



Operating Instructions
IF2008 ETH

Interface module for

- sensors of the optoNCDT ILD 1420 / ILD 1750 / ILD1900 / ILD2300 series
- sensors of the optoNCDT ILR2250 series
- systems of the confocal IFC 2421 / IFC 2422 / IFC 2451 / IFC 2461 / IFC 2465 / IFC 2466 / IFC 2471 series
- systems of the interferoMETER IMS5x00 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.



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



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



Indicates a user action.



Indicates a tip for users.

Measurement

Indicates hardware or a software button/menu.

1.2 Warnings



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 interface module.

The supply voltage must not exceed the specified limits.

- > Risk of injury
- > Damage to or destruction of the interface module.



Avoid shocks and impacts to the interface module.

- > Damage to or destruction of the interface module.

1.3 Notes on CE Marking

The following apply to the IF2008 ETH interface module:

- EU Directive 2014/30/EU
- EU Directive 2011/65/EU

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

The EU Declaration of Conformity and the technical documentation are available to the responsible authorities according to the EU Directives.

1.4 Intended Use

- The IF2008 ETH interface module is designed for use in industrial and laboratory applications. It is used to convert the MICRO-EPSILON internal sensor protocol (RS422) to Ethernet.
- The IF2008 ETH interface module must only be operated within the limits specified in the technical data, [see 2](#).
- The IF2008 ETH interface module 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 controller.
- Take additional precautions for safety and damage prevention in case of safety-related applications.

1.5 Proper Environment

Protection class: IP65

Temperature range:

- Operation: 0 ... +50 °C (+32 ... +122 °F)
- Storage: +5 ... +50 °C (+41 ... +122 °F)

Humidity: 5 ... 95 % (non-condensing)

Ambient pressure: Atmospheric pressure

2. Technical Data

Model	IF2008/ETH
Speed	Ethernet: 200 kHz data output
Supply voltage	11 ... 30 VDC
Power consumption	< 4 W with 24 VDC (without sensor)
Signal input	RS422
Digital interface	Ethernet
Switching input/switching output	4x I/O (adjustable via software)
Connection	Sensors/encoders: 8 x 12-pin. socket; Ethernet: 4-pin. socket; Supply: 5-pin. socket; I/O: 12-pin. socket
Mounting	Screw connection via four mounting brackets
Temperature range	Storage: +5 ... 50 °C (+41 ... +122 °F)
	Operation: +0 ... 50 °C (+32 ... +122 °F)
Humidity	5 % ... 95 % (non-condensing)
Shock (DIN-EN 60028-2-27)	15 g, 6 ms in 3 axes
Vibration (DIN-EN 60068-2-6)	2 g, 20 ... 500 Hz
Protection class (DIN-EN 60529)	IP65 (when all plugs are connected)
Compatibility	optoNCDT 1420, 1750, 1900, 2300
	optoNCDT ILR2250
	interferoMETER IMS5x00
	confocalDT 2421, 2422, 2451, 2461, 2465, 2466, 2471
	optoCONTROL 2520, 2600
Material	Die-cast aluminum
Weight	1700 g
Control and indicator elements	1 x LED for power status, 1 x LED for Ethernet status, 8 x LEDs for sensor-/encoder status

2.1 Mechanics and Environment

Temperature range:

- Operation: 0 ... +50 °C (+32 ... +122 °F)
- Storage: +5 ... +50 °C (+41 ... +122 °F)

Protection class: IP65 (When all plugs are connected.)

Dimensions: Interface module approx. 220 x 171 x 29, 1 mm
(outer dimensions incl. mounting brackets and connectors)

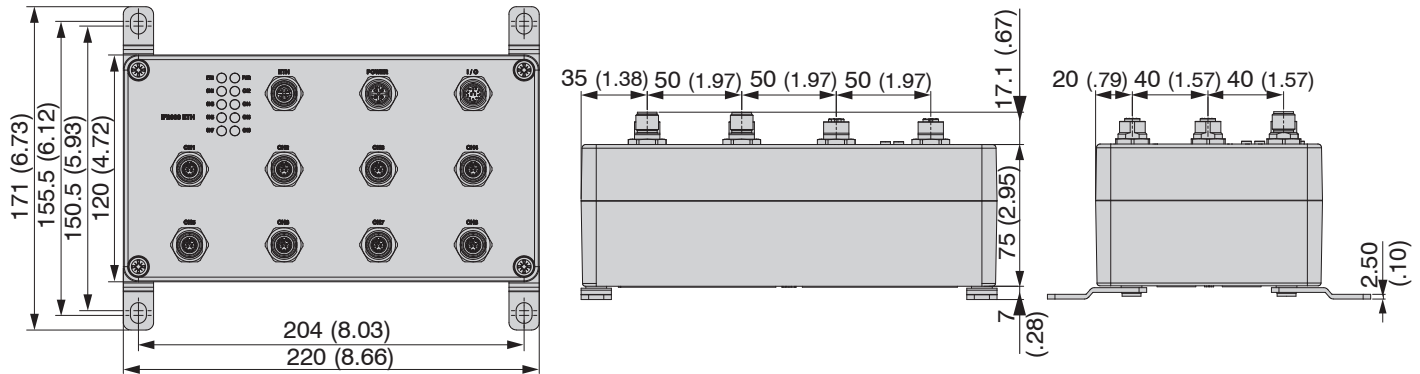


Fig. 1 Dimensional drawing for IF2008 ETH interface module in mm (inches)

