More Precision

MICRO-EPSILON

optoNCDT // Laser Triangulation Displacement Sensors

|	Nine models with measuring ranges from 5mm to 600mm
	Ideal for OEM applications
312Hz 375Hz 1000Hz	**Adjustable measuring rate up to 1.5kHz**
Analog Digital	**Analogue (U/I) and digital output**
Trigger TeachIn	**Trigger input and teach-in**
Filter inside	**Adjustable filter functions Peak selection (firmware)**
	High flex cables for dragchain or robot use
Certified	**Calibration certificate included**

The miniature optoNCDT 1402 series is the leading sensor in this price/ performance category. The compact construction enables integration inside small areas. The optoNCDT 1402 series is ideally suited for integration into machines and automation applications.

optoNCDT 1402
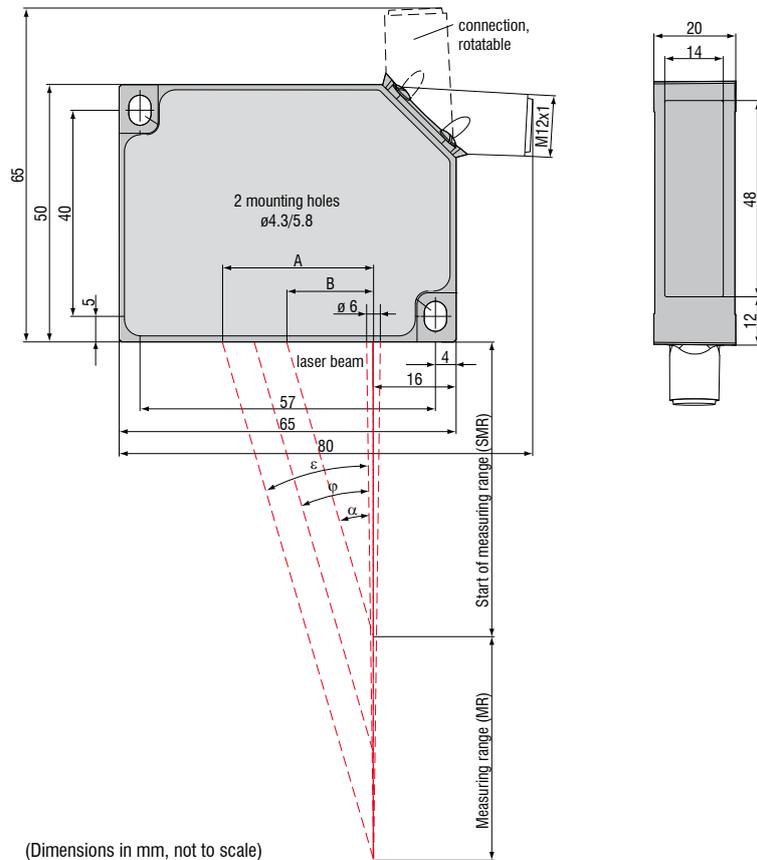
(Dimensions in mm, not to scale)

MR	SMR	α	φ	ε	A	B
5	20.0	33.5	35.5	37.1	18.9	13.2
10	20.0	33.5	32.9	32.4	19.1	13.2
20	30.0	31.2	27.9	25.8	24.2	18.2
50	45.0	25.1	19.6	16.9	28.9	21.1
100	50.0	23.1	14.4	11.3	30.1	21.3
200	60.0	20.1	9.4	6.8	30.8	22.0
250VT	100.0	14.7	7.6	5.5	33.9	26.2
600	200.0	9.7	4.3	3	41.6	33.7

