



## Operating Instructions

**capa****NCDT** 6110/6120/IP

CSE05  
CSE1  
CSE1,25  
CSE2  
CSE3

CSE05/M8  
CSE1,25/M12  
CSE2/M16  
CSE3/M24

CSF2  
CSF4  
CSF6  
CSF2-CRg4,0  
CSF4-CRg4,0  
CSF6-CRg4,0

Non-contact Capacitive Displacement Measuring

MICRO-EPSILON  
MESSTECHNIK  
GmbH & Co. KG  
Königbacher Straße 15

94496 Ortenburg / Germany

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

# Contents

<b>1.</b>	<b>Safety .....</b>	<b>5</b>
1.1	Symbols Used .....	5
1.2	Warnings .....	5
1.3	Notes on CE Marking .....	6
1.4	Intended Use .....	7
1.5	Proper Environment .....	7
<b>2.</b>	<b>Functional Principle, Technical Data .....</b>	<b>8</b>
2.1	Measuring Principle .....	8
2.2	Structure .....	9
	2.2.1 Sensors .....	11
	2.2.2 Sensor Cable .....	12
	2.2.3 Controller .....	13
2.3	Technical Data .....	14
<b>3.</b>	<b>Delivery .....</b>	<b>15</b>
3.1	Unpacking .....	15
3.2	Storage .....	15
<b>4.</b>	<b>Installation and Assembly .....</b>	<b>16</b>
4.1	Precautionary Measures .....	16
4.2	Sensor .....	16
	4.2.1 Radial Point Clamping, Circumferential Clamping, Series CSE Sensors .....	16
	4.2.2 Mounting with Thread, Series CSEx/Mx Sensors .....	17
	4.2.3 Dimensional Drawings Sensors .....	18
4.3	Sensor Cable .....	22
	4.3.1 General .....	22
	4.3.2 Cable with Type C Connector .....	22
	4.3.3 Cable with Type B Connector .....	24
	4.3.4 Cable with Type E Connector .....	26
4.4	Controller .....	27
4.5	Ground Connection, Grounding .....	28
4.6	Power Supply, Display/Output Device, Sensor Connection .....	28

---

<b>5.</b>	<b>RS485 Interface .....</b>	<b>29</b>
5.1	Hardware Interface .....	29
5.2	Protocol.....	29
	5.2.1 Reading Measuring Values .....	30
	5.2.2 Scaling the Measuring Values .....	31
	5.2.3 Example of the Measuring Value Transmission.....	32
	5.2.4 Setting the RS485 Address.....	34
5.3	Commands and Settings.....	35
<b>6.</b>	<b>Operation .....</b>	<b>36</b>
<b>7.</b>	<b>Maintenance .....</b>	<b>37</b>
<b>8.</b>	<b>Liability for Material Defects.....</b>	<b>38</b>
<b>9.</b>	<b>Decommissioning, Disposal .....</b>	<b>38</b>
	<b>Appendix</b>	

## 1. Safety

Knowledge of the operating instructions is a prerequisite for equipment operation.

### 1.1 Symbols Used

The following symbols are used in this instruction manual:



Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.



Indicates a situation that may result in property damage if not avoided.



Indicates a user action.



Indicates a tip for users.

### 1.2 Warnings



Disconnect the power supply before touching the sensor surface.

- > Risk of injury
- > Static discharge

Connect the power supply and the display/output device in accordance with the safety regulations for electrical equipment.

- > Risk of injury
- > Damage to or destruction of the sensor and/or controller



Avoid shocks and impacts to the sensor and controller.

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

The power supply must not exceed or continuously fall below the specified limits.

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

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 capaNCDT 61x0/IP:

- 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 capaNCDT 61x0/IP measuring system is designed for use in industrial areas. It is used for
  - displacement, distance, thickness and movement measurement
  - position measuring of parts or machine components
- 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 in case of safety-related applications.

## 1.5 Proper Environment

- Protection class:
  - Sensor IP 40, IP 54 (functionality reduced)
  - Controller IP 68
- Operating temperature:
  - Sensor: -50 ... +200 °C (-58 to +392 °F), type CSE  
-40 ... +100 °C (-40 to 212 °F), type CSF
  - Sensor cable: -20 ... +80 °C (-4 to 176 °F) (permanently)  
-20 ... +100 °C (-4 to 212 °F) (up to 10,000 h)
  - Controller: -20 ... +60 °C (-4 to 140 °F)
- Humidity: 5 - 95 % (non-condensing)
- Ambient pressure: Atmospheric pressure
- Storage temperature:
  - Sensor: -50 ... +200 °C (-58 to +392 °F), type CSE  
-40 ... +100 °C (-40 to 212 °F), type CSF
  - Sensor cable: -50 ... +80 °C (-58 to 176 °F)
  - Controller: -20 ... +75 °C (-4 to 167 °F)
- The space between the sensor surface and the target must have an unvarying dielectric constant.
- The space between the sensor surface and the target may not be contaminated (for example water, rubbed-off parts, dust, etc.).

## 2. Functional Principle, Technical Data

### 2.1 Measuring Principle

The principle of capacitive distance measurement with the capaNCDT system is based on the principle of the parallel plate capacitor. For conductive targets, the sensor and the target opposite form the two plate electrodes.

If a constant AC current flows through the sensor capacitor, the amplitude of the AC voltage at the sensor is proportional to the distance between the capacitor electrodes. The AC voltage is demodulated, amplified and output as an analog signal.

The capaNCDT system evaluates the reactance  $X_C$  of the plate capacitor which changes strictly in proportion to the distance:

$$X_C = \frac{1}{j\omega C}; \quad \text{capacitance } C = \epsilon_r * \epsilon_o * \frac{\text{area}}{\text{distance}}$$

**i** A small target and bent (uneven) surfaces cause a non-linear characteristic.

This theoretical relationship is realized almost ideally in practice by designing the sensors as guard ring capacitors.

The linear characteristic of the measuring signal is achieved for electrically conductive target materials (metals) without any additional electronic linearization. Slight changes in the conductivity or magnetic properties do not affect the sensitivity or linearity.

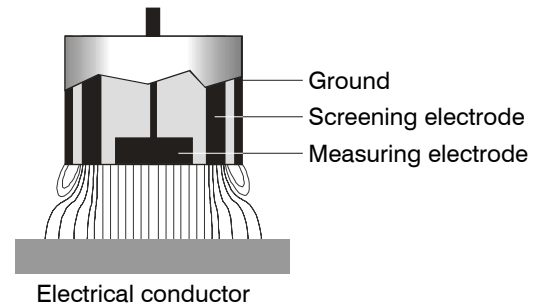


Fig. 1 Functional principle of a capacitive sensor



## 2.2 Structure

The non-contact, single-channel measuring system of capaNCDT 61xx/IP, installed in an aluminum housing, consists of:

- Controller
- Sensor
- Sensor cable
- Power supply and signal cable

The signal processing electronics with oscillator, demodulator, AD converter and integrated preamplifier is in the controller <sup>1</sup>.

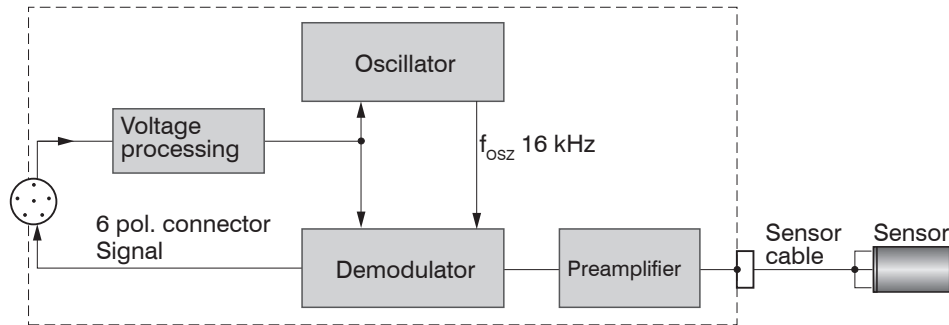


Fig. 2 Block diagram capaNCDT 6110/IP

1) The controller 6120/IP: Contains additionally an AD converter for converting to a RS485 interface.