- Connections:
 - 1 flange socket, 4-pin, type Binder 09 3732 500 04 for Ethernet connection
 - 1 flange connector, 5-pin, type Binder 09 3441 600 05 for power connection
 - 1 flange connector, 12-pin, type Binder 09 3491 600 12 for I/O
 - 8 flange sockets, 12-pin, type Binder 09 3492 600 12 (channels 1-8) for sensor/encoder connection
- Status LEDs:
 - 1 LED for power status
 - 1 LED for Ethernet status
 - 8 LEDs for sensor/encoder status

2.2 Power Supply

- 11 ... 30 VDC power supply for interface module and sensors
- Reverse polarity protection: yes
- Galvanic isolation: no
- All GND signals are connected internally and with the housing.

2.3 Ethernet

- LAN interface 100 Mbit

2.4 Sensor/Encoder Interface

- The following sensor types can be connected:
 - optoNCDT ILD 1420 / ILD 1750 / ILD 1900 / ILD2300
 - optoNCDT ILR2250
 - confocal IFC 2421 / IFC 2422 / IFC 2451 / IFC 2461 / IFC 2465 / IFC 2466 / IFC 2471
 - interferoMETER IMS5x00
- The following encoder types can be connected:
 - Power supply +5 VDC
 - RS422 interface with quadrature signals and reference mark

3. Delivery

3.1 Unpacking, Included in Delivery

1 IF2008 ETH interface module

1 Operating instructions

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

Optional accessories are available in the appendix, [see A 1](#).

3.2 Storage

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

4. Hardware

4.1 Connector Overview

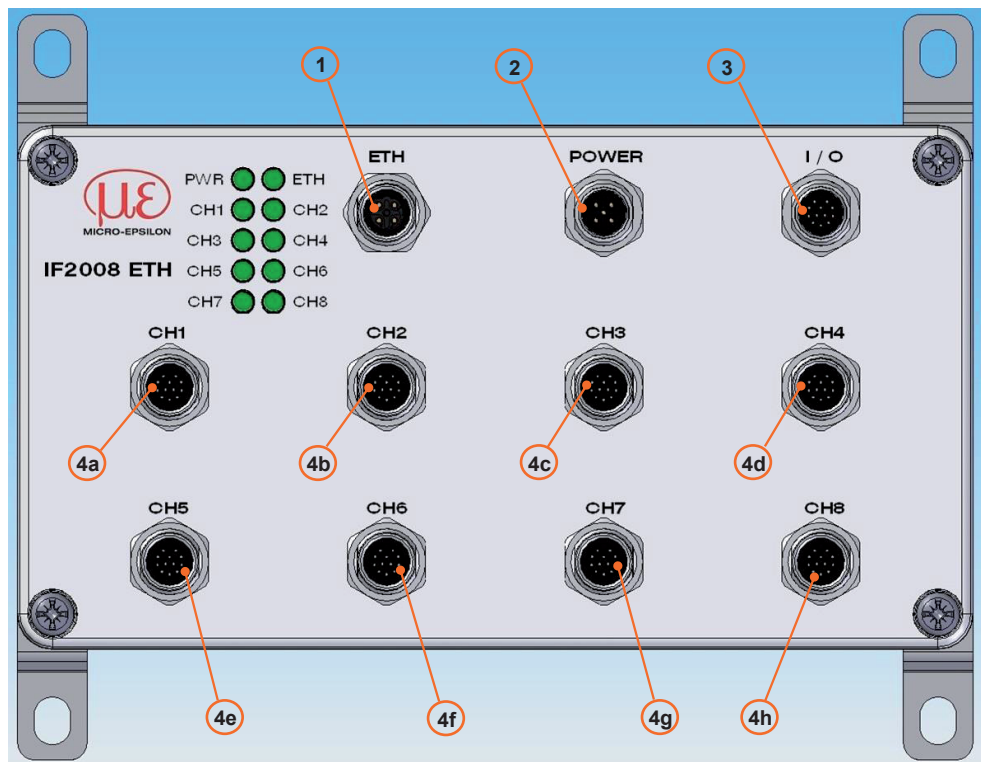


Fig. 2 Plug-in connections IF2008 ETH interface module

Connector	Description
①	Flange socket, 4-pin, type Binder 09 3732 500 04 for Ethernet connection
②	Flange connector, 5-pin, type Binder 09 3441 600 05 for power connection
③	Flange connector, 12-pin, type Binder 09 3491 600 12 for I/O connection
④a to ④h	Flange socket, 12-pin, type Binder 09 3492 600 12 for sensor/encoder connection

Fig. 3 Overview of plug-in connections

4.2 Pin Assignment

Pin assignments, see Fig. 3, are described in the following tables below, see Fig. 4 and subsequent:

