MICRO-EPSILON

Operating Instructions

C-Box/2A

Controller for ILD 1420, ILD 1750, ILD 1900, ILD 2300 and confocalDT IFC2422 series

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1. Safety

System operation assumes knowledge of the operating 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.

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

NOTICE

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

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

1.3 Notes on CE Marking

The following apply to the C-Box/2A:
- EU Directive 2014/30/EU
- EU Directive 2011/65/EU, “RoHS“

Products which carry the CE mark satisfy the requirements of the EU directives cited and the relevant applicable harmonized European standards (EN). The controller is designed for use in industrial environments.

The EU Declaration of Conformity is available to the responsible authorities according to EU Directive, article 10.

1.4 Intended Use

- The C-Box/2A is designed for industrial use in automated manufacturing and machine monitoring. It is used for
  - processing 2 digital input signals, e. g. thickness measurement
  - filtering of measurements
- The controller must only be operated within the limits specified in the technical data, see 2.2.
- 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: IP40 [1]
- Temperature range:
  - Operating: +5 ... +50 °C (+41 ... +122 °F)
  - Storage: 0 ... +50 °C (+32 ... +122 °F)
- Humidity: 5 - 95 % (non condensing)
- Ambient pressure: Atmospheric pressure

i The protection class is limited to water (no penetrating liquids or similar).

1) Only with sensor cable connected.

2. Functional Principle, Technical Data

2.1 Functional Principle

The C-Box/2A is used for processing two digital input signals.

Features:

- Processing of 2 input signals
- Programmable via Ethernet (web pages)
- Semi-automatic sensor detection for MICRO-EPSILON sensors with digital output
- Triggering
- Ethernet interface with TCP and UDP protocols
- USB interface
- D/A converter of the digital measurements, output via current and voltage interface

The C-Box/2A is installed in a stable aluminium case.

Two digital sensors of the same series can be directly connected to the C-Box/2A via RS422.

Both sensors are synchronized via the C-Box/2A; the C-Box/2A is the master.

The parameterization of all inputs and outputs on the C-Box/2A is performed via a Web interface.

An internal time base also enables the calculation of measurement results of different measuring frequencies.

2.2 Technical Data

Model	C-Box/2A
Connections	- 2 Sensor connectors (HD-Sub, 15-pin), - 2 RS422 interfaces - 1x Ethernet (PC, 100 Mbit/s), - 1x USB 2.0, type B, max. 12 Mbit, - 1 plug-in terminal block 16-pin ▪ External power supply ▪ External laser on/off ▪ External trigger input ▪ 2 analog outputs (current or voltage) - 1 external multi function input - 1 external trigger input, HTL and TTL compatible (measurement output, edge) - Input voltage ▪ TTL ≤ 0.7 V / HTL ≤ 3.0 V > trigger not active ▪ TTL > 2.2 V / HTL > 8.0 V > trigger active - input current 3.0 mA max. - input frequency 100 kHz max. - 2 switching outputs
Supported sensors	Sensors of the ILD 1420 series with a measuring rate of 0.25 ... 4 kHz, sensors of the ILD 1750 series with a measuring rate of 0.3 ... 7.5 kHz, sensors of the ILD 1900 series with a measuring rate of 0.25 ... 10 kHz and sensors of the ILD 2300 series with a measuring rate of 1.5 … 49 kHz
Functions	Filter: average moving 2…512 / recursive 2…32768, Median 3,5,7,9
	Zero, mastering, synchronization
	Scaling analog outputs

Model	**C-Box/2A**
Analog output	- 1 current output per connected sensor ▪ 4 – 20 mA - 1 voltage output per connected sensor; programmable: ▪ Unipolar 0 – 5 V / Unipolar 0 – 10 V ▪ Bipolar ± 5 V / Bipolar ± 10 V - Tolerance of current and voltage output: 0.04 %
Laser switch off	- Switch respectively voltage input: ▪ switching input connected with > laser = on ▪ switching input open > laser = off ▪ input voltage < 3 V (HTL) > laser = on ▪ input voltage > 8 V (HTL) > laser = off
Firmware	Measurement configurations can be saved (max. 8) two languages (English, German), can be updated
LED	For successful connection controller/sensor, Ethernet
Power supply	- 13 – 30 VDC for full functionality, power consumption max. 200 mA without sensor - 10 – 13 VDC with reduced DA converter function, power consumption max. 200 mA without sensor, analog output 0 - 5 V or ± 5 V only - Reverse polarity protection - No galvanic isolation, all GND signals are connected internally and with the housing
Power consumption sensors	Maximum two sensors from internal power supply
Weight	Appr. 210 g
Case dimensions	Appr. 103 x 39 x 106 mm
Protection class	IP40

Model		C-Box/2A
Temperature range	Operating	+5 ... +50 °C (+41 ... +122 °F)
	Storage	0 ... +50 °C (+32 ... +122 °F)
Relative air humidity		5 ... 95 %, non-condensing

3. Delivery

3.1 Unpacking, Included in Delivery

1 C-Box/2A

1 Operating instructions

1 16-pin. female terminal box (cable clamp) with locking function type Weidmüller B2CF 3.50/16/180 SN BK BX

➡ Carefully remove the components of the measuring system from the packaging end ensure that the goods are forwarded in such a way that no damage can occur.

➡ Check for completeness and transport damage immediately after unpacking.

➡ In case of damage or missing parts, please contact the supplier immediately.

3.2 Storage

Temperature range storage: 0 ... +50 °C (+41 ... +122 °F)

Humidity: 5 - 95 % (non-condensing)

4. Installation and Mounting

4.1 Dimensional Drawing

Pay attention to careful handling during the installation and operation.

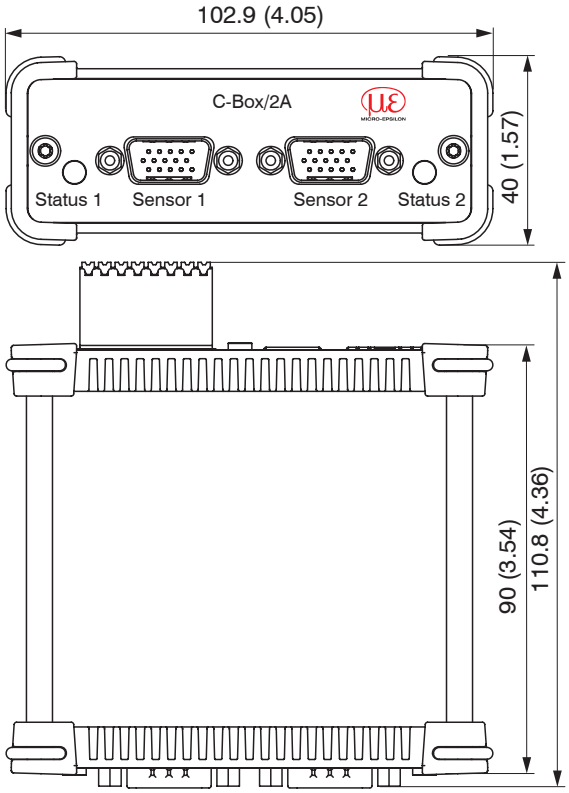


Fig. 1 Dimensions C-Box/2A, dimensions in mm (inches), not to scale

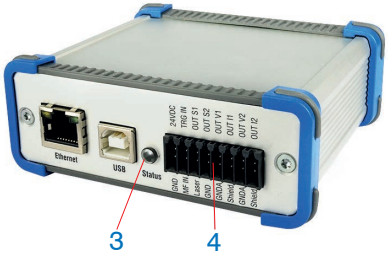
4.2 Electrical Connections, LEDs

Pin	Signal
1	RS422 TxD-
2	RS422 TxD+
3	RS422 RxD-
4	RS422 RxD+
5	GND
6	RS422 TRG+
7	RS422 TRG-
8	5V CMOS output (reserve, do not connect)
9	Power supply +24 V via power connection
10	Power supply +24 V via power connection
11	Multfunction output TTL or HTL compatible
12	Laser on, HTL compatible
13	NC
14	NC
15	GND

Fig. 2 Pin assignment sensor connector (2), sensor 1 resp. sensor 2

LED color	Description
Off	Sensor not connected
Green	Sensor in measurement mode and within the measurement range
Red	Sensor in measurement mode and sensor outside the measurement range
Orange	Sensor in setup mode (no measurement output)

Fig. 3 Description LED (1) for sensor 1 resp. sensor 2



Pin	Designation	Signal
1	24VDC	Power
2	GND	GND
3	TRG IN	Trigger in
4	MF IN	Multi function input
5	OUT S1	Switching output 1
6	Laser	Laser
7	OUT S2	Switching output 2
8	GND	GND
9	OUT V1	Measurement value voltage 1
10	GNDA	Analog GND1
11	OUT I1	Measurement value current 1
12	Shield	Schirm
13	OUT V2	Measurement value voltage 2
14	GNDA	Analog GND2
15	OUT I2	Measurement value current 2
16	Shield	Schirm

Fig. 4 Pin assignment 16-pin terminal block (4), type Weidmüller (B2CF)

LED color	Description
Off	no power supply (power off)
Green	Power on, data output on USB interface not active or data output on USB interface active and data communication error free
Orange	Power on, data output on USB interface active, data communication faulty or disconnected
Red	Power on, data output on USB interface active, USB cable not connected or communication disconnected

Fig. 5 LED description for power and USB status (3)

4.3 Laser on

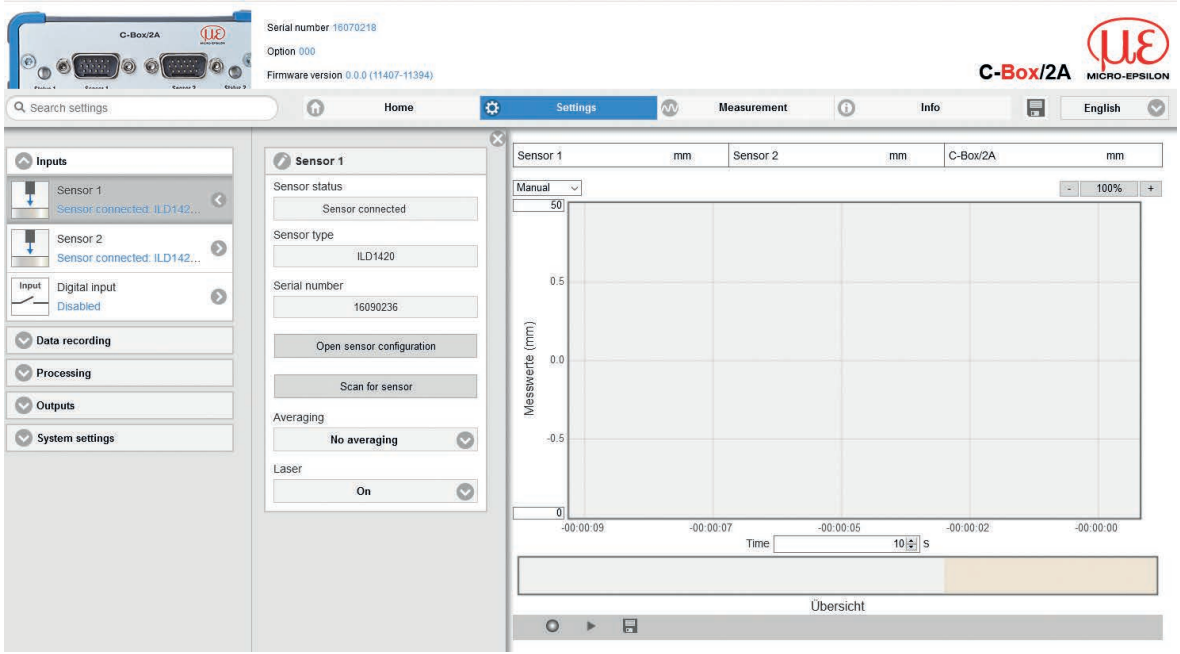


Fig. 6 View Settings - Inputs - Sensor 1/2 - Laser

The measuring laser on the sensor is activated via an optocoupler input. This is advantageous if the sensor has to be switched off for maintenance or similar. Switching can be done with a transistor (for example open collector in an optocoupler) or a relay contact.

➡ Connect pin 6 `Laser` with pin 8 `GND` by a jumper.

i The laser is off unless pin 6 is electrically connected to pin 8.

5. Operation

5.1 Getting Ready for Operation

The C-Box/2A must be installed in accordance with the installation instructions, see 4, and connected to an automation unit, e.g. PLC, and the power supply in compliance with the connection instructions.

After switching on the operating voltage, the C-Box/2A performs an initialization sequence and goes into the measurement operating mode afterwards.

The laser operation on optical sensors is only indicated at the sensor by an LED. If no measured values are transmitted, check whether the sensors are switched on and whether a target is in the measuring range of the sensor.

5.2 Installation of USB Driver

You will find the driver C-Box/2A WinUSB under:

www.micro-epsilon.de/link/software/medaqlib

- Connect C-Box/2A to the usb port of your computer.
- Connect C-Box/2A to power supply.
- Open Windows system control.
- Go to device manager.

You will see a device with a question mark (unknown device).

- Right mouse click on it.

A menu opens.

- Select `Properties`.
- Select `Drivers`.
- Select `Update driver`.
- Browse to the directory with the downloaded Win usb drivers.
- Click on `ok`.
- Wait until installation will finish.

If the installation is done properly, you will find C-Box/2A in the device manager, see Fig. 7.

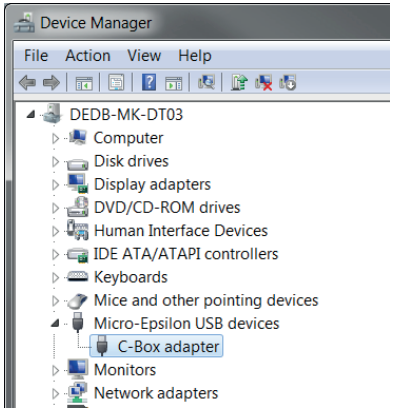


Fig. 7 View Device Manager after installing the USB driver

5.3 Software Update

The software can only be updated via USB.

- Download the USB driver from the homepage, see 5.2 and unpack it.
- Start the installation program.
- Search for the C-Box.
- Choose the update file.
- Start the installation.
- Wait until the installation is complete.

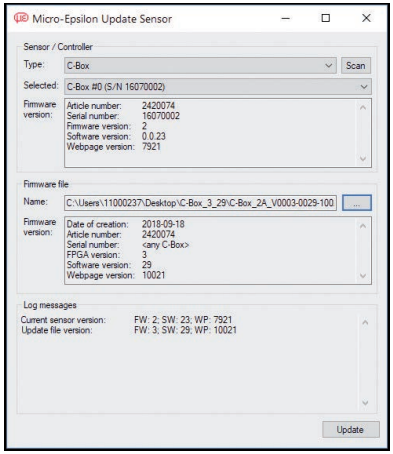


Fig. 8 View MICRO-Epsilon Update Sensor

5.4 Operation Using Ethernet

Dynamic web pages are generated in the C-Box/2A which contain the current settings of the C-Box/2A and the peripherals. The operation is only possible while there is an Ethernet connection to the C-Box/2A.

5.4.1 Requirements

You need a web browser (e.g. Mozilla Firefox or Internet Explorer) on a PC with a network connection. Decide about connecting the C-Box/2A to a network or directly to a PC.

The C-Box/2A is delivered as standard with a fixed IP address. If you do not require a static IP address, you can enable DHCP (Dynamic Host Configuration Protocol) as automatic IP address allocation. The controller will be assigned an IP address by the DHCP server, see 5.4.2.

If you have set your browser so that it accesses internet through a proxy server, please add the IP address of the controller to the IP addresses that should not be routed through the proxy server in the settings of the browser.

Parameter	Description
Address type	Static IP address (standard) or dynamic IP address (DHCP, Standard)
IP address	Static IP address of the controller (only active if no DHCP is selected).
Gateway	Gateway to the other subnets
Subnet mask	Subnet mask of the IP subnet

Fig. 9 Basic Ethernet settings

5.4.2 Access via Ethernet

<table>
<tr><td colspan="2">Direct connection to PC, controller with static IP (Factory setting)</td><td>Network</td></tr>
<tr><td>PC with static IP</td><td>PC with DHCP</td><td>Controller with dynamic IP, PC with DHCP</td></tr>
<tr><td colspan="2">➡ Connect the C-Box/2A („Ethernet“ female connector) with a PC via an Ethernet direct connection (LAN). Use a LAN cable with RJ-45 connectors for this.</td><td>➡ Connect the controller with a switch (Intranet). Use a LAN cable with RJ-45 connectors.</td></tr>
</table>

For a direct connection the controller needs a fixed IP address.

