 Accessories

PC710-6/4		Power and output cable, length 6 m, 4-wire, one-side tinned Strands AD: 5.6 mm
PC5/5		Power and output cable; connector M12x1, 5 pin, A-coding, length: 5 m, 5-core, open ends, AD: 5.6 mm, IP 67
IF 7001		Single channel USB/RS485 converter for MSC7xxx
You will find further information to IF 7001 under: https://www.micro-epsilon.com/download/manuals/ass--IF-7001--en.pdf		

A 2 Factory Settings

The controller is assigned with the following parameters by default:

- Automatic recognition of customer signals
- Automatic sensor recognition

Upon successful recognition:

- Start of measuring range (Plunger pulled-out): ~2 V or 4 mA
- Midrange (Electric zero): ~6 V or 12 mV

Language: German

A 3 Software

The SensorTool offers you a documented driver software.

A 3.1 Search / Sensor Finder

- Connect the controller to a free USB port on your PC (e.g. via IF7001) and connect the power supply.
- In the drop down menu, set the sensor groups `induSENSOR`, `Sensortype induSENSOR MSC7xxx` and activate the other settings according to the figure below, see Fig. 25.

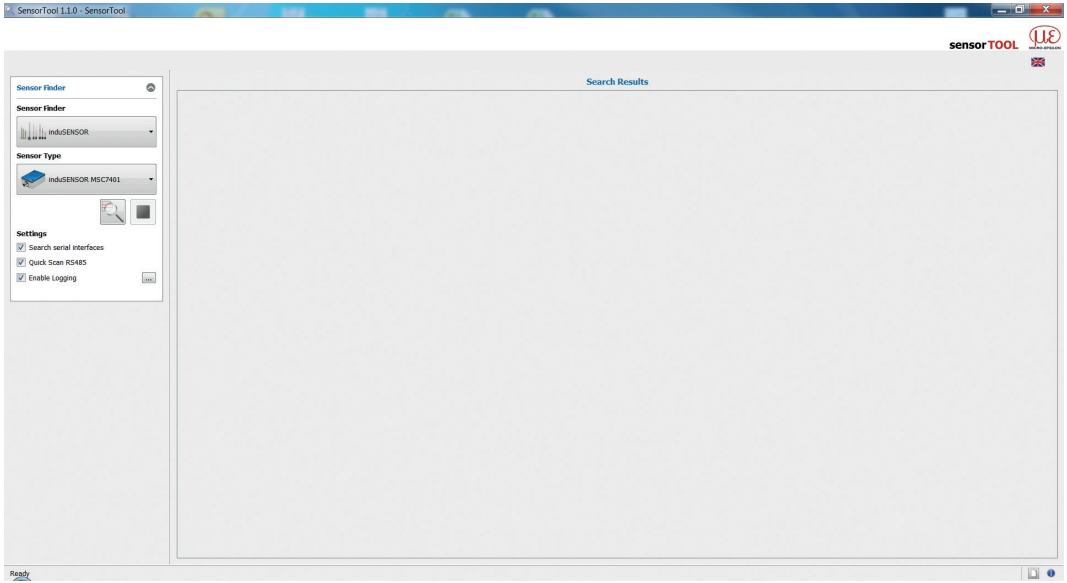


Fig. 25 Main view

- Then click the `Search` button.

The channels found are now listed in the overview.

➡ Choose the desired language by clicking on the respective flag icon.

Fig. 26 Language German

Fig. 27 Language English

➡ Click the `Configure Serial Interface` button to set the basic settings for the serial interface.