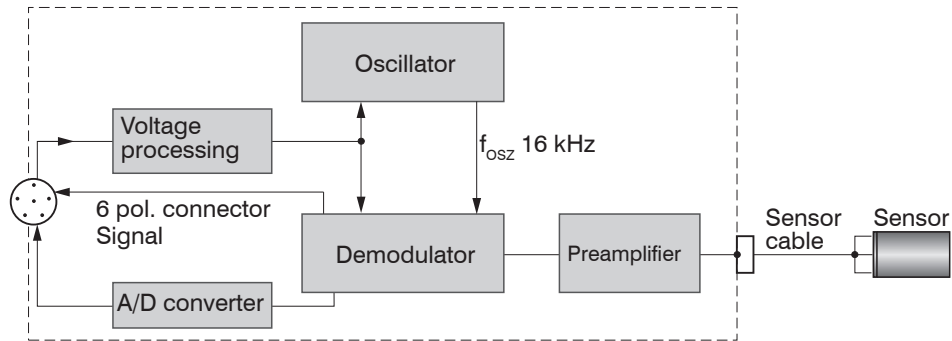


Fig. 3 Block diagram capaNCDT 6120/IP

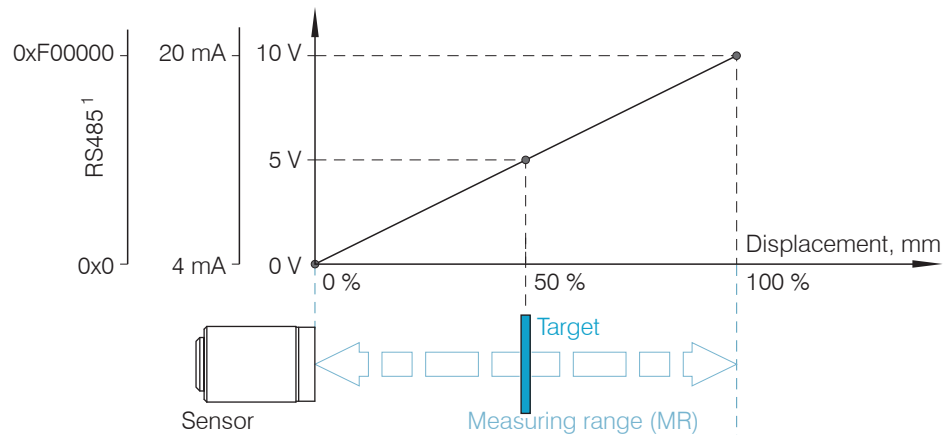


Fig. 4 Glossary, signal output

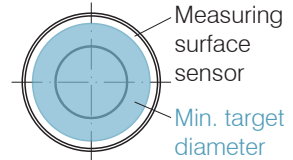
1) Digital interface DT6120/IP/U, DT6120/IP/U/ECL2, DT6120/IP/I or DT6120/IP/I/ECL2 only. Voltage or current output are only possible as an alternative.

### 2.2.1 Sensors

For this measuring system, several sensors can be used.

➡ In order to obtain accurate measuring results, keep the surface of the sensor clean and free from damage.

The capacitive measuring process is area-related. A minimum area, see Fig. 5, is required depending on the sensor model and measuring range.

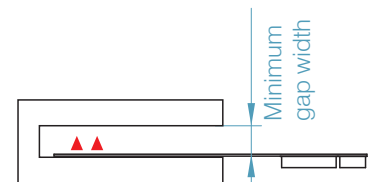


Sensor model		Measuring range, nominal	Min. target diameter
CSE05	CSE05/M8	0.5 mm	6 mm
CSE1		1 mm	8 mm
CSE1,25	CSE1,25/M12	1.25 mm	10 mm
CSE2	CSE2/M16	2 mm	14 mm
CSE3	CSE3/M24	3 mm	20 mm

Sensor model		Measuring range, nominal	Min. target size	Min gap width
CSF2	CSF2-CRg4,0	2 mm	appr. 50.5 x 14.0 mm	≥ 0.75 mm
CSF4	CSF4-CRg4,0	4 mm	appr. 90.5 x 17.5 mm	≥ 0.75 mm
CSF6	CSF6-CRg4,0	6 mm	appr. 127.3 x 25 mm	≥ 0.75 mm

Fig. 5 Sensors for electrical conducting targets (metals)

▲▲ Measurement direction



### **2.2.2 Sensor Cable**

Sensor and controller are connected by a special, double screened sensor cable.

Do not shorten or lengthen these special cables.

Usually, a damaged cable can not be repaired.

Tread-proof model with metal hose is available for industrial applications.

Switch off the device when plugging and removing connectors.

Do not crush the sensor cable.

Do not modify to the sensor cable.

> Lost of functionality

**NOTICE**

### 2.2.3 Controller

The capaNCDT 6110/6120/IP contains a voltage processing, oscillator, integrated preamplifier, demodulator <sup>2</sup> as well as an output level.

The voltage processing produces all necessary internal voltages from the power supply. The oscillator supplies the sensor with frequency and amplitude-stabilized alternating voltage. The frequency is 16 kHz. The internal preamplifier generates the distance-dependent measuring signal and amplifies it. Demodulator and output level convert the measuring signal into a standard voltage signal <sup>3</sup>.

#### **NOTICE**

The output voltage can reach up to a maximum of 13 VDC when sensor is disconnected or measurement is exceeded.

> Damage to downstream devices



Fig. 6 Controller DT6110/6120/IP

2) The controller 6120: Contains additionally an AD converter.

3) An analog-digital converter converts the measuring signal and outputs it to the RS485 interface.

## 2.3 Technical Data

Controller modell	DT6110/IP/U	DT6110/IP/I	DT6120/IP/U	DT6120/IP/I	
Resolution static	0.01 % FSO (2 Hz)				
Resolution dynamic	0.02 % FSO (1000 Hz)				
Frequency response	1 kHz (-3 dB)				
Linearity	≤ ±0.1 % FSO				
Sensitivity	≤ ±0.1 % FSO				
Long-term stability	0.02 % FSO/month				
Temperature stability	50 ppm FSO/K (+10 ... +40 °C); 100 ppm FSO/K (-20 ... +10 °C and +40 ... +60 °C)				
Operating temperature	Sensor	type CSF -40 ... +100 °C   type CSE: -50 ... +200 °C			
	Sensor cable	permanent: -20 ... +80 °C, up to 10,000 h: -20 ... +100 °C			
	Controller	-20 ... +60° C			
Power supply	9 ... 28 VDC (max. 1.4 W)	11 ... 28 VDC (max. 2 W)	9 ... 28 VDC (max. 1.6 W)	11 ... 28 VDC (max. 2.2 W)	
Output	analog	0 ... 10 V (short circuit proof) optional: ±5 V, 10 ... 0 V	4 ... 20 mA max. 500 Ohm load	0 ... 10 V (short circuit proof) optional: ±5 V, 10 ... 0 V	4 ... 20 mA max. 500 Ohm load
	digital	---	---	RS485, 230400 Baud (adjustable), 24 bit measuring values, max. 2 kSamples (adjustable)	
Storage temperature	-20 ... +75 °C				
Protection class	Sensor	IP 40, IP 54 (functionality reduced)			
	Controller	IP 68			
Shock	20 g / half sine 5 ms in XYZ axis / 1000 shocks per axis (DIN-EN 60068-2-29)				
Vibration	10 g / 10 ... 2000 Hz in XYZ axis / 10 cycles per axis (DIN-EN 60068-2-6)				
Weight	165 g				

FSO = Full Scale Output

capaNCDT 61xx/IP

### **3. Delivery**



#### **3.1 Unpacking**

- 1 Controller
- 1 Power supply and output cable SCAC3/6/IP
- 1 Instruction Manual

Optional accessories:

- 1 Sensor
- 1 Sensor cable with connector
- 1 IF1032/ETH interface converter from analog (DT6110/IP) or RS485 Ethernet (DT6120/IP) on Ethernet/EtherCAT

You will find further optional accessories in the appendix.