- Start the sensorTOOL x.x.x program, see Fig. 10.
- In the Sensor group dropdown menu, select Interfaces and in the Sensor type dropdown menu, select C-Box.
- Click the Sensor button.
- Now select the C-Box/2A from the list, in order to change the address settings, click the Configure sensor IP button.
  - IP Type: static IP-Address
  - IP Address: 169.254.168.150 [1]
  - Subnet mask: 255.255.0.0
  - Gateway: 169.254.1.1
- Click the Apply button, in order to transmit the changes to the C-Box/2A.
- Click the Open Website button, in order to display the C-Box/2A on your standard browser. Alternatively, change the IP settings according to the settings on your PC (IP address ranges must match).

1) This assumes that the LAN connection on the PC uses the following IP address, for example: 169.254.168.1

Wait until Windows has established a network connection (connection with limited connectivity).

- Start the sensorTOOL x.x.x program, see Fig. 10.
- In the Sensor group dropdown menu, select Interfaces and in the Sensor type dropdown menu, select C-Box.
- Click the Sensor button.
- Now select the C-Box/2A from the list.
- Click the Open Website button, in order to display the C-Box/2A on your standard browser.

- Enter the C-Box/2A in the DHCP / register the C-Box/2A in your IT department.

The C-Box/2A is assigned an IP adress by your DHCP server. You can query this IP address by using the sensorTOOL x.x.x program.

- Start the sensorTOOL x.x.x program, see Fig. 10.
- In the Sensor group dropdown menu, select Interfaces and in the Sensor type dropdown menu, select C-Box.
- Click the Sensor button.
- Now select the C-Box/2A from the list.
- Click the Open Website button, in order to display the C-Box/2A on your standard browser.

Interactive web pages for setting the C-Box/2A and peripherals are now shown in the web browser, see Fig. 11 ff.

Parallel operation with web browser and ASCII commands is possible; the last setting applies. Do not forget to save.

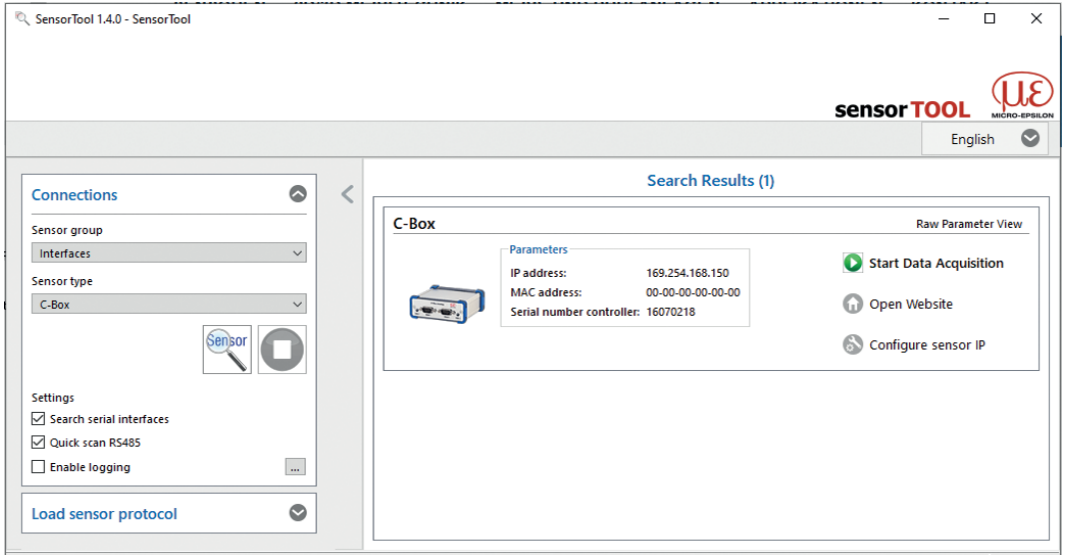
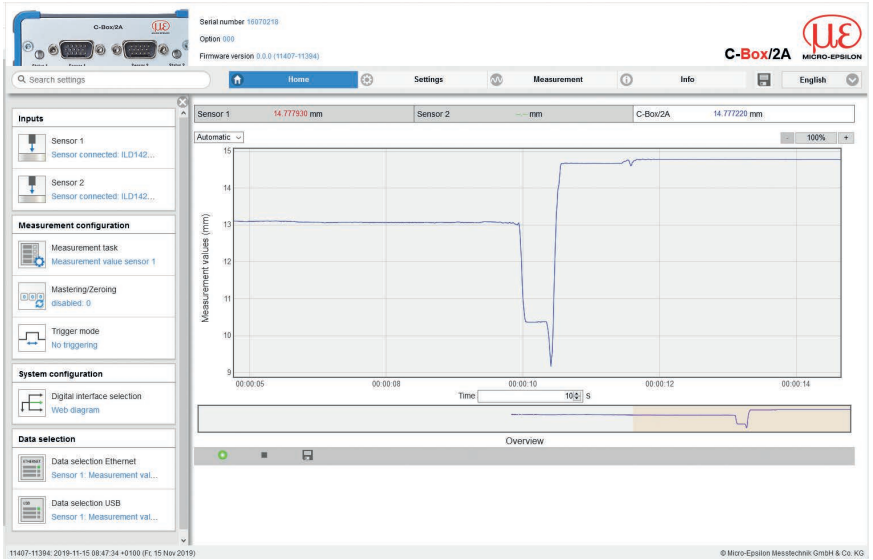


Fig. 10 sensorTOOL auxiliary program for sensor search

The `sensorTOOL x.x.x` program is available online at http://www.micro-epsilon.com/service/download/software.

The `sensorTOOL x.x.x` program searches the available interfaces for connected controllers.



You can access features in the upper navigation bar (Settings, Measurement and Info).

The appearance of the web pages can change depending on the functions and the sensors connected. Each page contains descriptions of the parameters and thus tips to configure the web page.

Fig. 11 First interactive web page after calling the IP address

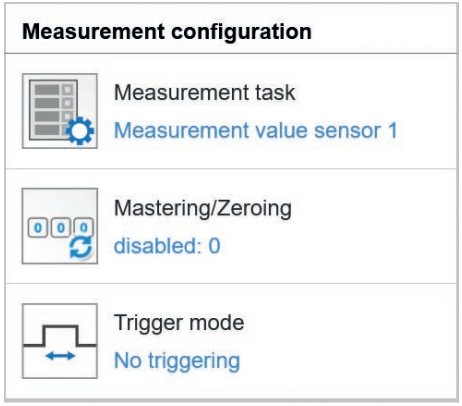
All settings in the web page are applied immediately in the C-Box/2A after clicking the button `Submit`.

The controller is active and supplies measurement values. The currently running measurement can be controlled using the function buttons in the `diagram control` section.

The Home menu provides you with an overall view of inputs set or connected sensors, the measuring configuration set, system configuration and data selection, see also operating menu, see A 3.

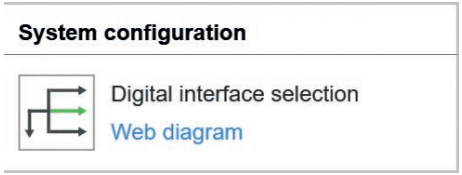
Inputs menu

The inputs section shows in blue text the current settings for connected sensors, see 6.3.1.



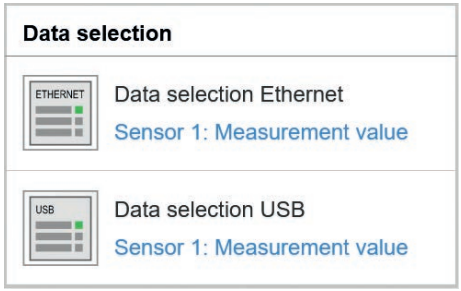
Measurement configuration menu

The measurement configuration section shows in blue text the current measurement task, see 6.4.1 and additional processing configurations, such as mastering/zeroing and trigger mode.



System configuration menu

The system configuration section shows in blue text the currently selected digital interface, see 6.6.1.



Data selection menu

The data selection section shows in blue text the currently selected data for the Ethernet and USB interfaces, see 6.6.2; that data are required for further processing.

5.4.3 Measured Value Presentation with Web Browser

Start the display of measurement values by using the `Measurement` tab.

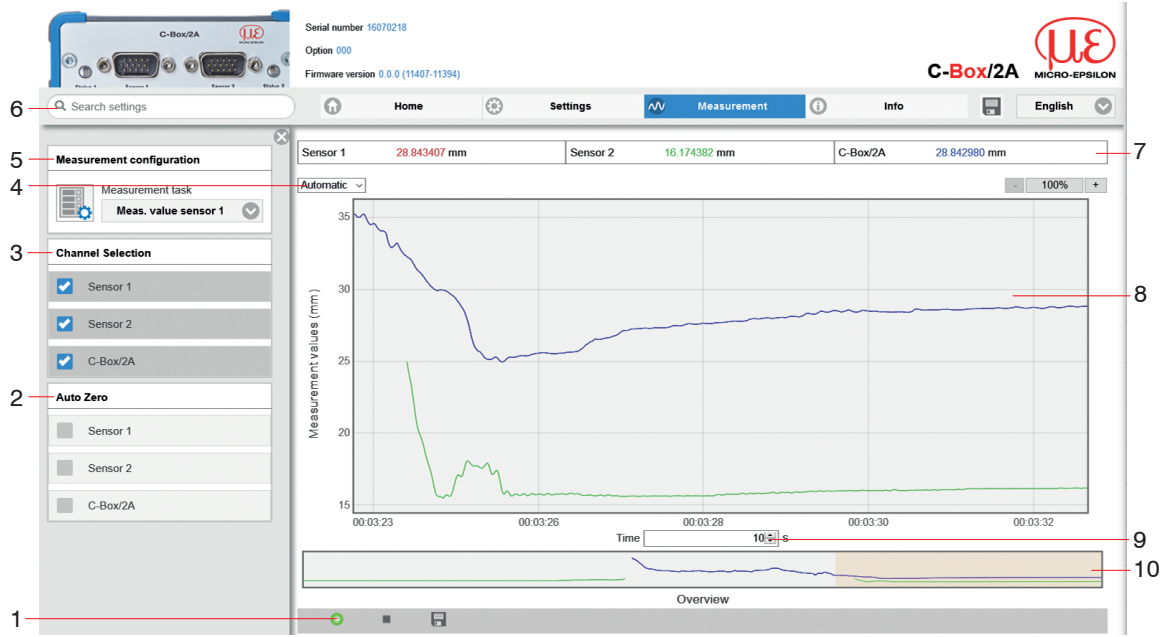


Fig. 12 Presentation of the measurement and calculation results

1 Function buttons in the diagram control section:

Clicking the button starts the measurement.

The icon means: Measurement is running.

Clicking the button interrupts recording and pauses the diagram; data selction and zoom function are still possible.

The icon means: Measurement is stopped.

Clicking the button opens the Windows selection dialog for file name and storage location, which allows you to save the last 10,000 or 50,000 values in a CSV file (separated by semicolons).

2 The check boxes in the `Auto Zero` window/selection set the selected channel to zero only in the diagram. This setting does not affect the C-Box/2A or connected sensors.

3 The check boxes in the `Channel Selection` window/selection allow you to specify the channels that you would like displayed in the diagram.

4 To scale the measurement values axis (Y axis) in the graphic, `Automatic` (= auto scaling) or `Manual` (= manually set) are available.

5 In the `Measurement task` drop-down menu of the `Measurement configuration` window/selection, you can specify the measurement task you would like to select, see 6.4.1.

6 The search function permits time-saving access to functions and parameters.

7 The text boxes above the graphic display the current values for distance, exposure time, current measuring rate, display rate and time stamp.

8 Mouse over function. When stopped and the mouse is moved across the graphic, points on the curve are marked with a circle symbol and the associated values are displayed in the text boxes above the graphic. Peak intensity is also updated.

9 Scaling of the X axis can be defined by using an input field below the time axis.

10 Scaling of the X axis: When a measurement is running, the entire signal can be enlarged (zoomed) using the left slider. If the diagram is stopped, the right slider can be used, as well.

The zoom window can also be dragged with the mouse from the center of the zoom window (crossed arrows).

By letting the diagram display run in a separate tab or browser window, you avoid having to restart the display every time.

➡ Click the `Start` button to begin displaying measurement results.

➡ Click the `Stop` button to stop displaying measurement results.

➡ Click `Save` button to save the previously accumulated measurement and calculation results in a CSV compatible file inclusive timing information.

The measurement values are saved after the measurement is stopped. The measured values are stored with a dot as decimal mark if the language is set to English, otherwise a comma is used.

Only a limited number of measured values can be stored (about 50,000).

The oldest values will be overwritten when more values are captured.

Each curve can be deactivated and activated using the associated checkbox (checkmark). In addition, the horizontal scrolling (slider) is possible in the diagram.

In the `Measurement task` drop-down menu of the `Measurement configuration` window/selection, you can specify the measurement task you would like to select.

The check boxes in the `Channel Selection` window/selection allow you to specify the channels that you would like displayed in the diagram.

The check boxes in the `Auto Zero` window/selection set the selected channel to zero only in the diagram. This setting does not affect the C-Box/2A or connected sensors.

The y-axis can be scaled manually or by using the `Autoscale` function.

5.5 Programming Using ASCII Commands

As an additional feature, you can program the controller via an ASCII interface, physically an RS422. For this purpose, the controller must be connected to a PC/PLC and an RS422 serial interface using a suitable interface converter, see A 1.

Observe the correct RS422 basic setting in the programs used.

After the connection has been established, you can transmit commands listed in the Appendix, see A 2, to the controller using a terminal program.

5.6 Timing Behavior, Flow of Measurement Values

Without triggering, the controller requires 5 cycles to process the C-Box values:

The cycle time depends on the C-Box setting and values range from 0.4 to 80 kHz.

6. Setting Controller Parameters

6.1 Preparation for Setting the Options

You can program the C-Box/2A in various ways:
- in a web browser using the `sensorTOOL x.x.x` program and the web interface.
- with an ASCII command set and terminal program using RS422.

i If you do not permanently save the programming in the sensor, the settings are lost when the sensor is turned off.

6.2 General Overview

Inputs	Sensor 1, Sensor 2, Digital input
Data recording	Measurement task, Measuring rate, Error handling
Processing	Filter/Averaging, Mastering/Zeroing, Trigger mode, Synchronization, Output data rate
Outputs	Digital interface selection, Data selction Ethernet, Data selection USB, Settings Ethernet, Settings USB, Digital Outputs, Analog output 1, Analog output 2
System settings	Language & Unit, Save settings, Load settings, Manage settings on PC, Reset

6.3 Inputs

➡ On the `Settings` tab, switch to the `Inputs` menu.

6.3.1 Sensor 1, Sensor 2

Sensor 1, Sensor 2	*Sensor status / Sensor type / Serial number*	*Open sensor configuration*	Selection of the connected sensor. It supports sensors of the ILD2300, ILD1420, ILD1750, ILD1900, IFC2421 and IFC2422 series. For ILD1420 and ILD1750 sensors it is possible to open a configuration page. For this, the digital interface must be deactivated. If no sensor is shown, one has the possibility to search for sensors, too.
		Scan for sensor	
	Averaging	*No averaging*	–
		Moving average over N values	*2 / 4 / 8 / 16 / 32 / 64/ 128*
		Recursive average over N values	Value
		Median filter over N values	*3 / 5 / 7 / 9*
	Laser	*On / Off*	Turns on or off the laser light source on the sensor.

Fields with a gray background require a selection.

Value

Fields with dark border require the specification of a value.

Filter / averaging in the sensor or controller

Several filter types are available for the measured values. Filtering prevents the noise of the signal and ensures better resolution, see 6.5.1.

Moving average

The arithmetic mean value M_{gl} is generated and output via the selectable filter width N of consecutive measured values.

$$M_{gl} = \frac{\sum_{k=1}^{N} MV(k)}{N}$$

MV = measured value,
N = averaging value,
k = continuous index (in the window)
M_{gl} = average value or output value

Each new measured value is added, and the first (oldest) value is removed from the averaging (from the window). This produces short response times for measurement jumps.

Example: N = 4

Measured values

... 0, 1, 2, 2, 1, 3 → $\frac{2, 2, 1, 3}{4} = M_{mov}(n)$

... 1, 2, 2, 1, 3, 4 → $\frac{2, 1, 3, 4}{4} = M_{gl}(n+1)$

Output value

Moving average in the controller C-Box/2A allows only potentials of 2 for N. The highest averaging value is 512.