Model	ILD 1402-5	ILD 1402-10	ILD 1402-20	ILD 1402-50	ILD 1402-100	ILD 1402-200	ILD 1402-250VT	ILD 1402-400	ILD 1402-600
Measuring range	5mm	10mm	20mm	50mm	100mm	200mm	250mm	400mm	600mm
Start of measuring range SMR	20mm	20mm	30mm	45mm	50mm	60mm	100mm	200mm	200mm
Midrange MMR	22.5mm	25mm	40mm	70mm	100mm	160mm	225mm	400mm	500mm
End of measuring range EMR	25mm	30mm	50mm	95mm	150mm	260mm	350mm	600 mm	800mm
Linearity [1]	5...9μm	5...18μm	7...36μm	12...90μm	20...180μm	40...360μm	50...1200μm	120...2000μm	120...3000μm
	$\leq$0.18% FSO						$\leq$0.5% FSO		
Resolution [2] averaged with averaging factor 64	0.6μm	1μm	2μm	5μm	10μm	13μm	32μm	80μm	80μm
	0.01% FSO								
dynamic 1.5 kHz	1...3μm	2...5μm	5...10μm	6...25μm	12...50μm	13...100μm	32...300μm	80...480μm	80...600μm
	0.02...0.05% FSO						0.02...0.12% FSO		
Measuring rate, programmable	1.5kHz; 1kHz; 750Hz; 375Hz; 50Hz								
Light source	semiconductor laser <1mW, 670nm (red)								
Laser safety class	class 2 IEC 60825-1 : 2008-05								
Spot diameter SMR	110μm	110μm	210μm	1100μm	1400μm	2300μm	5000μm	2.6 x 5mm	2.6 x 5mm
MMR	380μm	650μm	530μm	110μm	130μm	2200μm	5000μm	2.6 x 5mm	2.6 x 5mm
EMR	650μm	1200μm	830μm	1100μm	1400μm	2100μm	5000μm	2.6 x 5mm	2.6 x 5mm
Protection class	IP 67								
Vibration	15g / 10Hz … 1kHz						20g / 10Hz…1kHz	15g / 10Hz…1kHz	
Shock	15g / 6ms (IEC 68-2-29)								
Weight (without cable)	appr. 83g						appr. 130g		
Temperature stability	0.03 % FSO/°C						0.08 % FSO/°C		
Operation temperature	0 …+50°C								
Storage temperature	-20 ... +70°C								
Output analogue	4 ... 20mA (1 ... 5V with cable PC 1402-3/U); free scalable within the nominal range								
digital	RS422 / 14bit								
Control I/O	1x open collector output (switching output, switch, error); 1x input (teach in, trigger); 1x laser on/off								
Supply	11 ... 30VDC, 24VDC / 50mA								
Controller	integrated signal processor								
Software	free setup and aquisition tool + SDK (software development kit)								
Electromagnetic compatibility (EMC)	EN 61326-1:2006 / EN 55011 Class B (Interface emission) EN 61326-1:2006 / EN 61000-4-2:1995 + A1:1998 + A2:2001 (Interference resistance)								

FSO = Full scale output   All specifications apply for a diffusely reflecting matt white ceramic target
[1] values apply for 0 - 30% FSO and 30 - 100 % FSO   [2] resolution digital output 14bit
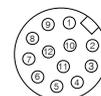SMR = Start of measuring range   MMR = Midrange   EMR = End of measuring range

Connector axial

Ø15   45.4

12-pin-connector
(view on solder termination side of male inserts)

| Pin		Description	colour PC1402-x/I
3	RS422 Rx+	serial input	green
4	RS422 Rx-	serial input	yellow
5	RS422 Tx+	serial output	grey
6	RS422 Tx-	serial output	pink
7	+U B	11-30DV 24V MP	red
8	Laser off	switch input	black
9	Teach in	switch input	violet
10	Error	switch output	brown
11	I OUT	4 ... 20mA	white
12	GND	supply and signal ground	blue
1/2	n.c.		

The cable screen is connected with the sensor housing. The interface and power supply cable are robot rated and UL certfied. At one end there is a 12pin M12 connector, the other end is open.