Connector	Pin	Signal	Comment
①	1	Ethernet Tx+	-
	2	Ethernet Rx+	-
	3	Ethernet Tx-	-
	4	Ethernet Rx-	-

Fig. 4 Pin assignment of Ethernet interface

Connector	Pin	Function	Comment
②	1	+24 VDC ¹	Power supply for interface module and sensors
	2	+24 VDC ¹	
	3	GND	
	4	GND	
	5	Shield	

Fig. 5 Pin assignment of power connection

Connector	Pin	Function	Comment
③	1	External input 1	-
	2	External input 2	-
	3	External input 3	-
	4	External input 4	-
	5	External output 1	-
	6	External output 2	-
	7	External output 3	-
	8	External output 4	-
	9	n.c.	-
	10	n.c.	-
	11	Voltage output	LLL = +5 V, HLL = +24 V
	12	GND	-

Fig. 6 Pin assignment I/O interface

1) Permissible supply voltage range 11 ... 30 V

Connector	Pin	Signal IF2008 ETH	Signal ILD 1420	Signal ILD 1900	Signal ILD 2300
4a	1	TRG+	n.c.	TRG+	TRG+
	2	TRG-	n.c.	TRG-	TRG-
4b	3	Tx+	Rx+	Rx+	Rx+
	4	Tx-	Rx-	Rx-	Rx-
4c	5	Rx+	Tx+	Tx+	Tx+
	6	Rx-	Tx-	Tx-	Tx-
4e	7	+24 VDC	+24 VDC	+24 VDC	+24 VDC and Laser on/off+
	8	Laser on/off	Laser on/off	Laser on/off	Laser on/off-
4f	9	Multi-function output	Multi-function input	Multi-function input	n.c.
	10	ERROR input	ERROR output	n.c.	n.c.
4h	11	+ VDC (only for encoder)	n.c.	n.c.	n.c.
	12	GND	GND	GNG	GND

Connector	Pin	Signal IF2008 ETH	Signal ILR 2250	Signal IFC 24xx	Signal IMS 5x00
4a	1	TRG+	n.c.	n.c.	n.c.
	2	TRG-	n.c.	n.c.	n.c.
4b	3	Tx+	Rx+	Tx+	Tx+
	4	Tx-	Rx-	Tx-	Tx-
4c	5	Rx+	Tx+	Rx+	Rx+
	6	Rx-	Tx-	Rx-	Rx-
4e	7	+24 VDC	+24 VDC	n.c.	n.c.
	8	Laser on/off	n.c.	n.c.	n.c.
4f	9	Multi-function output	n.c.	TRG+ (HLL)	TRG+ (HLL)
	10	ERROR input	Trig	n.c.	n.c.
4h	11	+ VDC (only for encoder)	n.c.	n.c.	n.c.
	12	GND	GND	GND	GND

Fig. 7 Pin assignment sensor interface

Connector	Pin	Signal IF2008ETH	Signal Encoder
4a	1	A+	A+
	2	A-	A-
4b	3	B+	B+
	4	B-	B-
4c	5	R+	R+
	6	R-	R-
4e	7	+24 VDC ¹	n.c.
	8	Laser on/off ¹	n.c.
4f	9	Multi-function output ¹	n.c.
	10	ERROR input ¹	n.c.
4g	11	+5 VDC	+5 VDC
	12	GND	GND