-  Remove the parts of the system carefully from the packaging and transport them in such a way that they are not damaged.
-  Check for completeness and shipping damages immediately after unpacking. In case of damage or missing parts, please contact the manufacturer or supplier.

#### **3.2 Storage**

- Storage temperature:
  - Sensor: -50 ... +200 °C (-58 ... +392 °F)
  - Sensor cable: -50 ... +80 °C (-58 ... +176 °F)
  - Controller: -20 ... +75 °C (-4 ... +167 °F)
- Humidity: 5 - 95 % RH (non-condensing)

## 4. Installation and Assembly

### 4.1 Precautionary Measures

No sharp-edged or heavy objects should be allowed to affect the sensor cable sheath.

- ➡ Protect the cable against pressure loads in pressurized rooms.
- ➡ Avoid folding the cables in any case.
- ➡ Check the connections for tight fit.

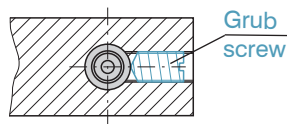
**i** A damaged cable cannot be repaired.

### 4.2 Sensor

The sensors may be mounted free-standing or flush.

When assembling, make sure that the polished sensor surface is not scratched.

#### 4.2.1 Radial Point Clamping, Circumferential Clamping, Series CSE Sensors



This simple type of fixture is only recommended for a force and vibration-free installation position. The grub screw must be made of plastic so that it cannot damage or deform the sensor housing.

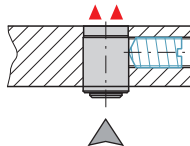


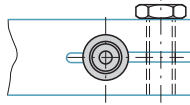
Fig. 7 Radial point clamping with grub screw

#### **NOTICE**

Do not use metal grub screws!

> Danger of damaging the sensor





This sensor mounting option offers maximum reliability because the sensor is clamped around its cylindrical housing. It is absolutely necessary in difficult installation environments, for example on machines, production plants et cetera.

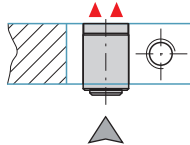
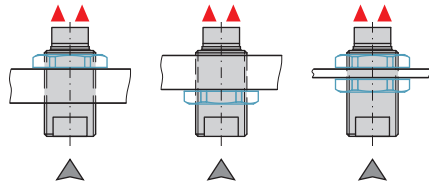


Fig. 8 Circumferential clamping with clamping ring

**i** Tension at the cable is inadmissible!

#### 4.2.2 Mounting with Thread, Series CSEx/Mx Sensors



For holders with an internal thread, a mounting nut is sufficient for attaching the sensor. For thin holders, Micro-Epsilon recommends mounting nuts on both sides for mounting. Attach the sensor preferably at the end of the thread towards the active measuring surface. Please note the maximum torque, see [Fig. 10](#).

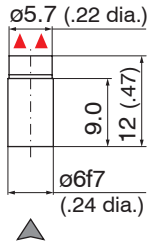
Fig. 9 Mounting with thread

▲▲ Active measuring surface sensor, ▲ connector side

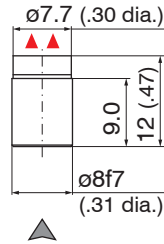
### 4.2.3 Dimensional Drawings Sensors

#### Cylindric sensors

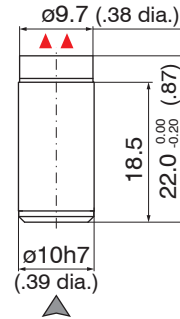
CSE05



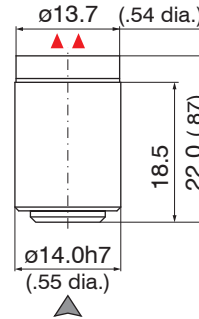
CSE1



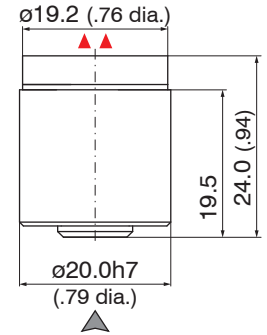
CSE1,25



CSE2



CSE3



▲▲ Active measuring surface sensor, ▲ connector side

Dimensions in mm (inches), dimensional drawings of other sensors are available on request..

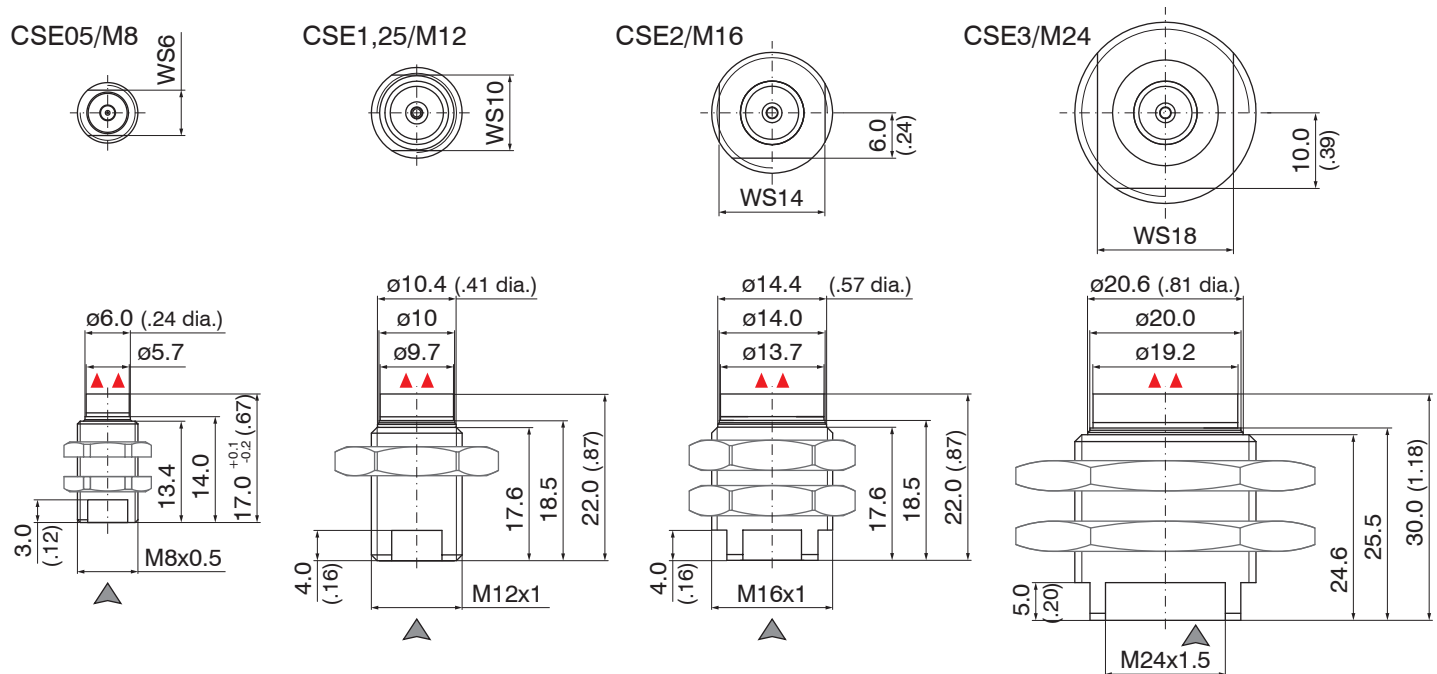


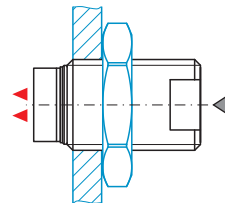
Fig. 10 Cylindrical sensors with thread and male connector, dimensions in mm (inches)

▲ Connector side

Dimensions in mm (inches), dimensional drawings of other sensors are available on request.