Compatible with optoNCDT 1401

Eight models with measuring ranges from 5mm to 600mm

312Hz 375Hz 1000Hz **Adjustable measuring rate up to 1.5kHz**

*A*nalog *D*igital **Analogue (U/I) and digital output**

*T*rigger *T*eachIn **Trigger input and teach-in**

*F*ilter inside **Adjustable filter functions Peak selection (firmware)**

High flex cables for drag chain or robot use

Certified **Calibration certificate included**

The optoNCDT 1402(025) has been designed as a drop in replacement for the former optoNCDT 1401 series. Similar to the former sensor, this series has a 7 pin connecter and RS232 or analogue outputs as standard (user selectable).
The mating electrical connector is included in the scope of supply.

optoNCDT 1402(025)
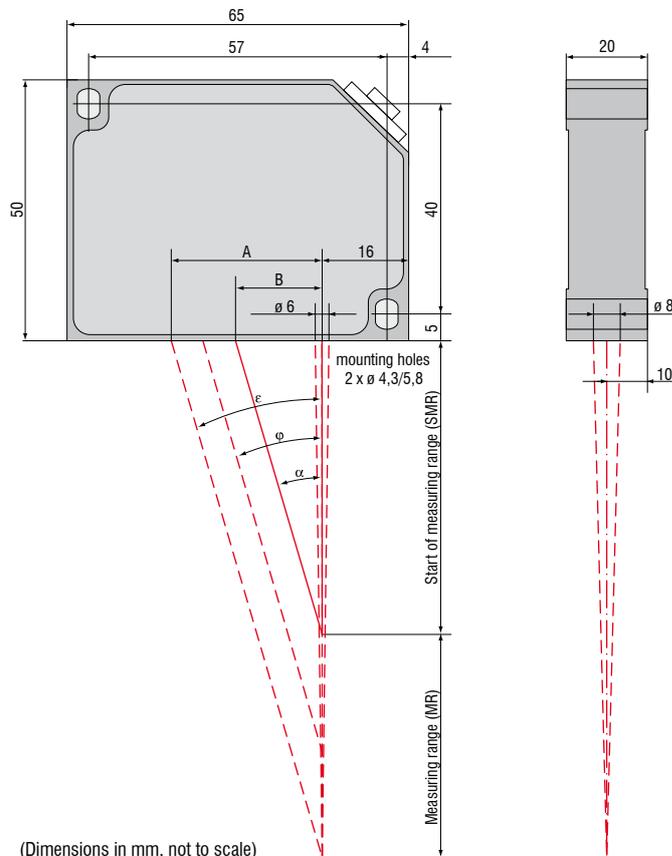
(Dimensions in mm, not to scale)

| MR	SMR	α	φ	ε	A	B
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20	30.0	31.2	27.9	25.8	24.2	18.2
50	45.0	25.1	19.6	16.9	28.9	21.1
100	50.0	23.1	14.4	11.3	30.1	21.3
200	60.0	20.1	9.4	6.8	30.8	22.0
400	200.0	9.7	5.3	3.8	41.4	33.7
600	200.0	9.7	4.3	3	41.6	33.7

