Instruction Manual

optek FOUNDATION Fieldbus™

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For converters:
C4161
C4261
C4262
C4462
HC4361
HC4462
C8486
C8086

FOUNDATION

Preface

This instruction manual is written to assist the user in proper procedures for trouble-free operation.

It is explicitly pointed out that optek-Danulat GmbH assumes no responsibility for loss or damage caused due to improper use of this instruction manual or products described herein.

On request, this manual is available in other languages as well as in digital format.

Our products are being continuously improved. Technical data is subject to change without notice.

Essen, January 2023

Table of contents

1 Using the instruction manual

1.1 Validity of this instruction manual

This instruction manual is valid for optek FOUNDATION Fieldbus™ converters C4161, C4261, C4262, C4462, HC4361, HC4462, C8086 and C8486. It contains specific information on the FOUNDATION Fieldbus™ interface.

Note!
Information regarding the installation and operation of the converter is provided in the supplied standard instruction manual of the corresponding converter.

FOUNDATION Fieldbus™ converters can be recognized by “6” in the model number. The model number of FOUNDATION Fieldbus™ converters is set up as follows:

Model number: (H)C4_**6**_
Model number C 8_8 **6**

The model number indicates the hardware configuration of your converter. E.g a converter C4262 is thus a C4000 series converter with inputs for two sensors as well as a FOUNDATION Fieldbus™ H1 interface and two lamp outputs.

Therefore, the following combinations of instruction manuals apply:

Tab. 1 Instruction manual combinations overview

FOUNDATION Fieldbus™ converter	**Instruction manuals**		**Remark: Amendment with respect to standard instruction manual**
	Additional manual	**Standard of**	
C4161	FOUNDATION Fieldbus™	C4121	Instead of mA- and remote inputs, there is a FOUNDATION Fieldbus™ interface. Thus chapters “Connecting the mA-inputs” (C4000 and HazeControl only) and “Connection Remote In” do not apply to the FOUNDATION Fieldbus™ version.
C4261	FOUNDATION Fieldbus™	C4221	
C4262	FOUNDATION Fieldbus™	C4222	
C4462	FOUNDATION Fieldbus™	C4422	
HC4361	FOUNDATION Fieldbus™	HC4321	
HC4462	FOUNDATION Fieldbus™	HC4422	
C8486	FOUNDATION Fieldbus™	C8480	
C8086	FOUNDATION Fieldbus™	C8080	

Note!
For all works, observe this instruction manual as well as the corresponding standard instruction manual. If the converter is not used as described in these instruction manuals, your safety and the converter function could be affected.
To keep up reliability of the product, enhance its life cycle and avoid down times, you have to follow the instructions in the manuals. Furthermore, please follow the existing accident prevention and environmental protection instructions, as well as recognized technical instructions for safe and professional working.

1.2 Pictograms and signal words

Important information in this instruction manual is marked with the following pictograms:

Danger!
This pictogram indicates immediate danger to life and health of persons. The text next to the symbol gives information on how to avoid bodily injuries.

If the possible cause of risk can be specified, the corresponding pictogram precedes instructions:

Danger!
Electrical voltage.
This pictogram indicates danger due to electrical voltage.

Caution!
This pictogram indicates information on how to avoid material damage.

Note!
This pictogram indicates instructional or general advice.

Pictograms on the converter

The following pictogram is on the back of the converter.
It indicates possible and unapparent dangers.
Read this instruction manual before undertaking any work.

2 Intended use

The converter is to be used exclusively for optek-sensors according to the technical data.
In combination with inline sensors for turbidity, concentration, color and UV absorbance, the converter is used for displaying and processing measuring results.
The converter may only be interfaced with sensors listed in the "Technical data" chapter of the corresponding instruction manuals.

The converter is to be installed in control cabinets with external switch, which allows the user to disconnect power. Please refer to the "Technical data" chapter.

This converter is not intended for use in explosion-proof areas.

Tampering or unauthorized substitution of parts or changes of the converter or its software may affect the performance and result in unsafe operation.

The manufacturer is not liable for damage resulting from use contrary to the intended use.

Following this instruction manual is part of the intended use.

3 Safety

3.1 *General safety instructions*

Only operate the converter when free from defects and in accordance with the instructions provided in this manual.

Read this instruction manual prior to initial commissioning. This applies especially to persons only operating the converter occasionally, such as maintenance staff.

Observe all safety and information labels on the product and keep them in readable condition.

Inspect the product for signs of physical damage. Report any damage immediately and do not commission the product until corrective actions have been taken.

Protect the converter from impacts causing corrosion or preventing components from working properly.

Have faulty parts of the measuring system replaced immediately.

Spare parts must comply with the technical requirements defined by optek. This is always guaranteed when using original spare parts.

For maintenance and repair activities, attach a warning sign to the external release device to prevent re-commissioning of the converter.

When malfunctioning, take the product out of operation. Repair the malfunctions immediately by a qualified electrician.

The safety instructions are to be supplemented with the current national regulations on accident prevention.

After maintenance and repair proper function, as well as the fulfillment of the safety requirements and testing must be guarenteed.

3.2 *Safety instructions for works on electrical equipment*

Work on electrical equipment has to be carried out by qualified electricians only.

The power line connection of the converter must be specified correctly to prevent overload.

Disconnect the voltage supply before connecting the power line. Only connect the power line when voltage-free. Do not use the terminal socket for release since no first-to-mate last-to-break protective ground contact is provided.

Do not work on live active parts of the electrical equipment. When working on the electrical equipment, observe the following safety regulations:
1. Switch voltage-free.
2. Protect against re-commissioning.
3. Check if voltage-free.
4. Cover live parts.
5. Ground and short-circuit.

In case of faults in the power supply, disconnect the converter immediately.

In case of a short-circuit, there is a danger of sparking and fire.

Use only original fuses with specified current and triggering characteristics!
When a fuse has to be exchanged, first try to detect the cause and clear the fault before exchanging the fuse.

When work on live parts is necessary, use insulated tools only.

4 Description FOUNDATION Fieldbus™

Introduction

FOUNDATION Fieldbus™ H1 is a bi-directional communication protocol and used for communication among multiple nodes (field devices) and controller (process control system).

The H1 FF network exhibits the following properties:

- Two-wire (ungrounded) network cable
- 100 ohm (nominal) characteristic impedance
- DC power is conveyed over the same two wires as the digital data
- 31.25 kbps data rate

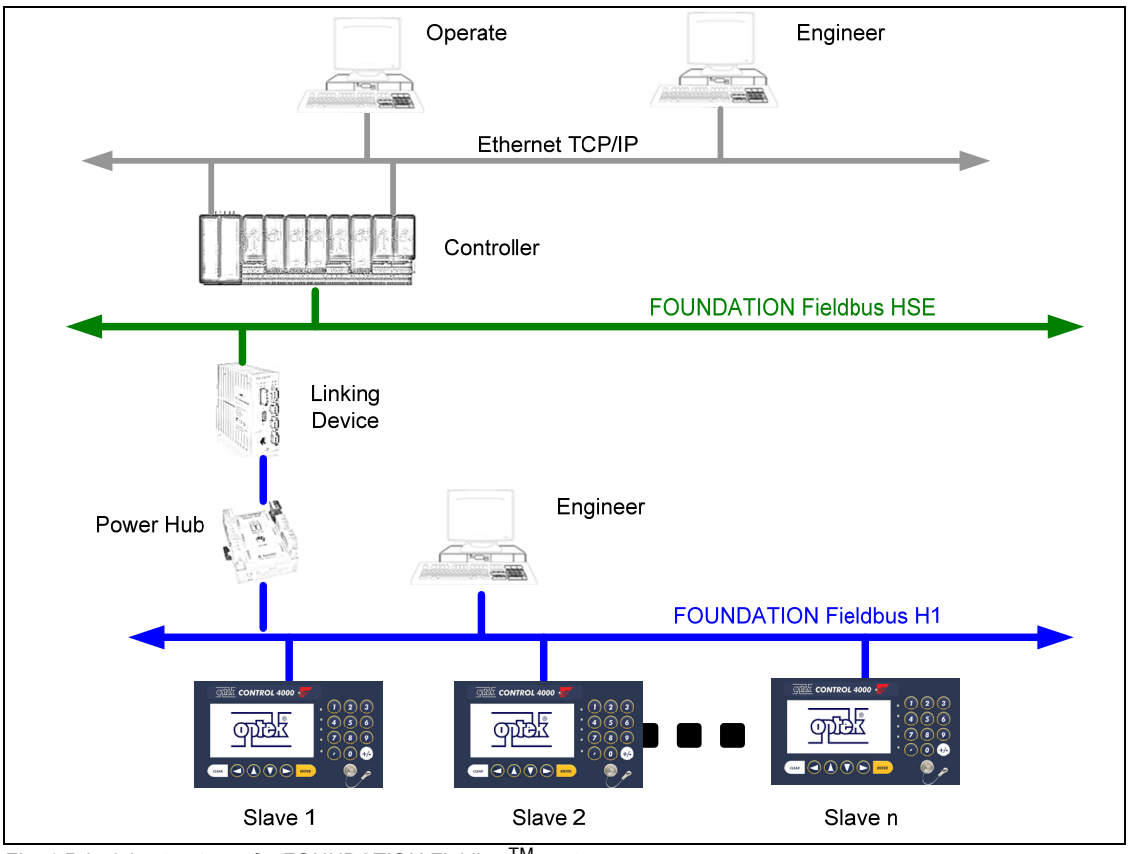


Fig. 1 Principle structure of a FOUNDATION Fieldbus™ system

Note!
DC Power over the bus cable supplied only the fieldbus interface of the devices.
For the full functional service a separate power supply must be available.

High Speed Ethernet (HSE)

High Speed Ethernet (HSE) uses Ethernet as the physical layer and provides a high-speed backbone for the H1 - network. It´s large capacity to move data, along with the inherent FOUNFATION Fieldbus™ functionality, and publish/subscribe access, fits in with plant-wide integration in the process industries.

The HSE FF network exhibits the following properties:

- 100BASE-TX/10BASE-T, Automatic Recognition, Connector: RJ45
- 10 or 100 Mbps data rate

Linking Device

Linking devices are HSE devices used to interconnected H1 devices to a HSE network. A linking device also provides an H1 bridge for H1 inter communications.

Link Active Scheduler (LAS)

The link active scheduler controls every communication that occurs on the bus. A fieldbus segment can connect up to 32 devices. The LAS is the Master for the Time Scheduler of the specific segment.

Device addressing (Device ID)

Each FF device has a unique specific address, as defined by the combination of:

manufacturer number:	optek-Danulat GmbH = 4000FF	$(4194559)_{DEZ}$
device number:	C_HC4xxx/C8xxx family = 100	$(256)_{DEZ}$
serial number:	FBK2___xxxxxxxxxx	xxxxxxxxxx – (10 digit)

After the device was recognized on fieldbus segment, the device configuration by acyclic communication can start.

Note!
If you have purchased multiple optek converters, they must be enabled one by one into operation, to unambiguously assign the Device ID to the converter.

System configuration

For configuration of the optek devices the following are needed:

- Device Description File (.DD)
- Capabilty File (.CFF)
- Configuration Tool:
  - (e.g. National Instruments NI-FBUS Configurator or Softing FF Configurator) or
  - Integrated configuration tool of your control system (e.g. Emerson Delta V and/or AMS Device Manager)

5 Description optek C4000 / HC / C8000 bus interface

5.1 C4000 / HC FF interface

To allow the easiest possible commissioning of the C4000 converter and the Haze Control into the bus, the reliable concept of parameterization via parameter sets was maintained. Up to eight parameter sets can be stored on each converter with a product number and product name.

For comfortable handling even of complex parameter sets (e.g. complex mathematical operations), the well-known PC-Transfer Advanced software is used for the Control 4000.

Thus, almost all internal parameters can be changed when changing the product number. The product number can be changed locally or via access to an individual register via the bus.

Even complex parameter changes, such as the exchange of the mathematical operations of several input signals or the exchange of the linearization function for a simple operation in the control system, are therefore possible. It is not necessary to reboot the converter or bus segment.

The structure with up to four independently definable measuring results, each of which is designated with a name and assigned text on the unit was also adapted.

The four measuring results also play a central role for mapping on the bus: To each of these measuring results a transducer block is implemented to control the access and define an interface for use by function blocks. For C4000 and Haze Control only the first four analyzer transducer blocks are connected with the corresponding measurement result M01- M04. Analyzer TB 5 – 8 are not connected in these devices.

Eight analog input function blocks processes data to a specified algorithm and an internal set of control parameters. The assignment of the blocks (Transducer TB to Function Block) is arbitrary.

For each measuring result a status parameter is contained, which indicates the quality of these parameters. The Status field is composed of three parts: Quality, Sub-Status and Limits. It indicates the quality of the parameter value:

Quality

Good Cascade	The quality of the value is good, and it may be part of a cascade structure
Good Non-Cascade	The quality of the value is good, and the block doesn’t support a cascade path
Uncertain	The quality of the value is less than normal, but the value may still be useful
Bad	The value is not useful

Sub-Status

The Sub-Status takes additional information to initialize or break a cascade control, alarms and others. There are different sets of Sub-Status for each quality.

Limits
It provides information whether the associated value is limited or not, as well the direction. The limits are classified as: High-High Limited, High Limited, Low Limited, and Low Low Limited. Each level can be controlled individually.

Since the signal loss state is admitted for some applications but indicates technical malfunctions in others, the user can change the assignment to uncertain or bad.

The functionality defined with parameter sets can be queried in acyclic data traffic with the standard parameters of the function blocks. Thus, e.g. set limits of the measuring range and the names of the units can be read by the control system. Apart from the measuring results, in cyclic traffic, the switching status of the four relay outputs are available as well. They are arranged in a shared digital input block.

To send analog signals from control to converter, there are two analog output blocks. In the converter, these are used like mA-inputs of converter models (H)C4X2Z (X = 1–4, Z = 1–2).

The following figure shows the FOUNDATION Fieldbus™ interface for the C4000 and the Haze Control converter.

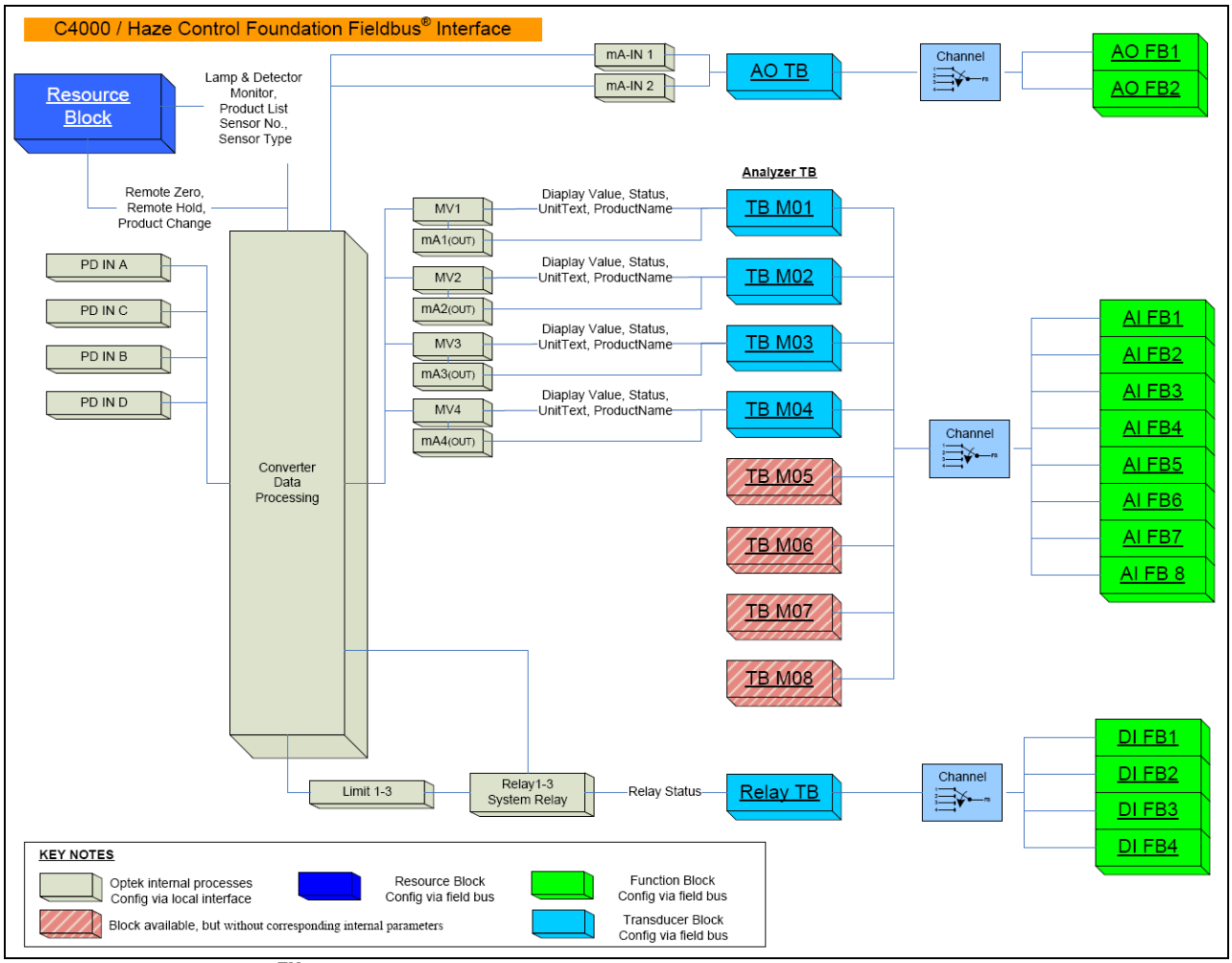


Fig. 2 FOUNDATION Fieldbus™ interface for C4000 and Haze Control

Abbreviations mean the following:

RB = resource block
TB = transducer block
FB = function block
AO = analog output block
AI = analog input block
DI = digital input
PD IN X = detector input A-D
MV 1-4 = measuring value 1-4

5.2 C8000 FF interface

To allow the easiest possible commissioning of the C8000 converter into the bus, the reliable concept of parameterization via parameter sets was maintained.
Up to eight parameter sets can be stored on each converter with a product number and product name.

Thus, almost all internal parameters can be changed when changing the product number. The product number can be changed locally or via access to an individual register via the bus.

Even complex parameter changes like the exchange of the linearization function for a simple operation in the control system, are therefore possible. It is not necessary to reboot the converter or bus segment.

The structure with up to eight independently definable measuring results, each of which is designated with a name and assigned text on the unit was also adapted.

The eight measuring results also play a central role for mapping on the bus: To each of these measuring results a transducer block is implemented to control the access and define an interface for use by function blocks. For C8000 the TB parameters are connected with the corresponding measurement results M01- M08.

Eight analog input function blocks processes data to a specified algorithm and an internal set of control parameters. The assignment of the blocks (Transducer TB to Function Block) is arbitrary.

For each measuring result a status parameter is contained, which indicates the quality of these parameters. The Status field is composed of three parts: Quality, Sub-Status and Limits. It indicates the quality of the parameter value.

Quality

Good Cascade	The quality of the value is good, and it may be part of a cascade structure
Good Non-Cascade	The quality of the value is good, and the block doesn’t support a cascade path
Uncertain	The quality of the value is less than normal, but the value may still be useful
Bad	The value is not useful

Sub-Status
The Sub-Status takes additional information to initialize or break a cascade control, alarms and others. There are different sets of Sub-Status for each quality.

Limits
It provides information whether the associated value is limited or not, as well the direction. The limits are classified as: High-High Limited, High Limited, Low Limited, and Low Low Limited. Each level can be controlled individually.

Since the signal loss state is admitted for some applications but indicates technical malfunctions in others, the user can change the assignment to uncertain or bad.