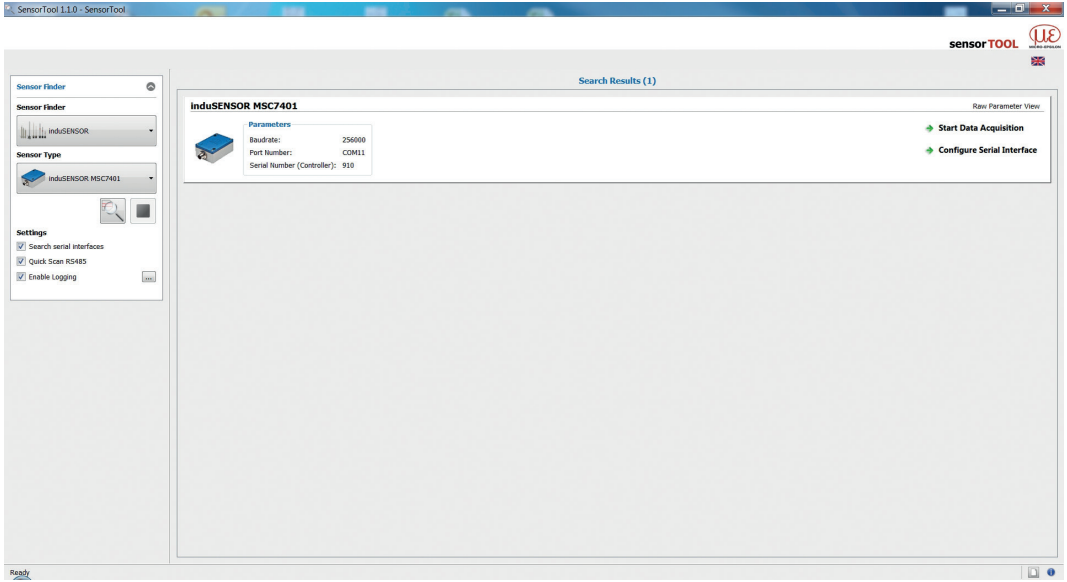


Fig. 28 Window Search Results

The following window is displayed:

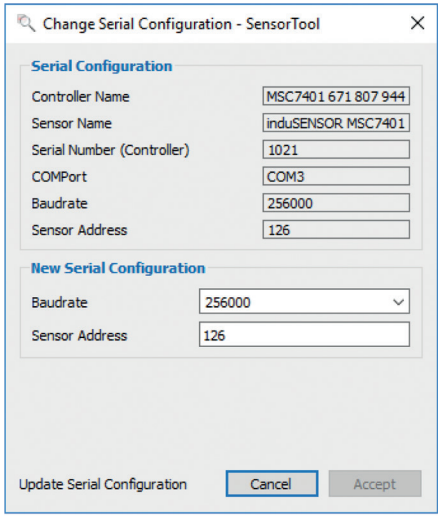


Fig. 29 Window Change Serial Configuration - SensorTool

Tip: Set the baud rate to 256,000 Baud.

Start the data acquisition/configuration by clicking `Start Data Acquisition` or the controller picture, see Fig. 28.

The following window is displayed:

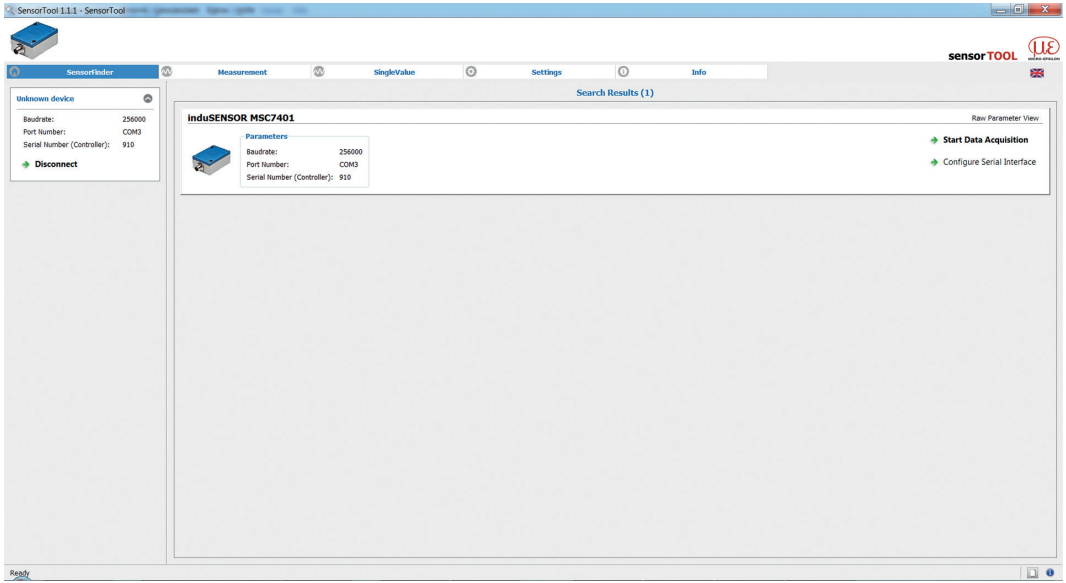


Fig. 30 View Sensorfinder

A 3.2 Measurement

To check your measurements, a simple depiction of your data acquisition is available, see Fig. 31.