Model		ILD 1402-5(025)	ILD 1402-10(025)	ILD 1402-20(025)	ILD 1402-50(025)	ILD 1402-100(025)	ILD 1402-200(025)	ILD 1402-400(025)	ILD 1402-600(025)
Measuring range		5mm	10mm	20mm	50mm	100mm	200mm	400mm	600mm
Start of measuring range	SMR	20mm	20mm	30mm	45mm	50mm	60mm	200mm	200mm
Midrange	MMR	22.5mm	25mm	40mm	70mm	100mm	160mm	400mm	500mm
End of measuring range	EMR	25mm	30mm	50mm	95mm	150mm	260mm	600mm	800mm
Linearity [1]		5...9µm	5...18µm	7...36µm	12...90µm	20...180µm	40...360µm	120...1200µm	120...3000µm
		≤0.18% FSO						≤0.5% FSO	
Resolution [2]	averaged with averaging factor 64	0.6µm	1µm	2µm	5µm	10µm	13µm	80µm	80µm
		0,01% FSO.							
	dynamic 1.5 kHz	1...3µm	2...5µm	5...10µm	6...25µm	12...50µm	13...100µm	80...480µm	80...600µm
		0.02...0.05% FSO						0.02...0.12% FSO	
Measuring rate, programmable		1.5kHz; 1kHz; 750Hz; 375Hz; 50Hz							
Light source		semiconductor laser <1mW, 670nm (red)							
Laser safety class		class 2 IEC 60825-1 : 2008-05							
Spot diameter	SMR	110µm	110µm	210µm	1100µm	1400µm	2300µm	2.6 x 5mm	2.6 x 5mm
	MMR	380µm	650µm	530µm	110µm	130µm	2200µm	2.6 x 5mm	2.6 x 5mm
	EMR	650µm	1200µm	830µm	1100µm	1400µm	2100µm	2.6 x 5mm	2.6 x 5mm
Protection class		IP 67							
Vibration		15g / 10Hz … 1kHz							
Shock		15g / 6ms (IEC 68-2-29)							
Weight (without cable)		appr. 83g						appr. 130g	
Operation temperature		0 …+50℃							
Storage temperature		-20 ... +70℃							
Measurement output	analogue	4 ... 20mA (1 ... 5V with cable PC 1401-3/U); free scalable within the nominal range							
	digital	RS232 / 14bit							
Control I/O		1x open collector output (switching output, switch, error); 1x input (teach in, trigger); 1x laser on/off							
Supply		11 ... 30VDC, 24VDC / 50mA							
Controller		integrated signal processor							
Software		free setup and aquisition tool + SDK (software development kit)							
Electromagnetic compatibility (EMC)		EN 61326-1:2006 / EN 55011 Class B (Interface emission) EN 61326-1:2006 / EN 61000-4-2:1995 + A1:1998 + A2:2001 (Interference resistance)							

FSO = Full scale output   All specifications apply for a diffusely reflecting matt white ceramic target
[1] values apply for 0 - 30% FSO and 30 - 100 % FSO   [2] resolution digital output 14bit
SMR = Start of measuring range   MMR = Midrange   EMR = End of measuring range

Connector axial (included)

M9.0 x 0,5
ø 14
~40
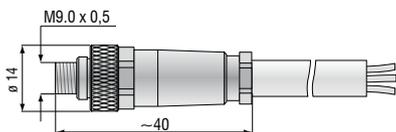
7-pin-connector
(view on solder termination side of male inserts)

Pin connection current/RS232 7x1x0.14	
Pin	Description
1	Error
2	Laser on/off
3	RX232
4	TX232
5	4 ... 20 mA
6	GND
7	Supply 11 ... 30 VDC

Accessories for all optoNCDT Series

Power supply
- PS 2020 (Power Supply 24 V / 2,5 A, Input 100 - 240 VAC,
  output 24 VDC / 2.5 A, for snap in mounting on DIN 50022 rail)

Controller
- CSP 2008 (controller for processing of multiple sensor signals;
  analogue and digital interfaces)

Interface card
- IF2008 (Interface card for individual signal processing;
  analogue and digital interfaces)

Converter
- IF2004/USB 4 Channel RS422/USB Converter

Accessories optoNCDT 1302/1402/1402SC

Supply and output cable, rated for moving cable tracks
(also available in 90° version)
- PC 1402-3/I (3m, output 4 ... 20mA)
- PC 1402-6/I (6m, output 4 ... 20mA)
- PC 1402-3/U (3m, with integral resistance, output 1 ... 5VDC)
- PC 1402-6/U (6m, with integral resistance, output 1 ... 5VDC)
- PC1402-3/IF2008 (3m, supply and output cable)
- PC 1402-3/USB (3m, supply and output cable)
- PC1401/1402-0.2 (0.2m, adapter cable 12-pin to 7-pin)
- PC 1402-3/CSP (3m, required for CSP 2008, optoNCDT 1402 only)