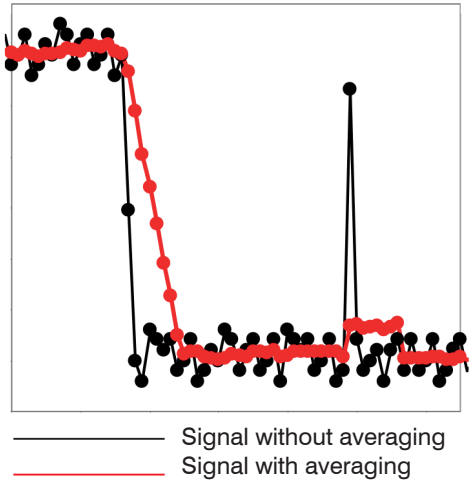


Fig. 13 Moving average, N = 8

Application tips

- Smooths measured values
- The effect can be finely controlled in comparison with the recursive averaging.
- With uniform noise of the measured values
- without spikes
- At a slightly rough surface, in which the roughness should be eliminated.
- Also suitable for measured value jumps at relatively low settling time

Recursive average

Each new metric MW is weighted to the (n-1) value of the previous average.

Formula:

$$M_{rec}(n) = \frac{MV_{(n)} + (N-1) \times M_{rec\,(n-1)}}{N}$$

MV = measured value,
N = averaging value, N = 1 ... 32768
n = measurement index
M_{rec} = average value or output value

Each new measurement value MV(n) is added, as a weighted value, to the (n-1)-fold of the previous averaging value.

Recursive averaging allows for very strong smoothing of the measurements, however it requires long response times for measurement jumps. The recursive average value shows low-pass behavior.

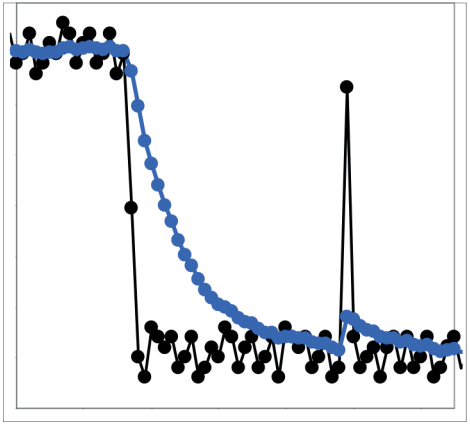


Fig. 14 Recursive average, N = 8

Application tips

- Permits a high degree of smoothing of the measurement values. However, it requires extremely long transient recovery times for measured value jumps (low-pass behavior)
- Permits a high degree of smoothing for noise without strong spikes
- For static measurements, to smooth signal noise
- For dynamic measurements on rough surfaces, to eliminate the roughness, e. g. roughness of paper
- For the elimination of structures, e. g. parts with uniform grooves, knurled rotary parts or roughly milled parts
- Unsuitable for highly dynamic measurements

Median

The median of the pre-set filter width N (N = 3, 5, 7, 9) of the measurement values is calculated. For this purpose, the incoming measurement values are re-sorted after each measurement. The median value is then output as the median. If an even value is selected for filter width N, the two median measurement values are added and divided by two.

Example: Median of five measurement values

... 0 1 2 4 5 1 3 → Sorted measurement values: 1 2 **3** 4 5 $\quad \text{Median}_{(n)} = 3$

... 1 2 4 5 1 3 5 → Sorted measurement values: 1 3 **4** 5 5 $\quad \text{Median}_{(n+1)} = 4$

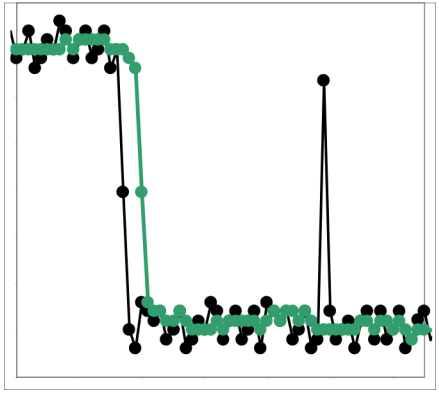


Fig. 15 Median, N = 7

Application tips

- The measurement value curve is not smoothed to a great extent, used to eliminate spikes
- Suppresses individual interference pulses
- In short, strong signal peaks (spikes)
- Also suitable for edge jumps (only minor influence)
- For rough, dusty or dirty environment, to eliminate dirt or roughness
- Further averaging can be used after the median filter

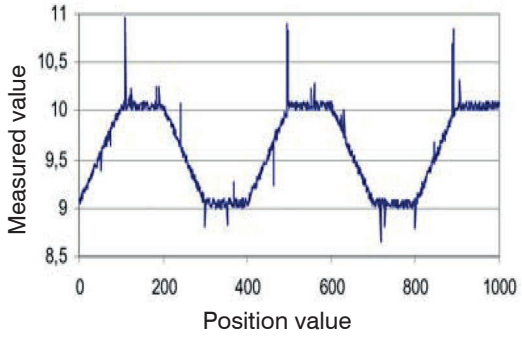


Fig. 16 Original profile

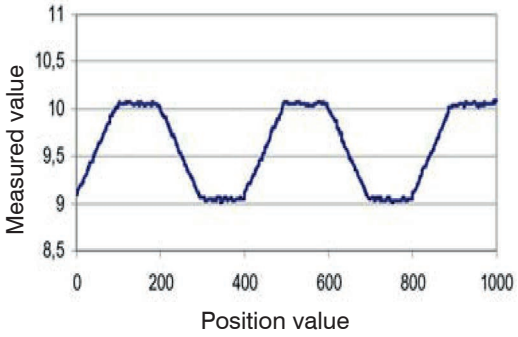


Fig. 17 Profile with Median, N = 9

6.3.2 Digital Input

Selecting the function of the multifunction input:

Digital input	Function	*Disabled*	The multifunction input has no function.
		Master c-Box/2A value	Multifunction input is master pulse input for the C-Box/2A. i For this function to work mastering must be enabled, see 6.5.2.
		Forward to sensor 1	Multifunction input is forwarded to the corresponding input of the connected sensor 1.
		Forward to sensor 2	Multifunction input is forwarded to the corresponding input of the connected sensor 2.
		Forward to sensor 1 and 2	Multifunction input is forwarded to the corresponding inputs of the connected sensors 1 and 2.
	Logic for digital input	*Low-level logic*	Settings, see also Trigger mode chapter, see 6.5.3 or Synchronisation chapter, see 6.5.4.
		High-level logic	

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

6.4 Data Recording

➡ On the `Settings` tab, switch to the `Data recording` menu.

6.4.1 Measurement Task

Specifies which value (possibly mastered or averaged before) will be output as C-Box/2A measurement value:

Measurement task	Measuring mode	*Measurement value sensor 1*	Measured value of the sensor connected to sensor 1 connection, i.e., the C-Box/2A value includes the value from sensor 1. i If you operate exclusively one sensor on the C-Box/2A, it must be connected to sensor 1 connection.
		Thickness sensor 1-2	Forms the difference between the two distance values of the sensors 1/2 in direct or diffuse reflection, with two-sided distance measurement, and outputs the result as a thickness value. The thickness calculation requires as starting value the thickness of a reference object; this value is to be defined as master value.
		Step sensor 1-2	Forms the difference between the two distance values of the sensors 1/2 in direct or diffuse reflection, with one-sided distance measurement, and outputs the result as height value. Value C-Box/2A = Value sensor 1 minus value sensor 2

i The selected measuring program is used as the standard measuring program on startup.

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

6.4.2 Measuring Rate

Measuring rate	*Measuring rate (kHz)*	*0.5 / 1.0 / 2.0 / 4.0*	When synchronization is switched off, the measuring rate can be set freely. Value range: from 0.4 to 80 kHz. Otherwise, the possible measuring rates are specified by the connected sensors / controllers, see Fig. 18.
	Data rate Web diagram (kHz)	*0.5 / 1.0*	i The Web diagram interface uses a slower data rate for data transmission. So for higher measuring rates not all the measured values will be visible in the diagram or saved to file.

Sensor / Controller	**Measuring rate**
ILD 1420	0.25 / 0.5 / 1 / 2 / 4 kHz
ILD 1750	0.3 ... 7.5 kHz (continuously adjustable) 7.5 kHz / 5 kHz / 2.5 kHz / 1.25 kHz / 625 Hz / 300 Hz (adjustable)
ILD 1900	0.25 ... 10 kHz (continuously adjustable) 10 kHz / 8 kHz / 4 kHz / 2 kHz /1.0 kHz / 500 Hz / 250 Hz (adjustable)
ILD 2300	1.5 / 2.5 / 5 / 10 / 20 / 30 / 50 kHz. Please note that a measurement frequency of 50 kHz involves a reduction of the sensor measuring range.
confocalDT IFC2422	Continuously adjustable 6.5 kHz ... 0.1 kHz, step size 1 Hz

Fig. 18 Preset measuring rates

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

6.4.3 Error Handling

Error handling	Error handling on wrong measurment values	*Error output, no value*		If a valid metric can not be obtained, an error value is output. If this hinders further processing, alternatively the last valid measured value can be held over a certain number of measuring cycles, that is, repeatedly output.
		Hold last valid value	Value	
		Hold last valid value forever		

Fields with a gray background require a selection.

Value

Fields with dark border require the specification of a value.

6.5 Processing

➡ On the `Settings` tab, switch to the `Data recording` menu.

6.5.1 Filter/Averaging

Filter/Averaging	Averaging	*No averaging*		Measurements are not averaged.
		Moving average	*2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 / 512*	About the selectable filter width N of consecutive measured values the arithmetic mean Mgl is formed and output. Each new reading is added and the first (oldest) reading removed from the averaging.
		Recursive average	*2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 / 512 / 1024 / 2048 / 4096 / 8192 / 16384 / 32768*	Each new metric MW (n) is weighted to the (n-1) -fold of the previous average.
		Median filter	*3 / 5 / 7 / 9*	The median is formed from a preselected filter width N of measured values. For this purpose, the incoming measured values are re-sorted after each measurement. The mean value is then output as median. If an even value is selected for the filter width N, then the middle two metrics are added together and divided by two.

i These settings are for the C-Box/2A only. They do not affect the connected sensors.

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

There are several filter types available for the measured values. Filtering reduces the noise of the measurement signal and thus ensures better resolution. The filter width is used to set the number of measured values that the filter affects.

You will find further information respectively adjustment possibilities in the Chap. Sensor 1, Sensor 2, see 6.3.1.

6.5.2 Mastering/Zeroing

Mastering/Zeroing	Mastering is	Master value (mm)		
	disabled	Value	*Set master value*	Trigger zeroing or mastering. Master value range: -1024 to 1024 mm.
	enabled		*Reset master value*	Cancel zeroing or mastering.

6.5.3 Trigger Mode

Trigger mode	Selected mode			
		No triggering		See below for description.
		Level-triggering	Value	
		Edge triggering		
		Software triggering		

Level triggerung

A continuous output of the measured value is made as long as the selected level is present. After that the data output stops. The trigger is adjustable to high level / low level.

Edge triggering

After the trigger event, the sensor outputs the previously set number of measured values or starts a continuous measurement output. It is possible to trigger on the rising edge / falling edge.

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

Software triggering

A measured value output is started as soon as a software command is triggered. The trigger time is defined inaccurate. After the trigger event, the sensor outputs the previously set number of readings or starts a continuous readout.

Active logic level

Logic Level Sets, at which threshold the trigger switches:

Low-level logic (LLL)

≤ 0.7 V: Low level

≥ 2.2 V: High level

High-level logic (HLL)

≤ 3.0 V: Low level

≥ 8.0 V: High level

Number of readings

1...16382: Number of readings to be output after a trigger event

16383: Start of an infinite readout after a trigger event

0: Stop the trigger and ending the infinite measurement output

i For all measurement tasks, it must be remembered that the combination of level / edge triggering and external synchronization is not is possible.

6.5.4 Synchronization

Synchronization	Synchronization	*No synchronization*		Sync off. The measuring rate can be freely adjusted. Value range: from 0.4 to 80 kHz.
		Internal synchronization		The C-Box/2A forms the time base.
		External synchroniza-tion	*Low-level logic (LLL)* *≤ 0.7 V: Trigger not active* *≥ 2.2 V: Trigger active*	The Sychronization signal is received from an external signal source, e.g. function generator.
			High-level logic (HLL) *≤ 3.0 V: Trigger not active* *≥ 8.0 V: Trigger active*	

External synchronization is not possible when edge or level triggering is active.

All sensors can be synchronised from the C-Box/2A. A synchronization between them of sensors of the same type is then no longer necessary. Sensors with different measuring ranges from the same series can be synchronized.

The C-Box/2A operates as Master; the sensors operate as Slave. The small time offset of the measured value between individual sensors no longer applies. The controller only reacts to the edge of a synchronization signal.

6.5.5 Output Data Rate

Output data rate	Output every ... measured value	Value	The reduction of the output rate causes only every nth measured value to be output. The other measured values are discarded. Any desired averaging over n values must be set separately.
	Reducing applies for following interfaces	*Analog*	
		Ethernet	
		USB	

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

6.6 Outputs

➡ On the `Settings` tab, switch to the `Outputs` menu.

6.6.1 Digital Interface Selection

Digital interface selection	Used interface for data output		
	Web diagram	*Disabled*	No metrics are output through the digital interface.
		Ethernet	Ethernet enables fast, non-real-time data transmission (packet-based data transfer). The meter can be configured via the web interface or by ASCII commands, see A 2, via a terminal program.
		Web diagram	The recorded measurements are displayed in the diagram of the website.
		USB	The USB interface provides a lower data rate interface for the transmission of measured value data. Configuration is via ASCII commands, see A 2.

i For a measured value output with subsequent analysis without immediate process control, the Ethernet interface is recommended. If real-time measurement value output is required for process control, the analog interfaces should be used.

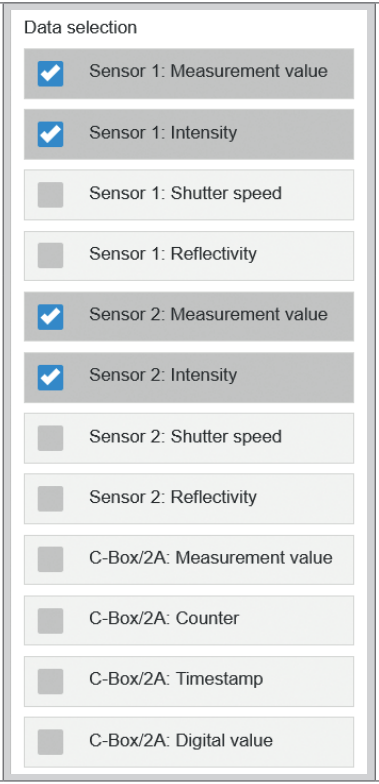
Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

6.6.2 Data Selection Ethernet and Data Selection USB

Here you can select the data to be transmitted via the digital interfaces.

Use the check box to activate the data to be transmitted.

Data selection Ethernet	Data selection		From the sum of all available data, those needed for further processing can be selected. These are then output sequentially in fixed sequence. Information about data format, output sequence and further explanations are available in the MEDAQLib operating instructions, see 7, or in the operating instructions of MICRO-EPSILON sensors.
Data selection USB			

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

You cannot display and save the additional values in the web diagram. To do so, please use the C-Box/2A tool. The C-Box/2A tool is available on the MICRO-EPSILON website at https://www.micro-epsilon.de/accessories/C-Box-2A/.

6.6.3 Settings Ethernet

<table>
<tr><td rowspan="7">Settings Ethernet</td><td>Adress type</td><td>DHCP</td><td>Static IP address</td><td rowspan="4">Submit IP settings</td><td rowspan="7">The C-Box/2A provides the measured values itself as server (transmission type: server / TCP). As a client, a self-created program or a tool such as ICONNECT can be used. The documentation of the data format can be found in the MEDAQULib operating instructions of MICRO-EPSILON, see 7. It is possible to set the maximum number of data frames in the measurement package. 0 means that the number is determined automatically.</td></tr>
<tr><td>IP address</td><td rowspan="3"></td><td>169.254.168.150</td></tr>
<tr><td>Subnet mask</td><td>255.255.0.0</td></tr>
<tr><td>Default gateway</td><td>169.254.1.1</td></tr>
<tr><td>Transmission type</td><td colspan="2">Server/TCP</td><td rowspan="3"></td></tr>
<tr><td>Data port</td><td colspan="2">Value</td></tr>
<tr><td>Frames per measurement packet</td><td>Automatic /</td><td>Manual
Value</td></tr>
</table>

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

6.6.4 Settings USB

Settings USB	Scaling	Standard scaling	For standard calibration, the entire measuring range of the sensor / controller is output.		
		Two-point scaling	Start of range	Value	The two-point scaling requires the specification of the beginning and end of the range; Value range: from -1024 to 1024 mm. The minimum value must be less than the maximum value.
			End of range	Value	

6.6.5 Digital Outputs

Selecting the function of the fault outputs

Digitale outputs	Error output 1 / Error output 2	Level low Sensor 1: Error output 1 Sensor 1: Error output 2 Sensor 2: Error output 1 Sensor 2: Error output 2 Sensor 1: Measurement value Sensor 1: Intensity Sensor 1: Shutter speed Sensor 1: Reflectivity Sensor 2: Measurement value Sensor 2: Intensity Sensor 2: Shutter speed Sensor 2: Reflectivity C-Box/2A: Measurement value Level low Level high	See next page for description.