Fig. 8 Pin assignment encoder interface

1) Only for sensors

4.3 LED Overview

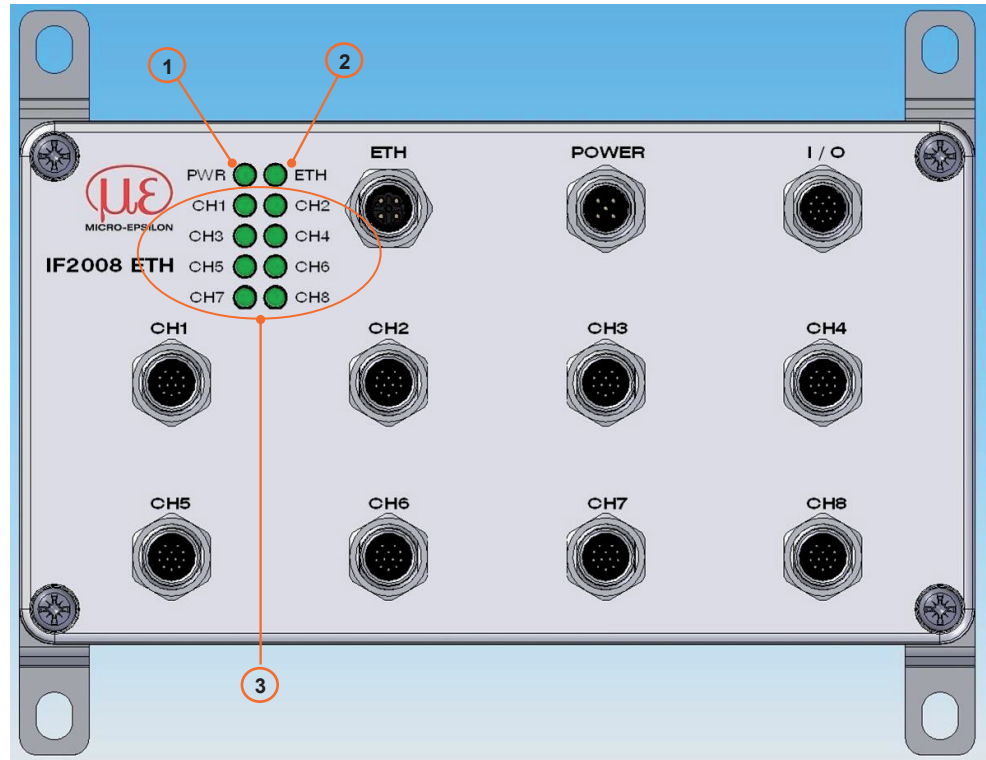


Fig. 9 Status LEDs IF2008 ETH interface module

LED	LED color	Description
①	Off	Power supply off
	Green	Interface module is ready for operation
	Orange	Interface module is in bootloader/flash mode
	Red	Initialization of the interface module
②	Off	No Ethernet connection
	Orange	Connection between PC and interface module (100 Mbps)
	Flashing	Data transmission between PC and interface module
③	Off	No sensor connected
	Green	No sensor/encoder selected
	Orange	Interface set for sensor
	Red	Interface set for sensor

Fig. 10 Description of multi-color status LED

5. Disclaimer

All components of the device have been checked and tested for functionality in the factory. However, should any defects occur despite careful quality control, these shall be reported immediately to MICRO-EPSILON or to your distributor / retailer.

MICRO-EPSILON undertakes no liability whatsoever for damage, loss or costs caused by or related in any way to the product, in particular consequential damage, e.g., due to

- non-observance of these instructions/this manual,
- improper use or improper handling (in particular due to improper installation, commissioning, operation and maintenance) of the product,
- repairs or modifications by third parties,
- the use of force or other handling by unqualified persons.

This limitation of liability also applies to defects resulting from normal wear and tear (e.g., to wearing parts) and in the event of non-compliance with the specified maintenance intervals (if applicable).

MICRO-EPSILON is exclusively responsible for repairs. It is not permitted to make unauthorized structural and / or technical modifications or alterations to the product. In the interest of further development, MICRO-EPSILON reserves the right to modify the design.

In addition, the General Terms of Business of MICRO-EPSILON shall apply, which can be accessed under Legal details | Micro-Epsilon <https://www.micro-epsilon.com/impresum/>.

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

6. Service, Repair

If the interface module is defective, please send us the affected parts for repair or exchange.

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

MICRO-EPSILON MESSTECHNIK
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www.micro-epsilon.com

7. Decommissioning, Disposal

In order to avoid the release of environmentally harmful substances and to ensure the reuse of valuable raw materials, we draw your attention to the following regulations and obligations:

- Remove all cables from the sensor and/or controller.
- Dispose of the sensor and/or the controller, 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.
- You are obliged to comply with all relevant national laws and regulations.

For Germany / the EU, the following (disposal) instructions apply in particular:

- Waste equipment marked with a crossed garbage can must not be disposed of with normal industrial waste (e.g. residual waste can or the yellow recycling bin) and must be disposed of separately. This avoids hazards to the environment due to incorrect disposal and ensures proper recycling of the old appliances. 
- A list of national laws and contacts in the EU member states can be found at https://ec.europa.eu/environment/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en. Here you can inform yourself about the respective national collection and return points.
- Old devices can also be returned for disposal to MICRO-EPSILON at the address given in the imprint at <https://www.micro-epsilon.de/impressum/>.
- We would like to point out that you are responsible for deleting the measurement-specific and personal data on the old devices to be disposed of.
- Under the registration number WEEE-Reg.-Nr. DE28605721, we are registered at the foundation Elektro-Altgeräte Register, Nordostpark 72, 90411 Nuremberg, as a manufacturer of electrical and/or electronic equipment.

Appendix

A 1 Accessories

Name	Description	Article Number
PC2008-5/M12 Power supply cable, 5m	M12 on one side, socket, one side open ends, 5-pin, A-coded, suitable for use with robots and drag chains, 5 m long	29011310
SCD2520-3 Digital output cable, 3 m long	Digital output cable, 3 m long to connect an Ethernet/EtherCAT interface, angled 4-pin M12 plug on one side, RJ45 plug on other side, 3 m long	2901925
PCE1420-3/M12 sensor cable extension, 3 m	Sensor extension cable for ILD1420 in connection with IF2008/ETH, length 3 m, one side with 12-pole socket overmolded one side with 12-pole plug type Binder series 713, drag-chain suitable	29011146
PCE1900-3/M12 sensor cable extension, 3m	Power supply and output cable for connecting an ILD1900 to the IF2008/ETH	29011326
PCE2300-3/M12 Extension cable, 3 m	Power supply and output cable to connect an ILD2300 on the IF2008/ETH, 3 m long	29011279
SC2471-3/IF2008ETH Connector cable, 3 m	Connection cable to connect a confocal IFC 24xx controller, 3 m long	29011145
	Connector cable between IMC5400/5600 and IF2008/ETH, length 3 m	
PCE2250-3/IF2008ETH Connecting cable 3m	Connecting cable between ILR2250-100 and IF2008/ETH, Length 3m	29011398