With the C8000 family only the system relay status and value is mapped to the first parameter in the relay transducer block, the other three parameters are not connected.

Also the analog output block are not connected, this feature is not supported by the devices of the C8000 family.
The mA output allocation is adjustable in C8000; therefore the assignment of the output value to the mA parameter in the TB can be different. In the default setting of the converter, the assignment is given.

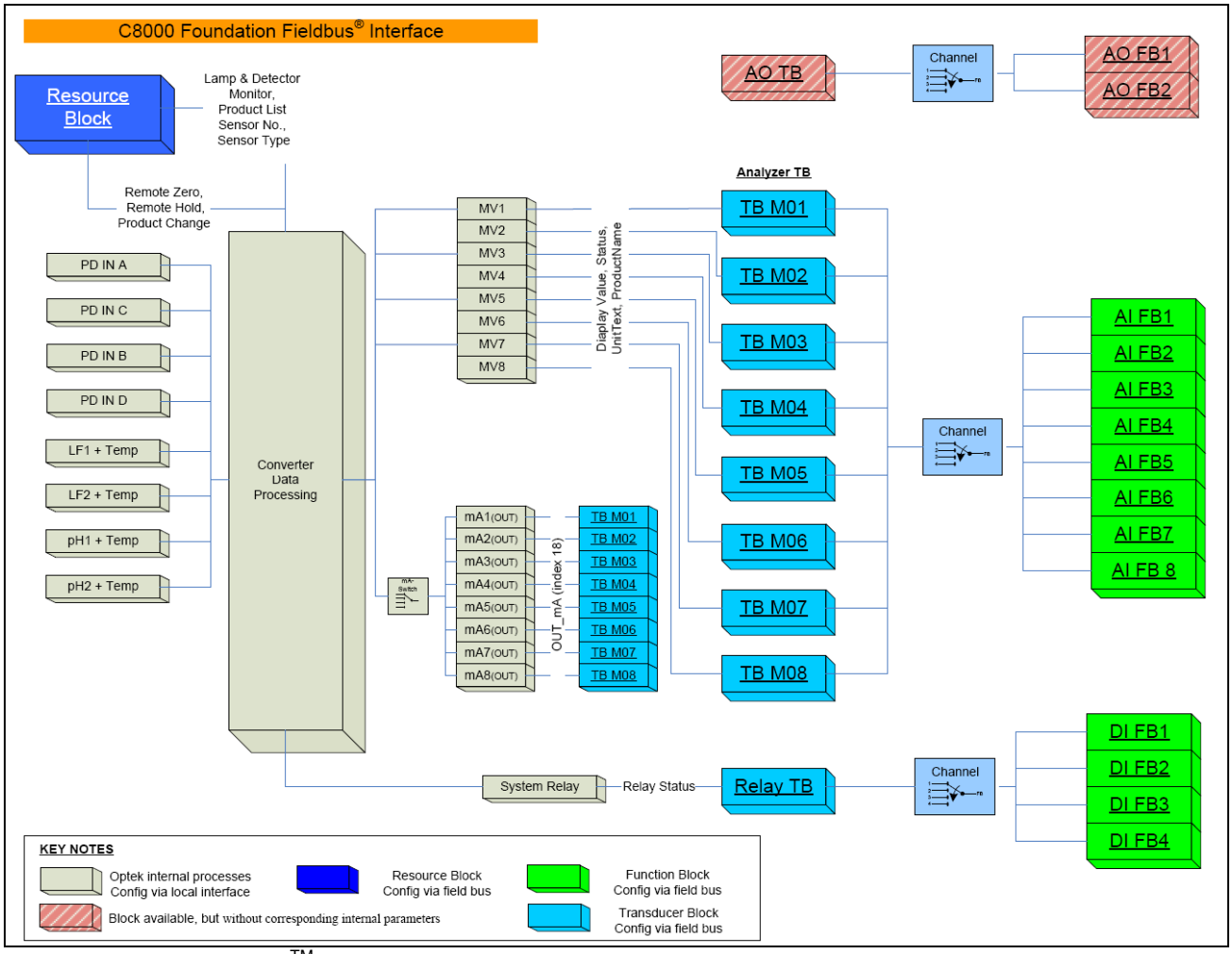


Fig. 3 FOUNDATION Fieldbus™ interface for C8000

Abbreviations mean the following:

RB = resource block
TB = transducer block
FB = function block
AO = analog output block
AI = analog input block
DI = digital input
PD IN X = detector input A-D
MV 1-8 = measuring value 1-8

5.3 Technical data FOUNDATION Fieldbus™ interface

Tab. 2 Technical data FOUNDATION Fieldbus™ interface

Physical:	FOUNDATION™ Fieldbus™ H1 (IEC 61158-2) Data rate : 31.25 kbit/sec
Connection:	Polarity independent
Voltage range:	9…32 V
Background current:	18 mA
Galvanic separation:	Function separation
Intrinsic safety:	No
Manufacture ID:	optek-Danulat GmbH (0x4000FF)
Device ID:	C_HC4xxx / C8xxx family (0x100)
Address range:	The H1 fieldbus address will set from host system (LSA) Each address range according the fieldbus specification is permissible
Used Blocks	1 x Resource Block 8 x Analyser TB 1 x Relay TB 1 x Analoge TB 8 x AI FB 4 x DI FB 2 x AO FB

5.4 Converter front view

5.4.1 Converter front view C4000 and Haze Control

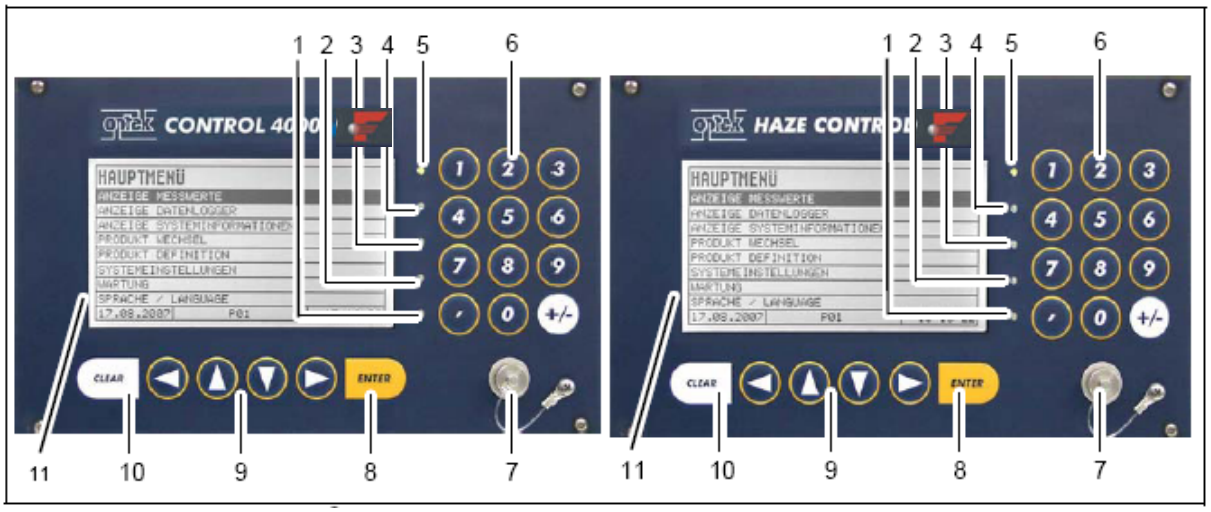


Fig. 4 Front panel FOUNDATION Fieldbus™ converter C4000 and Haze Control

Numbers stand for:

1. LED (flashes red), indicates lamp failure or system failure
2. LED (yellow), switch indicator for alarm 3 when a value exceeds or falls below a limit value
3. LED (yellow), switch indicator for alarm 2 when a value exceeds or falls below a limit value
4. LED (yellow), switch indicator for alarm 1 when a value exceeds or falls below a limit value
5. LED (green), indicates readiness for operation
6. Numerical keyboard (single assignment)
7. Connection for RS-232 (control-connect cable)
8. ENTER key (confirmation of entries)
9. Cursor key (moving in the menus and entries)
10. CLEAR key (rejecting entries, returning to previous menu)
11. Display

5.4.2 Converter front view C8000

Fig. 5 Front panel FOUNDATION Fieldbus™ converter C8000

Numbers stand for:
1. LED (green), indicates readiness for operation
2. Numerical keyboard (single assignment)
3. Connection for RS-232 (control-connect cable)
4. LED (flashes red), indicates lamp failure or system failure
5. ENTER key (confirmation of entries)
6. Cursor key (moving in the menus and entries)
7. CLEAR key (rejecting entries, returning to previous menu)
8. Display

5.5 Rear view C4161 converter

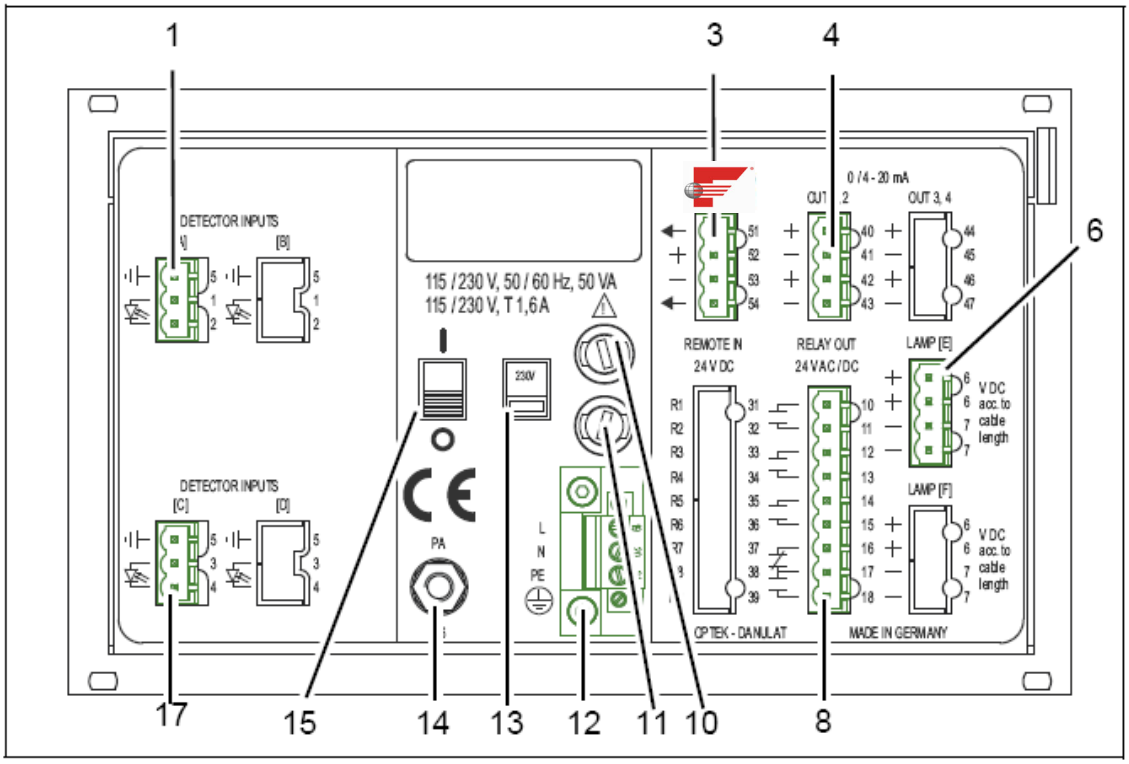


Fig. 6 Rear view C4161 converter

Numbers stand for:
1. Detector input A (only for optek-sensors)
2. -
3. FOUNDATION Fieldbus™ interface
4. mA-output 1, mA-output 2 (0/4–20 mA)
5. -
6. Lamp output E (only for optek-sensors)
7. -
8. Relay outputs 1, 2, 3 for limit values or system status feedback, system relay (enabled)
9. -
10. Fuse I 115 / 230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
11. Fuse II 115 / 230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
12. Power supply (fixed)
13. Selector switch for voltage (factory setting 230 V AC) - (does not apply for a 24 V AC/DC version)
14. Potential equalization (in the non-ex-proof version, only necessary in extreme EMC requirements)
15. ON / OFF switch
16. -
17. Detector input C (inactive)

5.6 Rear view C4261 converter

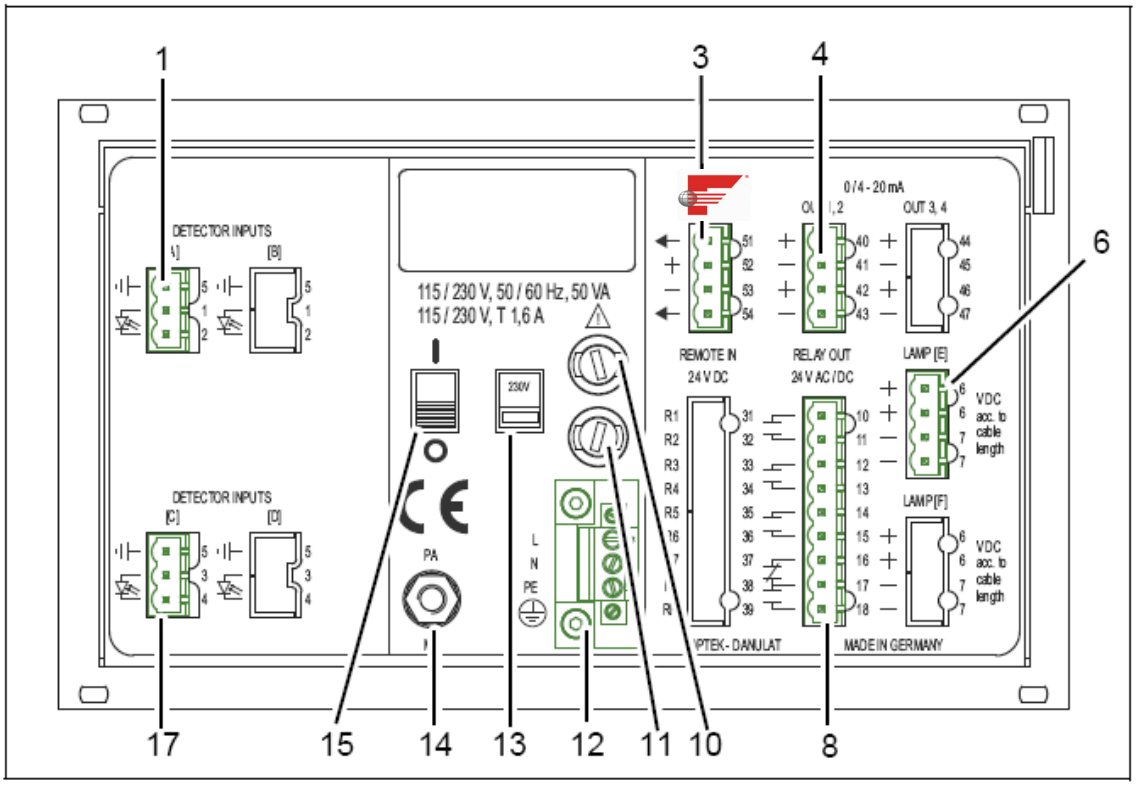


Fig. 7 Rear view C4261 converter

Numbers stand for:
1. Detector input A (only for optek-sensors)
2. -
3. FOUNDATION Fieldbus™ interface
4. mA-output 1, mA-output 2 (0/4–20 mA)
5. -
6. Lamp output E (only for optek-sensors)
7. -
8. Relay outputs 1, 2, 3 for limit values or system status feedback, system relay (enabled)
9. -
10. Fuse I 115/230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
11. Fuse II 115/230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
12. Power supply (fixed)
13. Selector switch for voltage (factory setting 230 V AC) - (does not apply for a 24 V AC/DC version)
14. Potential equalization (in the non-ex-proof version, only necessary in extreme EMC requirements)
15. ON / OFF switch
16. -
17. Detector input C (only for optek-sensors)

5.7 Rear view C4262 converter

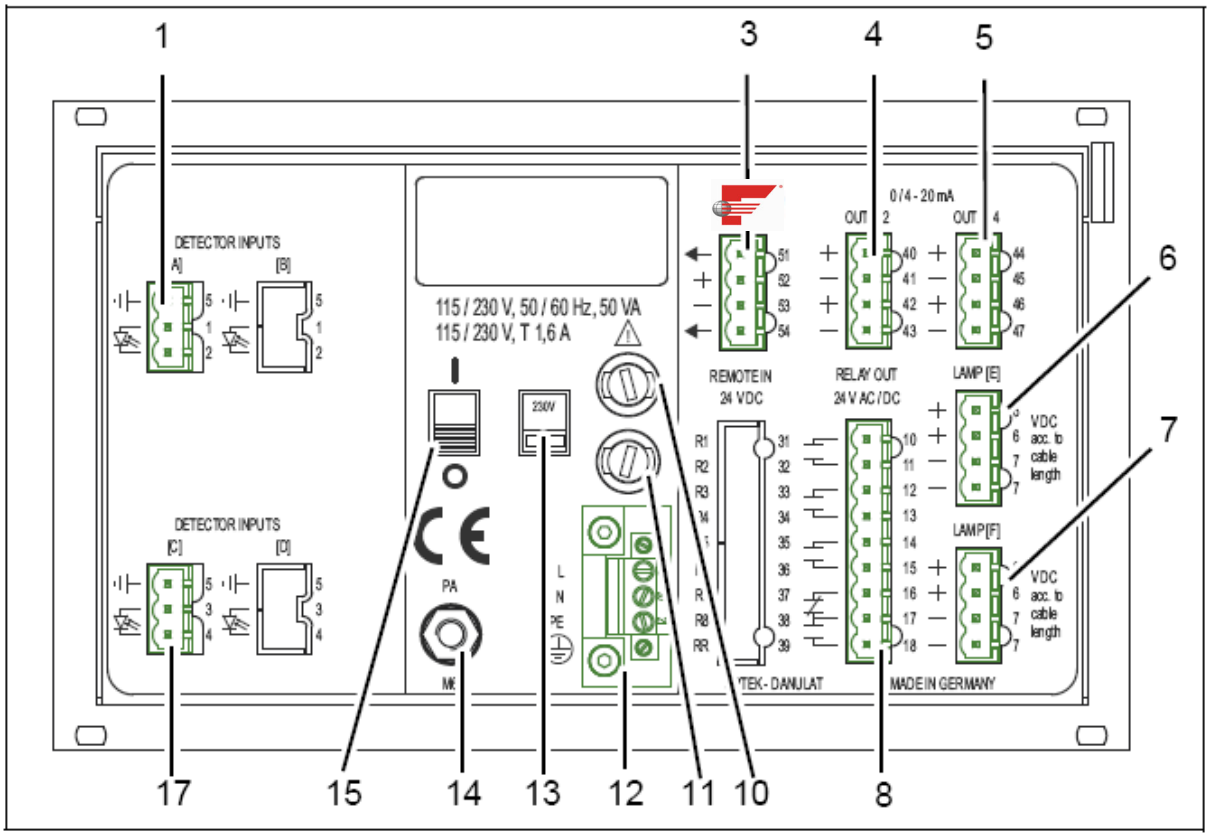


Fig. 8 Rear view C4262 converter

Numbers stand for:
1. Detector input A (only for optek-sensors)
2. -
3. FOUNDATION Fieldbus™ interface
4. mA-output 1, mA-output 2 (0/4–20 mA)
5. mA-output 3, mA-output 4 (0/4–20 mA)
6. Lamp output E (only for optek-sensors)
7. Lamp output F (only for optek-sensors)
8. Relay outputs 1, 2, 3 for limit values or system status feedback, system relay (enabled)
9. -
10. Fuse I 115/230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
11. Fuse II 115/230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
12. Power supply (fixed)
13. Selector switch for voltage (factory setting 230 V AC) - (does not apply for a 24 V AC/DC version)
14. Potential equalization (in the non-ex-proof version, only necessary in extreme EMC requirements)
15. ON / OFF switch
16. -
17. Detector input C (only for optek-sensors)