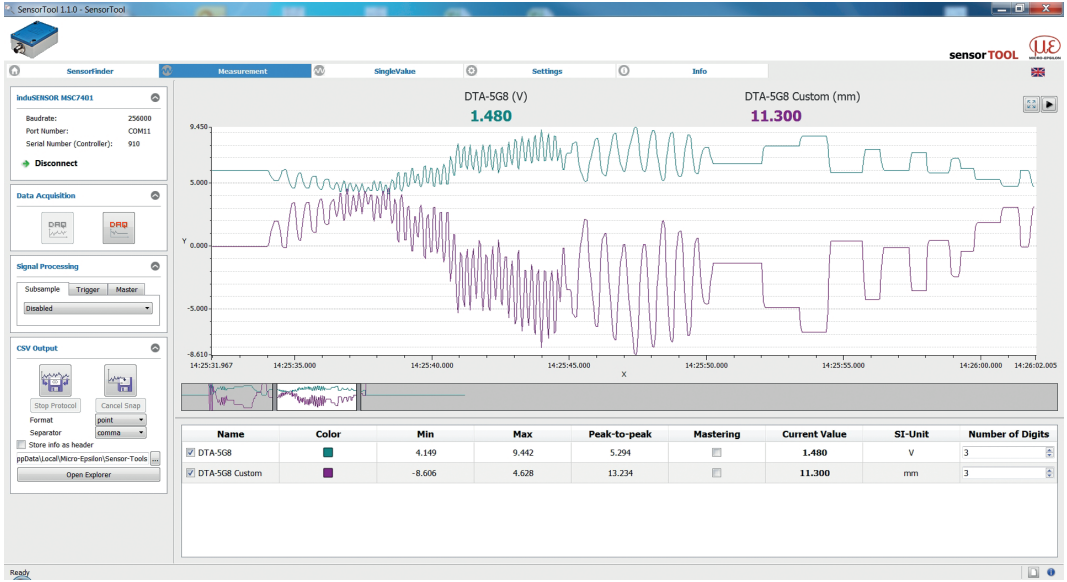


Fig. 31 View Measurement

A 3.2.1 Basic View

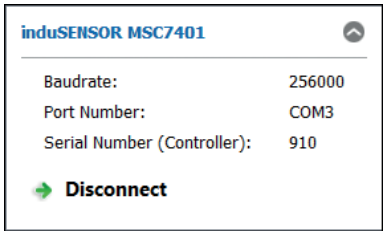


Fig. 32 Detail view Disconnect

	➡ Click the `Reset Y-Scale` button to reset the Y-Scale to initials settings (e.g. after zooming).
	➡ Click the `Jump to Head` button to display the current signal course.

A 3.2.2 Data Acquisition Start / Stop

➡ Start the data acquisition by clicking the `Start` button, see Fig. 33.

The recording is completely restarted and the previously stopped recording is lost.

➡ Stop the data acquisition by clicking the `Stop` button, see Fig. 34.

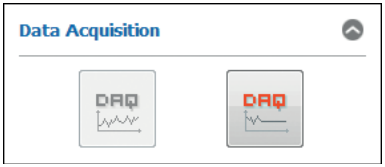


Fig. 33 Start *Fig. 34 Stop*

A 3.2.3 Signal Processing

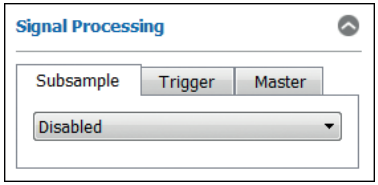


Fig. 35 Detail view signal processing

You can select the following options for signal processing:

Data Acquisition	Signal processing	*Subsample*	*Disabled*	*Deactivated; basic settings*
			Sample-based	*Number of samples is adjustable, every xth measurement is recorded.*
			Time-based	*Time-based; time can be set in milliseconds* [1]
		Trigger	*Disabled*	*Deactivated; basic settings*
			Continuous	*Manual trigger*
			One-shot (sample-based)	*Sample can be set; records the signal course according to the set samples; the more samples, the longer the course*
			One-shot (time-based)	*Milliseconds can be set; records the signal course according to the time set*
		Master	*Master now*	*Sets the current sensor position regardless of the values in the table*
			Reset	*Resets the master.*

For the `Master`, please also note the table, see Fig. 38.

1) For example every 5000 ms: The signal course displayed is updated after this period has elapsed.