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

Sensor x: Error output y

The value of the selected fault output of the selected sensor is output.

Sensor x: Measurement value

Returns the result of the range check for the metric of the selected sensor. The valid range is determined by the Upper and Lower threshold input fields in mm.

Sensor x: Intensity

Returns the result of the range check for the intensity value of the selected sensor. The valid range is determined by the Upper or Lower threshold input fields in %.

Sensor x: Shutter time

Returns the result of the range check for the exposure time of the selected sensor. The valid range is determined by the Upper or Lower threshold input fields in μs.

Sensor x: Reflectivity [1]

Returns the result of the range check for the reflectivity value of the selected sensor. The valid range is determined by the Upper or Lower threshold input fields.

C-Box/2A: Measurement value

Returns the result of the range check for the C-Box/2A reading. The valid range is determined by the Upper or Lower threshold input fields in mm.

Level low

The error value is already low.

Level high

At the error output the level is always high.

1) For the ILD 2300 sensor, the setting x: temperature applies instead of the setting x: reflectivity

6.6.6 Analog Output 1, Analog Output 2

Analog output 1, Analog output 2	Output area	*Inactive / 0V ... 5V / -5V ... 5V / -10V ... 10V / 4mA ... 20mA*			Specification of analog output, current or voltage with selectable value range.
	Output signal	*Fixed output value / Sensor 1: Measurement value / Sensor 1: Intensity/ Sensor 1: Shutter speed / Sensor 1: Reflectivity / Sensor 2: Measurement value / Sensor 2: Intensity/ Sensor 2: Shutter speed / Sensor 2: Reflectivity / C-Box/2A: Measurement value*			Specification of analog output, current or voltage with selectable value range.
	Scaling	*Standard scaling*			At Standard scaling outputs the entire measuring range of the sensor / controller.
		Two-point scaling	Start of range (mm)	Value	The two-point scaling requires the specification of the beginning and end of the range.
			End of range (mm)	Value	

1) Only one measured value can be transmitted.

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

6.7 System Settings

➡ On the `Settings` tab, switch to the `System settings` menu.

When programming has been completed, store all settings permanently in a set of parameters to ensure that these settings are available when the sensor is switched on the next time.

6.7.1 Unit, Language

The web interface promotes the units millimeter (mm) and inch when displaying measuring results. You can choose German or English in the web interface. You can change the language in the menu bar.

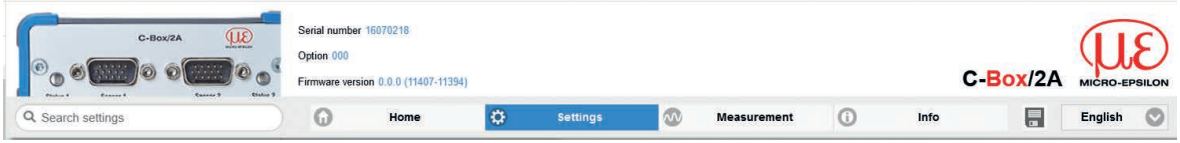


Fig. 19 Language selection in the menu bar

Language, Unit	Language at startup	*Browser / German / English / Chinese / Japanese / Korean*	Specifies the language used at startup.
	Unit on the website	*Millimeter / Inch*	Specifies the unit of the measurement display. ℹ The unit has no effect on the sensor itself.

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

6.7.2 Save Settings

All settings on the controller, for example connected sensors and calculation functions can be saved permanently in application programs, so-called setups, in the controller.

Save settings	Save in the setup number	*1 / 2 / 3 / 4 / 5 / 6 / 7 / 8*	Save	Clicking the button saves the settings to the selected setup file.

i After the programming, store all settings permanently under a setup no.(1 / 2 / 3 ... 8) in the controller, so that they are available again when the C-Box/2A is switched on the next time.

6.7.3 Load Settings

Load settings	Load from setup number	*1 / 2 / 3 / 4 / 5 / 6 / 7 / 8*	Load	A click on the button loads the settings of the selected setup file.
	Load	*All settings / Interface settings only / Measurement settings only*		

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

6.7.4 Manage Settings on PC

Use this menu to save a backup copy of the controller data to a PC or to restore backed up setup files to the controller.

i Save the controller settings, before exporting or importing data, see 6.7.2.

Manage settings on PC	Export settings	*Export*	The `Opening C-Box_2A_Settings.txt` dialog opens.	All settings of the C-Box/2A are stored in a file.
	Import settings	*Browse*	-	Select an appropriate settings file in the open file dialog. The settings of the C-Box/2A are read from a file and sent to the C-Box/2A. i Only suitable settings are imported.
	Select settings	*Controller settings*	Import	
		Ethernet settings		

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

6.7.5 Reset

Reset	Reset to factory defaults	*All setups*	Reset C-Box/2A	The C-Box/2A is reset to the factory default settings. All setups will be deleted and the default parameters will be loaded.
		Keep interface		The settings for language, password and Ethernet remain unchanged.
	Reboot options	*Reboot sensors*	Reboot C-Box/2A	The C-Box/2A will be rebooted. The measurement is interrupted. Unsaved changes are lost.

6.8 Info

➡ Switch to the `Info` tab.

All necessary information, such as company address, telephone and fax numbers and e-mail address, as well as information about serial and version numbers of the controller and connected sensors is available here.

i The current operating instructions are available by clicking the left side of the operating instructions menu.

On the right side, all important controller and sensor information is available.

Fields with a gray background require a selection.

Value — Fields with dark border require the specification of a value.

7. Software Support with MEDAQLib

MEDAQLib (Micro-Epsilon Data Acquisition Library) offers you a documented driver DLL. Therewith you embed the C-Box/2A, in combination with

- Ethernet card
- USB

into an existing or a customized PC software.

MEDAQLib

- contains a DLL, which can be imported into C, C++, VB, Delphi and many additional programs,
- makes data conversion for you,
- works independent of the used interface type,
- features by identical functions for the communication (commands),
- provides a consistent transmission format for all MICRO-EPSILON sensors.

For C/C++ programmers MEDAQLib contains an additional header file and a library file. You will find the latest driver / program routine at:

www.micro-epsilon.com/download/

www.micro-epsilon.de/link/software/medaqlib/

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. Service, Repair

If the controller is defective:

If possible, save the current C-Box/2A settings in a parameter set on your PC, see 6.7.4, to reimport them into the C-Box/2A after the repair. The opening of the C-Box/2A is only subjected to the manufacturer. In the cause of a fault cannot be clearly identified, please send the entire measuring system to:

MICRO-EPSILON MESSTECHNIK
GmbH & Co. KG
Koenigbacher Str. 15
94496 Ortenburg / Germany
Tel. +49 (0) 8542 / 168-0
Fax +49 (0) 8542 / 168-90

info@micro-epsilon.com
www.micro-epsilon.com

10. Decommissioning, Disposal

➡ Remove all supply and output cables from the C-Box/2A.

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

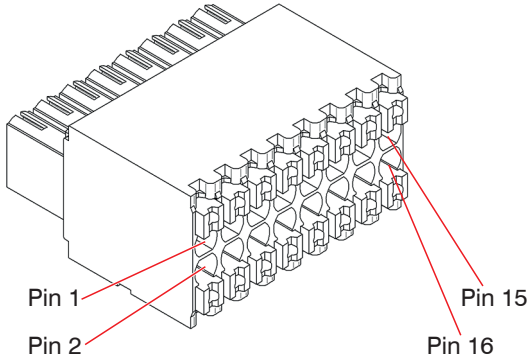


Fig. 20 Pin assignment 16-pin terminal box

Female connector suitable for

- Conductor type solid/fine-stranded, cross section from 0.08 ... 1.5 mm² AWG 28 ... 16

- Conductor type fine-stranded (with insulated/uninsulated ferrule), cross section from 0.25 ... 1 mm² AWG 24 ... 18

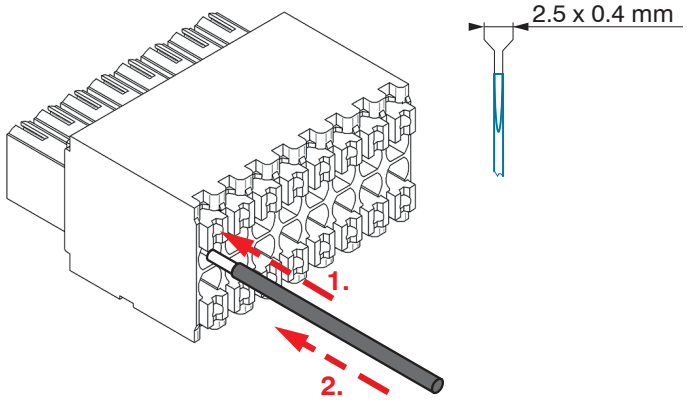
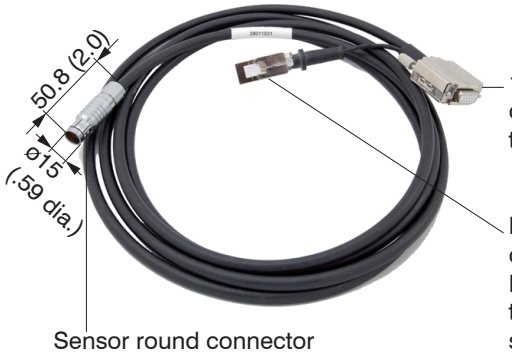


Fig. 21 Steps for wiring the cable clamp

Attach the female connector in bench vise as far as possible.

1. Press the orange clamping lever inwards.
2. Insert the connecting wire into the terminal.
3. Release the operating slot.

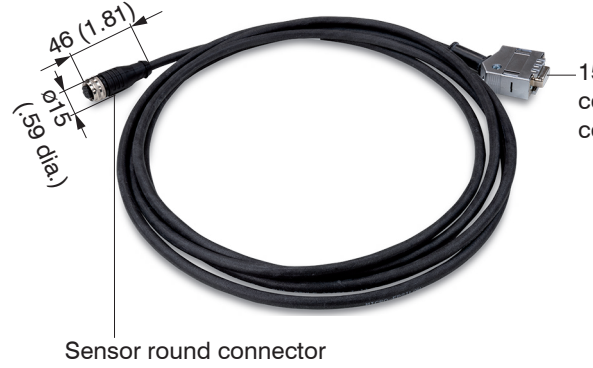
i Please use a screwdriver with a max. blade width of 2.5 x 0.4 mm.



Interface and power supply cable to connect an ILD23xx to a C-Box/2A,
cable length x = 3, 6, 9 or 25 m

Fig. 22 PC2300-3/C-Box/RJ45 power supply and interface cable

You can adjust settings to the sensor via the RJ45 Ethernet connector using the web interface or ASCII adjustments.



Interface and power supply cable to connect an ILD1420 to a C-Box/2A, cable length x = 3, 6, 9 or 10 m

Fig. 23 PCF1420-3/C-Box power supply and interface cable

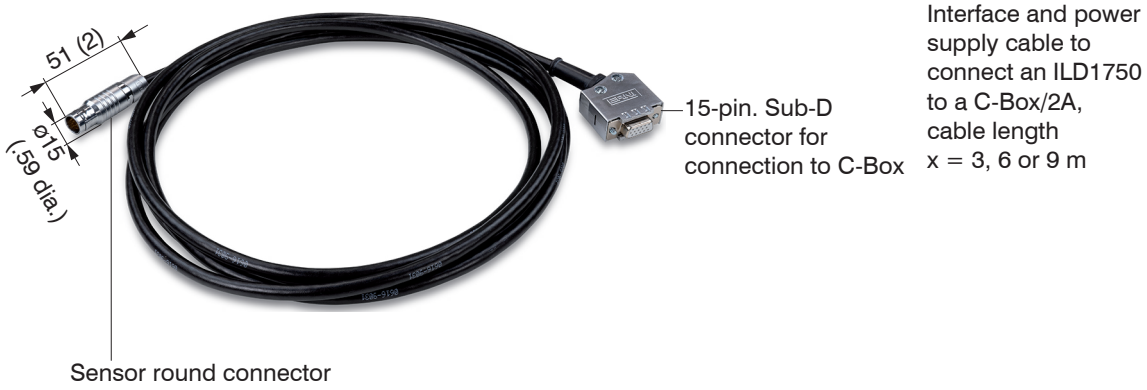


Fig. 24 PC1750-3/C-Box power supply and interface cable

A 2 ASCII Communication with Sensor

A 2.1 General

The ASCII commands can be sent to the controller via the RS422 interface, USB or Ethernet. All commands, inputs and error messages are in English. A command always consists of the command name and zero or more parameters, which are separated by spaces and are completed with CR LF (corresponds \r\n).

The echo is always active, i. e.:

- With a command for setting parameters first the command name and afterwards OK respectively error and finally the prompt return as answer.
- With a command for reading parameters first the command name and afterwards the parameter value and finally the prompt return at answer.
- With a command with answer of several lines first the command name and in the next lines the parameters return as answer.

A 2.2 Data Protocol

All values to be output at the same time are combined for transmission to a frame. A maximum of 12 values/ frames are possible. The measured values are transmitted via TCP/IP with 32 bit and USB with a maximum of 18 data bits

Structure of a measured value frame:

- Sensor 1 Value
- Sensor 1 Intensity
- Sensor 1 Shutter
- Sensor 1 Reflectivity
- Sensor 2 Value
- Sensor 2 Intensity
- Sensor 2 Shutter
- Sensor 2 Reflectivity
- C-Box Value
- C-Box Counter
- C-Box Timestamp
- C-Box Digital

With the Ethernet transmission a header and then a sequence of data frames is transmitted with each package.

The header consists of:

- Preamble (32 bits): MEAS
- Order number (32 bits)
- Serial number (32 bits)
- Flags1 (32 bits), see Fig. 25
- Flags2 (32 bits), see Fig. 26, momentarily without function
- Bytes per frame (16 bits) / Number of frames in the package (16 bits)
- Frame counter (32 bits)

The data frames in the package is always complete (No frame can be distributed on several packages). Each frame consists of his selected measured values (up to 12). Each measured value has again 32 bits.

The valid ranges for sensor and C-Box/2A values are as follows:

- Via RS422/USB:
  - Sensor measured values and additional values depending on sensor, see also operating instructions manual
    optoNCDT 1750, optoNCDT 1900 and optoNCDT 2300.
  - C-Box measured values from 0 .. 131071, from 262073 … 262143 (18 bits) error values
  - C-Box Counter von 0 .. 262143 (18 bits)
  - C-Box Timestamp von 0 .. 262143 (18 bits)
  - C-Box Digital von 0 .. 262143 (18 bits)
- Via TCP/IP (Ethernet):
  - Sensor measured values and additional values depending on the sensor, see also operating instructions optoNCDT 1750, optoNCDT 1900 and optoNCDT 2300.
  - However, an additional Hi Byte (0x00) is transmitted to comply with 32 bits.
  - C-Box measured values from INT_MIN (-2147483648) to INT_MAX (2147483647)-11, INT_MAX-10 to INT_MAX are error values
  - C-Box Counter von INT_MIN bis INT_MAX
  - C-Box Timestamp von INT_MIN bis INT_MAX
  - C-Box Digital von INT_MIN bis INT_MAX

Flag 1 bits	Description
0	Sensor 1 Value
1	unused
2	Sensor 2 Value
3	unused
4	C-Box Value
5 to 7	unused
8	Sensor 1 Intensity
9	Sensor 1 Shutter
10	Sensor 1 Reflectivity

Flag 1 bits	Description
11	Sensor 2 Intensity
12	Sensor 2 Shutter
13	Sensor 2 Reflectivity
14	C-Box Counter
15	C-Box Timestamp
16	C-Box Digital
17 to 30	unused
30 to 31	01 (fixed value, to distinguish from C-Box, where it is 00)

Fig. 25 Description Flags 1 (Ethernet)

Flag 2 bits	Description
0 up to 31	0

Fig. 26 Description Flags 2 (Ethernet)

Value	Interface	Value range
Sensor 1 Value, Sensor 2 Value, C-Box Value	USB	0 ... 262072
	Ethernet -INT_MAX ... INT_MAX -11	-2147483647 ... 2147483636
C-Box Counter, C-Box Timestamp, C-Box Digital	USB	0 ... 262143
	Ethernet: -INT_MAX ... INT_MAX	-2147483647 ... 2147483647

Fig. 27 Valid ranges (raw values)

Value	Interface	Value range
Sensor 1 Value, Sensor 2 Value, C-Box Value	USB	262073 ... 262143
	Ethernet: INT_MAX -10 ... INT_MAX	2147483637 ... 2147483647

Fig. 28 Error ranges (raw values)

Value	Interface	Calculation	Unit
C-Box Value	USB		[mm]
		$\text{Value} = \frac{\text{Digital} * (\text{C-Box Range Max} - \text{C-Box Range Min})}{131072.0} + \text{C-Box Range Min}$	
	Ethernet	$\text{Value} = \frac{\text{Digital}}{1.0e+006}$	[mm]
C-Box Time-stamp	USB	$\text{Value} = \frac{\text{Digital (Left shift by 8 bits)}}{1.0e+006}$	[s]
	Ethernet	$\text{Value} = \frac{\text{Digital (unsigned int)}}{1.0e+006}$	[s]
C-Box Counter	USB	Digital	without
	Ethernet	Digital (unsigned int)	without
C-Box Digital	, see Fig. 48		

Fig. 29 Calculation of the values

C-Box Digital		
Bits	Description	
0	Trigger IN (TRG IN)	Connector input
1	Multi function input (MF IN)	Connector input
2	Laser-ON (Laser)	Connector input
3	Switching output S1 (OUT S1)	Connector output
4	Switching output S1 (OUT S2)	Connector output
5	Multi function output	Sensor1 output
6	Laser-ON	Sensor1 output
7	Switching input 1	Sensor1 input
8	Switching input 2	Sensor1 input
9	Multi function output	Sensor1 output
10	Laser-ON	Sensor2 output
11	Switching input 1	Sensor2 input
12	Switching input 2	Sensor2 input
13 bis 15 (bzw. 31)	reserved (0)	

Fig. 30 Description C-Box Digital

During a restart or after a configuration change at the C-Box/2A this initializes the sensors and the measuring restarts.