5.8 Rear view C4462 converter

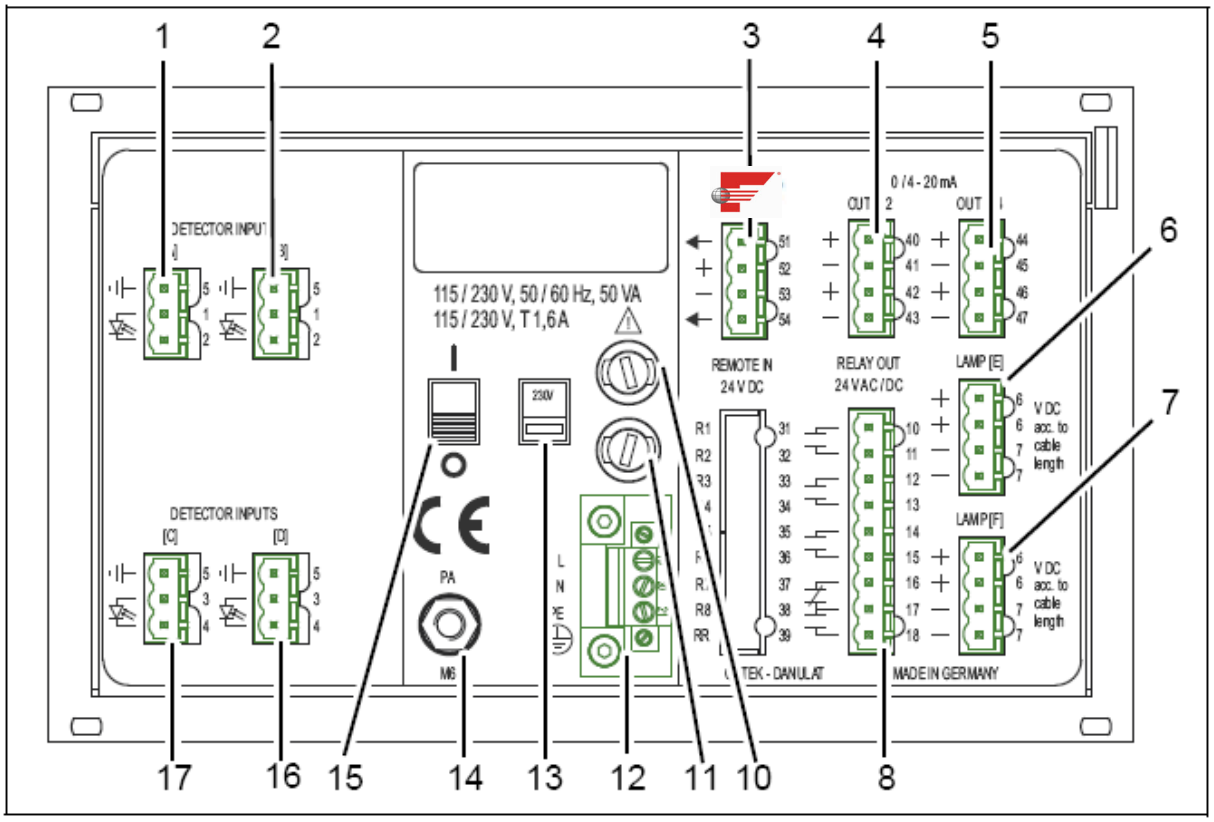


Fig. 9 Rear view C4462 converter

Numbers stand for:
1. Detector input A (only for optek-sensors)
2. Detector input B (only for optek-sensors)
3. FOUNDATION Fieldbus™ interface
4. mA-output 1, mA-output 2 (0/4–20 mA)
5. mA-output 3, mA-output 4 (0/4–20 mA)
6. Lamp output E (only for optek-sensors)
7. Lamp output F (only for optek-sensors)
8. Relay outputs 1, 2, 3 for limit values or system status feedback, system relay (enabled)
9. -
10. Fuse I 115/230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
11. Fuse II 115/230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
12. Power supply (fixed)
13. Selector switch for voltage (factory setting 230 V AC) - (does not apply for a 24 V AC/DC version)
14. Potential equalization (in the non-ex-proof version, only necessary in extreme EMC requirements)
15. ON / OFF switch
16. Detector input D (only for optek-sensors)
17. Detector input C (only for optek-sensors)

5.9 Rear view HC4361 converter

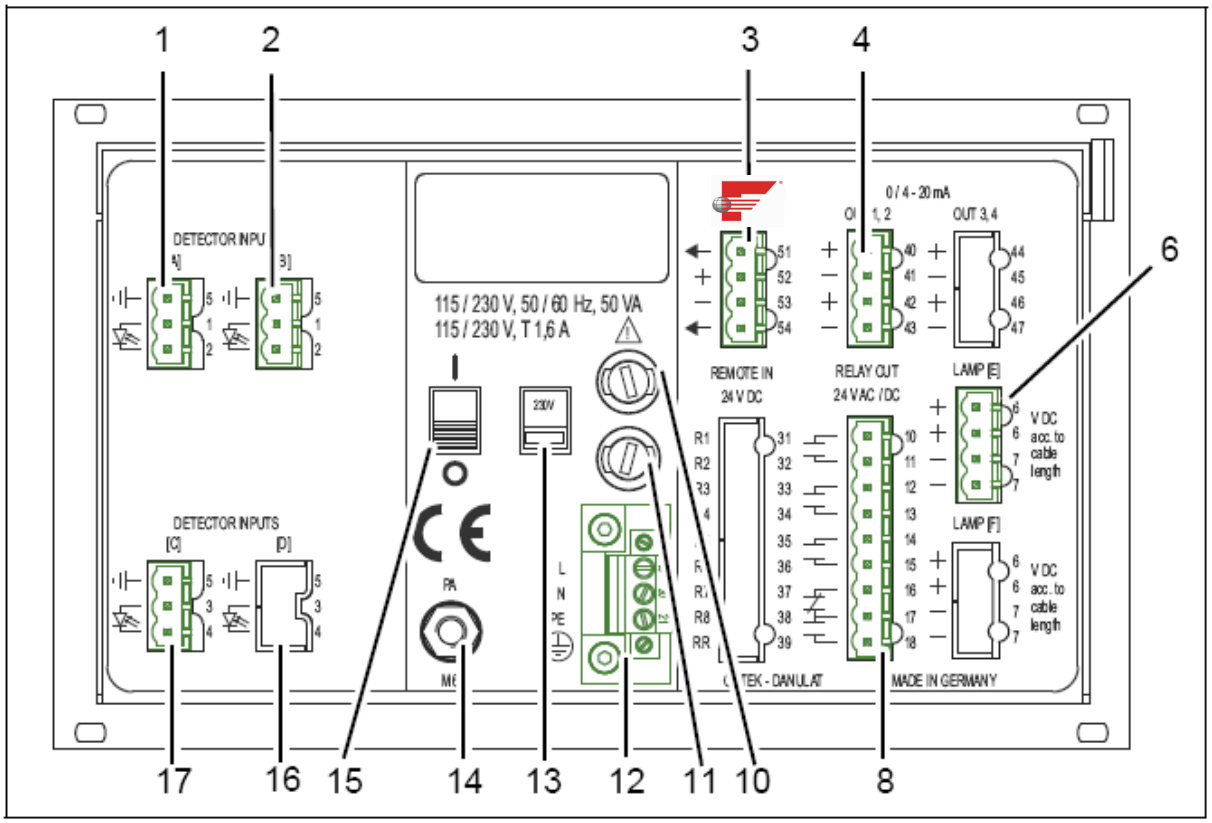


Fig. 10 Rear view HC4361 converter

Numbers stand for:
1. Detector input A (only for optek-sensors)
2. Detector input B (only for optek-sensors)
3. FOUNDATION Fieldbus™ interface
4. mA-output 1, mA-output 2 (0/4–20 mA)
5. –
6. Lamp output E (only for optek-sensors)
7. –
8. Relay outputs 1, 2, 3 for limit values or system status feedback, system relay (enabled)
9. -
10. Fuse I 115/230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
11. Fuse II 115/230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
12. Power supply (fixed)
13. Selector switch for voltage (factory setting 230 V AC) - (does not apply for a 24 V AC/DC version)
14. Potential equalization (in the non-ex-proof version, only necessary in extreme EMC requirements)
15. ON / OFF switch
16. Detector input D (inactive)
17. Detector input C (only for optek-sensors)

5.10 Rear view HC4462 converter

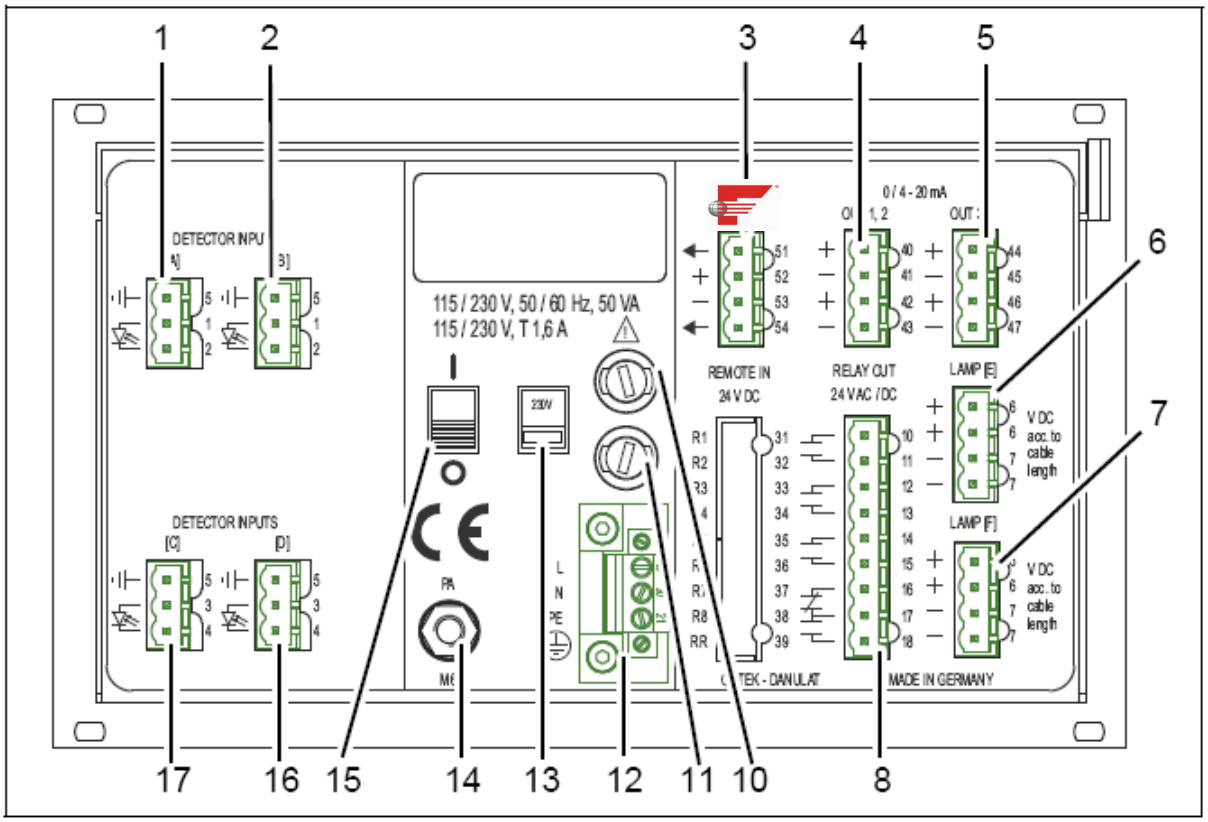


Fig. 11 Rear view HC4462 converter

Numbers stand for:
1. Detector input A (only for optek-sensors)
2. Detector input B (only for optek-sensors)
3. FOUNDATION Fieldbus™ interface
4. mA-output 1, mA-output 2 (0/4–20 mA)
5. mA-output 3, mA-output 4 (0/4–20 mA)
6. Lamp output E (only for optek-sensors)
7. Lamp output F (only for optek-sensors)
8. Relay outputs 1, 2, 3 for limit values or system status feedback, system relay (enabled)
9. -
10. Fuse I 115/230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
11. Fuse II 115/230 V AC T 1.6 A (24 V AC/DC: T 3.15 A option)
12. Power supply (fixed)
13. Selector switch for voltage (factory setting 230 V AC) - (does not apply for a 24 V AC/DC version)
14. Potential equalization (in the non-ex-proof version, only necessary in extreme EMC requirements)
15. ON / OFF switch
16. Detector input D (only for optek-sensors)
17. Detector input C (only for optek-sensors)

5.11 Rear view C8486 converter

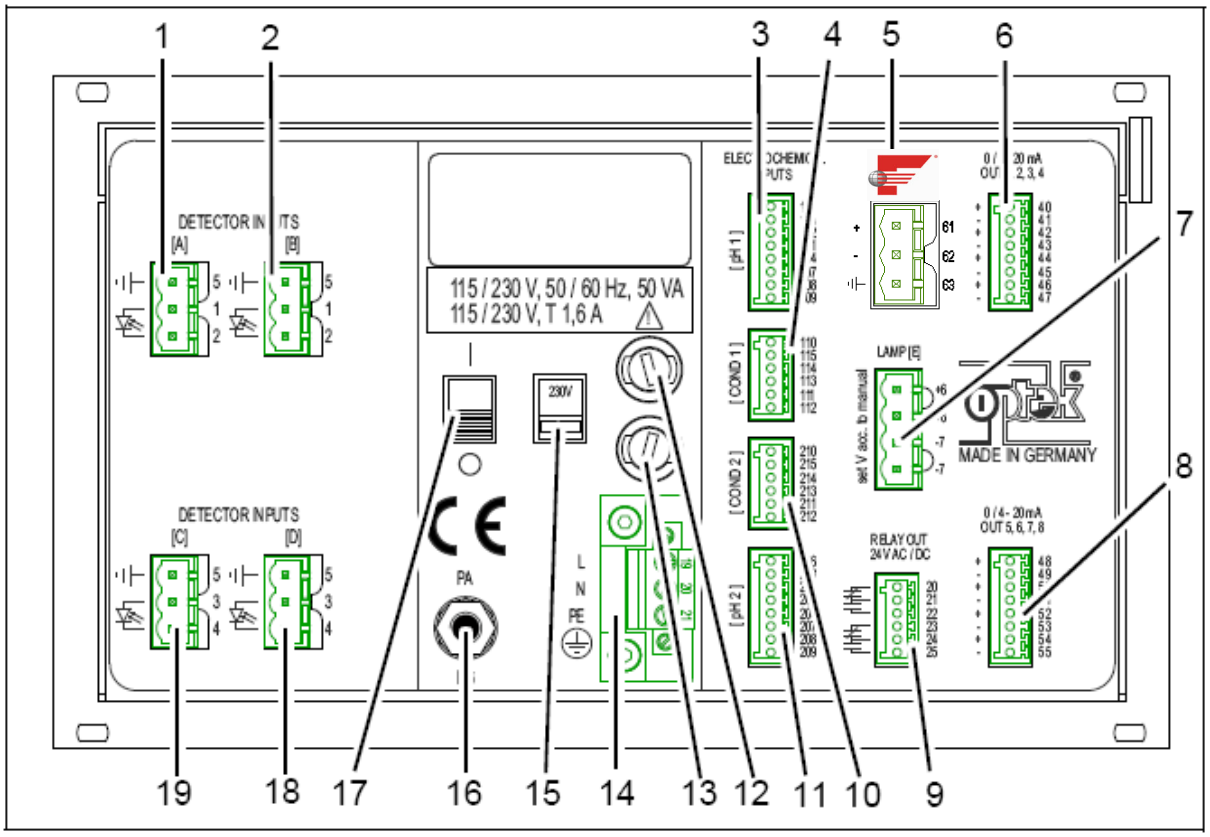


Fig. 12 Rear view C8486 converter

Numbers stand for:
1. Detector input A (only for optical optek-sensors)
2. Detector input B (only for optical optek-sensors)
3. pH input pH1
4. Conductivity input COND1 (only for optek ACF sensors)
5. FOUNDATION Fieldbus™ interface
6. mA-output1, mA-output 2, mA-output 3, mA-output 4 (0/4 - 20 mA)
7. Lamp output E (only for optek-sensors)
8. mA-output 5, mA-output 6, mA-output 7, mA-output 8 (0/4 - 20 mA)
9. Relay output for system relay (enabled)
10. Conductivity input COND2 (only for optek ACF sensors)
11. pH input pH2
12. Fuse I 115 / 230 V AC T 1.6 A (option 24 V AC / DC: T 3.15 A)
13. Fuse II 115 / 230 V AC T 1.6 A (option 24 V AC / DC: T 3.15 A)
14. Power supply (fixed)
15. Selector switch for voltage (factory setting 230 V AC) - (does not apply for a 24 V AC / DC version)
16. Potential equalization (only necessary in extreme EMC requirements)
17. ON / OFF switch
18. Detector input D (only for optical optek-sensors)
19. Detector input C (only for optical optek-sensors)

5.12 Rear view C8086 converter

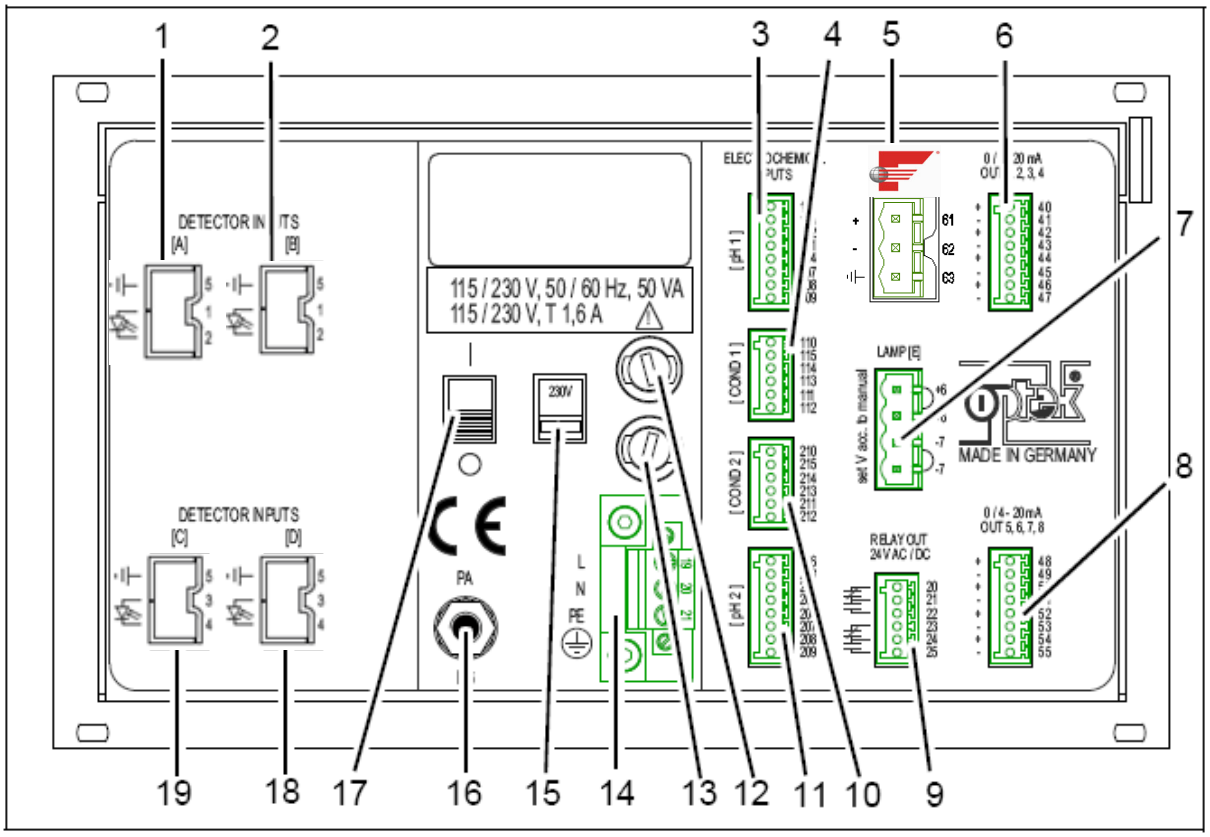


Fig. 13 Rear view C8086 converter

Numbers stand for:

1. -
2. -
3. pH input pH1
4. Conductivity input COND1 (only for optek ACF sensors)
5. FOUNDATION Fieldbus™ interface
6. mA-output1, mA-output 2, mA-output 3, mA-output 4 (0/4 - 20 mA)
7. Lamp output E (inactive)
8. mA-output 5, mA-output 6, mA-output 7, mA-output 8 (0/4 - 20 mA)
9. Relay output for system relay (enabled)
10. Conductivity input COND2 (only for optek ACF sensors)
11. pH input pH2
12. Fuse I 115 / 230 V AC T 1.6 A (option 24 V AC / DC: T 3.15 A)
13. Fuse II 115 / 230 V AC T 1.6 A (option 24 V AC / DC: T 3.15 A)
14. Power supply (fixed)
15. Selector switch for voltage (factory setting 230 V AC) - (does not apply for a 24 V AC / DC version)
16. Potential equalization (only necessary in extreme EMC requirements)
17. ON / OFF switch
18. -
19. -

5.13 Connecting the sensors

Danger!
Electrical voltage!
Switch the converter voltage-free before connecting the sensor!
Install electrical connections only by qualified electricians!