A 3.2.4 CSV Output

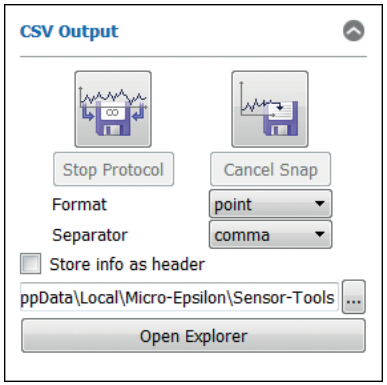


Fig. 36 Detail view CSV output

	Click this button to start acquiring the measurement data.
Stop Protocol	Click this button to stop recording.
	Click this button to save the currently selected measurement value.
Cancel Snap	Click this button to cancel the recording.

Data acquisition	CSV output	*Format*	*point / comma*
		Separator	*comma / semicolon / tabulator / space*
		Master	*Master now / Reset*

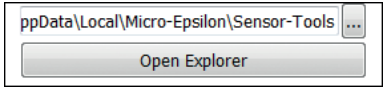
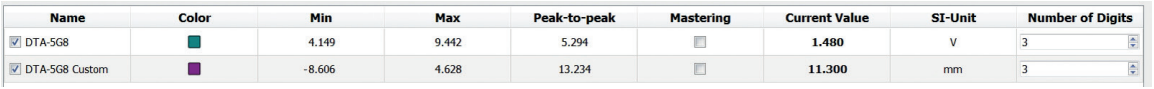


Fig. 37 Detail view change to explorer



Name	Show or hide signal curves of the sensors used.
Color	Change the color settings of the single signal courses.
Mastering	When the Master tab is activated in the menu `Data acquisition > Signal processing, see Fig. 35`, you can enter the values manually under `Current value` after activating the `Mastering` checkbox.

Fig. 38 Depiction and description of data acquisition table

A 3.3 Settings

A 3.3.1 General

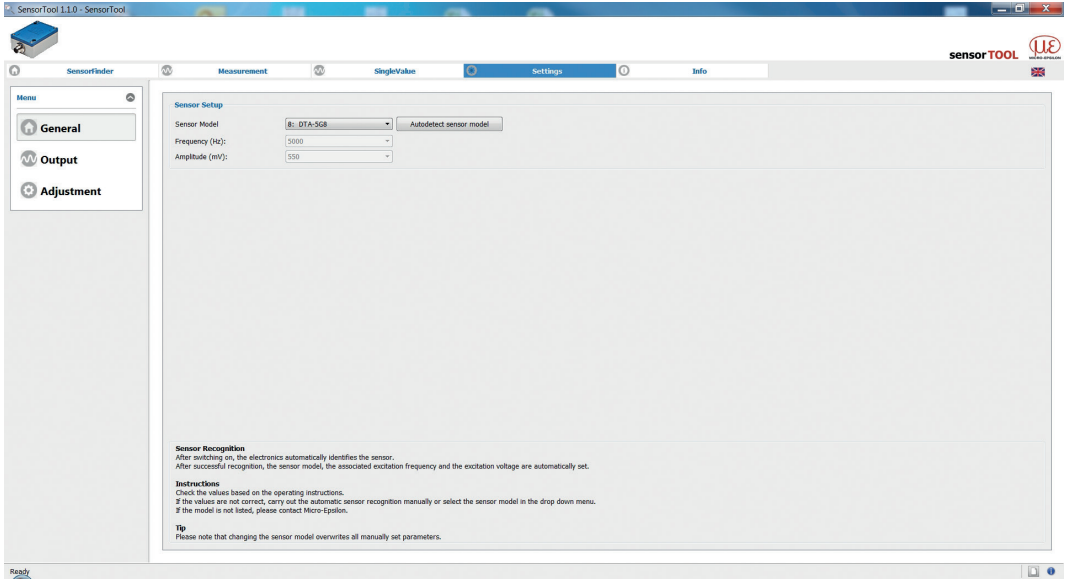


Fig. 39 View Settings General

Sensor Setup	Sensor model	*1 - 6: DTA-xD oder 7 - 10: DTA-xG8* *127: user defined DTA* *129 - 131, 133: LDR-x* *132: LVP-25* *255: user defined LDR* *0: unknown sensor*	
		Detect sensor model automatically	
	Frequency (Hz)	*1000 / 2000 / 5000 / 9000 / 10000 / 13000 / 16000 / 21000*	*Autodetect sensor model*
	Amplitude (mV)	*550 / 350 / 150 / 75*	

Three options for sensor recognition:

- Automatic sensor recognition
- Model setting
- User-specific sensor setting

Sensor Recognition

After switching on, the electronics automatically identifies the sensor.