A 2 ASCII Communication with Sensor

Command port 23 protocol (Telnet)

A 2.1 Commands Overview

Group	Chapter	Command	Short info
General			
	Information		
	Chap. A 2.2.1.1	GETINFO	IF2008/ETH information
	Chap. A 2.2.1.2	GETINFOn	Sensor information
	Chap. A 2.2.1.3	PRINT	Parameter overview
	Interfaces		
	Chap. A 2.2.2.1	IPCONFIG	Ethernet settings
	Chap. A 2.2.2.2	MEASTRANSFER	Setting measurement server
	Chap. A 2.2.2.3	MEASCNT ETH	Size of TCP / IP packets
	Chap. A 2.2.2.4	LANGUAGE	Language webinterface
	Chap. A 2.2.2.5	CHANNELMODE	Operating mode
	Timer		
	Chap. A 2.2.3.1	TIMERFREQUENCYn	Timer frequency
	Chap. A 2.2.3.2	TIMERPULSEWIDTH	Timer pulse width
	Parameter management		
	Chap. A 2.2.4.1	STORE	Save parameters
	Chap. A 2.2.4.2	READ	Read parameters
	Chap. A 2.2.4.3	SETDEFAULT	Factory settings
	Chap. A 2.2.4.4	RESET	Restarting IF2008/ETH
Sensor			
	Settings		
	Chap. A 2.3.1.1	BAUDRATE	Sensor channel baudrate
	Chap. A 2.3.1.2	LASERPOW	Sensor laser outputs
	Chap. A 2.3.1.3	TRIGGEROUTPUT	Trigger outputs
	Functions		
	Chap. A 2.3.2.1	SENSORERROR	Sensor error inputs
	Chap. A 2.3.2.2	TUNNELn `` . . . ``	Tunneling sensor commands
	Chap. A 2.3.2.3	TUNNELn ...	Tunneling sensor commands
Encoder			
	Settings		
	Chap. A 2.4.1.1	ENCINTERPOL	Encoder interpolation type
	Chap. A 2.4.1.2	ENCREF	Encoder behavior at reference
	Chap. A 2.4.1.3	ENCVALUE	Encoder default value
	Chap. A 2.4.1.4	ENCDIR	Encoder counting direction
	Chap. A 2.4.1.5	ENCLATCHSRC	Encoder detection source
	Functions		
	Chap. A 2.4.2.1	ENCSET	Set encoder value
	Chap. A 2.4.2.2	ENCRESET	Reset reference marks
	Chap. A 2.4.2.3	ENCCLEAR	Rest encoder
	Chap. A 2.4.2.4	GETENVALUE	Query encoder value
	Chap. A 2.4.2.5	GETENCREF	Query reference counter
Digital I/O			
	General		
	Chap. A 2.5.1.1	EXTLEVEL	Digital logic
	Schalteingänge		
	Chap. A 2.5.2.1	EXTINLATCHSRC	Digital inputs detection source
	Chap. A 2.5.2.2	GETEXTINPUT	Query digital inputs
	Chap. A 2.5.2.3	EXTINPUTMODE1	Programming digital input 1
	Chap. A 2.5.2.4	EXTINPUTMODE2	Programming digital input 2
	Chap. A 2.5.2.5	EXTINPUTMODE3	Programming digital input 3
	Schaltausgänge		
	Chap. A 2.5.3.1	EXTOUTSRC	Programming digital outputs

A 2.2 General Commands

A 2.2.1 Information

A 2.2.1.1 IF2008/ETH Information

```
GETINFO
```

Controller data are queried. Output as per example below:

```
->GETINFO
Name:                IF2008ETH
Serial:              17000000
Option:              000
Article:             2213030
MAC-Address:         00-0C-12-02-04-3F
FPGA-Version:        16
MAC-Address:         7480
Boot-Version:        0.1.01
Version:             0.0.08
->
```

A 2.2.1.2 Sensor Information

```
GETINFO n
```

n = 0 ... 8

Outputs the corresponding sensor's information.

n = 0: Information for all sensors

A 2.2.1.3 Parameter Overview

```
PRINT [ALL]
```

- No parameter: This command outputs a list of all setting parameters and its values.
- ALL: This command outputs a list of all setting parameters and their values, as well as additional information, such as GETINFO.

A 2.2.2 Interfaces

A 2.2.2.1 Ethernet Settings

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

Setting of the Ethernet interface.

- DHCP: If no DHCP server is available, a link-local address is searched for after approx. 30 seconds.
- STATIC: Sets an IP address, the net mask and the gateway in IPv4 format as xxx.xxx.xxx.xxx

If the IP address, net mask and/or gateway are not stated, their values remain unchanged.