An overview of the connections of our sensors as well as of the wiring plans can be found in the standard instruction manual of the converter which is provided.

5.14 FOUNDATION Fieldbus™ interface

Low-speed Fieldbus cables
Different types of fieldbus cables can be used for FOUNDATION Fieldbus™. In the following table the specified cable types are listed according to the IEC/ISA 61158-2 Physical Layer standard. The recommended fieldbus cable is type A. This type of cable should be used in new installation. Also the other types of cables (type B, C and D) can be used, but with the disadvantage of a reduce cable length. That´s why these types are not recommended.

Tab. 3 Technical data FOUNDATION Fieldbus™ cable

	Type A (Recommended)	Type B	Type C	Type D
Build-up	Individually-shielded twisted pair cable	Overall-shielded twisted pair cable	Unshielded twisted pair cable	Overall-shielded non-twisted cable
Wire cross-section	0.82 mm² (AWG 18)	0.32 mm² (AWG 22)	0.13 mm² (AWG 26)	1.25 mm² (AWG 16)
Max. length of cable (incl. stub)	1900 m	1200 m	400 m	200 m

5.14.1 Connection to C4000 / Haze Control converter

Caution!
Install electrical connections only by qualified electricians!
The FOUNDATION Fieldbus™ interface shall only be connected to circuits which cannot become dangerously active (SELV / PELV).

Tool • Screw driver

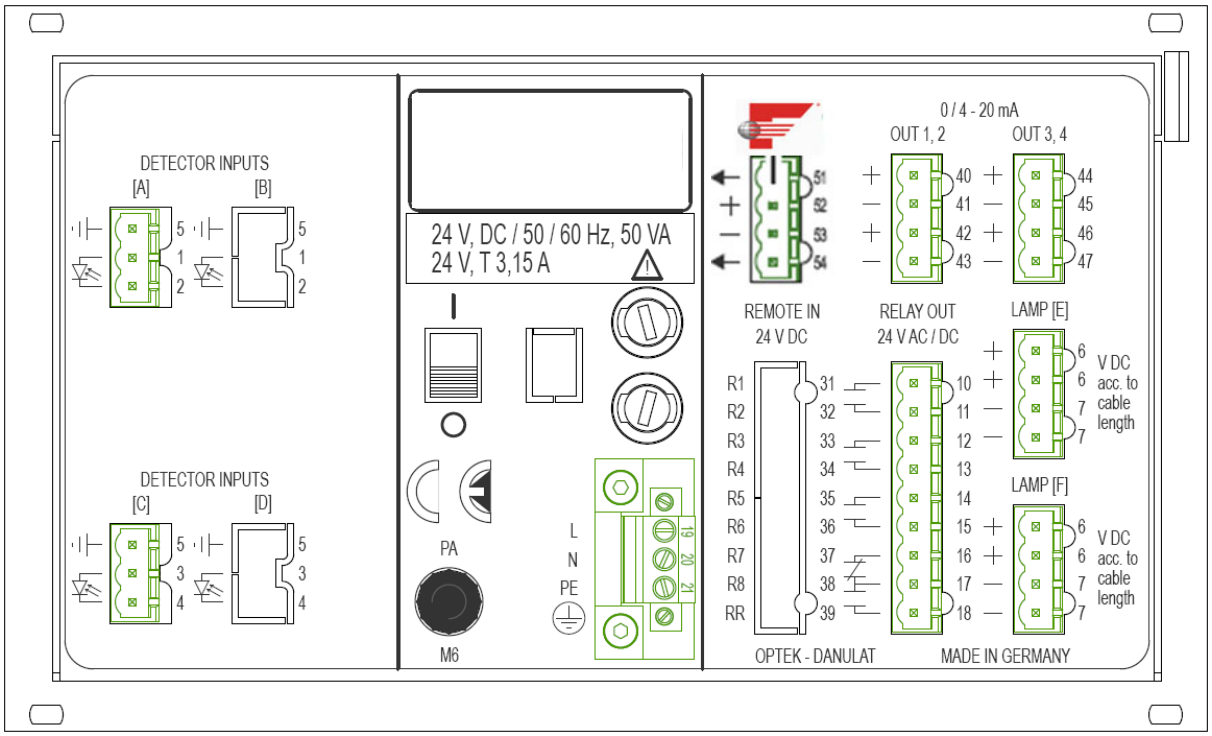


Fig. 14 Fieldbus terminals FOUNDATION Fieldbus™

The fieldbus is connected to the supply clamps of the device (terminals 51 – 54):

- grounding (shield) = terminal 51 / 54
- cable red = terminal 52 +
- cable black = terminal 53 –

The connection to the FOUNDATION Fieldbus™ depends on the realization on site but should be shielded.

Note!
The supply voltage of the FOUNDATION Fieldbus™ interface must be bus-powered. It is not supplied by the converter.

5.14.2

5.14.2 Connection to C8000 converter

Caution!
Install electrical connections only by qualified electricians!
The FOUNDATION Fieldbus™ interface shall only be connected to circuits which cannot become dangerously active (SELV / PELV).

Tool • Screw driver

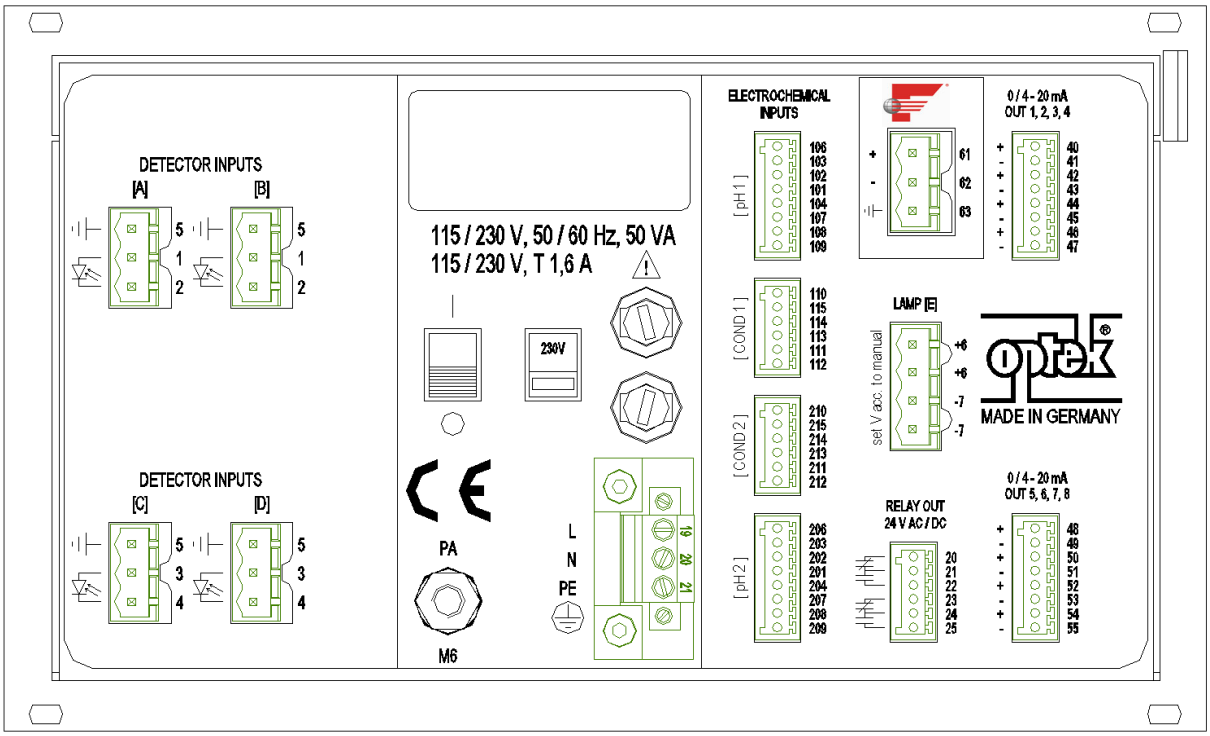


Fig. 15 Fieldbus terminals FOUNDATION Fieldbus™

The fieldbus is connected to the supply clamps of the device.
(terminals 61– 63):

- grounding (shield) = terminal 63
- cable red = terminal 61 +
- cable black = terminal 62 –

The connection to the FOUNDATION Fieldbus™ depends on the realization on site but should be shielded.

Note!
The supply voltage of the FOUNDATION Fieldbus™ interface must be bus-powered. It is not supplied by the converter.

5.14.3 Configuration with Device Description (all derivates)

DD files (Device Description) are provided according to FF specifications. Load the DD files in your configuration tool of the FF H1 system to display the H1 Device information into the catalogue of the host system.

Tab. 4 Provided EDD files

DD4 Files	
Binary Filename	0101.FFO
Symbol Filename	0101.SYM
DD5 Files	
Binary Filename	0101.FF5
Symbol Filename	0101.SY5
CF Files	
Capability Filename:	010101.CFF

This file is on the CD-ROM supplied and or can be acquired via the FOUNDATION Fieldbus™ Organisation: www.fieldbus.org

5.14.4 Commissioning

To integrate our optek device into your FF – communication system, you have to configure it first. For the commissioning you can use configuration tools and operating programs from different manufacturers.
Examples:

- Operation of Gateway
  - Softing FG-110FF
- Operation of control system
  - Emerson Delta V (Vers.≥ 9.3)
- Asset-Management-System
  - NI-FBUS configurator (Vers. ≥ 4.1.1)*1)
  - Softing FF-Conf. (Vers. ≥ 1.2)
  - AMS (Vers. ≥ 9.0)
  - Emerson Field Communicator (375, 475) *2)

With these tools you are able to have access to the FF – function and all specific device parameters. Predefined function blocks enable a consistent access to all fieldbus device data.

*1) Using NI-FBUS configurator refer to chapter 7.4, on page 68.
*2) Using Emerson Field Communicator refer to chapter 7.5, on page 72.

6 Specifications

The Foundation Fieldbus™ Interface for C4000, Haze Control and C8000 converters provide the following block structure:

Tab. 5 Device Info

User blocks	Description
1 RB	Block which consists of standard FF parameters that provide the interface for common resource characteristics and optek specific expansion features.
8 analyzer TB	Provide the measurement results: - 4 x measurement values (C4000 / Haze Control) - 8 x measurement values (C8000)
1 Relay TB	- For four relay outputs (C4000 / Haze Control) - For system relay only (C8000)
1 AO TB	For mA-Inputs
8 AI FB	This block takes the analog input data from the measurement inputs of the converter
4 DI FB	This block takes the discrete input data from the relay outputs of the converter
2 AO FB	The AO block provides an analog value to generate a mA-Input signal. (C4000 and HazeControl only)

Note!
A detailed description of the bus interface is given in “Description optek Control 4000/ Haze Control or C8000 bus interface”, chapter 5, on page 10.

6.1 *Resource Block*

This block contains all hardware-related data that can be monitored and applied by general operations.

Tab. 6 Resource Block

Index	Parameter Name	Object Type	FMS Data Type	Store	Size (Bytes)	Access
The standard FOUNDATION Fieldbus™ resource block parameter						
1	**ST_REV**	S	Unsigned16	S	2	R
2	**TAG_DESC**	S	Octet String	S	32	RW
3	**STRATEGY**	S	Unsigned16	S	2	RW
4	**ALERT_KEY**	S	Unsigned8	S	1	RW
5	**MODE_BLK**	R	DS-69	D	4	RW
6	**BLOCK_ERR**	S	Bit_String	D	2	R
7	**RS_STATE**	S	Unsigned8	D	1	R
8	**TEST_RW**	R	DS-85	D	112	RW
9	**DD_RESOURCE**	S	Visible_String	D	32	R
10	**MANUFAC_ID**	S	Unsigned32	S	4	R
11	**DEV_TYPE**	S	Unsigned16	S	2	R
12	**DEV_REV**	S	Unsigned8	S	1	R
13	**DD_REV**	S	Unsigned8	S	1	R
14	**GRANT_DENY**	R	DS-70	S	2	RW
15	**HARD_TYPES**	S	Bit_String	S	2	R
16	**RESTART**	S	Unsigned8	D	1	RW
17	**FEATURES**	S	Bit_String	S	2	R
18	**FEATURES_SEL**	S	Bit_String	S	2	RW
19	**CYCLE_TYPE**	S	Bit_String	S	2	R
20	**CYCLE_SEL**	S	Bit_String	S	2	RW
21	**MIN_CYCLE_T**	S	Unsigned32	S	4	R
22	**MEMORY_SIZE**	S	Unsigned16	S	2	R
23	**NV_CYCLE_T**	S	Unsigned32	S	4	R
24	**FREE_SPACE**	S	Float	D	4	R
25	**FREE_TIME**	S	Float	D	4	R
26	**SHED_RCAS**	S	Unsigned32	S	4	RW
27	**SHED_ROUT**	S	Unsigned32	S	4	RW
28	**FAULT_STATE**	S	Unsigned8	N	1	R
29	**SET_FSTATE**	S	Unsigned8	D	1	RW
30	**CLR_FSTATE**	S	Unsigned8	D	1	RW
31	**MAX_NOTIFY**	S	Unsigned8	S	1	R
32	**LIM_NOTIFY**	S	Unsigned8	S	1	RW
33	**CONFIRM_TIME**	S	Unsigned32	S	4	RW
34	**WRITE_LOCK**	S	Unsigned8	S	1	RW
35	**UPDATE_EVT**	R	DS-73	D	14	R
36	**BLOCK_ALM**	R	DS-72	D	15	RW
37	**ALARM_SUM**	R	DS-74	Mixed	8	RW
38	**ACK_OPTIONS**	S	Bit_String	S	2	RW
39	**WRITE_PRI**	S	Unsigned8	S	1	RW
40	**WRITE_ALM**	R	DS-72	D	13	RW
41	**ITK_VER**	S	Unsigned16	S	2	R

Note!
WRITE_LOCK (index 34)
This parameter cannot be set with Emerson AMS Suite. An external configuration tool (e.g. NI-FBUS Configurator) is necessary.

Note!
Necessary parameter to identify the correct Device Description (DD) data

MANUFAC_ID	**(index 10**)	optek-Danulat GmbH	0x4000FF
		Manufacturer identification number - used by an interface device to locate the DD file for the resource.	
DEV_TYPE	**(index 11)**	C_HC4xxx / C8xxx family	0x100
DEV_REV	**(index 12)**		
DD_REV	**(index 13)**		

Tab. 7 Resource Block (cont.)

Index	Parameter Name	Object Type	FMS Data Type	Store	Size (Bytes)	Access
FF Field Diagnostics Profile (FF-912)						
42	**FD_VER**	S	Unsigned16	S	2	R
43	**FD_FAIL_ACTIVE**	S	Bit_String	D	4	R
44	**FD_OFFSPEC_ACTIVE**	S	Bit_String	D	4	R
45	**FD_MAINT_ACTIVE**	S	Bit_String	D	4	R
46	**FD_CHECK_ACTIVE**	S	Bit_String	D	4	R
47	**FD_FAIL_MAP**	S	Bit_String	S	4	RW
48	**FD_OFFSPEC_MAP**	S	Bit_String	S	4	RW
49	**FD_MAINT_MAP**	S	Bit_String	S	4	RW
50	**FD_CHECK_MAP**	S	Bit_String	S	4	RW
51	**FD_FAIL_MASK**	S	Bit_String	S	4	RW
52	**FD_OFFSPEC_MASK**	S	Bit_String	S	4	RW
53	**FD_MAINT_MASK**	S	Bit_String	S	4	RW
54	**FD_CHECK_MASK**	S	Bit_String	S	4	RW
55	**FD_FAIL_ALM**	R	DS-87	D	15	RW
56	**FD_OFFSPEC_ALM**	R	DS-87	D	15	RW
57	**FD_MAINT_ALM**	R	DS-87	D	15	RW
58	**FD_CHECK_ALM**	R	DS-87	D	15	RW
59	**FD_FAIL_PRI**	S	Unsigned8	S	1	RW
60	**FD_OFFSPEC_PRI**	S	Unsigned8	S	1	RW
61	**FD_MAINT_PRI**	S	Unsigned8	S	1	RW
62	**FD_CHECK_PRI**	S	Unsigned8	S	1	RW
63	**FD_SIMULATE**	R	DS-89	D	9	RW
64	**FD_RECOMMEN_ACT**	S	Unsigned16	D	2	R
42	**FD_VER**	S	Unsigned16	S	2	R
43	**FD_FAIL_ACTIVE**	S	Bit_String	D	4	R
44	**FD_OFFSPEC_ACTIVE**	S	Bit_String	D	4	R
45	**FD_MAINT_ACTIVE**	S	Bit_String	D	4	R
46	**FD_CHECK_ACTIVE**	S	Bit_String	D	4	R
47	**FD_FAIL_MAP**	S	Bit_String	S	4	RW
48	**FD_OFFSPEC_MAP**	S	Bit_String	S	4	RW
49	**FD_MAINT_MAP**	S	Bit_String	S	4	RW
50	**FD_CHECK_MAP**	S	Bit_String	S	4	RW
51	**FD_FAIL_MASK**	S	Bit_String	S	4	RW
52	**FD_OFFSPEC_MASK**	S	Bit_String	S	4	RW
53	**FD_MAINT_MASK**	S	Bit_String	S	4	RW
54	**FD_CHECK_MASK**	S	Bit_String	S	4	RW
55	**FD_FAIL_ALM**	R	DS-87	D	15	RW
56	**FD_OFFSPEC_ALM**	R	DS-87	D	15	RW
57	**FD_MAINT_ALM**	R	DS-87	D	15	RW
58	**FD_CHECK_ALM**	R	DS-87	D	15	RW
59	**FD_FAIL_PRI**	S	Unsigned8	S	1	RW
60	**FD_OFFSPEC_PRI**	S	Unsigned8	S	1	RW
61	**FD_MAINT_PRI**	S	Unsigned8	S	1	RW
62	**FD_CHECK_PRI**	S	Unsigned8	S	1	RW
63	**FD_SIMULATE**	R	DS-89	D	9	RW
64	**FD_RECOMMEN_ACT**	S	Unsigned16	D	2	R

Note!
For mapping of the alarm data refer to chapter 6.1.2

Tab. 8 Resource Block (cont.)