Supply and output cable, robot rated
(available in 90° version)
- PCR 1402-3/I (3m)
- PCR 1402-6/I (6m)
- PCR 1402-8/I (8m)

Supply and output cable 1402SC
- PC1402SC-3/I (3m, output 4...20 mA)
- PC1402SC-8/I (8m, output 4...20 mA)
- PC1402SC-10/I (10m, output 4...20 mA)
- PC1402SC-3/U (3m, output 1...5 V)
- PC1402SC-6/U (6m, output 1...5 V)
- PC1402SCT-3/I (3m, output 4...20 mA)
- PC1402SC-12/IF2008 (12m, supply and output cable)

Protective housing
- SGH ILD 1402(01)
- SGHF ILD 1402(01)

Accessories optoNCDT 1610 / 1630

Supply and output cable
- PC 1605-3 (3m)
- PC 1605-6 (6m)
- PC 1607-5/BNC (5m, BNC connector)

Accessories optoNCDT1700/1700LL/1700BL

Supply and output cable (drag chain rated)
- PC 1700-3 (3m)
- PC 1700-10 (10m)
- PC 1700-10/3/IF2008 (10m, for use with interface card IF2008)
- PC 1700-3/T (3m, for use with trigger box)
- PC 1700-10/T (10m, for use with trigger box)
- PC 1700-3/USB (3m, with USB-RS422-converter, power supply
  90 ... 230 VAC)

Supply and output cable (robot rated)
- PCR 1700-5 (5m)
- PCR 1700-10 (10m)

Protective housing
- SGH (size S and M)
- SGHF (size S and M)

Accessories optoNCDT 1710-50 / 2210

Supply and output cable (drag chain rated)
- PC 1800-3 (3m)
- PC 1800-8 (8m)
- PC2200-3/10/RS485 (3m, RS 485 for use with interface card IF2008)
- PC 2200-3/3/RS422 (3m, for IF2008/RS422/USB-converter)

Sensor cable extension (drag chain rated)
- CE 1800-3 (3m)
- CE 1800-8 (8m)

Accessories optoNCDT 2300

Supply and output cable
- PC2300-0,5Y (Connecting cable to PC or SPS; for operation a
  PC2300-3/SUB-D will be required)
- PC2300-3/SUB-D (3m; for operation a PC2300-0,5Y will be required)
- PC2300-3/CSP (3m, connecting cable ILD2300 and CSP2008)
- PC2300-10/CSP (10m, connecting cable ILD2300 and CSP2008)
- PC2300-15/CSP (15m, connecting cable ILD2300 and CSP2008)
- PC2300-3/IF2008 (3m, interface and supply cable)
- PC2300-3/OE (3m)
- PC2300-6/OE (6m)
- PC2300-9/OE (9m)
- PC2300-15/OE (15m)

Protective housing
- SGH (size S and M)
- SGHF (size S and M)
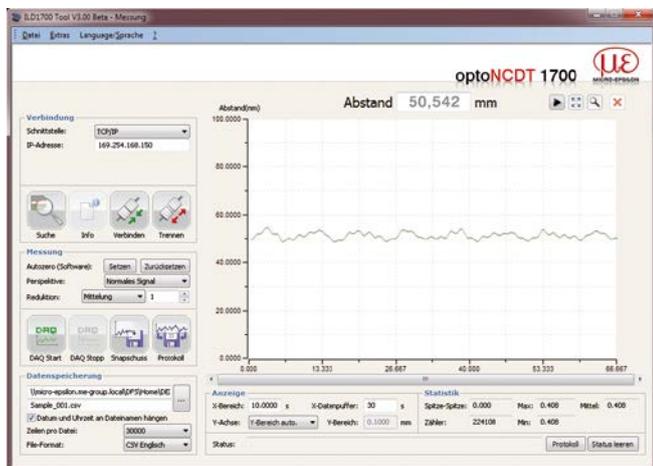
Setup and configuration software