A 2.2.2.2 Setting Measurement Server

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

Measured value output currently only on TCP server.

- The port is freely selectable between 1024 and 65535.

A 2.2.2.3 Size of TCP / IP Packets

MEASCNT_ETH <TupelCnt>

- Specifies the number of data tuples that are transmitted in one Ethernet packet. A data tuple consists of an address byte and a data byte. The format is described in Appendix, see A 2.6.
- 0: The number of data tuples is determined automatically to allow an Ethernet packet to be sent every 10 ms on average.
- 1 ... 716: Number of data tuples in an Ethernet packet. If the packets cannot be sent quickly enough, this value is exceeded.

A 2.2.2.4 Language Webinterface

LANGUAGE_BROWSER|ENGLISH|GERMAN

Language of the displayed web pages

- BROWSER: The display language is determined by the web browser.

A 2.2.2.5 Operating Mode

CHANNELMODEn NONE|SENSOR|ENCODER

n = 1..8 for the sensor /encoder channels 1 to 8.

Channels can be switched between sensor or encoder mode.

- NONE: Channel is deactivated.
- SENSOR: The channel is configured to record sensor data.
- ENCODER: The channel is configured for encoder operation.

A 2.2.3 Timer

A 2.2.3.1 Timer Frequency

TIMERFREQUENCYn <Frequency>

n = 1 ... 3 for the timers 1 to 3

Defining the frequency of the internal timer

The frequency can be freely adjusted from 0.1 Hz to 12 MHz (in Hz with three decimal places). The IF2008/ETH internally selects the next possible frequency which is supported.

A 2.2.3.2 Timer Pulse Width

TIMERPULSEWIDTHn <Pulsewidth>

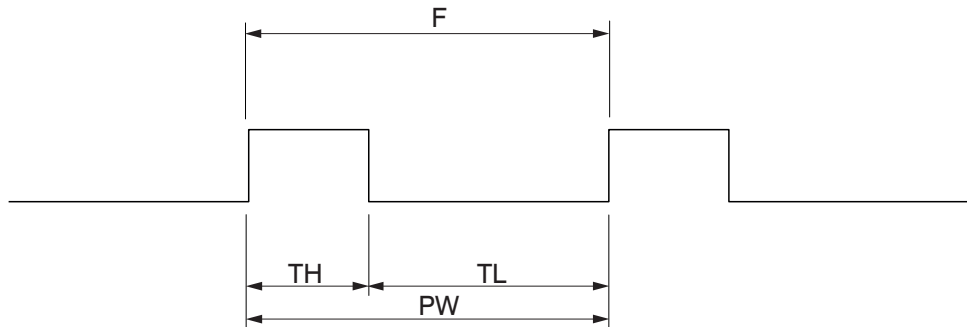
n = 1 ... 3 for the timer 1 to 3

Pulse width modulation of a timer cycle.

Determines the pulse width modulation of the timer signal; that is, the ratio of high to low portions of the timer signal in percent.

Pulse width modulation can be set between 0 (0 %) and 1 (100 %). Three decimal points are permitted. Internally, IF2008/ETH selects the next possible supported pulse width modulation.

A pulse width modulation of 0.5 means that the high and low portions of the timer signal have the same lengths. A pulse width modulation greater than 0.5 means that the high portion of the timer signal is longer than the low portion. A pulse width modulation smaller than 0.5 means that the high portion of the timer signal is shorter than the low portion.



F = Timer frequency
 TH = Timer signal high
 TL = Timer signal low
 Timer pulsewidth = $PW / (TH + TL)$

Fig. 11 Timer frequency and timer pulse width

A 2.2.4 Parameter Management

A 2.2.4.1 Save Parameters

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

Save the current parameters under the specified number in the flash memory of IF2008/ETH.

A 2.2.4.2 Read Parameters

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

Read the parameters under the specified number from the flash memory of IF2008/ETH.

The volume of data to be loaded must also be specified:

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

A 2.2.4.3 Factory Settings

SETDEFAULT [ALL] [NODEVICE]

Reset to factory settings

- ALL: All setups are reset to factory settings. If ALL is not specified, only the current setup is reset.
- NODEVICE: Only the settings for measurements are reset, the settings for interfaces are maintained.

A 2.2.4.4 Restarting IF2008/ETH

```
RESET
```

Restarts the IF2008/ETH.

A 2.3 Sensor

A 2.3.1 Settings

A 2.3.1.1 Sensor Channel Baudrate

```
BAUDRATEn <Baudrate>
```

n = 1 ... 8 for the sensor channels 1 to 8.

Setting the interface baud rate on the IF2008/ETH for the respective sensor channel.

The baud rate can be freely adjusted from 9600 bauds to 8 Mbaud. The IF2008/ETH internally selects the next possible baud rate which is supported.

A 2.3.1.2 Sensor Laser Outputs

```
LASERPOWn OFF|ON
```

n = 1 ... 8 for the sensor channels 1 to 8.