A 2.3 Commands Overview

Group	Chapter	Short info
General commands		
	Chap. A 2.3.1.1	Controller information
	Chap. A 2.3.1.2	Search sensor
	Chap. A 2.3.1.3	Sensor information
	Chap. A 2.3.1.4	Read all settings
	Chap. A 2.3.1.5	Language setting
	Chap. A 2.3.1.6	Synchronization
	Chap. A 2.3.1.7	Booting the controller
Triggering		
	Chap. A 2.3.2.1	Trigger Selection
	Chap. A 2.3.2.2	Trigger Level
	Chap. A 2.3.2.3	Number of measuring values displayed
	Chap. A 2.3.2.4	Software Trigger pulse
Interfaces		
	Chap. A 2.3.3.1	Ethernet
	Chap. A 2.3.3.2	Setting the measured value server
	Chap. A 2.3.3.3	Baudrate
	Chap. A 2.3.3.4	Find C/Box-2A
Handling of setups		
	Chap. A 2.3.4.1	Save parameter
	Chap. A 2.3.4.2	Load parameter
	Chap. A 2.3.4.3	Default settings

Group	Chapter	Short info
Measurement		
	Chap. A 2.3.5.1	Measurement mode
	Chap. A 2.3.5.2	Measuring rate
	Chap. A 2.3.5.3	Measured value averaging controller
	Chap. A 2.3.5.4	Measured value averaging sensor
	Chap. A 2.3.5.5	Setting masters / zero
Data output		
	Chap. A 2.3.6.1	Selection digital output
	Chap. A 2.3.6.2	Output data rate
	Chap. A 2.3.6.3	Scale output values
	Chap. A 2.3.6.4	Error processing
	Chap. A 2.3.6.5	Data selection for USB
	Chap. A 2.3.6.6	Data selection for Ethernet
	Chap. A 2.3.6.7	Function selection multifunctional input
	Chap. A 2.3.6.8	Activate error output, switching output 1
	Chap. A 2.3.6.9	Activate error output, switching output 2
	Chap. A 2.3.6.10	Limit values
	Chap. A 2.3.6.11	Data selection
	Chap. A 2.3.6.12	Output range
	Chap. A 2.3.6.13	Two-point scaling
	Chap. A 2.3.6.14	Send command to connected sensor
Laser		
	Chap. A 2.3.7.1	Laser off / laser on

Group	Chapter	Short info
Error values		
	Chap. A 2.3.8.1	Error values via USB
	Chap. A 2.3.8.2	Error values via Ethernet

A 2.3.1 General Commands

A 2.3.1.1 Controller Information

```
GETINFO
```

Controller data are queried. Output as per example:

```
->GETINFO
Name:         C-Box
Serial:       10000001
Option:       000
Article:      2420072
MAC-Address:  00-0C-12-01-06-08
Version:      xxx.xxx.xxx.xx
->
```

A 2.3.1.2 Search Sensor

```
SCAN1
```

The controller looks for sensors connected to the socket sensor 1.

The `SCAN2` command causes the controller to look for sensors connected to the socket Sensor 2.

A 2.3.1.3 Sensor Information

```
GETINFO1
```

Provides information about the sensor connected to the socket Sensor 1.

Example of a response if a ILD2300 [1] is connected:

```
->GETINFO1
Name: ILD2300
Serial: 11020009
Option: 001
Article: 2418004
MAC-Address: 00-0C-12-01-06-08
Version: 004.093.087.02
Measuring range: 20 mm
...
Imagetype: User
->
```

If the sensor was not recognized by the C-Box/2A, the error `E39 no sensor found` is output.

The `GETINFO2` command provides information about the sensor connected to the socket Sensor 2.

A 2.3.1.4 Read All Settings

```
PRINT [ALL]
```

Print is used to output all query commands, for each line a response with command names in front.

- ALL: Provides further information

A 2.3.1.5 Language Setting

```
LANGUAGE BROWSER|ENGLISH|GERMAN
```

Language of indicated web pages.

- BROWSER means display language of the web browser.

Default = BROWSER

1) For the ILD 1420, ILD 1750 and ILD 1900 accordingly.

A 2.3.1.6 Synchronization

```
SYNC NONE|INTERNAL|EXTERNAL [LLL | HLL]
```

- NONE: Sensors are not synchronized, the C-Box/2A runs with its own clock and takes just available sensor values.
- INTERNAL: C-Box/2A produces Sync impulse
- EXTERNAL: External Sync impulse is looped through to the sensors
  - In the case of external triggering it can still be switched between Low Level Logic (LLL) and High Level Logic (HLL).
  - Low Level Logic (0 ... 0,7 to 2,8 ... 30)
  - High Level Logic (0 ... 3 to 8 ... 30)

Default = INTERNAL LLL

A 2.3.1.7 Booting the Controller

```
RESET [ALL]
```

The C-Box/2A restarts.

- ALL: Also restart the sensors.

A 2.3.2 Triggering

A 2.3.2.1 Trigger Selection

```
TRIGGER NONE|EDGE|PULSE|SOFTWARE
```

Selection of trigger mode

- NONE: No triggering
- EDGE: Level triggering via TRG-IN (Measuring value output depends on TRIGGERCOUNT)
- PULSE: Gate triggering via TRG-IN (continuous measuring value output while TRG-In is inactive.)
- SOFTWARE: Triggering via the command TRIGGERSW (measuring value output depends on TRIGGERCOUNT)

Default = NONE

A 2.3.2.2 Trigger Level

```
TRIGGERLEVEL HIGH|LOW LLL|HLL
```

Sets the active level logic and the switching threshold for the trigger input.

- HIGH|LOW: active level logic
- LLL|HLL: Switching threshold
  - LLL = High level logic ==> LO = 0..0.7 Volt, HI = 8..30 Volt)
  - HLL = High level logic ==> LO = 0..3 Volt, HI = 8..30 Volt)

Default = HIGH LLL

A 2.3.2.3 Number of Measuring Values Displayed

```
TRIGGERCOUNT 0|1...16382|INFINITE|16383
```

Determines how many measuring values are output after a trigger event.

- 1...16382: Number of measuring values which are displayed after trigger event
- INFINITE|16383: Start the continuous measuring value output after a trigger event
- 0: Stops the continuous output of measuring values

Default = 1

A 2.3.2.4 Software Trigger Pulse

```
TRIGGERSW
```

Generating a software trigger. Is the trigger selection is not SOFTWARE, the error message „E43 triggermode SOFTWARE disabled“ is output.

If the command is resent with active measuring value output, the trigger is stopped and the measuring value output is finished.

A 2.3.3 Interfaces

A 2.3.3.1 Ethernet

```
IPCONFIG DHCP|STATIC [<IPAdresse> [<Netmask> [<Gateway>]]]
```

Set Ethernet interface.

- DHCP: IP address and gateway are automatically requested by DHCP. System looks for a LinkLocal address after appr. 30 minutes if no DHCP server is available.
- STATIC: Set IP address, net mask and gateway in format xxx.xxx.xxx.xxx

Values stay the same if no IP address, net mask, and/or gateway is typed in.

Default = STATIC 169.254.168.150 255.255.0.0 169.254.1.1

A 2.3.3.2 Setting the Measured Value Server

```
MEASTRANSFER SERVER/TCP [<PORT>]
```

In case of measured value output via Ethernet: currently only TCP server is provided.

- The port is freely selectable between 1024 and 65535.

Default = SERVER/TCP 1024

A 2.3.3.3 Baudrate

```
BAUDRATE <Baudrate>
```

Setting the interface baudrate to the PC. Possible variants: 115.200 (Default), 8.000.000, 4.000.000, 3.500.000, 3.000.000, 2.500.000, 2.000.000, 1.500.000, 921.600, 691.200, 460.800, 230.400, 9.600 Baud

Default = 115200

A 2.3.3.4 Find C-Box/2A

Search the C-Box/2A by using the `sensorTOOL x.x.x` program, see 5.4.2.

A 2.3.4 Handling of Setups

A 2.3.4.1 Save Parameter

```
STORE 1|2|3|4|5|6|7|8
```

Save the current parameter under the specified number in the flash. With the restart of the C-Box/2A the last saved data record is always loaded.

A 2.3.4.2 Load Parameter

```
READ ALL|DEVICE|MEAS 1|2|3|4|5|6|7|8
```

Read the current parameter under the specified number in the flash. In addition, the size of the loaded data needs to be specified:

- ALL: All parameters are loaded.
- DEVICE: Only the standard device settings are loaded (interface parameter).
- MEAS: Only the measurement settings are loaded (all features for the measurement).

A 2.3.4.3 Default Settings

```
SETDEFAULT [ALL] [NODEVICE]
```

- Sets the default values (Reset to default setting).
- ALL: All setups are deleted and default parameters are loaded, otherwise, only the current setup will be deleted.
- NODEVICE: Settings of IP address are kept temporarily.

A 2.3.5 Measurement

A 2.3.5.1 Measurement Mode

```
MEASMODE SENSOR1VALUE|SENSOR12THICK|SENSOR12STEP
```

Set measurement mode, possible are:

- SENSOR1VALUE: Measured value of sensor 1.
- SENSOR12THICK: The measured values of sensor 1 and sensor 2 are subtracted from measuring range and both results are added together. If the mastering is active, both values are subtracted from the internal mastering offset.
- SENSOR12STEP: Difference from measured value of sensor 1 minus measured value of sensor 2.

Default = SENSOR1VALUE

A 2.3.5.2 Measuring Rate

```
MEASRATE x.xxx
```

Measuring rate in kHz with three decimal places.

Only measuring rates that support the measuring rates are permit. During deactivated synchronization values between 0.400 and 80.000 are permitted.

A 2.3.5.3 Measured Value Averaging Controller

```
AVERAGE NONE|MOVING|RECURSIVE|MEDIAN [<Averaging depth>]
```

Output averaging of the C-Box/2A. The averaging value affects on the C-Box/2A measured value on all interfaces and analog.

- NONE: Measured value averaging not active
- MOVING: Moving average value (averaging depth 2, 4, 8, 16, 32, 64, 128, 256 and 512 possible).
- RECURSIVE: Recursive average value (averaging depth 2, 4, 8, ..., 32768)
- MEDIAN: Median (averaging depth 3, 5, 7 and 9 possible)

Default: NONE

A 2.3.5.4 Measured Value Averaging Sensor

```
AVERAGE1 NONE|MOVING|RECURSIVE|MEDIAN [<Averaging depth>]
```

Averaging in the sensors. The averaging value always affects all to be output displacement and difference values.

- NONE: Measured value averaging not active
- MOVING: Moving average value [1]
- RECURSIVE: Recursive average value [1]
- MEDIAN: Median [1]

The command `AVERAGE2 NONE|MOVING|RECURSIVE|MEDIAN [<Averaging depth>]` stops averaging the sensor connected to the socket Sensor 2.

Default = NONE

A 2.3.5.5 Setting Masters / Zero

```
MASTERMV NONE|MASTER <Master value>
```

Mastering the C-BOXVALUE

- NONE: Terminates the mastering
- MASTER: Setting the current measured value as master value
  - Master value in millimeters (min: -1024.0 mm, max: 1024.0 mm)
  - In case of master value is 0, then the mastering function has the same functionality as the zero setting.

Default = NONE

1) Only those values are possible, which are supported by the sensor.

A 2.3.6 Data Output

A 2.3.6.1 Selection Digital Output

```
OUTPUT NONE|ETHERNET|HTTP|USB
```

Activates data output at the desired interface.

- NONE: No measured value output
- ETHERNET: Output of measured values via Ethernet
- HTTP: Output of measured values over the web page of the C-Box/2A
- USB: Output of measured values via USB

Default = HTTP

A 2.3.6.2 Output Data Rate

```
OUTREDUCE <Output reduction> ([ANALOG] [USB] [ETHERNET])|NONE
```

Reduces the measured value output for all available interfaces.

- 1: Output of every measured value
- 2 ... 1000: Output of each n-th measured value

Default = 1 NONE

A 2.3.6.3 Scale Output Values

```
OUTSCALE_RS422_USB STANDARD|(TWOPOINT <Minimum measured value> <Maximum mea-
sured value>)
```

Sets the scaling of the C-BOXVALUE via USB.

The default scaling is for distance/level 0 to MR (Sensor 1) and for thickness measurement 0 to MR (Sensor1) + MR (Sensor2) (MR=Measuring range).

The minimum and maximum measured value must be indicated in millimeters. The available output range of the USB output is then spread between the minimum and maximum measured value. The minimum and maximum measured value must lie between -1024.0 and 1024.0 mm with 4 decimal places. The maximum value must be larger than the minimum value.

Default = STANDARD 0.0 50.0

A 2.3.6.4 Error Processing

```
OUTHOLD NONE|0|<Number>
```

Setting the behavior of the measured value output in case of error for the C-Box/2A measured value, not for the sensor values.

- NONE: No holding the last measured value, output of error value.
- 0: Infinite holding of the last measured value
- Number: Holding the last measured value on the number of measuring cycles; Then an error value (maximal 1024) is output.

Default = NONE

A 2.3.6.5 Data Selection for USB

```
OUT_USB NONE|([SENSOR1VALUE][SENSOR1INTENSITY][SENSOR1SHUTTER][SENSOR1REFLEC-
TIVITY][SENSOR2VALUE][SENSOR2INTENSITY][SENSOR2SHUTTER][SENSOR2REFLECTIVITY]
[C-BOXVALUE][C-BOXCOUNTER][C-BOXTIMESTAMP][C-BOXDIGITAL])
```

Setting the values to be output via USB.

- NONE: No output via USB
- SENSOR1VALUE: Measured value of Sensor 1
- SENSOR1INTENSITY: Intensity of Sensor 1
- SENSOR1SHUTTER: Shutter speed des Sensor 1
- SENSOR1REFLECTIVITY: Reflectivity of Sensor 1
- SENSOR2INTENSITY: Intensity of Sensor 2
- SENSOR2VALUE: Measured value of Sensor 2
- SENSOR2SHUTTER: Shutter speed des Sensor 2
- SENSOR2REFLECTIVITY: Reflectivity of Sensor 2
- C-BOXVALUE: Calculated value of C-Box
- C-BOXCOUNTER: Counter value of C-Box
- C-BOXTIMESTAMP: Timestamp of C-Box
- C-BOXDIGITAL: Digital inputs/outputs of C-Box

Default = SENSOR1VALUE

A 2.3.6.6 Data Selection for Ethernet

```
OUT_ETH NONE|([SENSOR1VALUE][SENSOR1INTENSITY][SENSOR1SHUTTER][SENSOR1REFLEC-
TIVITY][SENSOR2VALUE][SENSOR2INTENSITY][SENSOR2SHUTTER][SENSOR2REFLECTIVITY]
[C-BOXVALUE][C-BOXCOUNTER][C-BOXTIMESTAMP][C-BOXDIGITAL])
```

Setting the values to be output via Ethernet.