ILD Tools is the software included for easy sensor configuration. All the settings can be implemented conveniently via a Windows user interface on the PC. The sensor parameters are sent to the sensor via the serial port and can also be saved if required. ILD Tools also includes a module which can display and save measurement results. The link to the PC is made via the sensor cable with a USB converter. [available for all series except 16x0]

Driver support for customer software

For the optoNCDT sensors documented DLL drivers are available free of charge, which enables easy integration of the sensors into existing software. Software download free of charge from www.micro-epsilon.com/download

Protective housing for harsh environment

To protect the laser sensors in extreme environments individual protective housings are available for all sensor models. Three options for the protective housing are offered.

Option SGH:

Completely enclosed housing with an integrated front window, where the sensor measures through the window. The water resistant housing provides protection against solvents and detergents.

Option SGHF:

The SGHF version offers optimum protection for the sensor with integrated compressed air cooling and provides protection against fluids.

SGH ILD 1402(01) & SGHF ILD 1402(01)
for optoNCDT 1402(025)

SGx ILD size S (140x140x71mm)
for optoNCDT 1700 / 2300
dimensions 97x75mm

SGx ILD size M (140x180x71mm)
for optoNCDT 1700 / 2300
dimensions 150x80mm

IF2008 - PCI interface card

The IF 2008 interface card is designed for installation in PCs and enables the synchronous capture of 4 digital sensor signals and 2 encoders. The absolutely synchronous data acquisition plays an important role particularly for planarity or thickness measurement tasks. The data are stored in a FIFO memory in order to enable resource-saving processing in the PC in blocks.

Particular Benefits
- 4x digital signals and two encoders with basic printed circuit board
- Additional expansion board for a total of 6x digital signals, 2x encoder and 2x analogue signals and 8x I/O Signals
- FIFO data memory
- Synchronous data acquisition

IF2008E - Expansion board

The IF 2008E expansion board is designed for installation in PCs and enables the synchronous capture of 2 digital sensor signals and 2 encoders as well as 8 I/O-Signals. The expansion board is connected to the basis board IF2008. The absolutely synchronous data acquisition plays an important role particularly for planarity or thickness measurement tasks.

Particular Benefits
- Two digital signals, two analogue signals and 8 I/O signals
- Overall with IF2008: 6 digital signals, 2 encoders and 2 analogue signals and 8 I/O Signals
- FIFO data memory
- Synchronous data acquisition

Interface card IF2008, IF2008E for individual signal processing
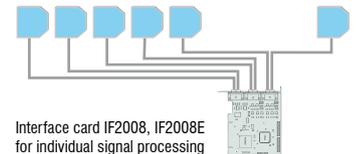
IF2004/USB 4 Channel RS422/USB Converter

The RS422/USB converter is used for transforming digital signals from up to 4 ILD sensors into USB data signals. Equipped with 4 trigger inputs and 1 trigger output additional USB converters can be adapted.

Particular Benefits
- 4x digital signals via RS422
- 4 trigger inputs, 1 trigger output
- Synchronous data aquisition
- USB interface

C-Box controller for up to 2 displacement signals

The C-Box is a compact controller for the digital-to-analogue conversion of a digital sensor signal and for the evaluation of two digital sensor signals. The output occurs via parameterisable analogue output, Ethernet, RS422 or USB. Besides the averaging and statistics function the measurement of thickness, average, step or tilting is possible. The C-Box may be used with ILD2300 and IFC2451/2471. The digital-to-analogue conversion happens with 16 Bit and 70 kHz maximum.