Index	Parameter Name	Object Type	FMS Data Type	Store	Size (Bytes)	Access
optek specific resource block parameter						
65	**DESCRIPTOR**	S	Visible_String	S	32	R
66	**DEVICE_MESSAGE**	S	Visible_String	S	32	R
67	**DEVICE_INSTAL_DATE**	S	Visible_String	S	16	R
68	**FIRMWARE_VERSION**	S	Visible_String	S	16	R
69	**INFO_ADDRESS_1**	S	Visible_String	S	24	R
70	**INFO_ADDRESS_2**	S	Visible_String	S	24	R
71	**INFO_ADDRESS_3**	S	Visible_String	S	24	R
72	**INFO_ADDRESS_4**	S	Visible_String	S	24	R
73	**INFO_ADDRESS_5**	S	Visible_String	S	24	R
74	**CONFIGURATION_STATUS**	S	Bit_String	S	1	R
75	**SET_LAMP_CHANNEL**	S	Unsigned16	S	1	RW
76	**STATUS_LAMP**	R	DS-Lamp	S	10	R
77	**DETECTOR_MONITOR**	R	DS-Detector	S	16	R
78	**ERROR_NUMBER**	S	Unsigned16	S	2	R
79	**PRODUCT_NAME**	R	DS-P_Name	S	96	R
80	**SENSOR_INFO**	R	DS-Sensor	S	32	R
81	**REMOTE_CONTROL_STATUS**	S	Unsigned8	S	1	R
82	**SET_HOLD**	S	Boolean	S	1	RW
83	**SET_ZERO_POINT**	S	Unsigned16	S	1	RW
84	**SET_PRODUCT**	S	Unsigned16	S	1	RW
85	**CONVERTER_SN**	S	Visible_String	S	16	R
86	**MODEL_NR**	S	Visible_String	S	16	R
87	**SET_UNCERTAIN_AS_BAD**	S	Unsigned8	S	1	RW
88	**SOFTWARE_REV**	S	Visible_String	S	32	R
89	**HARDWARE_REV**	S	Visible_String	S	32	R

Note!
PRODUCT_NAME (index 79)
HARDWARE_REV (index 89)

These two optek specific parameters in the resource block can lead to illustration problems using Emerson AMS Suite (different versions).

Note!
DESCRIPTOR (index 65)
DEVICE_MESSAGE (index 66)
DEVICE_INSTAL_DATE (index 67)

These three parameters contain the operator device description text, entered in SYSTEM SETTING\FIELDBUS menu of the converter.

Data type: Visible String

FIRMWARE_VERSION (index 68)

This parameter contains the current firmware version and date of the converter.

Data type: Visible String

INFO_ADDRESS_x (index 69 - 73)

These parameters contain the information from the SUBASSEMBLY MONITOR of the converter.

Data type: Visible String

CONFIGURATION_STATUS (index 74)

This parameter contains the configuration status of the individual slave circuit cards in summarized form.

Data type: Bit String

0 = There is a problem with the configuration of the corresponding circuit card.
1 = Configuration is OK.

Configuration bit (C4000 / HazeControl)

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
Not used		IO14 / IO16	IO -13	IO-24	MA-11 (2)	MA-11 (1)	MC-02

Configuration bit (C8000I)

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
Not used		IO27	IO -29	MA-17	MA-11 (2)	MA-11 (1)	MC-02

SET_LAMP_CHANNEL (index 75)

With this parameter, the register contents for Status_Lamp (Index 76) and Detector_Monitor (index 77) can be selected according to the selected lamp outputs or optek detector inputs.

The register contents correspond to the values of the corresponding monitor.
Data type: Unsigned16

High byte

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
Not used		-	LAMP F	CHANNEL D	CHANNEL B	CHANNEL C	CHANNEL A

In the high or low nibble, no more than 1 bit shall be set. If 0x00 is transferred as information, the information of LAMP E and CHANNEL A is written into the corresponding registers.

Low byte

Upon writing the parameter, the low byte value can be any value from 0 to 255.
For reading the parameter, the following applies:
0x__00 → Operation product change is executed.
Standby position when writing the value 0x00 for the high byte.
0x__FF → Operation was completed or standby position.

Example
0x00 → lamp E, channel A
0x18 → lamp F, channel D

0x15 → not permitted

At C8000 only optical sensors can be monitored

ERROR_NUMBER (index 78)

Corresponds to the error number currently displayed on the converter display. If you acknowledge the error window locally at the converter, the parameter is set to zero and the error number cannot be read via FOUNDATION Fieldbus™ anymore.

Data type: Unsigned16

PRODUCT_NAME (index 79)

This parameter contains a data structure with the name of all products.

Data type: DS-P_Name (see chapter Device Spec. Data structures)

SENSOR_INFO (index 80)

This parameter contains a data structure with the sensor serial number and the sensor model type entered in SYSTEM SETTING\..... menu of the converter. The mapping is independent from the physical input.
At the C8000, the first four System Data Memo, was readable via FOUNDATION Fieldbus™ Interface.

C4000/Haze Control

SYSTEM DATA SENSOR	MAPPED TO CHANNEL
1	A
2	B
3	C
4	D

C8000

SYSTEM DATA MEMO	MAPPED TO CHANNEL
1	A
2	B
3	C
4	D

Data type: DS-Sensor (see chapter Device Spec. Data structures)

REMOTE_CONTROL_STATUS (index 81)

With this parameter you can read which remote functionalities can be released in the C4000 / Haze Control or C8000 software.

Data type: Unsigned8

1 = Corresponding function in converter is released via bus.
0 = Corresponding function in converter is blocked via bus.

0x00000101 = The product change function (via parameter slot index 67) is not possible via FOUNDATION Fieldbus™ Interface. The other two remote functions are released.

Configuration bit (C4000 / Haze Control)

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
Not used					HOLD	PRODUCT CHANGE	SYSTEM ZERO POINT

Configuration bit (C8000)

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
Not used						PRODUCT CHANGE	SYSTEM ZERO POINT

SET_HOLD (index 82)

With this parameter, hold can be triggered or cancelled in the converter via FOUNDATION Fieldbus™ Interface. (only for C4000 / Haze Control)

Data type: Boolean

0x00 → false converter disables an existing system hold state.
0xFF → true converter enables a system hold state.

SET_ZERO_POINT (index 83)

With this parameter, the zero point for the corresponding measuring result can be read in and set according to the software description.

Data type: Unsigned16 as single bits

High byte

Configuration bit (C4000 / Haze Control)

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
Not used				Zero point M04	Zero point M03	Zero point M02	Zero point M01

Configuration bit (C8000)

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
Not used							Zero point global

Low byte

Upon writing the parameter, the low byte value can be any value from 0 to 255.
For reading the parameter, the following applies:
0x__00 → High byte (see above);
Low byte operation is executed.
0x00FF → Operation was completed or standby position.
Example:
0x0300 = Read in zero point for measuring results M01 and M02.
0x0B00 = Read in zero point for measuring results M01, M02 and M04.

Only optical measurements can be set to zero.

SET_PRODUCT (index 84)

With this parameter you can load a configured product in the converter.
Data type: Unsigned16

High byte

0x01 → change to product 1
0x02 → change to product 2
0x03 → change to product 3
0x04 → change to product 4
0x05 → change to product 5
0x06 → change to product 6
0x07 → change to product 7
0x08 → change to product 8

Low byte

Upon writing the parameter, the low byte value can be any value from 0 to 255.
For reading the parameter, the following applies:
0x__00 → Operation product change is executed.
Standby position when writing the value 0x00 for the high byte.
0x__FF → Operation was completed or standby position.

Note!
Using AMS Suite from Emerson (different versions) for product change can lead to problems, as product names will not be displayed. With other configuration tools this problem is not known.

CONVERTER_SN (index 85)

This parameter contains the serial number of the converter.

Data type: Visible String

MODEL_NR (index 86)

This parameter contains the converter name string.

Data type: Visible String

SET_UNCERTAIN_AS_BAD (index 87)

With this parameter you could manipulate the process status information.

Data type: Unsigned8.

You can select whether a status process value is mapped from UNCERTAIN to BAD.

0 = UNCERTAIN is displayed.
1 = UNCERTAIN is automatically mapped on BAD state.

SOFTWARE_REV (index 88)

This parameter contains the software revision of the FOUNDATION Fieldbus™ interface board.

Data type: Visible String

HARDWARE_REV (index 89)

This parameter contains the hardware revision of the FOUNDATION Fieldbus™ interface board.

Data type: Visible String

Note!
Using Emerson AMS Suite the parameter value will be displayed, but the headline of the corresponding value is not. This is due to the fact that a tag in the manufacturer specific dictionary is not read correctly.

6.1.1 View Object for Resource Block

Tab. 9 View Object Resource Block

Index	Parameter Name	View			
		1	2	3	4
1	**ST_REV**	2	2	2	2
2	**TAG_DESC**				
3	**STRATEGY**				2
4	**ALERT_KEY**				1
5	**MODE_BLK**	4		4	
6	**BLOCK_ERR**	2		2	
7	**RS_STATE**	1		1	
8	**TEST_RW**				
9	**DD_RESOURCE**				
10	**MANUFAC_ID**				4
11	**DEV_TYPE**				2
12	**DEV_REV**				1
13	**DD_REV**				1
14	**GRANT_DENY**		2		
15	**HARD_TYPES**				2
16	**RESTART**				
17	**FEATURES**				2
18	**FEATURES_SEL**		2		
19	**CYCLE_TYPE**				2
20	**CYCLE_SEL**		2		
21	**MIN_CYCLE_T**				4
22	**MEMORY_SIZE**				2
23	**NV_CYCLE_T**		4		
24	**FREE_SPACE**		4		
25	**FREE_TIME**	4		4	
26	**SHED_RCAS**		4		
27	**SHED_ROUT**		4		
28	**FAULT_STATE**	1		1	
29	**SET_FSTATE**				
30	**CLR_FSTATE**				
31	**MAX_NOTIFY**				1
32	**LIM_NOTIFY**		1		
33	**CONFIRM_TIME**		4		
34	**WRITE_LOCK**		1		
35	**UPDATE_EVT**				
36	**BLOCK_ALM**				
37	**ALARM_SUM**	8		8	
38	**ACK_OPTIONS**				2
39	**WRITE_PRI**				1
40	**WRITE_ALM**				
41	**ITK_VER**				2
42	**FD_VER**				2
43	**FD_FAIL_ACTIVE**	4		4	
44	**FD_OFFSPEC_ACTIVE**	4		4	
45	**FD_MAINT_ACTIVE**	4		4	
46	**FD_CHECK_ACTIVE**	4		4	
47	**FD_FAIL_MAP**				4
48	**FD_OFFSPEC_MAP**				4
49	**FD_MAINT_MAP**				4
50	**FD_CHECK_MAP**				4

51	**FD_FAIL_MASK**				4
52	**FD_OFFSPEC_MASK**				4
53	**FD_MAINT_MASK**				4
54	**FD_CHECK_MASK**				4
55	**FD_FAIL_ALM**				
56	**FD_OFFSPEC_ALM**				
57	**FD_MAINT_ALM**				
58	**FD_CHECK_ALM**				
59	**FD_FAIL_PRI**				1
60	**FD_OFFSPEC_PRI**				1
61	**FD_MAINT_PRI**				1
62	**FD_CHECK_PRI**				1
63	**FD_SIMULATE**			9	
64	**FD_RECOMMEN_ACT**	2		2	
65	**DESCRIPTOR**				32
66	**DEVICE_MESSAGE**				32
67	**DEVICE_INSTAL_DATE**				16
68	**FIRMWARE_VERSION**				16
69	**INFO_ADDRESS_1**				24
70	**INFO_ADDRESS_2**				24
71	**INFO_ADDRESS_3**				24
72	**INFO_ADDRESS_4**				24
73	**INFO_ADDRESS_5**				24
74	**CONFIGURATION_STATUS**				1
75	**SET_LAMP_CHANNEL**				1
76	**STATUS_LAMP**				10
77	**DETECTOR_MONITOR**				16
78	**ERROR_NUMBER**				2
79	**PRODUCT_NAME**		96		
80	**SENSOR_INFO**				32
81	**REMOTE_CONTROL_STATUS**				1
82	**SET_HOLD**				1
83	**SET_ZERO_POINT**				1
84	**SET_PRODUCT**				1
85	**CONVERTER_SN**		16		
86	**MODEL_NR**		16		
87	**SET_UNCERTAIN_AS_BAD**				1
88	**SOFTWARE_REV**				32
89	**HARDWARE_REV**				32

6.1.2 FF Field Diagnostic Alarms

Assignment of the RB parameters according to FF Field Diagnostic Profile (FF-912).

Tab. 10 Field Diagnostic Alarms

Manuf Spec.Cond.		Description	NAMUR Class	Recommended Action
Byte	Bit in Byte_String			
0	0	CHECK	Check Function	Set Transducer Block into AUTO mode
	1	-		*1)
	2	-		*1)
	3	-		*1)
	4	-		*1)
	5	-		*1)
	6	-		*1)
	7	-		*1)
1	8	SIGNAL LOSS MEASUREMENT VALUE 1	Off Specification	optek internal error: Signal Loss in one channel please check
	9	SIGNAL LOSS MEASUREMENT VALUE 2		optek internal error: Signal Loss in one channel please check
	10	SIGNAL LOSS MEASUREMENT VALUE 3		optek internal error: Signal Loss in one channel please check
	11	SIGNAL LOSS MEASUREMENT VALUE 4		optek internal error: Signal Loss in one channel please check
	12	SIGNAL LOSS MEASUREMENT VALUE 5		optek internal error: Signal Loss in one channel please check
	13	SIGNAL LOSS MEASUREMENT VALUE 6		optek internal error: Signal Loss in one channel please check
	14	SIGNAL LOSS MEASUREMENT VALUE 7		optek internal error: Signal Loss in one channel please check
	15	SIGNAL LOSS MEASUREMENT VALUE 8		optek internal error: Signal Loss in one channel please check
2	16	ERROR NUMBER AVAILABLE	Check Function	optek internal error: Internal Diagnostic Information available
	17	NO ISB COMMUNICATION		optek internal error: No communication on internal serial bus
	18	NO MODBUS COMMUNICATION		optek internal error: No MODBUS communication
	19	-		*1)
	20	-		*1)
	21	-		*1)
	22	-		*1)
	23	-		*1)
3	24	Flag when Error 1402 (TEMP_HI) occure	Failed	optek internal error: Maintenance required (Temp_HI)
	25	-		*1)
	26	-		*1)
	27	-		*1)
	28	-		*1)
	29	-		*1)
	30	-		*1)
	31	HW failure		optek internal error: Maintenance required (HW failure)

Note!
Signal Loss Measurement Value x will only occur in the field diagnostic alarms if the Resource Block parameter (index 87 - "SET_UNCERTAIN_AS_BAD") is set to Yes (1). Otherwise the Signal Loss is a permitted operating condition.

Note!
*1) Alarms, which are not used in the device specification of the converter, are always set to active during configuration. These alarms should not be an issue, as no error source in our converter is dedicated to these alarms. Nevertheless if these alarms interfere, you can switch them off manually in your configuration software (see Fig. 16).

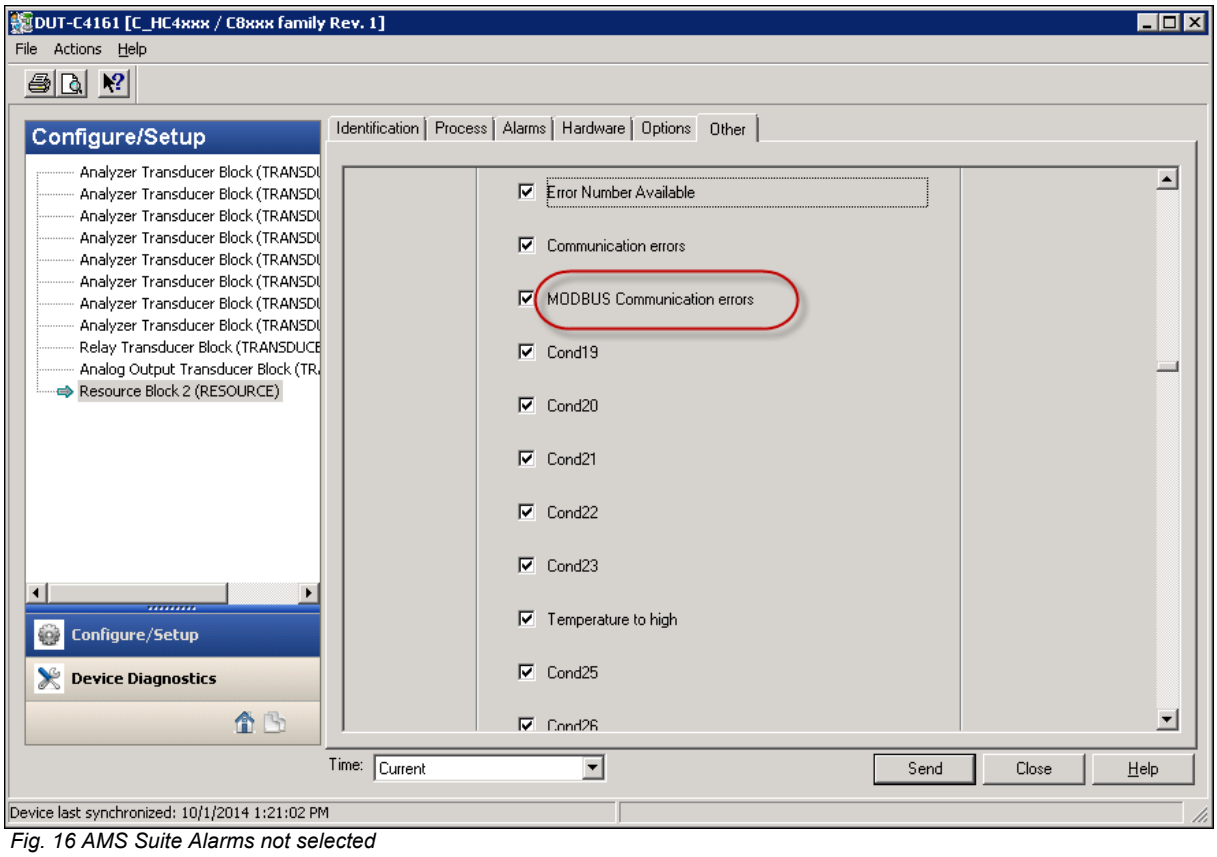


Fig. 16 AMS Suite Alarms not selected

6.2 *Analyzer Transducer Block*

Tab. 11 Analyzer Transducer Block

Index	Parameter Name	Object Type	FMS Data Type	Store	Size (Bytes)	Access
The standard FOUNDATION Fieldbus™ tranceducer block parameter						
1	**ST_REV**	S	Unsigned16	S	2	R
2	**TAG_DESC**	S	Octet String	S	32	RW
3	**STRATEGY**	S	Unsigned16	S	2	RW
4	**ALERT_KEY**	S	Unsigned8	S	1	RW
5	**MODE_BLK**	R	DS-69	D	4	RW
6	**BLOCK_ERR**	S	Bit_String	D	2	R
7	**UPDATE_EVT**	R	DS-73	D	14	RW
8	**BLOCK_ALM**	R	DS-72	D	13	RW
9	**TRANSDUCER_DIRECTORY**	A	Unsigned16	N	2	R
10	**TRANSDUCER_TYPE**	S	Unsigned16	S	2	R
11	**XD_ERROR**	S	Unsigned8	D	1	R
12	**COLLECTION_DIRECTORY**	A	Unsigend32	S	4	R
13	**PRIMARY_VALUE**	R	DS-65	D	5	R
14	**PV_UNIT**	S	Unsigned16	S	2	R
optek specific tranceducer block parameter						
15	**PV_TEXTUAL_UNIT**	R	VisiableString	S	8	R
16	**RANGE**	R	DS-Range	S	8	R
17	**PRODUCT**	S	VisiableString	S	12	R
18	**OUT_mA**	S	Float	D	4	R

Note!
PV_Unit (index 14)
Textual Unit (0x8000) → For Textual Unit read the index 15

PV_TEXTUAL_Unit (index 15)
This parameter contains Unit for the PRIMARY_VALUE.