- NONE: No output via Ethernet
- SENSOR1VALUE: Measured value of Sensor 1
- SENSOR1INTENSITY: Intensity of Sensor 1
- SENSOR1SHUTTER: Shutter time of Sensor 1
- SENSOR1REFLECTIVITY: Reflectivity of Sensor 1
- SENSOR2VALUE: Measured value of Sensor 2
- SENSOR2INTENSITY: Intensity of Sensor 2
- SENSOR2SHUTTER: Shutter time of Sensor 2
- SENSOR2REFLECTIVITY: Reflectivity of Sensor 2
- C-BOXVALUE: Calculated value of C-Box
- C-BOXCOUNTER: Counter value of C-Box
- C-BOXTIMESTAMP: Timestamp of C-Box
- C-BOXDIGITAL: Digital inputs/outputs of C-Box

Default = SENSOR1VALUE

A 2.3.6.7 Function Selection Multifunctional Input

```
MFIFUNC NONE|MASTER|SENSOR1|SENSOR2|SENSOR12 LLL|HLL
```

Function of the multifunction input, either masters or output to one or both multifunction outputs (sensor).

- NONE: No function
- MASTER: C-Box Mastering
- SENSOR1: Multifunction output for sensor 1
- SENSOR2: Multifunction output for sensor 2
- SENSOR12: Multifunction output for sensor 1 and 2
- LLL: Low Level Logic input
- HLL: High Level Logic input

Default = NONE LLL

A 2.3.6.8 Activate Error Output, Switching Output 1

```
ERROROUT1 SENSOR1ERROROUT1|SENSOR1ERROROUT2|SENSOR2ERROROUT1|SENSOR2ERROROUT2|S
ENSOR1VALUE|SENSOR1INTENSITY|SENSOR1SHUTTER|SENSOR1REFLECTIVITY|SENSOR2VALUE|SE
NSOR2INTENSITY|SENSOR2SHUTTER|SENSOR2REFLECTIVITY|C-BOXVALUE|LOW|HIGH
```

Select the signal source for the switching output 1 (to the periphery).

The first four switches only one error output of the sensors.

The next nine monitoring values from the sensors or the C-Box.

The last two switch the output to a level by command.

Default = LOW

A 2.3.6.9 Activate Error Output, Switching Output 2

```
ERROROUT2 SENSOR1ERROROUT1|SENSOR1ERROROUT2|SENSOR2ERROROUT1|SENSOR2ERROROUT2|S
ENSOR1VALUE|SENSOR1INTENSITY|SENSOR1SHUTTER|SENSOR1REFLECTIVITY|SENSOR2VALUE|SE
NSOR2INTENSITY|SENSOR2SHUTTER|SENSOR2REFLECTIVITY|C-BOXVALUE|LOW|HIGH
```

Select the signal source for the switching output 2 (to the periphery).

The first four switches only one error output of the sensors.

The next nine monitoring values from the sensors or the C-Box.

The last two switch the output to a level by command.

Default = LOW

A 2.3.6.10 Limit Values

```
ERRORLIMIT1 <Lower Limit><Upper Limit>
```

If a measured value respectively calculated value is to be monitored using ERROROUT1, the limits can be set here.

The minimum and maximum measured value is processed with four decimal places.

```
ERRORLIMIT2 <Lower Limit><Lower limit>
```

If a measured value respectively calculated value is to be monitored using ERROROUT2, the limits can be set here.

The minimum and maximum measured value is processed with four decimal places.

Default = 0.0 0.0

A 2.3.6.11 Data Selection

```
ANALOGOUT1 SENSOR1VALUE|SENSOR1INTENSITY|SENSOR1SHUTTER|SENSOR1REFLECTIVITY|SEN
SOR2VALUE|SENSOR2INTENSITY|SENSOR2SHUTTER|SENSOR2REFLECTIVITY|C-BOXVALUE|FIXED
[Wert]
```

Selection of the signal to be output via the analog output1.

For FIXED, the voltage / current value is indicated with four decimal places.

```
ANALOGOUT2 SENSOR1VALUE|SENSOR1INTENSITY|SENSOR1SHUTTER|SENSOR1REFLECTIVITY|SEN
SOR2VALUE|SENSOR2INTENSITY|SENSOR2SHUTTER|SENSOR2REFLECTIVITY|C-BOXVALUE|FIXED
[Wert]
```

Selection of the signal to be output via the analog output2.

For FIXED, the voltage / current value is indicated with four decimal places.

Default = SENSOR1VALUE

A 2.3.6.12 Output Range

```
ANALOGRANGE1 NONE|0-5V|0-10V|-5-5V|-10-10V|4-20mA
```

- NONE: No analog output (inactive)
- 0 - 5 V: The analog output1 outputs a voltage of 0 to 5 Volt.
- 0 - 10 V: The analog output1 outputs a voltage of 0 to 10 Volt.
- -5 - 5 V: The analog output1 outputs a voltage of -5 to 5 Volt.
- -10 - 10 V: The analog output1 outputs a voltage of -10 to 10 Volt.
- 4 - 20 mA: The analog output1 outputs a current of 4 to 20 milliamperes.

```
ANALOGRANGE2 NONE|0-5V|0-10V|-5-5V|-10-10V|4-20mA
```

- NONE: No analog output (inactive)
- 0 - 5 V: The analog output2 outputs a voltage of 0 to 5 Volt.
- 0 - 10 V: The analog output2 outputs a voltage of 0 to 10 Volt.
- -5 - 5 V: The analog output2 outputs a voltage of -5 to 5 Volt.
- -10 - 10 V: The analog output2 outputs a voltage of -10 to 10 Volt.
- 4 - 20 mA: The analog output2 outputs a current of 4 to 20 milliamperes.

Default = 0-10V

A 2.3.6.13 Two-point Scaling

```
ANALOGSCALE1 STANDARD|(TWOPOINT <Minimum Measured Value> <Maximum Measured
Value>)
```

Setting the scaling of analog output1.

The standard scaling is for distances -MR/2 to MR/2, for thickness measurement 0 to 2 MR (MR = measuring range), for intensity 0 to 100 %

If the minimum and maximum measured value is ‚0', the standard scale is used.

The minimum and maximum measured value must be indicated in millimeters (distance/thickness) respectively % (intensity).

The available output range of the analog output is then divided between the minimum and maximum measured value. The minimum and maximum measured value must be between -1024.0 and 1024.0 mm, four decimal places.

```
ANALOGSCALE2 STANDARD|(TWOPOINT <Minimalum Measred Value> <Maximum Measured
Value>)
```

Setting the scaling of analog output2.

The standard scaling is for distances -MR/2 to MR/2, for thickness measurement 0 to 2 MR (MR = measuring range), for intensity 0 to 100 %.

If the minimum and maximum measured value is ‚0', the standard scale is used.

The minimum and maximum measured value must be indicated in millimeters (distance/thickness) respectively % (intensity).

The available output range of the analog output is then divided between the minimum and maximum measured value. The minimum and maximum measured value must be between -1024.0 and 1024.0 mm, four decimal places.

Default = STANDARD

A 2.3.6.14 Send Command to Connected Sensor

```
CHANNEL1 <Command for Sensor 1>
```

The command is enclosed in quotation marks and is sent and provided by the C-Box/2A with a <CRLF> to the sensor connected to Sensor 1 socket. The response of the sensor is packaged and returned in quotation marks.

If no prompt comes, then up to 15000 ms is waited for the response and afterwards an error is returned.

If no sensor in the C-Box/2A is recognized, immediately an error message returns.

Example of a channel communication, the echo in the sensor is switched off:

Command: `CHANNEL1 "LASERPOW"<CRLF>`

Response: `CHANNEL1 "LASERPOW FULL"<CRLF>->`

Command: `CHANNEL1 "LASERPOW FULL"<CRLF>`

Response: `CHANNEL1 "<CRLF>"<CRLF>->`

Command: `CHANNEL1 "GETINFO"<CRLF>`

Response: `CHANNEL1 "<CRLF><CRLF>Name:ILD2300<CRLF>Serial:1020004<CRLF>...."<CRLF>->` [1]

The command `CHANNEL2` sends commands to the sensor connected to the Sensor 2 socket.

A 2.3.7 Laser

A 2.3.7.1 Laser off / Laser on

```
LASERPOW1 OFF|ON
```

Line for laser on/off. When the laser is enabled by a jumper between Laser on and GND, it can be switched via the `LASERPOW1 OFF / ON` command.

The `LASERPOW2` command operates analog and is addressed to the sensor connected to the Sensor 2 socket.

1) For the ILD 1420, ILD 1750 and ILD 1900 accordingly.

A 2.3.8 Error Values

A 2.3.8.1 Error Values via USB

262073	USB scaling underflow
262074	USB scaling overflow
262075	Too much data for this baud rate
262079	Measure value cannot be calculated
262080	Measure value cannot be examined, global error

A 2.3.8.2 Error Values via Ethernet

7ffffff8	Measure value cannot be calculated
7ffffff7	Measure value cannot be examined, global error

A 3 Control Menu

A 3.1 Tab Home

A 3.1.1 Input

Sensor 1 / Sensor 2	*Sensor status, Sensor type, Serial number*	Selection of the connected sensor It supports sensors of ILD2300, ILD1420, ILD1750, ILD1900, IFC2421 and IFC2422 series.	
	Averaging	*No averaging*	Measurement values are not averaged.
		Moving average	About the selectable filter width N of consecutive measured values the arithmetic mean Mgl is formed and output. Each new reading is added and the first (oldest) reading removed from the averaging.
		Recursive average	Each new metric MW (n) is weighted to the (n-1) -fold of the previous average.
		Median filter	The median is formed from a preselected filter width N of measured values. For this purpose, the incoming measured values are re-sorted after each measurement. The mean value is then output as median. If an even value is selected for the filter width N, then the middle two metrics are added together and divided by two.
	Laser	*On / Off*	Turns on or off the laser light source on the sensor.

A 3.1.2 Measurement Configuration

Measurement task	*Measurement value sensor 1*	Measured value of the sensor connected to connection 1.
	Thickness sensor 1-2	Forms the difference between the two distance values of the sensors 1/2 in direct or diffuse reflection, with two-sided distance measurement, and outputs the result as a thickness value.
	Step sensor 1-2	Forms the difference between the two distance values of the sensors 1/2 in direct or diffuse reflection, with one-sided distance measurement, and outputs the result as height value.

Mastering/Zeroing	*Mastering is disabled*	*Reset master value*	Value	Cancel zeroing or mastering
	Mastering is enabled	*Set master value*	Value	Trigger zeroing or mastering. Master value range: -1024 to 1024 mm.

Trigger mode	*No triggering*				
	Level triggering	*High level / Low level*			A continuous output of the measured value is made as long as the selected level is present. After that the data output stops, see 6.5.3.
		Low-Level Logic / High-Level Logic			
	Edge triggering	*Rising edge / Falling edge*	Value		After the trigger event, the sensor outputs the previously set number of measured values or starts a continuous measurement output, see 6.5.3.
		Low-Level Logic / High-Level Logic			
	Software triggering		Value	Trigger now	A measured value output is started as soon as a software command is triggered. The trigger time is defined inaccurate. After the trigger event, the sensor outputs the previously set number of readings or starts a continuous readout, see 6.5.3.

A 3.1.3 System Configuration

Digital interface selection	*Disabled*	No metrics are output through the digital interface.
	Ethernet	Ethernet enables fast, non-real-time data transmission (packet-based data transfer). The meter can be configured via the web interface or by ASCII commands via a terminal program, see A 2.
	Web diagram	The recorded measurements are displayed in the diagram of the website.
	USB	The USB interface provides a lower data rate interface for the transmission of measured value data. Configuration is via ASCII commands, see A 2.

A 3.1.4 Data Selection

Data selection Ethernet Data selection USB	*Sensor 1: Measurement value* / *Sensor 1: Intensity* / *Sensor 1: Shutter speed* / *Sensor 1: Reflectivity* / *Sensor 2: Measurement value* / *Sensor 2: Intensity* / *Sensor 2: Shutter speed* / *Sensor 2: Reflectivity* / *C-Box/2A: Measurement value* / *C-Box/2A: Counter* / *C-Box/2A: Timestamp* / *C-Box/2A: Digital value*	The data which are provided for the transmission are to activate with the checkbox, see 6.6.2.

A 3.2 Tab Settings

A 3.2.1 Inputs

Sensor 1 / Sensor 2	*Sensor status / Sensor type / Serial number*	Selection of the connected sensor. It supports sensors of the ILD2300, ILD1420, ILD1750, ILD1900, IFC2421 and IFC2422 series. Additional information, see 6.3.1.		
	Averaging	*No averaging*	Measurement values are not averaged.	
		Moving average Mittelwert over N values	*2/ 4 / 8 / 16 / 32 / 64 / 128*	The arithmetic mean value Mgl is generated and output via the selectable filter width N of consecutive measured values, see 6.3.1.
		Recursive average over N values	Value	Each new metric MW is weighted to the (n-1) value of the previous average, see 6.3.1.
		Median filter over N values	*3 / 5 / 7 / 9*	The Median is generated from a preselected filter width N of measured values, see 6.3.1.
	Laser	*On / Off*	Turns on or off the laser light source on the sensor.	

Digital input	Function	*Disabled*	The multifunction input has no function.
		Master C-Box/2A value	Multifunction input is master pulse input for the C-Box/2A. i For this function to work mastering must be enabled, see 6.5.2.
		Forward to sensor 1	Multifunction input is forwarded to the corresponding input of the connected sensor 1.
		Forward to sensor 2	Multifunction input is forwarded to the corresponding input of the connected sensor 2.
		Forward to sensor 1 and 2	Multifunction input is forwarded to the corresponding inputs of the connected sensors 1 and 2.
	Logic for digital input	Low-level logic	Settings, see also Trigger Mode chapter, see 6.5.3 or Synchronization chapter, see 6.5.4.
		High-level logic	

A 3.2.2 Data Recording

Measurement task	Measuring mode	*Measurement value sensor 1*	Measured value of the sensor connected to connection 1, i.e., the C-Box/2A value includes the value from sensor 1, see 6.4.1.
		Thickness sensor 1-2	Forms the difference between the two distance values of the sensors 1/2 in direct or diffuse reflection, with two-sided distance measurement, and outputs the result as a thickness value, see 6.4.1.
		Step sensor 1-2	Forms the difference between the two distance values of the sensors 1/2 in direct or diffuse reflection, with one-sided distance measurement, and outputs the result as height value, see 6.4.1.

Measuring rate	*Measuring rate (kHz)*	*0.5 / 1.0 / 2.0 / 4.0*	When synchronization is switched off, the measuring rate can be set freely. Value range: from 0.4 to 80 kHz. Otherwise, the possible measuring rates are specified by the connected sensors / controllers, see 6.4.2.
	Data rate Web-diagram (kHz)	*0.5 / 1.0*	¡ The Web diagram interface uses a slower data rate for data transmission. So for higher measuring rates not all the measured values will be visible in the diagram or saved to file.

Error handling	Error handling on wrong measurement values	*Error output, no value*		If a valid metric can not be obtained, an error value is output. If this hinders further processing, alternatively the last valid measured value can be held over a certain number of measuring cycles, that is, repeatedly output, see 6.4.3.
		Hold last valid value	Value	
		Hold last valid value forever		

A 3.2.3 Processing

Filter/Averaging	Averaging	*No averaging*		Measurement values are not averaged.
		Moving average	*2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 / 512*	About the selectable filter width N of consecutive measured values the arithmetic mean MgI is formed and output, see 6.5.1.
		Recursive average	*2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 / 512 / 1024 / 2048 / 4096 / 8192 / 16384 / 32768*	Each new metric MW (n) is weighted to the (n-1) -fold of the previous average, see 6.5.1.
		Median filter	*3 / 5 / 7 / 9*	The median is formed from a preselected filter width N of measured values, see 6.5.1.

Mastering/Zeroing	Mastering is	Master value (mm)		
	disabled	Value	*Set master value*	Trigger zeroing or mastering, see 6.5.2. Master value range: -1024 to 1024 mm.
	enabled		*Reset master value*	Cancel zeroing or mastering

Trigger mode	Selected mode	*No triggering*		Description, see 6.5.3
		Level triggering	Value	
		Edge triggering		
		Software triggering		

Synchronization	Synchronization	*No synchronization*		Sync off. The measuring rate can be freely adjusted. Value range: from 0.4 to 80 kHz.
		Internal synchronization		The C-Box/2A forms the time base.
		External synchroniza-tion	*Low-level logic (LLL)* *≤ 0.7 V: Trigger not active* *≥ 2.2 V: Trigger active*	The synchronization signal is received from an external signal source, e.g. function generator.
			High-level logic (HLL) *≤ 3.0 V: Trigger not active* *≥ 8.0 V: Trigger active*	

Output data rate	Output every ... measured value	Value	The reduction of the output rate causes only every nth measured value to be output. The other measured values are discarded. Any desired averaging over n values must be set separately.
	Reducing applies for following interfaces	*Analog*	
		Ethernet	
		USB	

A 3.2.4 Outputs

Digital interface selection	Used interface for data output		
	Web diagram	*Disabled*	No metrics are output through the digital interface.
		Ethernet	Ethernet enables fast, non-real-time data transmission (packet-based data transfer). The meter can be configured via the web interface or by ASCII commands, see A 2, via a terminal program.
		Web diagram	The recorded measurements are displayed in the diagram of the website.
		USB	The USB interface provides a lower data rate interface for the transmission of measured value data. Configuration is via ASCII commands, see A 2.