CSP2008 - Universal controller for up to six sensor signals

The controller CSP2008 has been designed to process 2 to 6 both optical and other sensors from Micro-Epsilon (6 digital or 4 analogue input signals max., 2x internal + 4x external via EtherCAT modules from the company Beckhoff. EtherCAT is intended as external bus for connecting further sensors and I/O modules. The controller is equipped with a display offering multicolour backlighting which changes its color in the case of exceeding the limit value while a signal is displayed.

Features

- Real-time processing of input and output signals at up to 100kHz (user selectable)
- Unique user interface for the configuration of the controller via Ethernet on a PC or laptop. All user selectable functions of the controller and the measured values can be viewed, displayed and stored in real time via your own web browser without installing any 3rd part software
- Simple sensor connection with automatic sensor recognition, configuration of the sensor using buttons and display on controller or via web browser
- Modular system upgradable with additional I/O modules for customer-specific requirements. The internal communication between I/O components using EtherCAT connection
  (CSP 2008 acts as master)
- Extremely flexible and powerful functionality; function modules can be combined in many ways.
- Simple mounting using DIN rail TS 35

System setup

Sensors via RS422
optoNCDT 1302
optoNCDT 1402
optoNCDT 1700
optoNCDT 2300
optoCONTROL 2500
optoCONTROL 2600
confocalDT 2451/2471
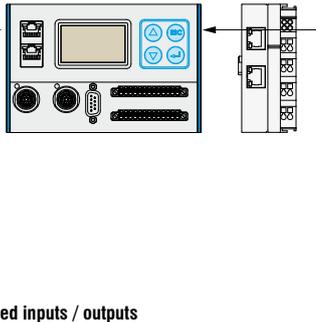
Beckhoff modules for extended inputs / outputs
EK1100, EtherCat bus coupler
EL4102, Analogue output terminal 0 V bis +10 V, 2 channels (16 Bit), EtherCAT
EL4132, Analogue output terminal -10 V bis +10 V, 2 channels (16 Bit), EtherCAT
EL4024, Analogue output terminal 4 ... 20 mA, 4 channels (12 Bit), EtherCAT
EL2002, Digital output terminal, 24 VDC/ 0,5 A, 2 channels, EtherCAT
EL2002, Digital output terminal, 24 VDC/ 0,5 A, 2 channels, EtherCAT
EL2004, Digital output terminal, 24 VDC/ 0,5 A, 4 channels, EtherCAT
EL3142, Analogue input terminal 0 ... 20 mA, 2 channels (16 Bit), EtherCAT
EL3162, Analogue input terminal 0 ... 10 V, 2 channels (16 Bit), EtherCAT
EL1002, Digital input terminal 24 VDC/3 ms, 2 channels, EtherCAT
EL1012, Digital input terminal 24 VDC/10 μs, 2 channels, EtherCAT
EL1014, Digital input terminal 24 VDC/10 μs, 4 channels, EtherCAT
EL1104, Digital input terminal 24 VDC/3 ms, 4 channels, EtherCAT
EL5101, Incremental encoder interface, RS485 differential inputs, EtherCAT
EK1122, 2-Port EtherCAT junction
RS422 extension terminal
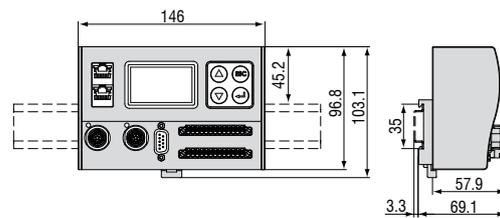
Universal controller with DIN rail TS 35
(dimensions not to scale)

High performance sensors made by Micro-Epsilon

Sensors and systems for displacement
and position

Sensors and measurement devices for
non-contact temperature measurement

2D/3D profile sensors (laser scanner)

Optical micrometers, fibre
optic sensors and fibre optics

Colour recognition sensors, LED analyzers
and colour online spectrometer

Measurement and inspection systems