After successful recognition, the sensor model, the associated excitation frequency and the excitation voltage are automatically set.

➡ Check the values based on the operating instructions.

If the values are not correct, carry out the automatic sensor recognition manually or select the sensor model in the drop down menu.

➡ If the model is not listed, please contact Micro-Epsilon.

i Please note that changing the sensor model overwrites all manually set parameters.

A 3.3.2 Output

After switching on, the controller automatically analyzes the output load.

Depending on the result, 4 … 20 mA or 2 … 10 V are automatically selected.

You can also set the output range manually via the drop down menu, see Fig. 41.

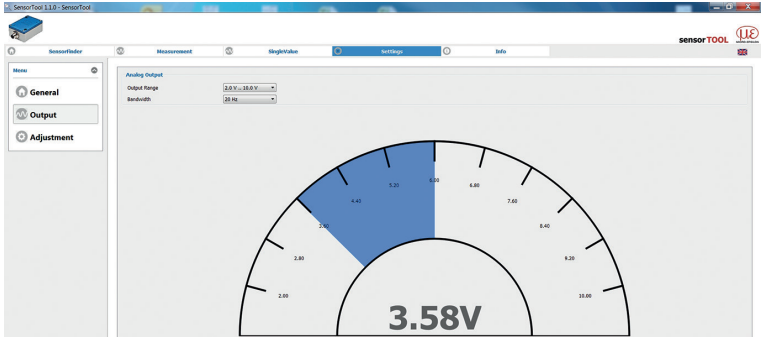


Fig. 40 View Settings - Output

Fig. 41 Section Settings - Analog output

Analog Output	Output Range	*Automatic / 0.0 V .. 10.0 V / 2.0 V .. 10.0 V / 0.0 V .. 5.0 V / 0.5 V .. 4.5 V / 4.0 mA .. 20.0 mA / 0.0 mA .. 20.0 mA / 0.0 mA .. 10.0 mA*	Description, see Chap. 5.3.2
	Band Width	*20 Hz / 50 Hz / 100 Hz / 200 Hz / 300 Hz*	-

Frequency Response:

In order to achieve an optimal resolution, it is recommended to reduce the frequency response as much as possible.

i Please note that a reduced frequency response also involves a reduced measurement dynamic.

A 3.3.3 Adjustment

There are two possible settings in the `Adjustment` menu:

- Two Point
- Zero Point

A 3.3.3.1 Two Point

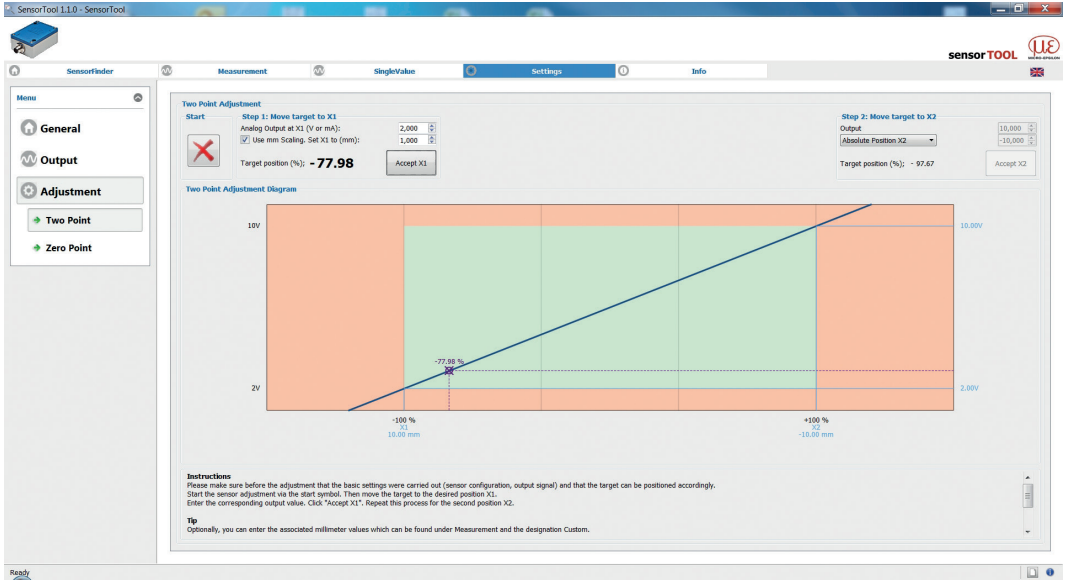


Fig. 42 View 1 Two Point Adjustment

- Please make sure before the adjustment that the basic settings were carried out (sensor configuration, output signal) and that the target can be positioned accordingly.
- Start the sensor adjustment via the `Start` button.
- Then move the target to the desired position X_1.
- Enter the corresponding output value. Click `Accept` X_1.