▲▲ Active measuring surface sensor

Sensor	Torque
CSE05/M8	2.5 Nm max.
CSE1,5/M12	10 Nm max.
CSE2/M16	20 Nm max.
CSE3/M24	70 Nm max.



Preferred mounting:

- ▶ Screw the sensor into the sensor holder.
- ▶ Turn the mounting nut on. Do not exceed torques.

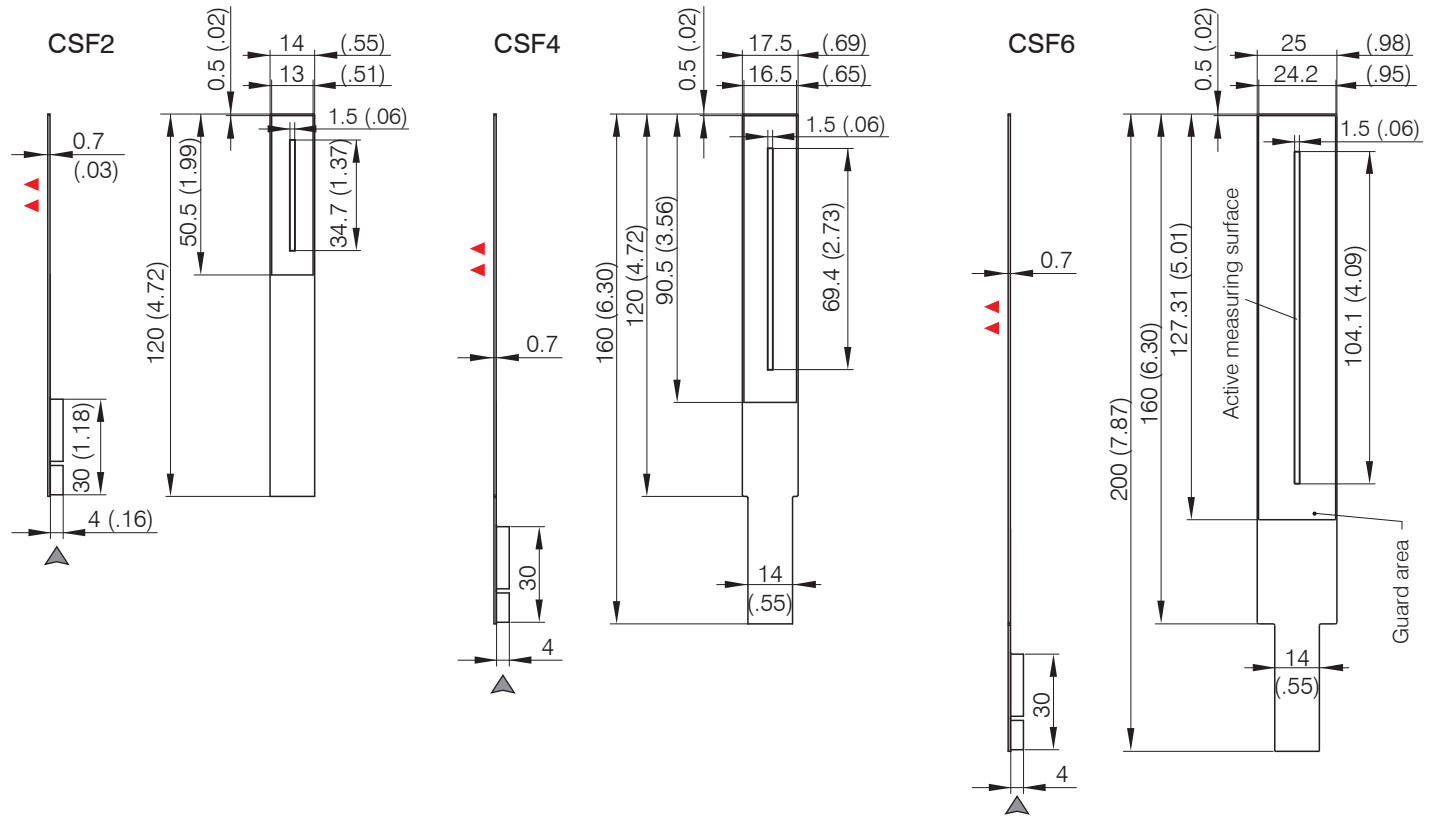


Fig. 11 Flat sensors with connector

▶ Active measuring surface sensor, ▲ connector side, dimensions in mm (inches)