Switches the connection for laser activation (pin 8)

- OFF: Laser is off
- ON: Laser is on

A 2.3.1.3 Trigger Outputs

```
TRIGGEROUTPUTn LOW|HIGH|TIMER1|TIMER2|TIMER3|INPUT1|INPUT2|INPUT3|INPUT4
```

n = 1 ... 8 for the sensor channels 1 to 8.

Selects the source for the trigger outputs on the sensor channels (pins 1+2 or pin 9).

- LOW, HIGH: Output has this fixed state
- TIMER1 ... 3: A timer switches the output
- INPUT1 ... 4: Output has the state of a digital input

A 2.3.2 Functions

A 2.3.2.1 Sensor Error Inputs

```
SENSORERROR
```

Returns the bit-coded state of the error line (pin 10) of all sensor channels (bit 0 = error state of sensor 1, bit 1 = error state of sensor 2, ...) as a decimal value.

The return value can be between 0 (no sensor reports an error) and 255 (all sensors report an error).

A 2.3.2.2 Tunneling Sensor Commands

```
TUNNELn "..."
```

n = 1 ... 8 for the sensor channels 1 to 8.

Returns the command in quotation marks to the respective sensor channel. The reply is returned from the data socket.

A quotation mark in the command must be quoted with a backslash, i.e. " -> \". The same applies for a backslash itself, i.e. \ -> \\.

Carriage return can be quoted with \r and line feed with \n. Arbitrary binary sequences are entered with \xhh (hh is a hexadecimal code).

ⓘ Sensors with ASCII protocol (e.g. ILD2300) must contain the final \r\n within the quotation marks.

A 2.3.2.3 Tunneling Sensor Commands (ASCII Version)

TUNNELn . . .

n = 1 ... 8 for the sensor channel 1 to 8.

Pure ASCII variant of tunnel command for easy entry via e.g. telnet.

The final carriage return of the tunnel command is also sent to the sensor so it recognizes the end of the command sequence.

A 2.4 Encoder

A 2.4.1 Settings

A 2.4.1.1 Encoder Interpolation Type

ENCINTERPOLn COUNTER|1|2|4

n = 1 ... 8 for the encoder channels 1 to 8.

Setting the interpolation depth of each encoder input.

- COUNTER: Normal counter mode
- 1, 2, 4: Interpolation stage (Single/double/quadruple evaluation)

A 2.4.1.2 Encoder Behavior at Reference

ENCREFn NONE|ONE|EVER|LIMIT

n = 1 ... 8 for the encoder channels 1 to 8.

Setting the effect of encoder reference track.

- NONE: Reference mark of encoder has no effect.
- ONE: Setting once (the encoder value (see ENCVALUEn) is taken over when the reference mark position is reached for the first time).
- EVER: Setting at all mark positions (the encoder value is taken over every time the reference marker position is reached).
- LIMIT: The encoder is limited between 0 and encoder value (see ENCVALUEn). When exceeding the threshold, the value is set to the opposite value (forward encoder value -> 0, backward 0 -> encoder value)

A 2.4.1.3 Encoder Default Value

ENCVALUEn <Encoder value>

n = 1 ... 8 for the encoder channels 1 to 8.

Indicates the value to which the corresponding encoder is to be set when reaching a reference mark position (or via software).

The encoder value can be set between 0 and 4294967295 (UINT_MAX).

A 2.4.1.4 Encoder Counting Direction

ENCDIRn NORMAL|REVERSE

- ENCDIR NORMAL: A is counting direction, B is counter clock
- ENCDIR REVERSE: reverse, C is always used to reset the counter

In the `NORMAL` setting, encoder track A determines the counting direction and encoder track B the counter clock; in the `REVERSE` setting, the exact opposite is true. Encoder track C is always used to reset the counter.

n = 1 ... 8 for the encoder channels 1 to 8.

Counting direction of encoder.

A 2.4.1.5 Encoder Detection Source

```
ENCLATCHSRCn NONE | TIMER1 | TIMER2 | TIMER3 | SENSOR1 | SENSOR2 | SENSOR3 | S
ENSOR4 | SENSOR5 | SENSOR6 | SENSOR7 | SENSOR8 | INPUT1 | INPUT2 | INPUT3 | INPU
T4 | SECONDREF | ANYREF
```

n = 1 ... 8 for the encoder channels 1 to 8.

Selects the source with which the encoder value is written in the IF2008/ETH FIFO (for continuous recording).

- NONE: No automatic encoder record.
- TIMER1 ... 3: Encoder is recorded using a timer.
- SENSOR1 ... 8: Synchronous encoder record along with data frames of a sensor.
- INPUT1 ... 4: Encoder record with rising edge of a digital input.
- SECONDREF: Encoder record when second reference mark is reached.
- ANYREF: Encoder record with each reference mark.

A 2.4.2 Functions

A 2.4.2.1 Set Encoder Value

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

Setting the encoder preset values (see ENCVALUEn) in the indicated encoder.

A 2.4.2.2 Reset Reference Marks

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

Reset the Detection of the First Mark Position (see ENCREFn).

A 2.4.2.3 Reset Encoder

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

Resetting the encoder value to 0 in the indicated encoder.