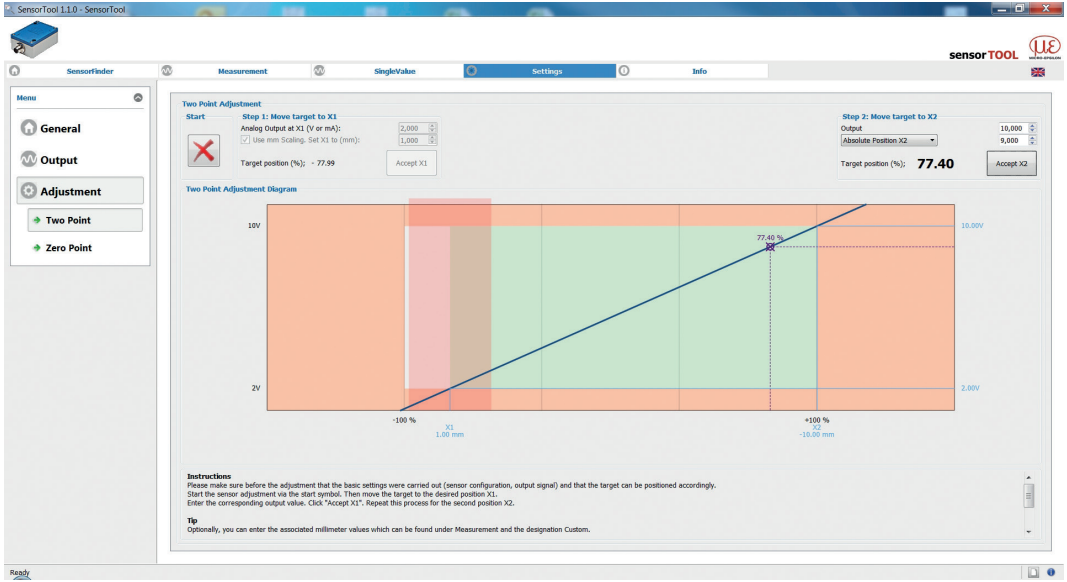


Fig. 43 View 2 Two Point Adjustment

➡ Repeat this process for the second position X_2.

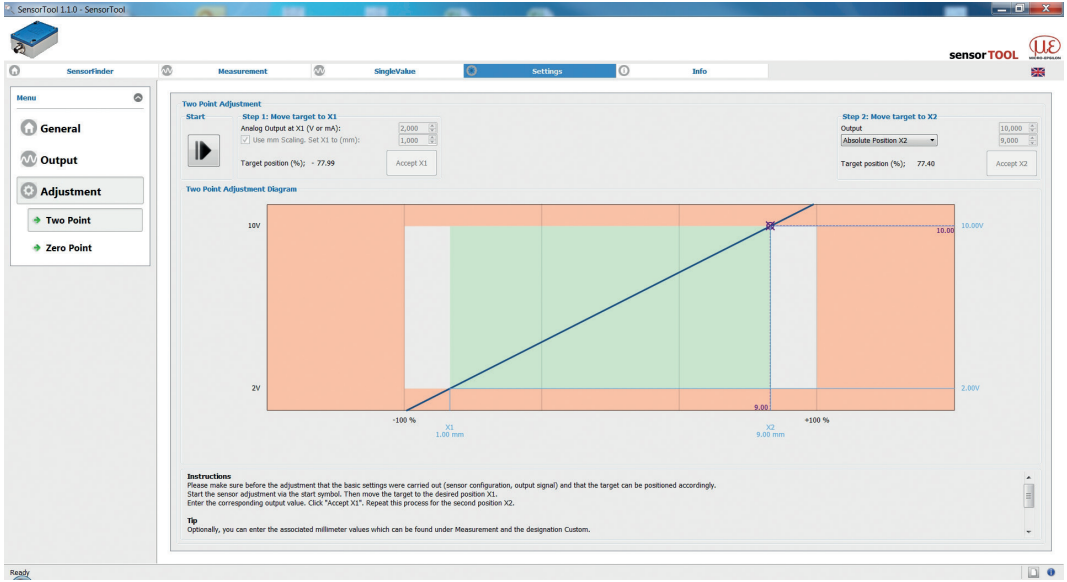


Fig. 44 View 3 Two Point Adjustment

Optionally, you can enter the associated millimeter values which can be found under `Measurement` and the designation `Custom`.