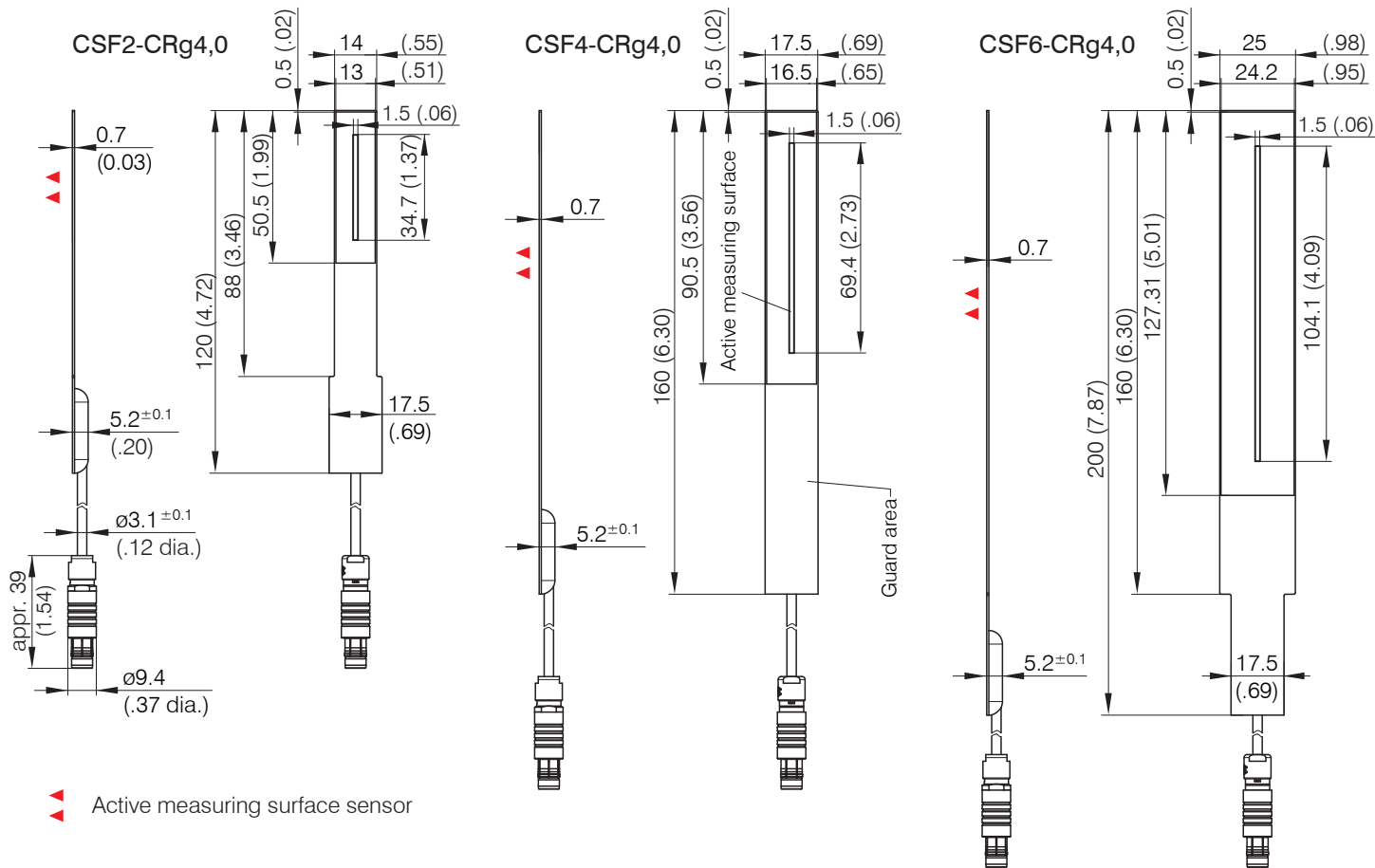


Fig. 12 Flat sensors with integrated cable, dimensions in mm (inches)

### 4.3 Sensor Cable

#### 4.3.1 General

The sensor is connected to the controller by the sensor cable.

The connection is made by simple plugging. The connector locks automatically with type C and B connectors. The tight fit can be checked by pulling the connector housing (cable bushing). The lock can be released and the connector can be opened by pulling the knurled housing sleeve of the cable bushing.

#### 4.3.2 Cable with Type C Connector

Type	Model	Cable length	Bending radius
CCgx,xC/PT	Tread-proof, with protective metal tubing	1 m, 2 m, 4 m, 6 m, 8m	static >20 mm dynamic >30 mm
CCgx,xC	Industrial applications		static >10 mm dynamic >22 mm
CCgx,xC/90			(recommended 30 mm)

Sensor cable suitable for sensors  
CSE05,  
CSE05/M8,  
CSE1

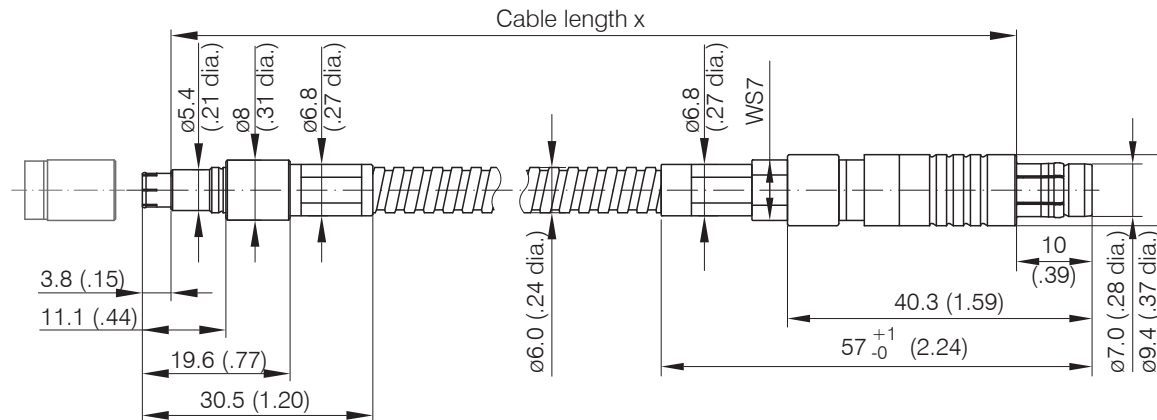


Fig. 13 Dimensional drawing sensor cable CCgxC/PT, dimensions in mm (inches)

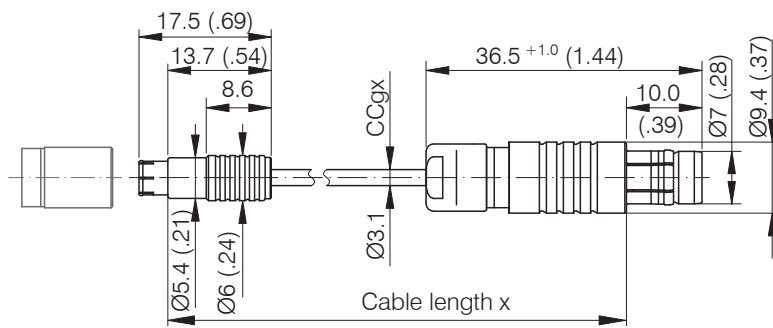
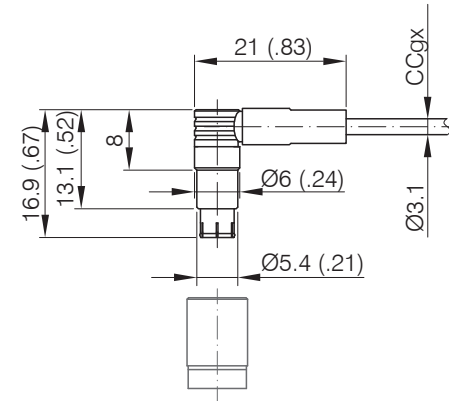


Fig. 14 Dimensional drawings sensor cable CCgxC

Dimensions in mm (inches)



CCgxC/90

### 4.3.3 Cable with Type B Connector

Type	Model	Cable length	Bending radius
CCgx,xB/PT	Tread-proof, with protective metal tubing	1 m, 2 m, 4 m, 6 m, 8m	static >20 mm dynamic >30 mm
CCgx,xB	Industrial applications		static > 10 mm dynamic >22 mm
CCgx,xB/90			(recommended 30 mm)

Sensor cable suitable for sensors  
 CSE1,25/M12,  
 CSE2, CSE2/M16,  
 CSE3, CSE3/M24

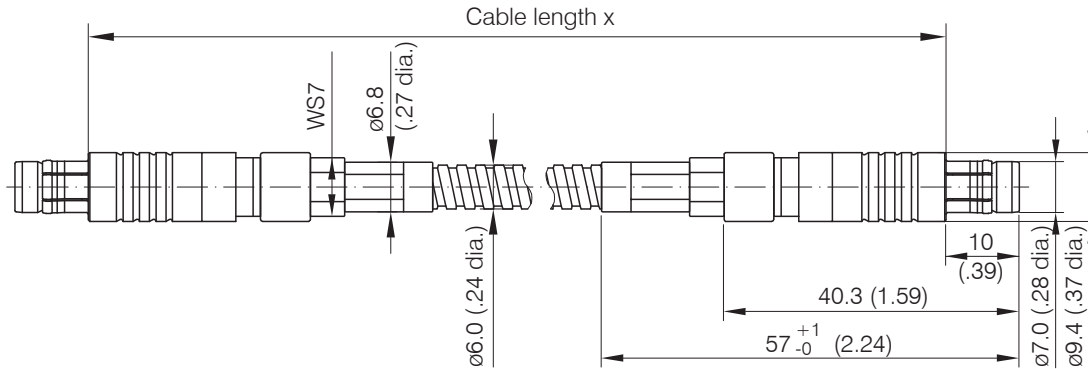


Fig. 15 Dimensional drawing sensor cable CCgxB/PT

**i** Sensor cables with connector type B enable to connect to each end both a sensor and a controller.

Dimensions in mm (inches)