Data selection Ethernet *Data selection USB*	Data selection	*Sensor 1: Measurement value / Sensor 1: Intensity / Sensor 1: Shutter speed / Sensor 1: Reflectivity / Sensor 2: Measurement value / Sensor 2: Intensity / Sensor 2: Shutter time / Sensor 2: Reflectivity / C-Box/2A: Measurement value / C-Box/2A: Counter / C-Box/2A: Timestamp / C-Box/2A: Digital value*	The data which are provided for the transmission are to activate with the checkbox, see 6.6.2.

Settings Ethernet	Address type	*DHCP*	*Static IP address*	Submit IP settings	The C-Box/2A provides the measured values itself as server (transmission type: server / TCP), see 6.6.3.
	IP address / Subnet mask / Default gateway		Values		
	Transmission type	Server/TCP			
	Data port	Value			
	Frames per measurement packet	*Automatic* /	*Manual*		
			Value		

Settings USB	Scaling	*Standard scaling*	For standard calibration, the entire measuring range of the sensor / controller is output.		
		Two-point scaling	Start of range (mm)	Value	The two-point scaling requires the specification of the beginning and end of the range., see 6.6.4.
			End of range (mm)	Value	

Digital output	Error output 1 / Error output 2	*Sensor 1: Error output 1 / Sensor 1: Error output 2 / Sensor 2: Error output 1 / Sensor 2: Error output 2 / Sensor 1: Measurement value / Sensor 1: Intensity / Sensor 1: Shutter time / Sensor 1: Reflectivity / Sensor 2: Measurement value / Sensor 2: Intensity / Sensor 2: Shutter time / Sensor 2: Reflectivity / C-Box/2A: Measurement value / Level low / Level high*	The data which are provided for the transmission are to activate in the dropdown menu, see 6.6.5.

Analog output 1, Analog output 2	Output area	*Inactive / 0V ... 5V / -5V ... 5V / -10V ... 10V / 4mA ... 20mA*			Specification of analog output, current or voltage with selectable value range.
	Output signal	*Fixed output value / Sensor 1: Measurement value / Sensor 1: Intensity/ Sensor 1: Shutter speed / Sensor 1: Reflectivity / Sensor 2: Measurement value / Sensor 2: Intensity/ Sensor 2: Shutter speed / Sensor 2: Reflectivity / C-Box/2A: Measurement value*			The data which are provided for the transmission are to activate in the dropdown men, see 6.6.6.
	Scaling	*Standard scaling*			At Standard scaling outputs the entire measuring range of the sensor / controller.
		Two-point scaling	Start of range (mm)	Value	The two-point scaling requires the specification of the beginning and end of the range.
			End of range (mm)	Value	

A 3.2.5 System Settings

Language & Unit	Language at startup	*Browser / German / English / Chinese / Japanese / Korean*	Specifies the language used at startup.
	Unit on the website	*Millimeter / Zoll*	Specifies the unit of the measurement display. ℹ The unit has no effect on the sensor itself.

Save settings	Save in setup number	*1 / 2 / 3 / 4 / 5 / 6 / 7 / 8*	Save	Clicking the button saves the settings to the selected setup file.

Load settings	Load from setup number	*1 / 2 / 3 / 4 / 5 / 6 / 7 / 8*	Load	A click on the button loads the settings of the selected setup file.
	Load	*All settings / Interface settings only / Measurement settings only*		

Manage settings on PC	*Export settings*	*The `Opening C-Box_2A_Settings.txt` dialog opens.*	Save file	All settings of the C-Box/2A are stored in a file.
	Import settings	*Browse*	Select the appropriate file in File Explorer.	The settings of the C-Box/2A are read from a file and sent to the C-Box/2A. ℹ Only suitable settings are imported.
	Select settings	*Controller settings*	Import	
		Ethernet settings		

Reset	Reset to factory defaults	*All setups*	Reset C-Box/2A	The C-Box/2A is reset to the factory default settings. All setups will be deleted and the default parameters will be loaded.
		Keep interface		The settings for language, password and Ethernet remain unchanged.
	Reboot options	*Reboot sensors*	Reboot C-Box/2A	The C-Box/2A will be rebooted. The measurement is interrupted. Unsaved changes are lost.

A 3.3 Tab Measurement

A 3.3.1 Measurement Configuration

Measurement task	*Meas. value sensor 1*	Use the drop-down menu to select. Additional information, see 6.4.1.
	Thickness sensor 1-2	
	Step sensor 1-2	

A 3.3.2 Channel Selection

Sensor 1 / Sensor 2 / C-Box/2A	The corresponding channel must be activated using the check box. Additional information, see 5.4.3.

A 3.3.3 Auto Zero

Sensor 1 / Sensor 2 / C-Box/2A	The corresponding channel must be zeroed in the diagram using the check box. Additional information, see 5.4.3.

A 3.4 Tab Info

Comany address	➡ Click the address.	The MICRO-EPSILON website opens.
Telephone	➡ Click .	
Fax	➡ Click .	
E-mail	➡ Click .	Your e-mail program opens.
Operating instructions	➡ Click `Download`.	The operating instructions open as a PDF file.

Controller information	The current sensor type, serial number, option, part number, firmware version, website version, MAC address and UUID are displayed.
Information sensor 1	The current status, sensor type, serial number, option, part number, firmware version and measuring range are displayed.
Information sensor 2	

☐ Selection required or checkbox

Value Specification of a value required

i The settings will be effective, if you click on the button Apply. After the programming all settings must be permanently stored under a parameter set so that they are available again when the sensor is switched on the next time.

MICRO-EPSILON

Operating Instructions

IF2004/USB

4-Channel RS422/USB Converter

The following sensors/systems can be connected to the 4-Channel RS422/USB Converter:

- Sensors of the ILD1420 / 1750 / 2300 series
- Sensors of the optoCONTROL ODC2500 / 2520 / 2600 series
- Systems of the confocalDT IFD2421 / 2422 / 2451 / /2461 / 2471 series
- Systems of the colorCONTROL ACS7000 series

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Contents

1. Safety

System operation assumes knowledge of the operating 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 according to the safety regulations for electrical equipment.

> Risk of injury

> Damage to or destruction of the converter

NOTICE

Avoid shocks and impacts to the converter.

> Damage to or destruction of the converter

The supply voltage must not exceed the specified limits.

> Damage to or destruction of the converter

Protect the cable against damage.

> Destruction of the converter

> Failure of the converter

1.3 Notes on CE Marking

The following apply to the IF2004/USB converter:

- EU Directive 2014/30/EU
- EU Directive 2011/65/EU, “RoHS“

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 converter is designed for use in industrial environments and meets the requirements.

1.4 Intended Use

- The converter IF2004/USB is designed for use in industrial and laboratory applications. It is used for
  - converting from the RS422 interface to the USB interface.
- The converter must only be operated within the limits specified in the technical data, see Chap. 2.2.
- The converter 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.

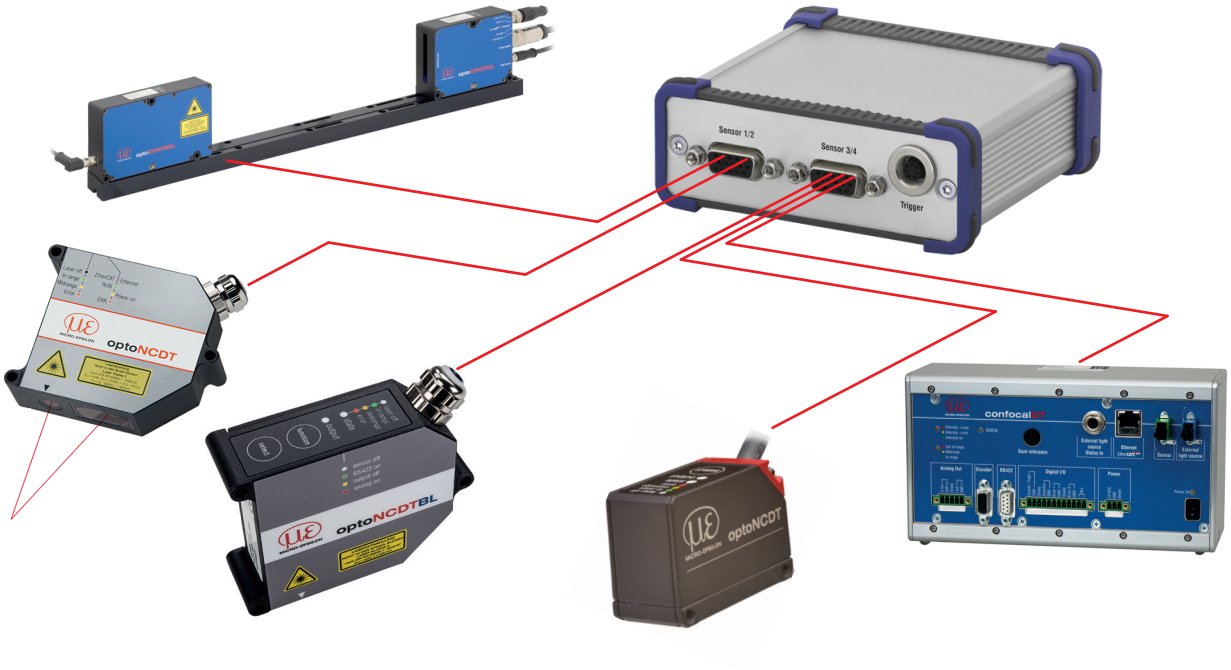
1.5 Proper Environment

- Protection class: IP 40 (applies only when cables are plugged in)
- Temperature range:
  - Operation: +5 ... +50 °C (+41 up to +122 °F)
  - Storage: +5 ... +50 °C (+41 up to +122 °F)
- Humidity: 5 - 95 % (non-condensing)
- Ambient pressure: Atmospheric pressure

2. Functional Principle

2.1 Description

You can connect up to four sensors respectively controllers of Micro-Epsilon with RS422 interface with the adapter IF2004/USB 2.0 to a USB port.



2.2 Technical Data

Power supply	Converter	via USB interface
	Sensors/Controller	24 Volt external, see Fig. 2
	Polarity protection	Yes
	Galvanic separation	No
	All GND signals are internal connected with the housing.	
USB bus	USB-Interface 2.0	
Sensor-Interface Sensor 1/2, Sensor 3/4	2 RS422 driver and 2 RS422 receiver per connector for data transmission, input/output frequency max. 8 MHz	
	2 RS422 driver per connector for sensor synchronization, output frequency max. 8 MHz	
Trigger inputs	4, TTL compatible	
	Input voltage	Low-Level ≤ 1.0 V
		High-Level > 2.0 V
	Input current	max. 3.0 mA
	Input frequency	max. 100 kHz
Trigger outputs	2, TTL compatible	
	Output voltage	Low-Level ≤ 0.7 V at I_{IN} = 5 mA
		High-Level > 2,8 V at I_{OUT} = 5 mA
	Function	programmable
FIFO	FIFO volume = 3072 tuple	
Temperature range	Operation	+5 ... +50 °C (+41 up to +122 °F)
	Storage	+5 ... +50 °C (+41 up to +122 °F)

3. Delivery

3.1 Unpacking, Included in Delivery

- 1 converter IF2004/USB
- 1 USB cable
- 1 CD with driver, instruction manual

➡ Carefully remove the components of the converter 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.

3.2 Storage

- Temperature range storage: +5 ... +50 °C (+41 up to +122 °F)
- Humidity: 5 - 95 % (non-condensing)

4. Mounting

4.1 Dimensions

Converter dimensions (external dimensions): approx. 102.9 x 40.0 x 94.0 mm

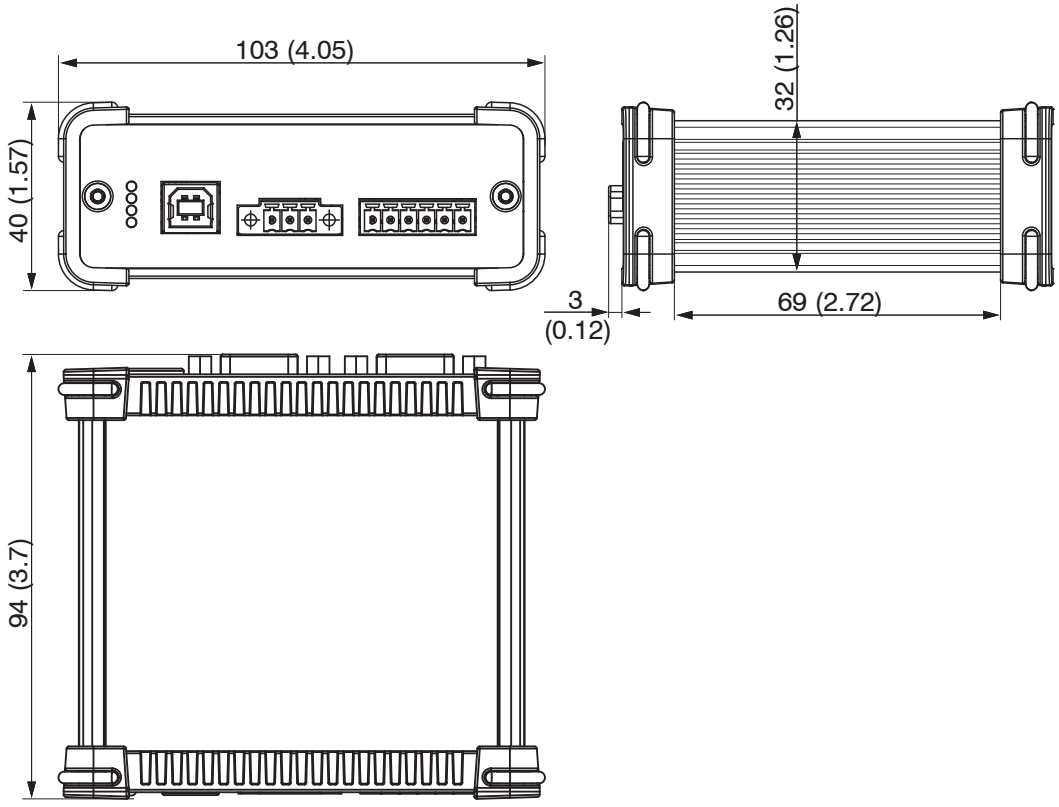


Fig. 1 Dimensional drawing IF2004/USB

4.2 Electrical Connections

4.2.1 Connection Possibilities

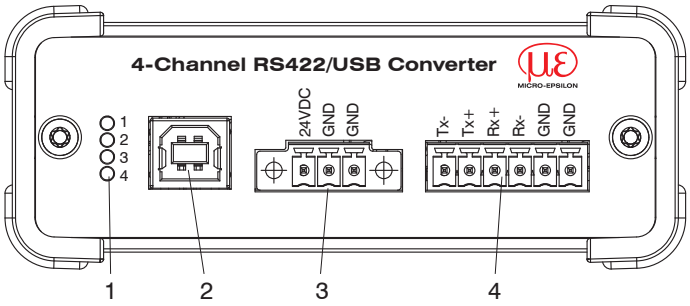


Fig. 2 Connectors and LEDs IF2004/USB - front side

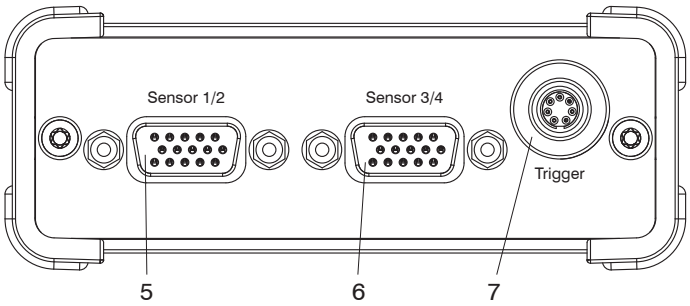


Fig. 3 Connectors IF2004/USB - rear side

Connectors and power LED:

No.	Description
1	4 LEDs green, function programmable (LED 1 to LED 4)
2	USB connector type B
3	3-pin terminal block type Phoenix contact no. 1827871 for power connection
4	6-pin terminal block type Phoenix contact no. 1803316 for additional sensor interface (sensor 1)
5	Sub-HD 15-pin connector for sensor interface (sensor 1 and 2)
6	Sub-HD 15-pin connector for sensor interface (sensor 3 and 4)
7	Binder connector series 712 7-pin type 09-0424-00 for external trigger inputs / outputs