The chart is divided into 3 areas:

Green	Taught-in range, limited by X_1, X_2 and the associated output signals
White	Usable range outside the taught-in range
Red	Unavailable range

A 3.3.3.2 Zero Point

Fig. 45 View 1 Zero Point adjustment

- Please make sure before the adjustment that the basic settings were carried out (sensor configuration, output signal) and that the target can be positioned accordingly.
- Start the sensor adjustment via the start `Start` button.
- Then move the target to the zero point X_0 (target position = 0 %).
- Enter the desired output value for the midrange and accept it by clicking the button `Accept` X_0.

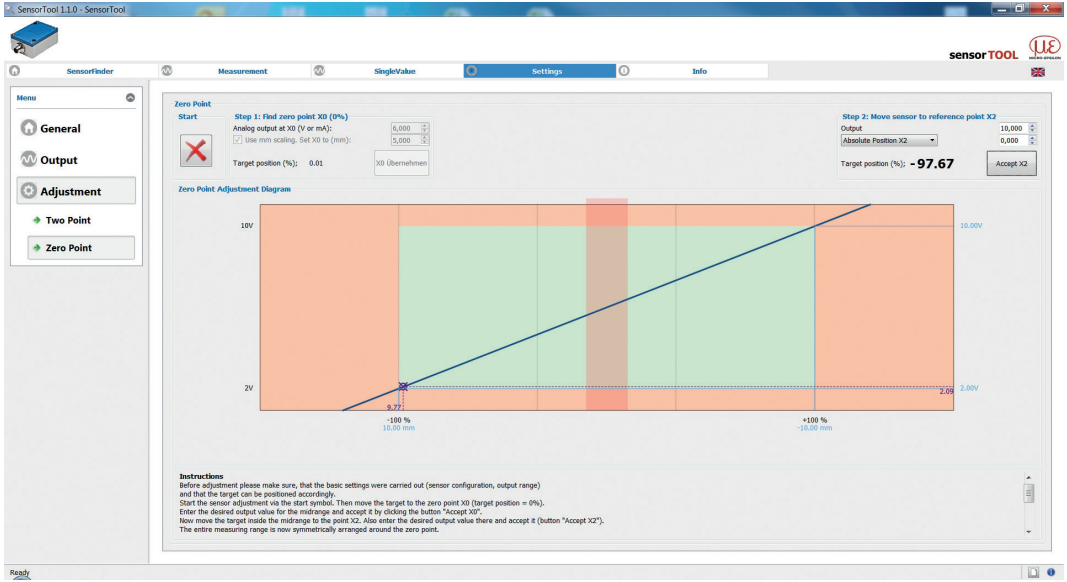


Fig. 46 View 2 Zero Point adjustment

➡ Now move the target inside the midrange to the point X_2.

➡ Also enter the desired output value there and accept it by pressing the button `Accept` X_2.