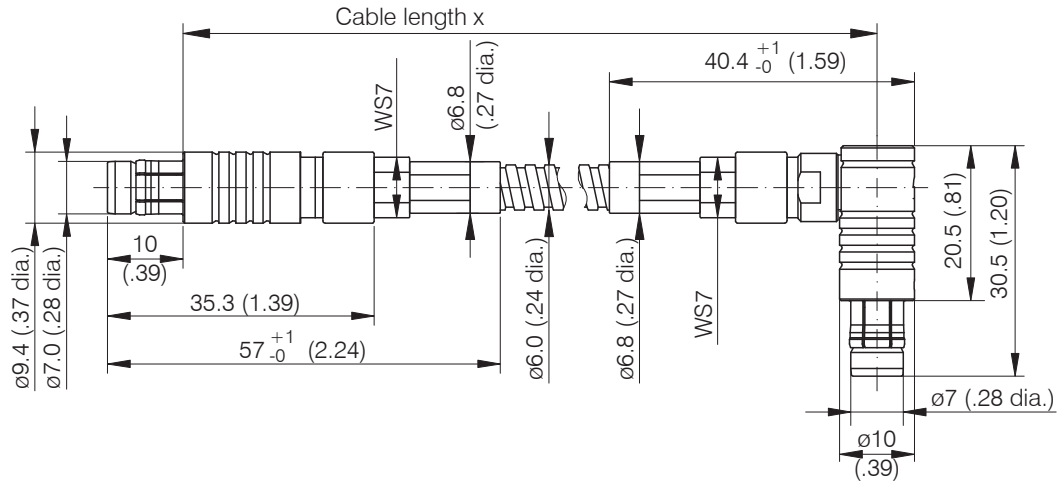


Fig. 16 Dimensional drawing sensor cable CCgxB/90/PT

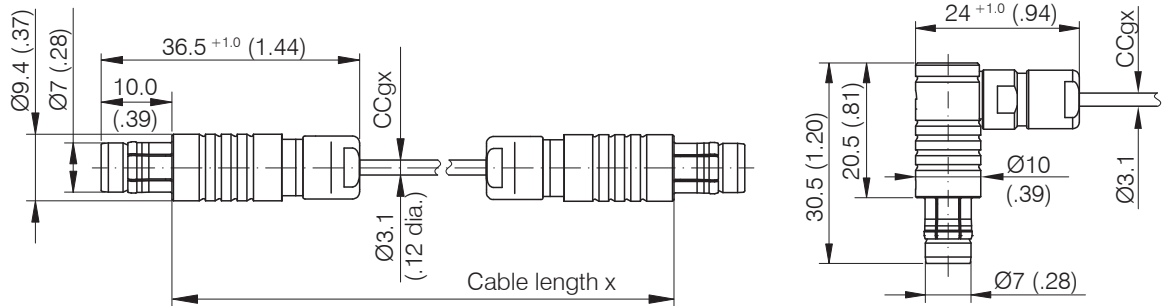


Fig. 17 Dimensional drawings sensor cable CCgxB

CCgxB/90

### 4.3.4 Cable with Type E Connector

Type	Model	Cable length	Bending radius
CCGx,xE	With patented miniature plug for flat sensors	4 m	static > 10 mm dynamic > 22 mm (recommended 30 mm)

Sensor cable suitable for sensors

CSF2,  
CSF4,  
CSF6

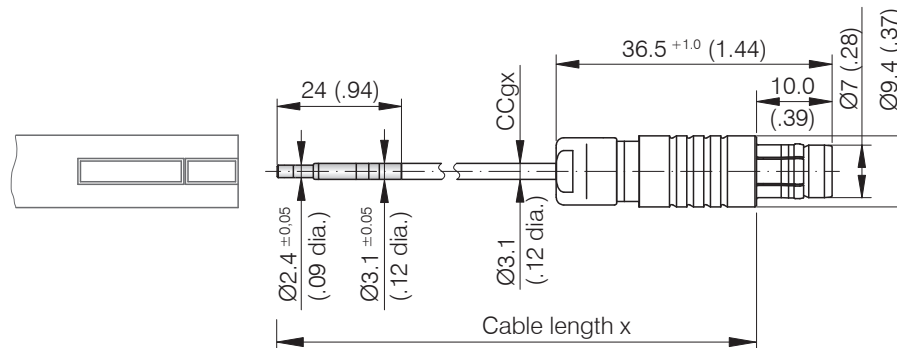


Fig. 18 Dimensional drawing sensor cable CCGxE

Dimensions in mm (inches)

#### 4.4 Controller

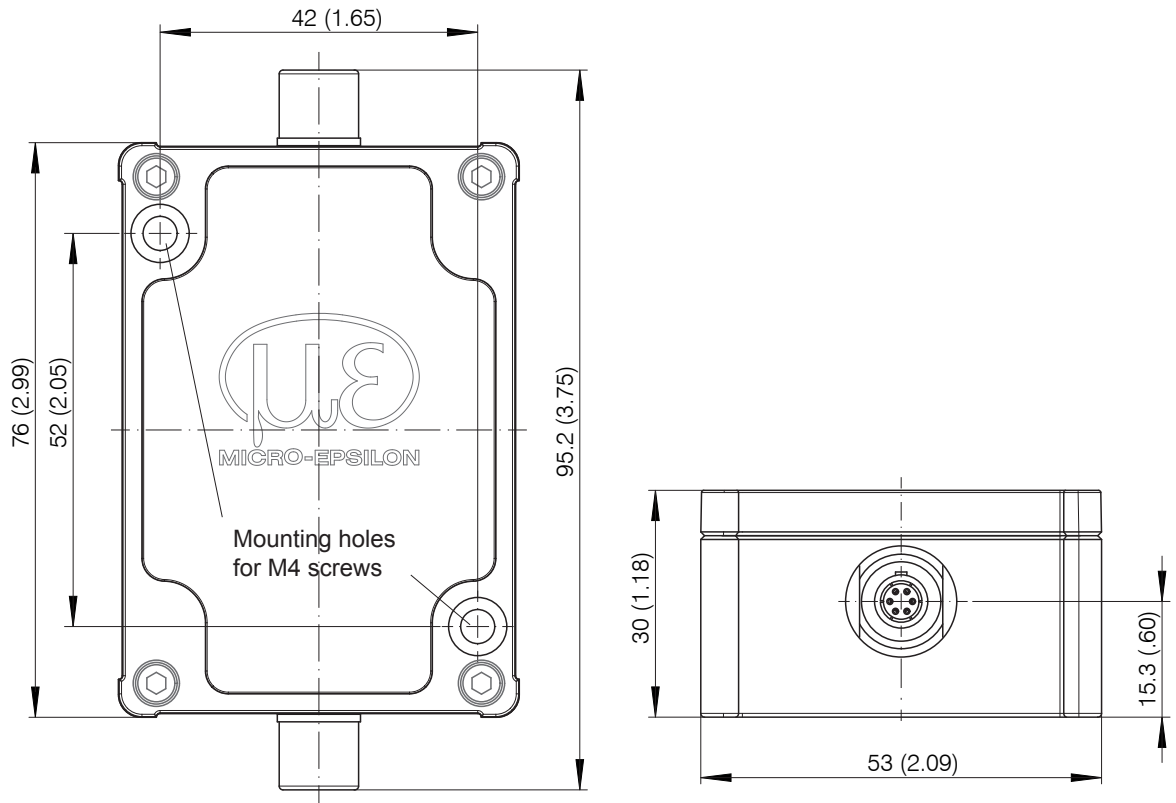


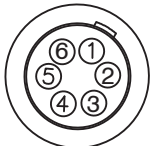
Fig. 19 Dimensional drawing controller

Dimensions in mm (inches)

#### 4.5 Ground Connection, Grounding

➡ Make sure you have a sufficient grounding of the measuring object, for example connect it with the sensor or the supply ground.