RANG (index 16)
This parameter contains Unit for the PRIMARY_VALUE.

PRODUCT (index 17)
This parameter contains current name of the used PRODUCT.

OUT_mA (index 18)
The TB number correspond with the physical number of the mA output

The mA output allocation is adjustable in C8000; therefore the assignment of the output value to the mA parameter in the TB can be different. In the default setting of the converter, the assignment is given.

Example:
Analyzer Transducer Block 2 (32864_2) → mA Value from mA-Output Channel 2

Note!
UPDATE_EVT (index 7)
TRANSDUCER_TYPE (index 10)
XD_ERROR (index 11)

Using AMS Suite from Emerson (different versions) of these parameters in the Transducer Block can lead to illustration problems. This problem is not known with other configuration tools.

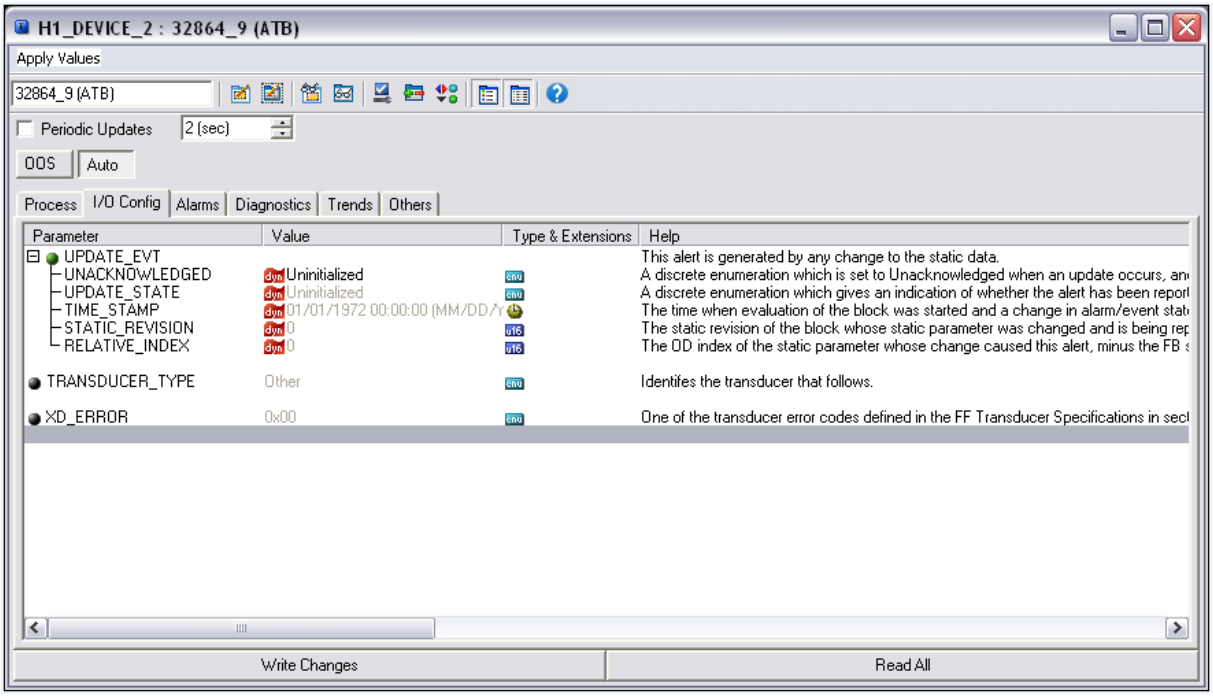


Fig. 17 Illustration problems with AMS Suite from Emerson

6.2.1 View Object for Analyzer Transducer Block

Tab. 12 View Object Analyzer Transducer Block

Index	Parameter Name	View			
		1	2	3	4
1	**ST_REV**	2	2	2	2
2	**TAG_DESC**				
3	**STRATEGY**			2	
4	**ALERT_KEY**	4		4	
5	**MODE_BLK**	2		2	
6	**BLOCK_ERR**				
7	**UPDATE_EVT**				
8	**BLOCK_ALM**				
9	**TRANSDUCER_DIRECTORY**				
10	**TRANSDUCER_TYPE**	2	2	2	2
11	**XD_ERROR**	1		1	
12	**COLLECTION_DIRECTORY**				
13	**PRIMARY_VALUE**	5		5	
14	**PV_UNIT**		2		
15	**PV_TEXTUAL_UNIT**		8		
16	**RANGE**				8
17	**PRODUCT**				12
18	**OUT_mA**	4		4	

6.3 *Relay Transducer Block*

Tab. 13 Relay Transducer Block

Index	Parameter Name	Object Type	FMS Data Type	Store	Size (Bytes)	Access
The standard FOUNDATION Fieldbus™ tranceducer block parameter						
1	**ST_REV**	S	Unsigned16	S	2	R
2	**TAG_DESC**	S	Octet String	S	32	RW
3	**STRATEGY**	S	Unsigned16	S	2	RW
4	**ALERT_KEY**	S	Unsigned8	S	1	RW
5	**MODE_BLK**	R	DS-69	D	4	RW
6	**BLOCK_ERR**	S	Bit_String	D	2	R
7	**UPDATE_EVT**	R	DS-73	D	14	RW
8	**BLOCK_ALM**	R	DS-72	D	13	RW
9	**TRANSDUCER_DIRECTORY**	A	Unsigned16	N	2	R
10	**TRANSDUCER_TYPE**	S	Unsigned16	S	2	R
11	**XD_ERROR**	S	Unsigned8	D	1	R
12	**COLLECTION_DIRECTORY**	A	Unsigend32	S	4	R
optek specific tranceducer block parameter						
13	**PV_D1**	R	DS-66	D	2	R
14	**PV_D2**	R	DS-66	D	2	R
15	**PV_D3**	R	DS-66	D	2	R
16	**PV_D4**	R	DS-66	D	2	R

Note!
PV_Dx (index 13 – 16)

PV_Dx	C4000 / HazeControl	C8000
1	System relay	System relay
2	Limit relay 1	n.c.
3	Limit relay 2	n.c.
4	Limit relay 3	n.c.

6.3.1 View Object for Relay Transducer Block

Tab. 14 View Object Relay Transducer Block

Index	Parameter Name	View			
		1	2	3	4
1	**ST_REV**	2	2	2	2
2	**TAG_DESC**				
3	**STRATEGY**			2	
4	**ALERT_KEY**	4		4	
5	**MODE_BLK**	2		2	
6	**BLOCK_ERR**				
7	**UPDATE_EVT**				
8	**BLOCK_ALM**				
9	**TRANSDUCER_DIRECTORY**				
10	**TRANSDUCER_TYPE**	2	2	2	2
11	**XD_ERROR**	1		1	
12	**COLLECTION_DIRECTORY**				
13	**PV_D1**	2		2	
14	**PV_D2**	2		2	
15	**PV_D3**	2		2	
16	**PV_D4**	2		2	

6.4 *Analog Output Transducer Block*

Tab. 15 Analog Outputr Transducer Block

Index	Parameter Name	Object Type	FMS Data Type	Store	Size (Bytes)	Access
The standard FOUNDATION Fieldbus™ tranceducer block parameter						
1	**ST_REV**	S	Unsigned16	S	2	R
2	**TAG_DESC**	S	Octet String	S	32	RW
3	**STRATEGY**	S	Unsigned16	S	2	RW
4	**ALERT_KEY**	S	Unsigned8	S	1	RW
5	**MODE_BLK**	R	DS-69	D	4	RW
6	**BLOCK_ERR**	S	Bit_String	D	2	R
7	**UPDATE_EVT**	R	DS-73	D	14	RW
8	**BLOCK_ALM**	R	DS-72	D	13	RW
9	**TRANSDUCER_DIRECTORY**	A	Unsigned16	N	2	R
10	**TRANSDUCER_TYPE**	S	Unsigned16	S	2	R
11	**XD_ERROR**	S	Unsigned8	D	1	R
12	**COLLECTION_DIRECTORY**	A	Unsigend32	S	4	R
optek specific tranceducer block parameter						
13	**PV_1**	R	DS-65	D	4	R
14	**PV_2**	R	DS-65	D	4	R

Note!
Analog Output Transducer Block is only functional on C4000 / HazeControl converters.

6.4.1 View Object Analog Output Transducer Block

Tab. 16 View Object Analyzer Transducer Block

Index	Parameter Name	View			
		1	**2**	**3**	**4**
1	**ST_REV**	2	2	2	2
2	**TAG_DESC**				
3	**STRATEGY**			2	
4	**ALERT_KEY**	4		4	
5	**MODE_BLK**	2		2	
6	**BLOCK_ERR**				
7	**UPDATE_EVT**				
8	**BLOCK_ALM**				
9	**TRANSDUCER_DIRECTORY**				
10	**TRANSDUCER_TYPE**	2	2	2	2
11	**XD_ERROR**	1		1	
12	**COLLECTION_DIRECTORY**				
13	**PV_1**	5		5	
14	**PV_2**	5		5	

6.5 *Function Block Channel configuration*

Tab. 17 Analog Outputr Transducer Block

Index	Block	Parameter Name	Index	C4000 HazeControl	C8000
Only valid in AI FB					
1	Analyzer TB 1	**PRIMARY_VALUE**	13	use	use
2	Analyzer TB 2	**PRIMARY_VALUE**	13	use	use
3	Analyzer TB 3	**PRIMARY_VALUE**	13	use	use
4	Analyzer TB 4	**PRIMARY_VALUE**	13	use	use
5	Analyzer TB 5	**PRIMARY_VALUE**	13	n.c.	use
6	Analyzer TB 6	**PRIMARY_VALUE**	13	n.c.	use
7	Analyzer TB 7	**PRIMARY_VALUE**	13	n.c.	use
8	Analyzer TB 8	**PRIMARY_VALUE**	13	n.c.	use
Only valid in DI FB					
9	Relay TB	PV_D1	13	use	use
10	Relay TB	PV_D2	14	use	n.c.
11	Relay TB	PV_D3	15	use	n.c.
12	Relay TB	PV_D4	16	use	n.c.
Only valid in AO FB					
13	**AO TB**	PV_1	13	use	n.c.
14	**AO TB**	PV_2	14	use	n.c.

Note!
CHANNEL parameter configuration depends on the device features.

Measuring value MV1 corresponds with PRIMARY_VALUE of the Analyzer TB1
Measuring value MV2 corresponds with PRIMARY_VALUE of the Analyzer TB2
Measuring value MV3 corresponds with PRIMARY_VALUE of the Analyzer TB3
Measuring value MV4 corresponds with PRIMARY_VALUE of the Analyzer TB4
Measuring value MV5 corresponds with PRIMARY_VALUE of the Analyzer TB5
Measuring value MV6 corresponds with PRIMARY_VALUE of the Analyzer TB6
Measuring value MV7 corresponds with PRIMARY_VALUE of the Analyzer TB7
Measuring value MV8 corresponds with PRIMARY_VALUE of the Analyzer TB8

Status Relay1 corresponds with PV_D1 of the Relay TB
Status Relay2 corresponds with PV_D2 of the Relay TB
Status Relay3 corresponds with PV_D3 of the Relay TB
Status Relay4 corresponds with PV_D4 of the Relay TB

mA-IN1 corresponds with PV_1 of the AO TB
mA-IN2 corresponds with PV_2 of the AO TB

To see an overview of the C4000 / Haze Control Foundation Fieldbus Interface please refer to Fig. 2, on page 11. For the C8000 Foundation Fieldbus Interface refer to Fig. 3, on page 14.

6.6 *AI Function Block*

This block takes the analog input data from the input signal of the converter and it makes available to other function blocks. It has scaling conversion, filtering, square root, low cut and alarm processing.

Tab. 18 AI Function Block

Index	Parameter Name	Object Type	FMS Data Type	Store	Size (Bytes)	Access
1	**ST_REV**	S	Unsigned16	S	2	R
2	**TAG_DESC**	S	Octet String	S	32	RW
3	**STRATEGY**	S	Unsigned16	S	2	RW
4	**ALERT_KEY**	S	Unsigned8	S	1	RW
5	**MODE_BLK**	R	DS-69	D	4	RW
6	**BLOCK_ERR**	S	Bit_String	D	2	R
7	**PV**	R	DS-65	D	5	R
8	**OUT**	R	DS-65	D	5	R
9	**SIMULATE**	R	DS-82	D	11	RW
10	**XD_SCALE**	R	DS-68	S	11	RW
11	**OUT_SCALE**	R	DS-68	S	11	RW
12	**GRANT_DENY**	R	DS-70	D	2	RW
13	**IO_OPTS**	S	Bit_String	S	2	RW
14	**STATUS_OPTS**	S	Bit_String	S	2	RW
15	**CHANNEL**	S	Unsigned16	S	2	RW
16	**L_TYPE**	S	Unsigned8	S	1	RW
17	**LOW_CUT**	S	Float	S	4	RW
18	**PV_FTIME**	S	Float	S	4	RW
19	**FIELD_VAL**	R	DS-65	D	5	R
20	**UPDATE_EVT**	R	DS-73	D	14	RW
21	**BLOCK_ALM**	R	DS-72	D	13	RW
22	**ALARM_SUM**	R	DS-74	S	8	RW
23	**ACK_OPTION**	S	Bit_String	S	2	RW
24	**ALARM_HYS**	S	Float	S	4	RW
25	**HI_HI_PRI**	S	Unsigned8	S	1	RW
26	**HI_HI_LIM**	S	Float	S	4	RW
27	**HI_PRI**	S	Unsigned8	S	1	RW
28	**HI_LIM**	S	Float	S	4	RW
29	**LO_PRI**	S	Unsigned8	S	1	RW
30	**LO_LIM**	S	Float	S	4	RW
31	**LO_LO_PRI**	S	Unsigned8	S	1	RW
32	**LO_LO_LIM**	S	Float	S	4	RW
33	**HI_HI_ALM**	R	DS-71	D	16	RW
34	**HI_ALM**	R	DS-71	D	16	RW
35	**LO_ALM**	R	DS-71	D	16	RW
36	**LO_LO_ALM**	R	DS-71	D	16	RW
37	**BLOCK_ERR_DESC_1**	S	Bit_String	D	4	R

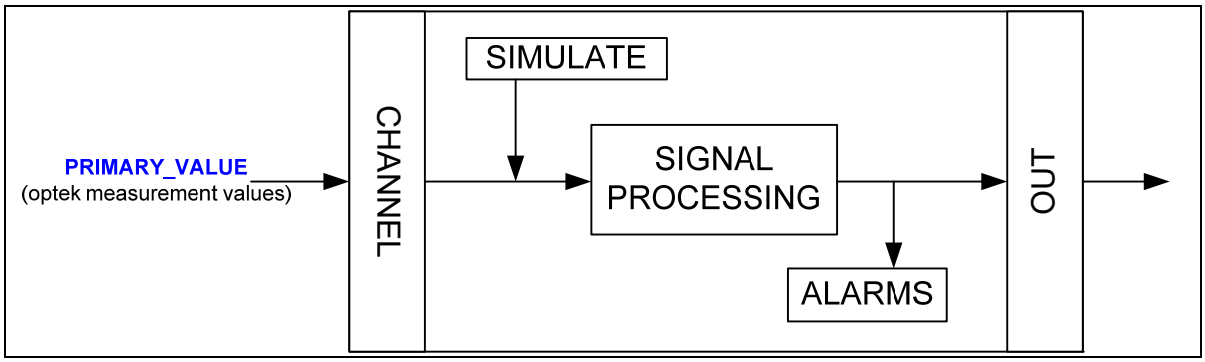


Fig. 18 Internal structure of the AI block.

Note!
XD_SCALE (index 10)
Using AMS Suite from Emerson (different versions) for this parameter leads to an illustration problem. Instead of the optek specific code 32768 with the text module “Textual Unit” an empty selection window is shown. Nevertheless to configure this block only the empty field has to be chosen (see Fig. 19).

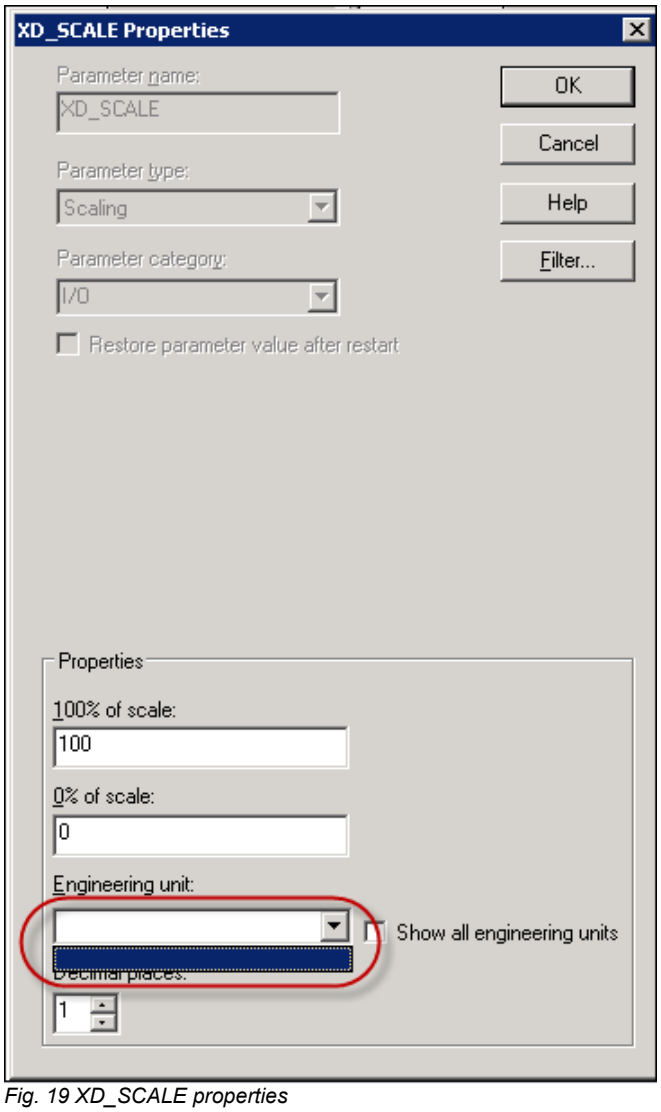


Fig. 19 XD_SCALE properties

6.6.1 View Object for AI Function Block

Tab. 19 View Object AI Function Block

Index	Parameter Name	View			
		1	2	3	4
1	**ST_REV**	2	2	2	2
2	**TAG_DESC**				
3	**STRATEGY**				2
4	**ALERT_KEY**				1
5	**MODE_BLK**	4		4	
6	**BLOCK_ERR**	2		2	
7	**PV**	5		5	
8	**OUT**	5		5	
9	**SIMULATE**				
10	**XD_SCALE**		11		
11	**OUT_SCALE**		11		
12	**GRANT_DENY**		2		
13	**IO_OPTS**				2
14	**STATUS_OPTS**				2
15	**CHANNEL**				2
16	**L_TYPE**				1
17	**LOW_CUT**				4
18	**PV_FTIME**				4
19	**FIELD_VAL**	5		5	
20	**UPDATE_EVT**				
21	**BLOCK_ALM**				
22	**ALARM_SUM**	8		8	
23	**ACK_OPTION**				2
24	**ALARM_HYS**				4
25	**HI_HI_PRI**				1
26	**HI_HI_LIM**				4
27	**HI_PRI**				1
28	**HI_LIM**				4
29	**LO_PRI**				1
30	**LO_LIM**				4
31	**LO_LO_PRI**				1
32	**LO_LO_LIM**				4
33	**HI_HI_ALM**				
34	**HI_ALM**				
35	**LO_ALM**				
36	**LO_LO_ALM**				
37	**BLOCK_ERR_DESC_1**				

6.7 *DI Function Block*

This block takes the discrete input data from the relay output from the converter and it makes the relay status available to other function blocks. It has the option to invert, filter and process alarms.