A 2.4.2.4 Query Encoder Value

```
GETENCVALUEn
```

n = 1 ... 8 for the encoder channels 1 to 8.

Asynchronous read-out of current encoder value. The return value can be between 0 and 4294967295 (UINT_MAX).

A 2.4.2.5 Query Reference Counter

```
GETENCREFn
```

n = 1 ... 8 for the encoder channels 1 to 8.

Request reference counter state.

- NONE: Reference mark not crossed since the last reset.
- FIRST: Reference mark crossed once.
- SECOND: Reference mark crossed several times.

A 2.5 Digital I/O

A 2.5.1 General

A 2.5.1.1 Digital Logic

```
EXTLEVEL LLL | HLL
```

Defines the logic level of the digital inputs/outputs

- LLL: Low level logic (Low 0.2 - 0.8 V High 4.5 - 5 V)
- HLL: High level logic (Low 0.2 - 0.8 V High 23.5 - 24 V)

A 2.5.2 Switching Inputs

A 2.5.2.1 Digital Inputs Detection Source

EXTINLATCHSRC NONE | TIMER1 | TIMER2 | TIMER3 | SENSOR1 | SENSOR2 | SENSOR3 | SENSOR4

Selects the source with which the values of the digital inputs are written in the IF2008/ETH FIFO (for continuous record).

- NONE: Digital inputs are not automatically recorded.
- TIMER1 ... 3: Digital inputs are recorded using a timer.
- SENSOR1 ... 4: Synchronous record of digital inputs along with data frames of a sensor.

A 2.5.2.2 Query Digital Inputs

GETEXTINPUT

Asynchronous, bit-coded, decimal read-out of current state of digital inputs (bit 0 = input 1, bit 1 = input 2, ...) as a decimal value. The return value can be between 0 and 15.

A 2.5.2.3 Programming Digital Input 1

EXTINPUTMODE1 NONE | LASERPOW

Function of digital input 1

- NONE: No special function
- LASERPOW: Switches the cable for laser activation in all channels (is AND-linked with LASERPOW_n, i.e. only when both signals are on, laser is on.)

A 2.5.2.4 Programming Digital Input 2

EXTINPUTMODE2 NONE | FIFOGATE

Function of digital input 2

- NONE: No special function
- FIFOGATE: Locks the IF2008/ETH FIFO with high signal for the sensor/encoder channels 1 - 4

A 2.5.2.5 Programming Digital Input 3

EXTINPUTMODE3 NONE | FIFOGATE

Function of digital input 3

- NONE: No special function
- FIFOGATE: Locks the IF2008/ETH FIFO with high signal for the sensor/encoder channels 5 - 8

A 2.5.3 Switching Outputs

A 2.5.3.1 Programming Digital Outputs

EXTOUTSRC_n LOW | HIGH | TIMER1 | TIMER2 | TIMER3

n = 1 ... 4 for the digital outputs 1 to 4

Selects the source for the digital outputs

- LOW, HIGH: Output has this fixed state
- TIMER1 ... 3: Output is switched using the corresponding timer.

A 2.6 Measurement Data Transmission to a Measurement Value Server, Measurement Value Block

Each data packet includes a header (28 bytes) and the following data.

Preamble (32 bits)	
Article number (32 bits)	
Serial number (32 bits)	
Flags 1 (32 bits)	
Flags 2 (32 bits)	
Number of tuples (16 bits)	Bytes per tuple (16 bits)
Counter (32 bits)	

Fig. 12 Measurement value block header

Header registration	Description
Preamble (32 bit)	MEAS
Article number (32 bit)	2213030
Serial number (32 bit)	32 bits
Flags 1 (32 bit)	Bit 0 ... 15: Respectively two bits describe a data channel. 00 = off, 01 = Encoder, 10 = Sensor, 11 = Reserved (CHANNELMODEn), Bit 16: Indicates if digital values are active. (EXTINLATCHSRC) Bit 17 ... 30: reserved, always 0 Bit 31: Indicates whether an overflow has occurred in the FIFO of the IF2008/ETH (data loss)
Flags 2 (32 bit)	Reserved, permanent 0
Number of tuples (16 Bit)	Number of tuples in packet
Bytes per tuple (16 Bit)	2 (each tuple consists of 2 bytes)
Counter (32 Bit)	Global, continuous tuple counter for all packets. The first packet has the value 0, so it will only be incremented after output.

Fig. 13 Inputs in the measurement value block header

Data:

Each sensor byte is equipped with another address byte and stored as tuple (first address and then data byte).

Address byte (8 bits):	Bits 0 ... 2:	Byte counter (0 - 7), starts from 0 after every break and stops at 7 with longer data frames from a sensor.
	Bits 3 ... 5:	Sensor/encoder channel (0 - 7) corresponds to the channel 1 to 8
	Bits 6 ... 7:	Data source: 00 = sensor, 01 = encoder, 10 = DigitalIn, 11 = reserved
Data byte (8 bits):	As received by the sensor	

Encoder transmission is always with 32 bits, i.e. four successive tuples.

DigitalIn is transmitted with 4 bits (upper four bits are 0), i.e. one tuple.



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