#### 4.6 Power Supply, Display/Output Device, Sensor Connection

Pin	Color SCAC3/6/IP	Signal	Description	 <p>View on solder pin side, 6-pin. female connector</p>
1	white	+24 V	+24 V power supply	
2	grey	GND	Supply ground	
3	pink	RS485_A <sup>1</sup>	RS485 interface	
4	green	AGND	Analog ground (for signal output)	
5	brown	U-out	Voltage output (R min 10 kOhm)	
		I-out <sup>2</sup>	Current output (max. 500 Ohm load)	
6	blue	RS485_B <sup>1</sup>	RS485 interface	
Shield			Cable shield, housing	

SCAC3/6/IP is a 3 m long, pre-assembled power supply and output cable.

1) Digital interface with DT6120/IP/U or DT6120/IP/I only

2) Voltage or current output

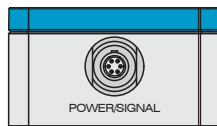


Fig. 20 Connection power supply and signal output

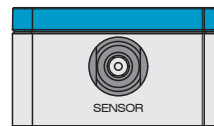


Fig. 21 Connection sensor cable

## 5. RS485 Interface

The RS485 interface is only present with the DT6120/IP.

You can read the measuring values in digital form via the RS485 interface.

MICRO-EPSILON supports you with the driver MEDAQLib, which contains all commands for the capaNCDT 6120/IP. You can download the driver directly under the link <http://www.micro-epsilon.de/link/software/medaqlib>.

You can also use the IF1032/ETH interface converter, see Chap. , for the configuration and reading of the measuring values via Ethernet.

### 5.1 Hardware Interface

The interface is a half-duplex RS485 interface (1 common line pair for Rx and Tx).

Baud rate: 230400 (other baud rates adjustable)

Data format: 1 start bit, 8 data bits, 1 parity bit (straight), 1 stop bit

RS485 Address: 126 (1 ... 126 adjustable)

In controller there is no RS485 terminal resistance. For RS485 cables longer than 5 meters a terminal resistance of 120 Ohm between the A and the B line both at the bus start and end is necessary.

### 5.2 Protocol

The capaNCDT 6120/IP behaves like a RS485-Slave. Since it is a halfduplex protocol, only the Master can initiate a communication. Each device on the RS485 bus requires a RS485 address. The master sends a request with address on the bus and only the Slave with the address then responds to the request.

### 5.2.1 Reading Measuring Values

Master: Request Data						
Byte:	SD	DA	SA	FC	FCS	ED
Value:	0x10	x	x	0x4C	x	0x16
FCS						

Slave: Response Data										
Byte:	SD	LE	LE rep	SD rep	DA	SA	FC	Data[]	FCS	ED
Value:	0x68	x	x	0x68	x	x	0x08	x	x	0x16
FCS										

Abbreviations:	
SD	StartDelimiter (0x10: telegram without data; 0x68 telegram with variable length)
LE	Length (number of bytes without SD, LE, LErep, SDrep, FCS, ED)
LErep	LE repeated
SDrep	SD repeated
DA	Destination Address /default 0x7E)
SA	Source Address (e.g. 0x01)
FC	Function Code
FCS	Checksum (sum of all bytes without SD, LE, LErep, SDrep, FCS, ED; without overflow, only 8 bits)
ED	EndDelimiter

Data[] - Measuring data (little endian)
---

The measuring data consists of a counter, the packet length  $m$  and the measuring values. The packet length  $m$  determines how many measuring values are transmitted. The packet length  $m$  is the number of measuring values sampled from the electronic, since the last request of measuring data, but is limited to the last 20 measuring values. The first measuring value in the data[] packet is the oldest value sampled, the last is the newest value sampled.

Data[0]	Counter [7:0]	unsigned short
Data[1]	Counter [15:8]	
Data[2]	Packet length $m$ [7:0]	unsigned char
Data[3]	Filler byte [7:0]	unsigned char
Data[4]	Measuring value 1 [7:0]	signed integer
Data[5]	Measuring value 1 [15:8]	
Data[6]	Measuring value 1 [23:16]	
Data[7]	Measuring value 1 [31:24]	
Data[8]	Measuring value 2 [7:0]	signed integer
Data[9]	Measuring value 2 [15:8]	
Data[10]	Measuring value 2 [23:16]	
Data[11]	Measuring value 2 [31:24]	
	...	
Data[..]	Measuring value $m$ [7:0]	signed integer
Data[..]	Measuring value $m$ [15:8]	
Data[..]	Measuring value $m$ [23:16]	
Data[..]	Measuring value $m$ [31:24]	

### 5.2.2 Scaling the Measuring Values

By default, 24-bit measuring values are transmitted. That is why:

0x0 = 0 % of sensor measuring value

0xF00000 = 100 % of sensor measuring value

If the sensor is out of measuring range, so correspondingly larger measuring values are output.

### 5.2.3 Example of the Measuring Value Transmission

Master: Request Data						
Byte:	SD	DA	SA	FC	FCS	ED
Value:	0x10	x	x	0x4C	x	0x16
				FCS		

DA = Destination address = slave address = 0x7E

SA = Source address = master address = 0x01

FCS = Checksum =  $0x7E + 0x01 + 0x43 = 0xC2$

Slave: Response Data										
Byte:	SD	LE	LE rep	SD rep	DA	SA	FC	Data	FCS	ED
Value:	0x68	0x13	0x13	0x68	0x01	0x7E	0x08	e.g. 16 bytes	x	0x16
							FCS			

LE = Length = 16 data bytes + 3 bytes (DA, SA, FC) = 19 bytes = 0x13

DA = Destination address = master address = 0x01

SA = Source address = slave address = 0x7E

FCS = Checksum =  $0x01 + 0x7E + \dots$



	Value	Name	Explanation
Data[0]	0x22	Counter [7:0]	Measuring value counter = 0x0122 = 290
Data[1]	0x01	Counter [15:8]	
Data[2]	0x03	Packet length m [7:0]	m = 3 -> 3 meas. values
Data[3]	0x00	Filler byte [7:0]	filler, can be ignored
Data[4]	0xB1	Measuring value 1 [7:0]	meas. value = 0x003244B1 (0xF00000 = 100 %) -> 0x003244B1 = 20.945 % e.g. 200 $\mu\text{m}$ sensor -> 41.89 $\mu\text{m}$
Data[5]	0x44	Measuring value 1 [15:8]	
Data[6]	0x32	Measuring value 1 [23:16]	
Data[7]	0x00	Measuring value 1 [31:24]	
Data[8]	0xAC	Measuring value 2 [7:0]	Next measurement value, see above
Data[9]	0x44	Measuring value 2 [15:8]	
Data[10]	0x32	Measuring value 2 [23:16]	
Data[11]	0x00	Measuring value 2 [31:24]	
Data[12]	0xB9	Measuring value 3 [7:0]	Next measurement value, see above
Data[13]	0x44	Measuring value 3 [15:8]	
Data[14]	0x32	Measuring value 3 [23:16]	
Data[15]	0x00	Measuring value 3 [31:24]	

A total of 3 measurement values (= m) were added since the last measuring value request in controller and transferred thereby.

### 5.2.4 Setting the RS485 Address

The RS485 address of controller can be changed with this telegram:

Master:														
SD	LE	LE	SD	DA	SA	FC	DSAP	SSAP	new_addr	ID_Hi	ID_Lo	Lock	FCS	ED
0x68	0x09	rep	rep	x	x	0x43	0x37	0x3E	x	0x0	0x0	0x0	x	0x16

DA Destination Address (= old Slave address)

SA Source Address = Master Address (e.g. 0x01)

FCS Checksum (sum of all bytes without SD, LE, LErep, SDrep, FCS, ED; without overflow, only 8 bits)

New\_addr New address (in range 1...126)

Answer Slave (short acknowledgement), on success:

SC
0xE5

No response:

No response indicates that an error has occurred in the address alignment. The controller still has the old address.

The new address is valid only after a reboot of the controller.