Tab. 20 DI Function Block

Index	Parameter Name	Object Type	FMS Data Type	Store	Size (Bytes)	Access
1	**ST_REV**	S	Unsigned16	S	2	R
2	**TAG_DESC**	S	Octet String	S	32	RW
3	**STRATEGY**	S	Unsigned16	S	2	RW
4	**ALERT_KEY**	S	Unsigned8	S	1	RW
5	**MODE_BLK**	R	DS-69	D	4	RW
6	**BLOCK_ERR**	S	Bit_String	D	2	R
7	**PV_D**	R	DS-66	D	2	R
8	**OUT_D**	R	DS-66	D	2	R
9	**SIMULATE_D**	R	DS-83	D	5	RW
10	**XD_STATE**	S	Unsigned16	S	2	RW
11	**OUT_STATE**	R	DS-66	S	2	RW
12	**GRANT_DENY**	R	DS-70	D	2	RW
13	**IO_OPTS**	S	Bit_String	S	2	RW
14	**STATUS_OPTS**	S	Bit_String	S	2	RW
15	**CHANNEL**	S	Unsigned16	S	2	RW
16	**PV_FTIME**	S	Float	S	4	RW
17	**FIELD_VAL_D**	R	DS-66	D	5	R
18	**UPDATE_EVT**	R	DS-73	D	14	RW
19	**BLOCK_ALM**	R	DS-72	D	13	RW
20	**ALARM_SUM**	R	DS-74	S	8	RW
21	**ACK_OPTION**	S	Bit_String	S	2	RW
22	**DISC_PRI**	S	Unsigned8	S	1	RW
23	**DISC_LIM**	S	Unsigned8	S	1	RW
24	**DISC_ALM**	S	DS-72	S	13	RW
25	**BLOCK_ERR_DESC_1**	S	Bit_String	D	4	R

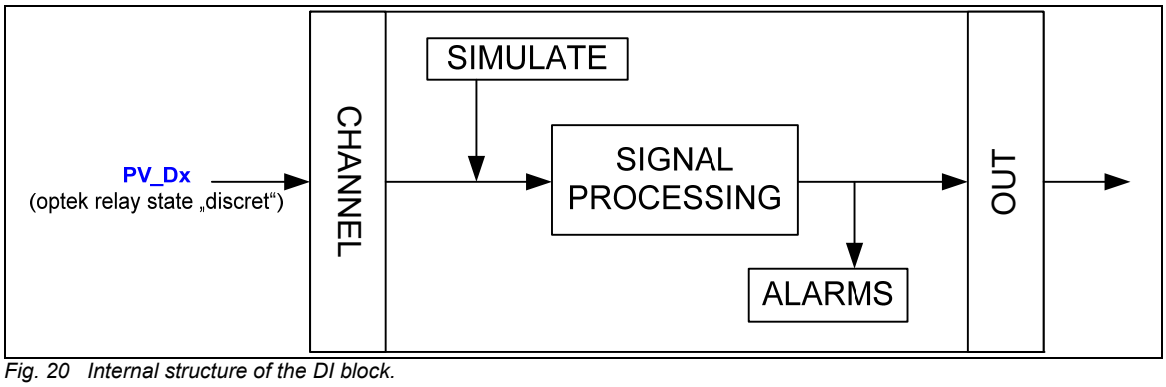


Fig. 20 Internal structure of the DI block.

6.7.1 View Object for DI Function Block

Tab. 21 View Object DI Function Block

Index	Parameter Name	View			
		1	2	3	4
1	**ST_REV**	2	2	2	2
2	**TAG_DESC**				
3	**STRATEGY**				2
4	**ALERT_KEY**				1
5	**MODE_BLK**				
6	**BLOCK_ERR**	4		4	
7	**PV_D**	2		2	
8	**OUT_D**	2		2	
9	**SIMULATE_D**	2		2	
10	**XD_STATE**		2		
11	**OUT_STATE**		2		
12	**GRANT_DENY**		2		
13	**IO_OPTS**				2
14	**STATUS_OPTS**				2
15	**CHANNEL**				2
16	**PV_FTIME**				4
17	**FIELD_VAL_D**	2		2	
18	**UPDATE_EVT**				
19	**BLOCK_ALM**				
20	**ALARM_SUM**	8		8	
21	**ACK_OPTION**				2
22	**DISC_PRI**				1
23	**DISC_LIM**				1
24	**DISC_ALM**				
25	**BLOCK_ERR_DESC_1**				

6.8 *AO Function Block*

The AO block provides an analog value to emulate the mA-Input signal for C4000 / Haze Control converters. It provides value and rate limiting, scaling conversion and fault state.

Tab. 22 AO Function Block

Index	Parameter Name	Object Type	FMS Data Type	Store	Size (Bytes)	Access
1	**ST_REV**	S	Unsigned16	S	2	R
2	**TAG_DESC**	S	Octet String	S	32	RW
3	**STRATEGY**	S	Unsigned16	S	2	RW
4	**ALERT_KEY**	S	Unsigned8	S	1	RW
5	**MODE_BLK**	R	DS-69	D	4	RW
6	**BLOCK_ERR**	S	Bit_String	D	2	R
7	**PV**	R	DS-65	D	5	R
8	**SP**	R	DS-65	D	5	R
9	**OUT**	R	DS-65	D	5	RW
10	**SIMULATE**	R	DS-82	D	20	RW
11	**PV_SCALE**	R	DS-68	S	11	RW
12	**XD_SCALE**	R	DS-68	S	11	RW
13	**GRANT_DENY**	R	DS-70	D	2	RW
14	**IO_OPTS**	S	Bit_String	S	2	RW
15	**STATUS_OPTS**	S	Bit_String	S	2	RW
16	**READBACK**	R	DS-65	D	5	R
17	**CAS_IN**	R	DS-65	D	5	R
18	**SP_RATE_DN**	S	Float	S	4	
19	**SP_RATE_UP**	S	Float	S	4	
20	**SP_HI_LIM**	S	Float	S	4	
21	**SP_LO_LIM**	S	Float	S	4	
22	**CHANNEL**	S	Unsigned16	S	2	RW
23	**FSTATE_TIME**	S	Float	S	4	RW
24	**FSTATE_VAL**	S	Float	S	4	
25	**BKCAL_OUT**	R	DS-65	D	5	R
26	**RCAS_IN**	R	DS-65	D	5	
27	**SHED_OPT**	S	Unsigned8	S	1	R
28	**RCAS_OUT**	R	DS-65	D	5	R
29	**UPDATE_EVT**	R	DS-73	D	14	RW
30	**BLOCK_ALM**	R	DS-72	D	13	RW
31	**BLOCK_ERR_DESC_1**	S	Bit_String	D	4	R

Note!
How to configure the analog outputs (for C4xxx / HC4xxx only) with the NI configurator is shown in the appendix. Please refer to chapter 7.3 on page 63.

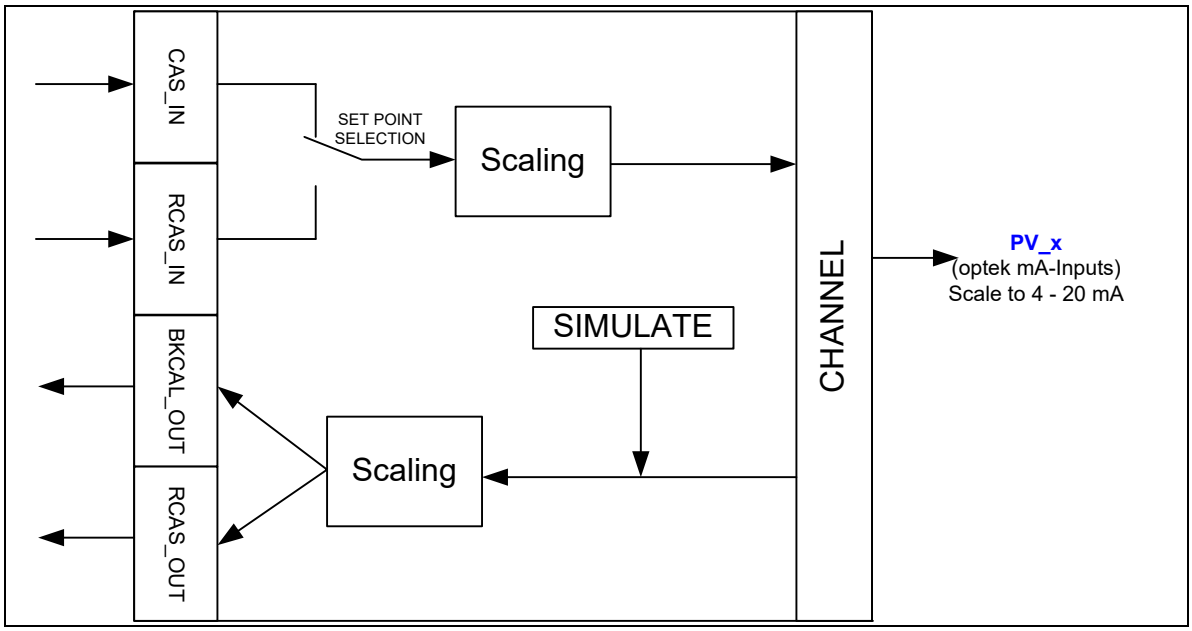


Fig. 21 internal structure of the AO block.

6.8.1 View Object for AO Function Block

Tab. 23 View Object AO Function Block

Index	Parameter Name	View			
		1	2	3	4
1	**ST_REV**	2	2	2	2
2	**TAG_DESC**				
3	**STRATEGY**				2
4	**ALERT_KEY**				1
5	**MODE_BLK**	4		4	
6	**BLOCK_ERR**	2		2	
7	**PV**	5		5	
8	**SP**	5		5	
9	**OUT**	5		5	
10	**SIMULATE**				
11	**PV_SCALE**		11		
12	**XD_SCALE**		11		
13	**GRANT_DENY**		2		
14	**IO_OPTS**				3
15	**STATUS_OPTS**				3
16	**READBACK**	5		5	
17	**CAS_IN**	5		5	
18	**SP_RATE_DN**				4
19	**SP_RATE_UP**				4
20	**SP_HI_LIM**		4		
21	**SP_LO_LIM**		4		
22	**CHANNEL**				2
23	**FSTATE_TIME**				4
24	**FSTATE_VAL**				4
25	**BKCAL_OUT**			5	
26	**RCAS_IN**			5	
27	**SHED_OPT**				1
28	**RCAS_OUT**			5	
29	**UPDATE_EVT**				
30	**BLOCK_ALM**				
31	**BLOCK_ERR_DESC_1**				

6.9 *Device specific data structures*

6.9.1 DS-Lamp

Tab. 24 DS-Lamp

Data Structure Identifier	DS Size (Byte)	Parameter	Data Type of Component	Size (Bytes)
DS-Lamp	10	LAMP_ON	Boolean	1
		SENSOR_ON_LAMP	Unsigned8	1
		LAMP_VOLTAGE_(V)	Float	4
		LAMP_CURRENT_(mA)	Float	4

6.9.2 DS-Detector

Tab. 25 DS-Detector

Data Structure Identifier	DS Size (Byte)	Parameter	Data Type of Component	Size (Bytes)
DS-Detector	16	PHOTO_CURRENT_(nA)	Float	4
		ZERO_CURRENT_(nA)	Float	4
		PHOTO_CURRENT_(CU)	Float	4
		PHOTO_CURRENT_ISA_(CU)	Float	4

6.9.3 DS-P_Name

Tab. 26 DS-P_Name

Data Structure Identifier	DS Size (Byte)	Parameter	Data Type of Component	Size (Bytes)
DS-P_Name	96	PRODUCT_1	VisibleString	12
		PRODUCT_2	VisibleString	12
		PRODUCT_3	VisibleString	12
		PRODUCT_4	VisibleString	12
		PRODUCT_5	VisibleString	12
		PRODUCT_6	VisibleString	12
		PRODUCT_7	VisibleString	12
		PRODUCT_8	VisibleString	12

6.9.4 DS-Sensor

Tab. 27 DS-Sensor

Data Structure Identifier	DS Size (Byte)	Parameter	Data Type of Component	Size (Bytes)
DS-Sensor	32	SENSOR_SN	VisibleString	16
		SENSOR_TYPE	VisibleString	16

6.9.5 DS-Range

Tab. 28 DS-Range

Data Structure Identifier	DS Size (Byte)	Parameter	Data Type of Component	Size (Bytes)
DS-Range	8	BEGIN_OF_RANGE	Float	4
		END_OF_RANGE	Float	4

6.10 *Number display format*

All float values are indicated according to float format ieee754.

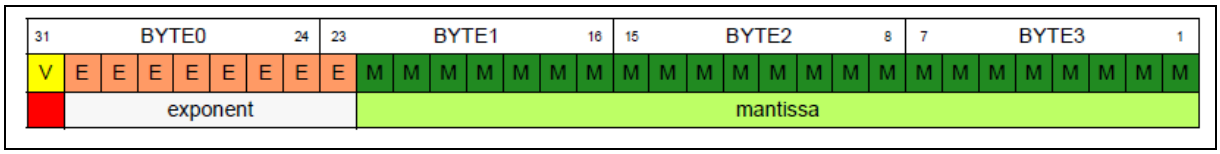


Fig. 22 Number display format

7 Appendix

7.1 Emerson device installation kit

For optek converters to be used with Emerson Process Management Systems, the required device installation kits can be found using the link below:

Emerson Process Management DeltaV and AMS Device Manager host systems:

http://www2.emersonprocess.com/en-US/documentation/deviceinstallkits/Pages/deviceinstallkitsearch.aspx.

Search for “optek-Danulat” as manufacturer.

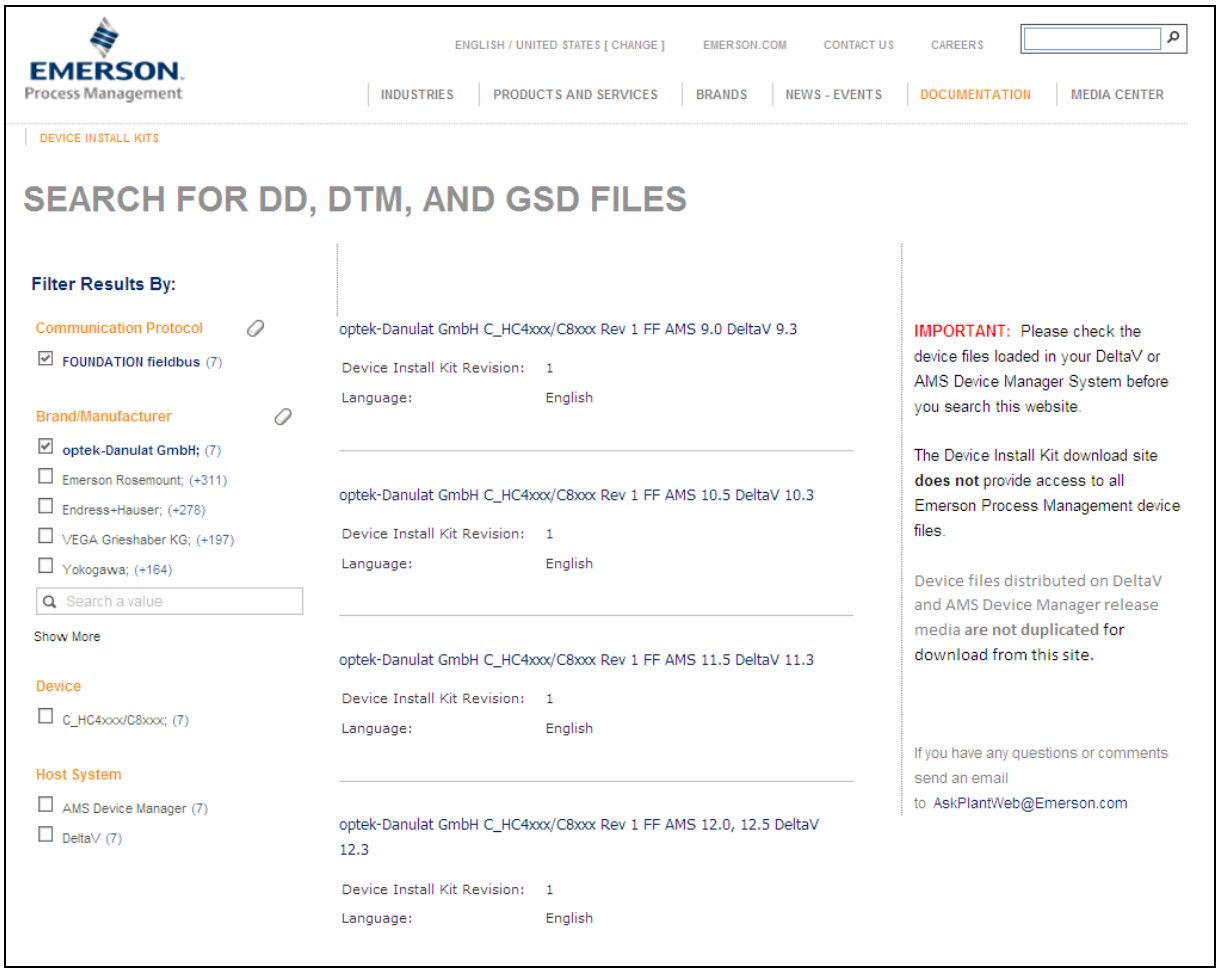


Fig. 23 Emerson device installation kit

7.2 Application Note: mA input via FOUNDATION FieldbusTM

This application note describes the general approach of using the mA input function via the FOUNDATION Fieldbus™ interface (for C4000/HC only).

1. Configuration of the Foundation Fieldbus Interface

- The input value of the AO function block must be in the range 4-20.
- Configure the AO function block (only the parameters below are needed)

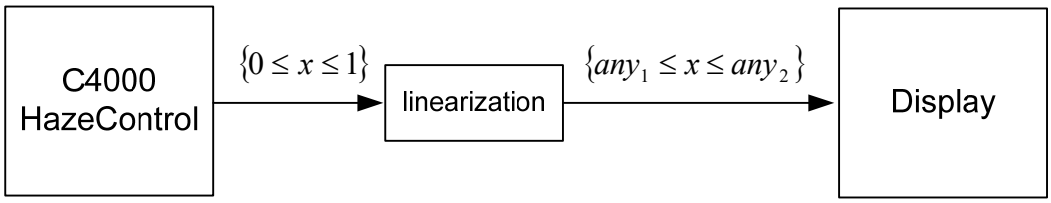
Index	Parameter Name	Configuration value
5	MODE_BLK	CAS_IN or RCAS_IN depending on your source
11	PV_SCALE	PV_SCALE.UNITS_INDEX = use the engineering unit of your value
12	XD_SCALE	XD_SCALE.UNITS_INDEX = mA (1211)
14	IO_OPTS	Fault State to value (512) *)
22	CHANNEL	Choose PV_1(13) or PV_2(14) depending on which mA-Input you use
23	FSTATE_TIME	0.0
24	FSTATE_VAL	0.0

*) **Standard**: use the last useable value → no signal loss will occur in our measurement cycle process

Use "FAULT STATE TO VALUE" in "IO_OPTS" and configure the parameter "FSTATE_VAL" to the 21.6 mA or 0 mA to get signal loss

FSTATE_TIME defines how long the fault must be detected before the limit values are activated.

2. Display the input value in the original range of values



- Configure the linearization table (e.g. L01) and save your entries.