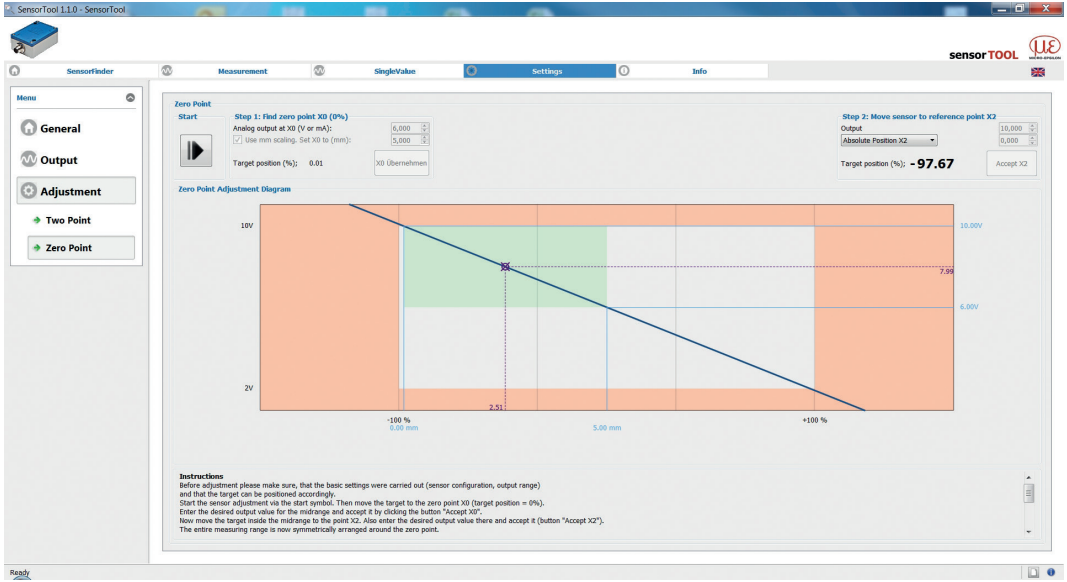


Fig. 47 View 3 Zero Point adjustment

The entire measuring range is now symmetrically arranged around the zero point.

Optionally you can enter the associated millimeter values which can be found under `Data acquisition` and the designation `Custom`.

The chart is divided into 3 areas:

Green	Taught-in range, limited by X_0, X_2 and associated output signals.
White	Usable range outside the taught-in range
Red	Unavailable range

A 3.4 Info

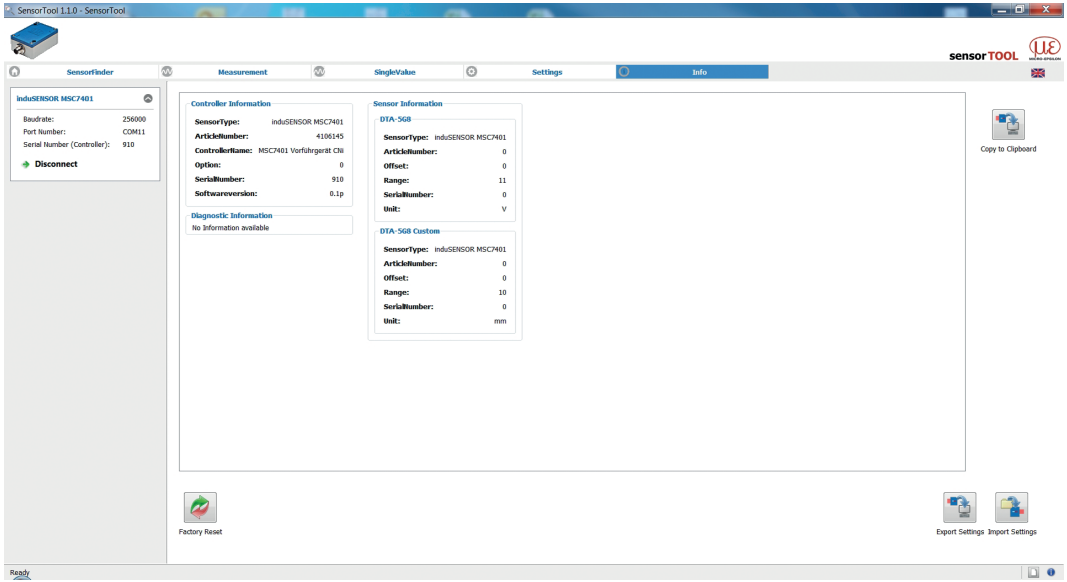


Fig. 48 View Info

This window provides the current overview of the controller information, sensor information, diagnostic information and the currently connected sensor.

By clicking the `Disconnect` button you return to the sensor search.

Clicking the `Copy to Clipboard` button copies the information and settings for the selected controller to the clipboard.

Fig. 49 Button Copy to Clipboard

By pressing the `Factory settings` button, you can restore the factory settings.

Fig. 50 Button Factory Reset

Clicking `Export Settings` opens the explorer and enables you to save the setting values in a default `*.csv` file on the PC.

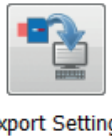


Fig. 51 Button Export Settings

Fig. 52 Button Import Settings

Clicking `Import Settings` opens the explorer and enables you to import the setting values from a default `*.csv` file onto the PC.

MICRO-EPSILON MESSTECHNIK GmbH & Co. KG
Königbacher Str. 15 · 94496 Ortenburg / Germany
Tel. +49 (0) 8542 / 168-0 · Fax +49 (0) 8542 / 168-90
info@micro-epsilon.de · www.micro-epsilon.com

X9751377-A021118HDR

© MICRO-EPSILON MESSTECHNIK