### 5.3 Commands and Settings

It can be made even more settings via the RS485 interface:

- Filter:
  - off
  - moving average (about 2 to 8 values)
  - arithmetic average (about 2 to 8 values)
  - Median (about 2 to 8 values)
  - dynamic noise reduction
- Data rate at which the measuring values can be added:
  - 5, 10, 20, 40, 80, 160, 320, 640, 1000 or 2000 Samples/s
- Baud rate of RS485 interface:
  - 9600, 115200, 230400, 460800 or 921600 Baud
- RS485 address of controller: 1 ... 126
- Firmware Update of controller

**i** Use for these settings either our MEDAQLib driver or the IF1032/ETH interface converter to Ethernet with the appropriate configuration option via web interface.

## 6. Operation

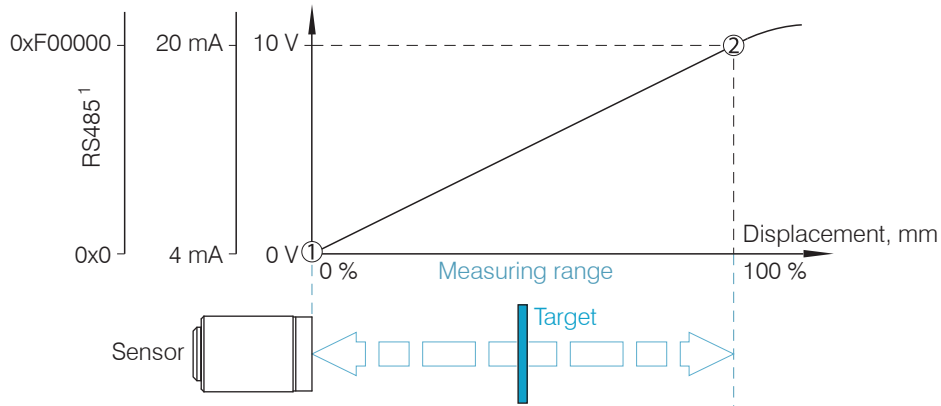
➡ Connect the display/output devices through the signal output socket, see Chap. 4.6. before connecting the device to the power supply and switching on the power supply.

The measuring system is delivered calibrated. Calibration by the user is not necessary.

**i** Allow the measuring system to warm up for about 10 minutes before the first measurement.

### NOTICE

The power supply may not exceed or continuously fall below the specified limits.  
Damage to or destruction of the sensor and/or controller.



1 = Start of measuring range  
2 = End of measuring range

Fig. 22 Signal characteristic in the measuring range

### CAUTION

Disconnect the power supply before touching the sensor surface.

- > Static discharge
- > Danger of injury

Digital interface with DT6120/IP/U or DT6120/IP/I only  
Voltage or current output are only possible as an alternative.

## 7. Maintenance

Make sure that the sensor surface is always clean.

➡ Switch off the power supply before cleaning.

➡ Clean with a clamp cloth; then rub the sensor surface dry.



Disconnect the power supply before touching the sensor surface.

> Static discharge

> Danger of injury

If the controller, the sensor or the sensor cable is defective, please send us the effected parts for repair or exchange. In the case of faults the cause of which is not clearly identifiable, send the whole measuring system back 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

Sensors of the same type can be replaced without calibrating the controller.

## **8. 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.

## **9. Decommissioning, Disposal**




➡ Remove the cable for electrical power and output signal from the controller.

Incorrect disposal may cause harm to the environment.

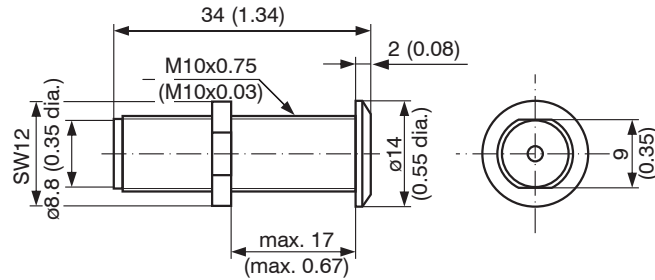
➡ Dispose of the device, its components and accessories, as well as the packaging materials in compliance with the applicable country-specific waste treatment and disposal regulations of the region of use.

## Appendix

### Optional Accessories

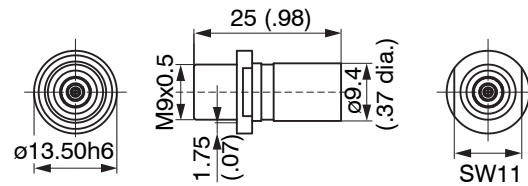
PS2020	 A blue DIN rail power supply unit with a terminal block on top and a connector on the side. The brand name 'PULS' is visible on the front panel.	<p>Power supply for DIN rail mounting Input 100 - 240 VAC Output 24 VDC / 2.5 A; L/W/H 120 x 120 x 40 mm</p> <p>Built-in type; mounting on symmetrical DIN-rail 35 mm x 7.5 mm, DIN 50022</p>
PS2401/100-240/24V/1A	 A black wall power supply with a two-prong AC plug and a cable with a green terminal block. Two interchangeable black inserts are shown next to it.	<p>Wall power supply; universal power supply open ends; changeable inserts; internationally usable</p>
IF1032/ETH	 A blue and silver interface module with a terminal block on the left and a connector on the right. The model number 'IF1032/ETH' is printed on the front.	<p>Interface module Ethernet/EtherCAT</p> <ul style="list-style-type: none"><li>- at DT6120: RS485 to Ethernet/ EtherCAT (24-bit resolution)</li><li>- at DT6110: Analog output to Ethernet/EtherCAT (only 14-bit resolution)</li></ul>

Vacuum feed through

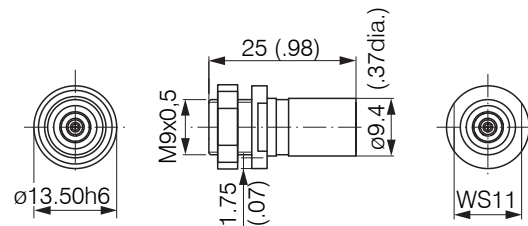


Female connector, triax straight,  
Max. leak rate  $1 \times 10^{-7}$  mbar · l s<sup>-1</sup>  
Compatible with connector type B

Vacuum feed through  
UHV/B



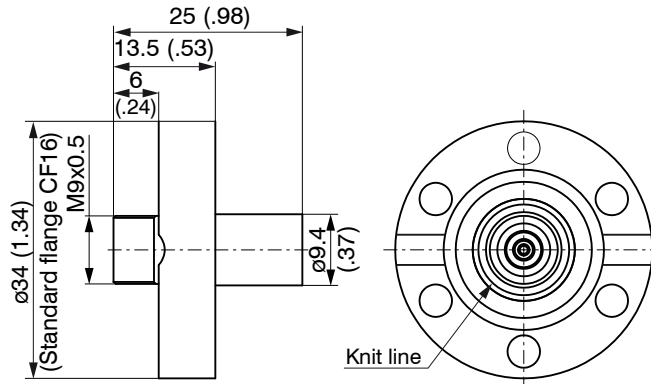
Vacuum feed through triax weldable  
Max. leak rate  $1 \times 10^{-9}$  mbar · l s<sup>-1</sup>  
Compatible with connector type B



Vacuum feed through triax screwable  
Max. leak rate  $1 \times 10^{-9}$  mbar · l s<sup>-1</sup>  
Compatible with connector type B



Vacuum feed through  
UHV/B



Vacuum feed through triax with  
CF16 flange  
Max. leak rate  $1 \times 10^{-9}$  mbar · l s<sup>-1</sup>  
Compatible with connector type B



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

X9751316.01-A011128MSC  
© MICRO-EPSILON MESSTECHNIK