Fig. 4 Overview connectors and LEDs

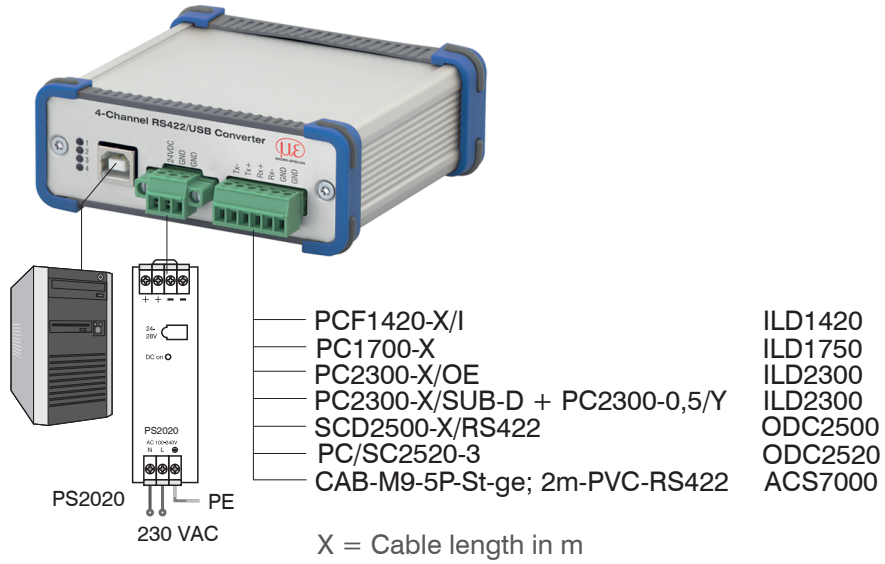


Fig. 5 Connectors front side

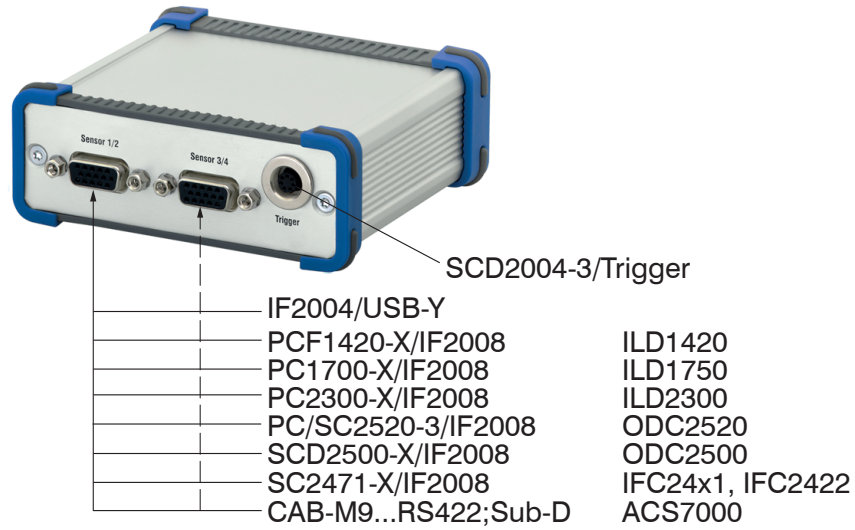
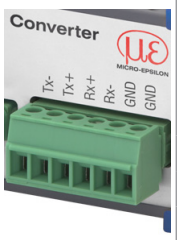


Fig. 6 Connectors rear side

4.2.2 RS422 Connectors to 6-pin Clamp

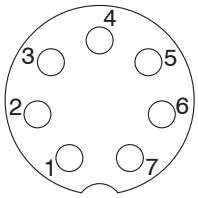
4.2.2.1 Serial Numbers up to 000253

Pin	Assignment	ILD 1420 PCF1420-X/I	ILD 1750 PC1700-X	ILD 2300 PC2300/OE PC2300-0,5/Y	ODC2520 PC/ SC2520-x	ODC2500 SCD2500-x/ RS422	ACS7000 CAB-M9-5P-St-ge	
1	Converter TxD-	green	gray	blue				
2	Converter TxD+	yellow	yellow	red				
3	Converter RxD+	pink	brown	violet				
4	Converter RxD-	gray	green	black				

4.2.2.2 Serial Numbers from 000300

Pin	Assignment	ILD 1420 PCF1420-X/I	ILD 1750 PC1700-X	ILD 2300 PC2300/OE PC2300-0,5/Y	ODC2520 PC/ SC2520-x	ODC2500 SCD2500-x/ RS422	ACS7000 CAB-M9-5P-St-ge	
1	Converter TxD-	yellow	yellow	red	green	green	brown	
2	Converter TxD+	green	gray	blue	brown	yellow	white	
3	Converter RxD+	gray	green	black	gray	white	yellow	
4	Converter RxD-	pink	brown	violet	yellow	brown	green	

4.2.3 Trigger Inputs

Pin 1	Trigger IN 1	
Pin 2	Trigger IN 2	
Pin 3	Trigger IN 3	
Pin 4	Trigger IN 4	
Pin 5	Trigger OUT 1	
Pin 6	Trigger OUT 2	
Pin 7	GND	
7-pin subminiature male cable connector, Company Binder, series 712, view: solder pin side male cable connector		

4.2.4 RS422 Connectors to 15-pol. Sub-D, Sensor 1/2 and 3/4

Pin 1	Sensor 1/3 Tx-		Pin 11	Sensor 2/4 Tx-
Pin 2	Sensor 1/3 Tx+		Pin 12	Sensor 2/4 Tx+
Pin 3	Sensor 1/3 Rx-		Pin 13	Sensor 2/4 Rx-
Pin 4	Sensor 1/3 RX+		Pin 14	Sensor 2/4 Rx+
Pin 5	GND		Pin 15	GND
Pin 6	Sensor 1/3 TRG+		Pin 8	Sensor 2/4 TRG +
Pin 7	Sensor 1/3 TRG-		Pin 9	Sensor 2/4 TRG-
Pin 10	+24 V [2)]		Pin 10	+24 V [2)]

[2)] Power supply +24 V via power connection, see Fig. 7

4.2.5 Supply Voltage

Nominal value: 24 VDC

- Only turn on the power supply after wiring has been completed.
- Connect the `24 VDC` and `GND` inputs at the converter with a 24 V voltage supply.

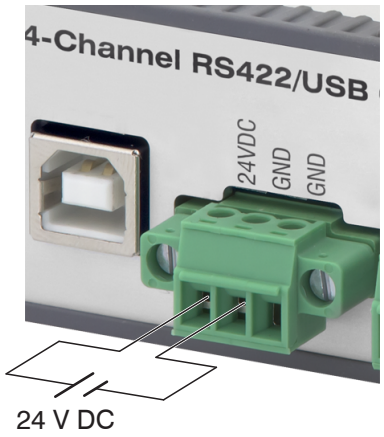


Fig. 7 Connector supply voltage

NOTICE

Use the power supply for measurement instruments only, not simultaneously for drives or similar pulse interferences.

> Disturbance of the data output

MICRO-EPSILON recommends using an optional available power supply unit PS2020, see Chap. A 1, for the converter.

5. Installation of Driver

Before first use of the converter install the respective driver of the company FTDI.

Source of supply for the driver	FTDI Virtual COM Port Treiber (ZIP, 1.32 MB)
Installation CD from unpacking	http://www.micro-epsilon.com/download/drivers/FTDI_VCP_Driver.zip

Install the driver as follows:

- Insert the installation CD into the CD-ROM drives.
- Connect the sensor/controller with the USB converter.
- Connect the USB converter cable with a free USB port.
- Connect the converter with a power supply.

The driver installation starts automatically. Depending on the operating system the latest driver of the internet or the driver CD is used.

For users of Windows 7:

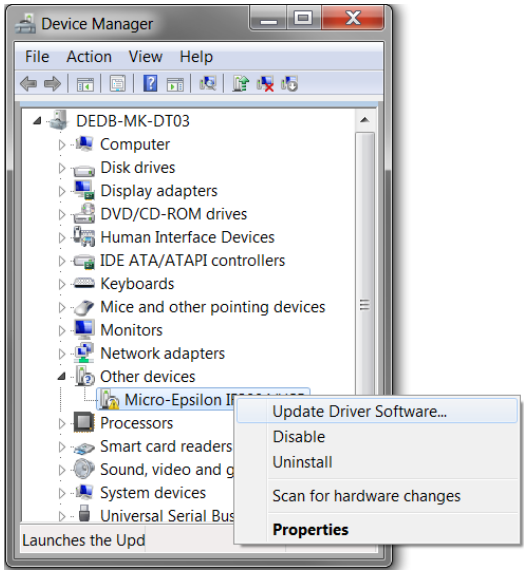
If you use an computer with internet access, connect the converter to a free USB port. Windows 7 automatically searches for the latest driver version and installs the driver.

Manual installation of driver:

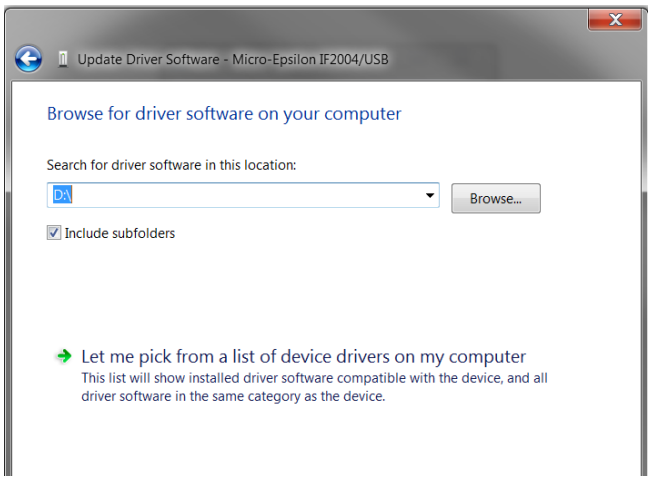
You can also install the driver manually if the driver is not installed automatically. Install the driver as follows:

- Insert the installation CD into the CD-ROM drives.
- Connect the sensor/controller with the USB converter.
- Connect the USB converter cable with a free USB port.
- Connect the converter with a power supply.

- Start the device manager, menu `Start` > `Control Panel` > `Device Manager`.
- Right-click the entry and choose `Update Driver Software ...`

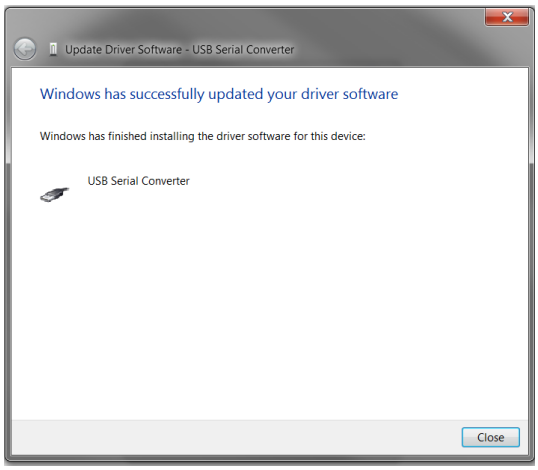


- Choose the path for the driver by means of `Browse...` .
- Click on the `Next` button.



The routine now starts the installation of the driver.

- Click on the button `Close` to finish installation.



6. Triggering

The trigger inputs trigger In 1 ... 4 on the converter are connected internal with a pull down resistance with the supply ground. The trigger inputs switches with TTL high level.

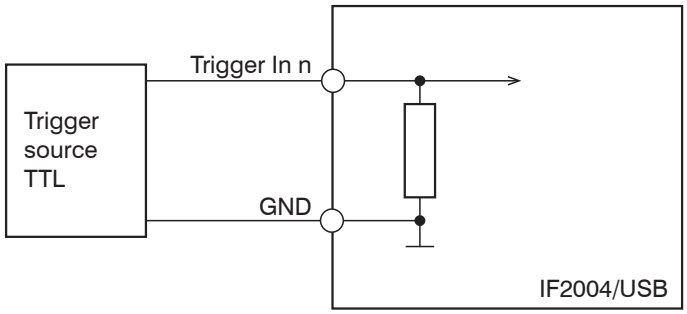
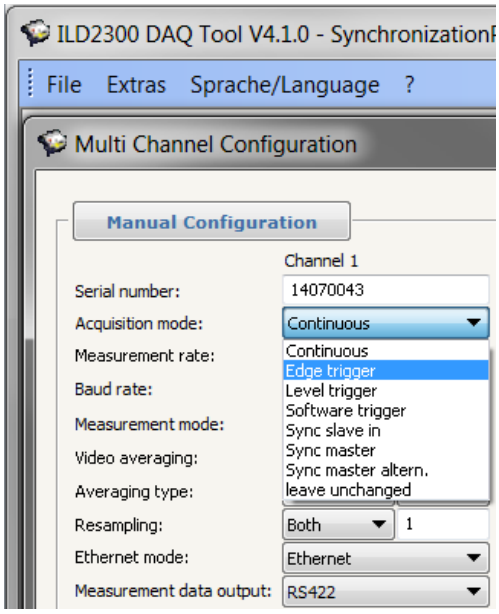


Fig. 8 Wiring trigger inputs

i Ideally connect sensors respectively controllers of the same series for triggering, different measuring ranges are possible. This enables coordinated output characteristics of the converter because the time responses of the connected sensors resp. controllers are equivalent.

For triggering sensors/controllers are set to a slave operating mode while the IF2004/USB works as master.

The following application of triggering presumes a operational IF2004/USB with connected sensors resp. controllers; the voltage supply of IF2004/USB is turned on:

<table>
<tr><td colspan="2">➡ Configure the trigger type in the sensor/controller.</td></tr>
<tr><td>Opportunity 1: MultiChannelTool</td><td>Opportunity 2: Data Acquisition Library</td></tr>
<tr><td colspan="2">You can find the MultiChannelTool and the Data Acquisition Library (MEDAQLib) in the download area of the respective sensors/controllers on our website.</td></tr>
<tr><td colspan="2">Example with ILD2300</td></tr>
<tr><td>➡ Choose the button <code>Multi channel configuration ...</code> in the menu <code>Extras</code> and choose the trigger type.</td><td>➡ Choose the command <code>SP_Trigger-mode.</code></td></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td colspan="2">➡ Start the measurement.</td></tr>
<tr><td colspan="2">➡ Activate triggering with a high impulse (TTL) on the trigger inputs of the converters, see Fig. 8.</td></tr>
</table>

7. Software Support with MEDAQLib

MEDAQLib offers you a documented driver DLL. Therewith you embed the RS422/USB converter and the connected sensors/controllers into an existing or a customized PC software.

MEDAQLib

- contains a DLL, which can be imported into C, C++, VB, Delphi and many additional programs,
- makes data conversion for you,
- works independent of the used interface type,
- features by identical functions for the communication (commands),
- provides a consistent transmission format for all MICRO-EPSILON sensors.

For C/C++ programmers MEDAQLib contains an additional header file and a library file.

You will find the latest driver / program routine at:

www.micro-epsilon.de/download

www.micro-epsilon.de/link/software/medaqlib

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. Service, Repair

If the converter or the USB cable is defective:

- Please send us the affected parts for repair or exchange.

In the cause of a fault cannot be clearly identified, please send the entire measuring system to:

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

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

10. Decommissioning, Disposal

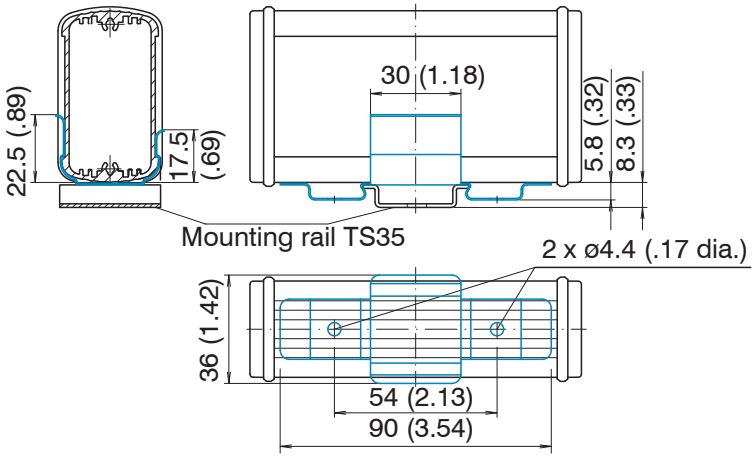
➡ Remove all cables from the converter.

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 Optional Accessories

DIN rail mounting clip		Installation of the converter on a DIN rail or for direct wall mounting
		
PS2020		Power supply for DIN rail mounting, input 230 VAC, output 24 VDC/2.5 A

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