	IN	OUT
01:	0.0000	any_1
02:	1.0000	any_2

- Configure the measurement result to display the input value (e.g. M01).

Parameter Name	Configuration value
DEFINE NAME	Choose your define name, standard “M01”
FUNCTION	Depending which mA input is used, choose 4-20 mA (1) or 4-20 mA (2)
x mA INPUT	---
x LINEARIZATION	Choose your stored linearization table
x SLOPE + OFFSET	Choose a SLOPE and/or OFFSET, if required
RANGE BEGIN/END	BEGIN: any_1 END: any_2
FORMAT	Choose a display number format

3. Calculation of the input value to the measurement function

If the mA input has to manipulate the optical function directly, use this procedure. Please note that internal value range is normalized.

- Configure the measurement result to display the input value (e.g. M01)

Parameter Name	Configuration value
DEFINE NAME	Choose your define name, standard “M01”
FUNCTION	Choose your optical measuring function (e.g. ABS –CU (A))
x mA INPUT	Depending which mA Input you use, choose one of the options (e.g. for mA1) $IN01 \quad (0-100\%)$ $IN01 * L15$ $1 + IN01 * L15$
x LINEARIZATION	Choose a linearization table if required
x SLOPE + OFFSET	Choose a SLOPE and/or OFFSET if required
RANGE BEGIN/END	Depending on your application
FORMAT	Choose a display number format

7.3 *Application Note: Configuration of analog outputs (C4xxx / HC4xxx only)*

The TAG´s of the single blocks can be assigned individually.

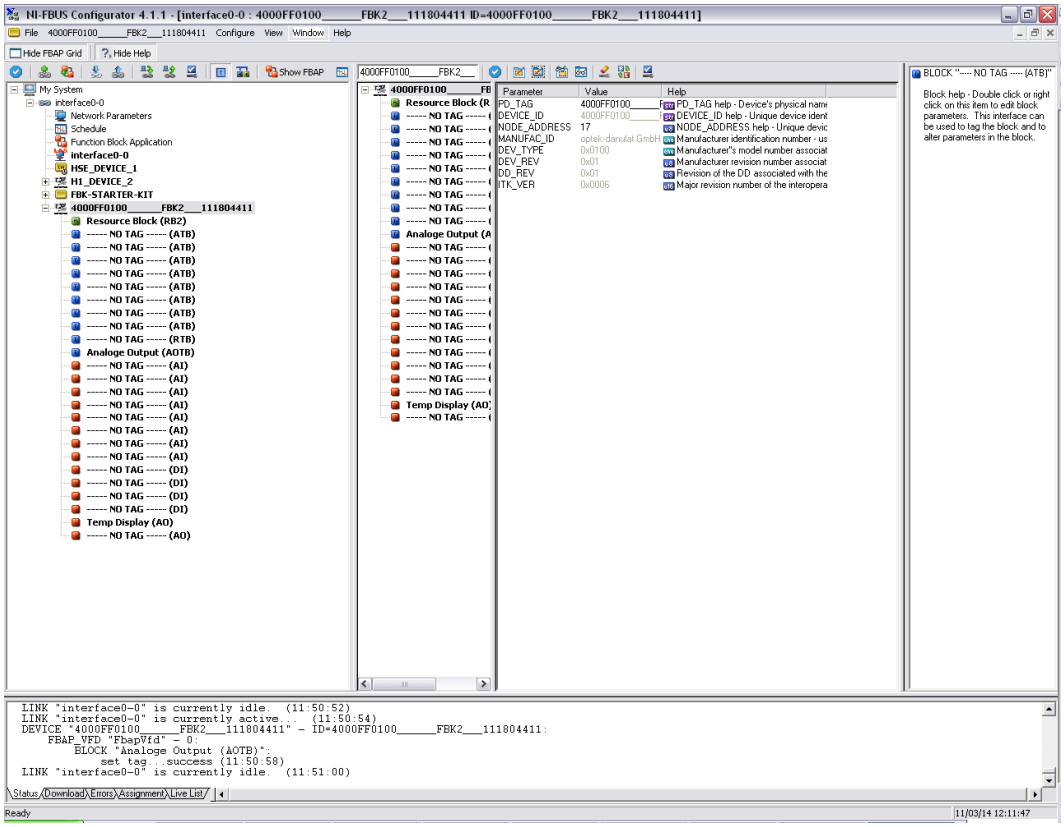


Fig. 24 NI FBUS Configurator – Configuration of analog outputs

In case the process value of another block should be displayed on the converter, the following procedure shows how to map a temperature value on the mA-input parameter interface as an example.

1. Choose parameter CHANNEL PV_1 for mA-IN1 (or CHANNEL PV_2 for mA-IN2)

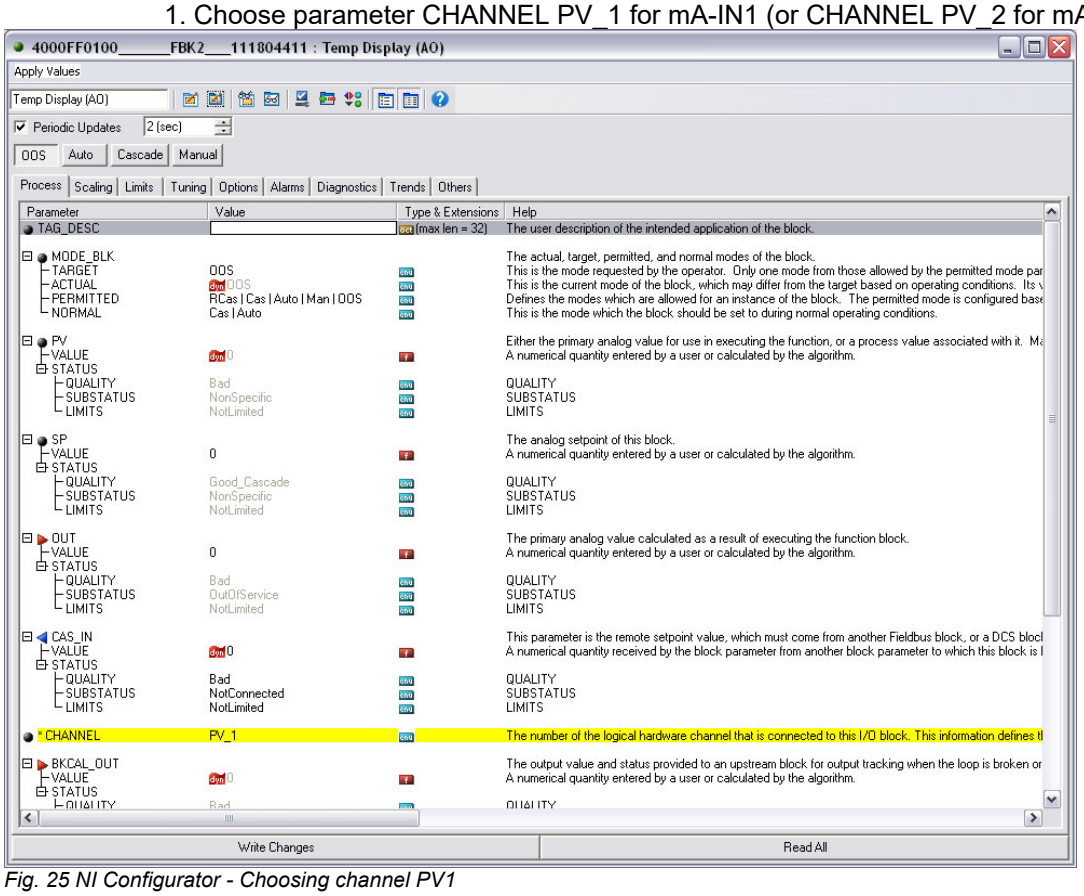


Fig. 25 NI Configurator - Choosing channel PV1

2. Configure parameter PV_SCALE and XD_SCALE

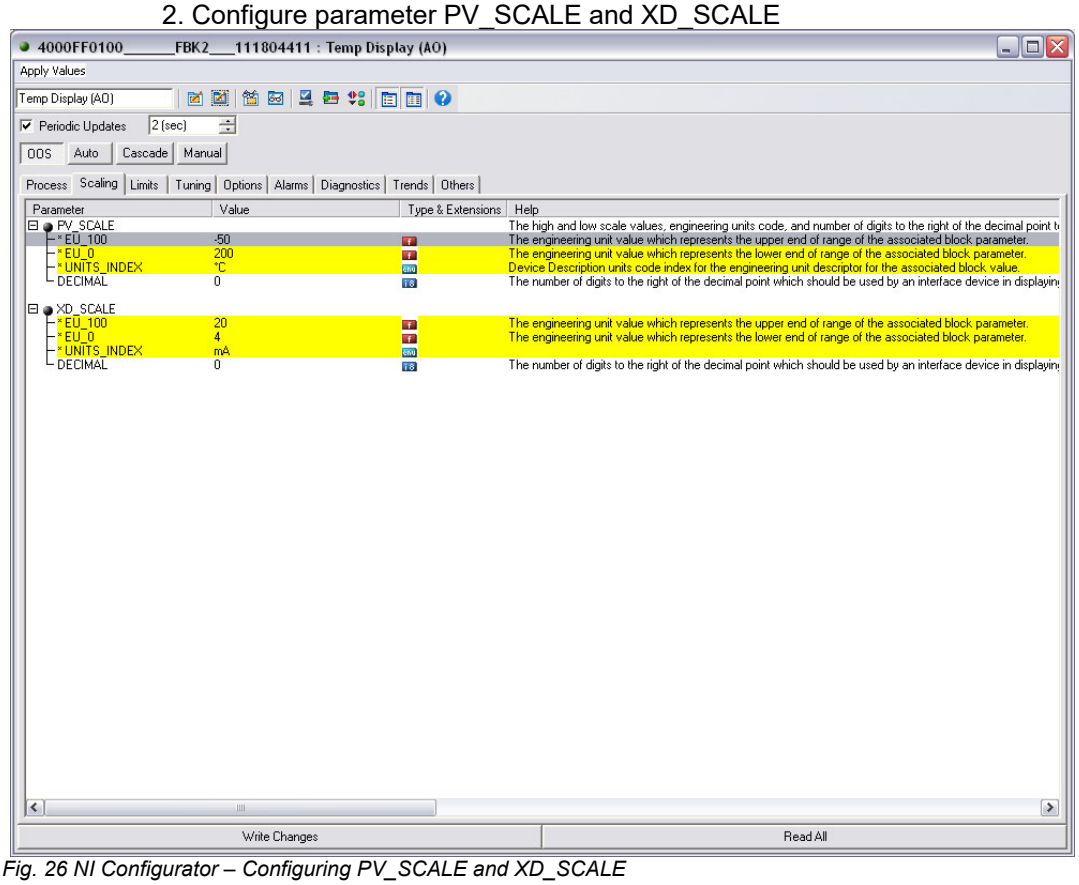


Fig. 26 NI Configurator – Configuring PV_SCALE and XD_SCALE

3. Choose parameter SHED_CPT

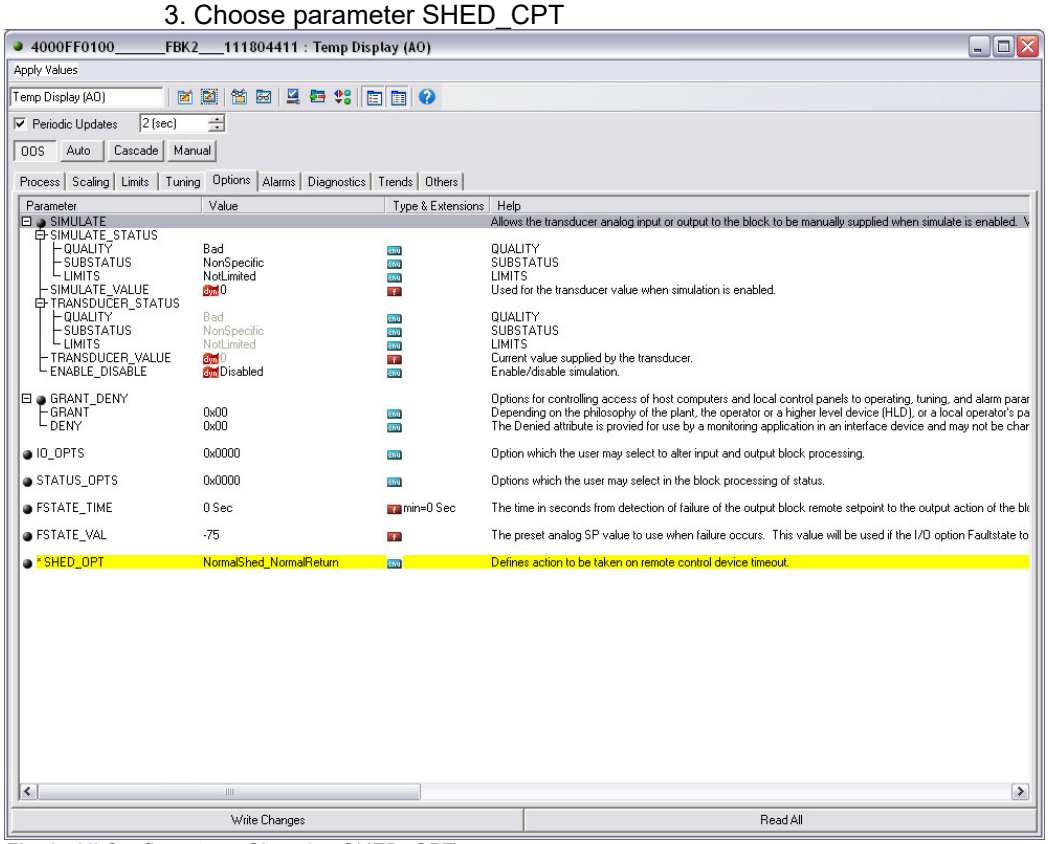


Fig. 27 NI Configurator – Choosing SHED_CPT

4. Choose parameter ALERT_KEY and set value to 1.

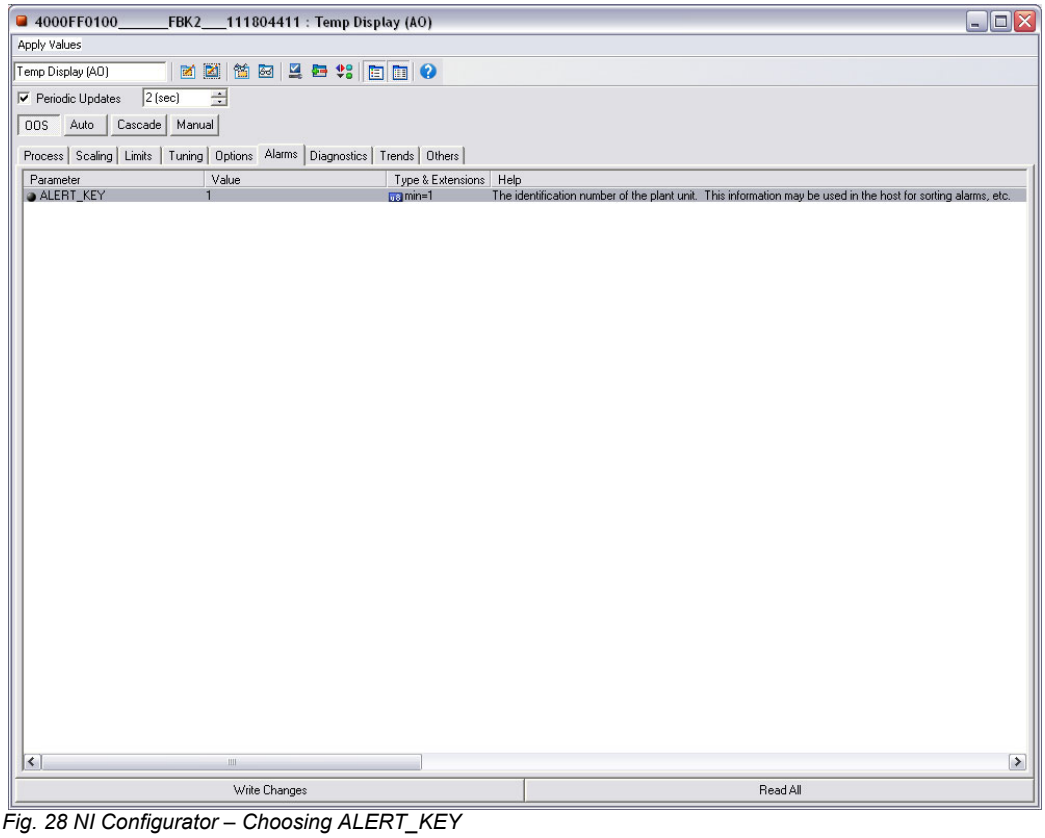


Fig. 28 NI Configurator – Choosing ALERT_KEY

5. Transfer the parameter of your external device into our function blocks and activate them.

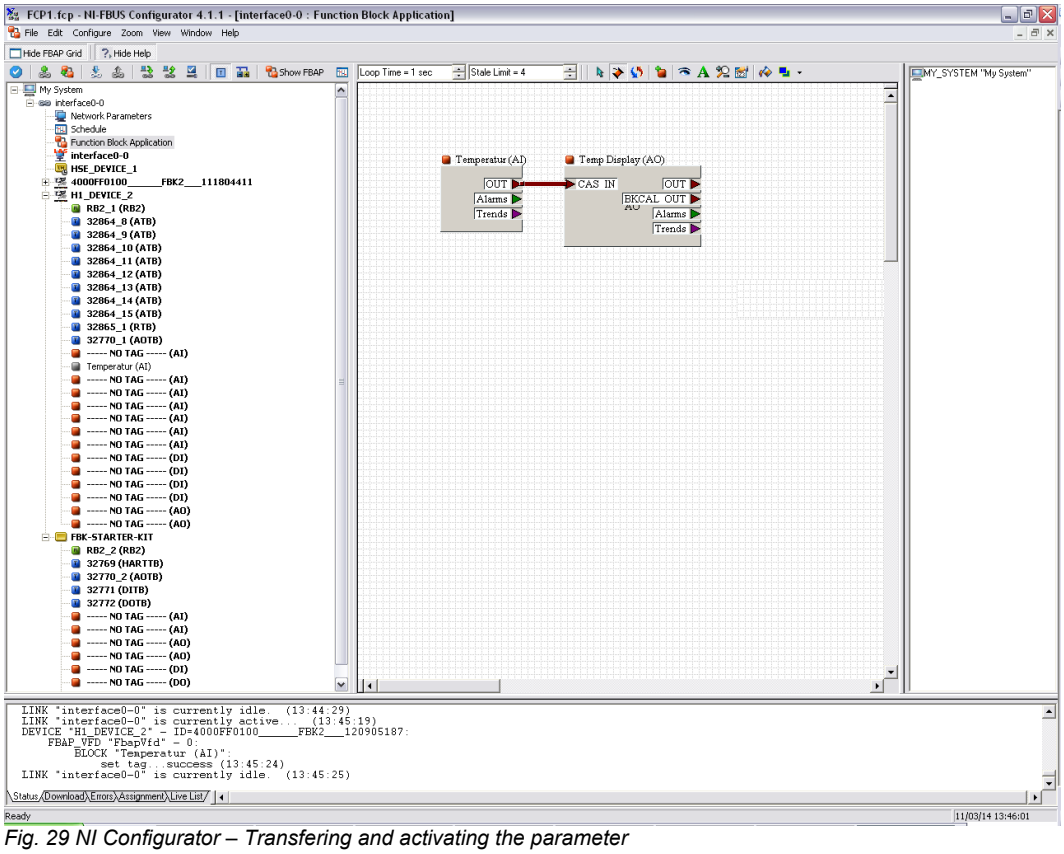


Fig. 29 NI Configurator – Transfering and activating the parameter

6. Transfer the schedule to LAS

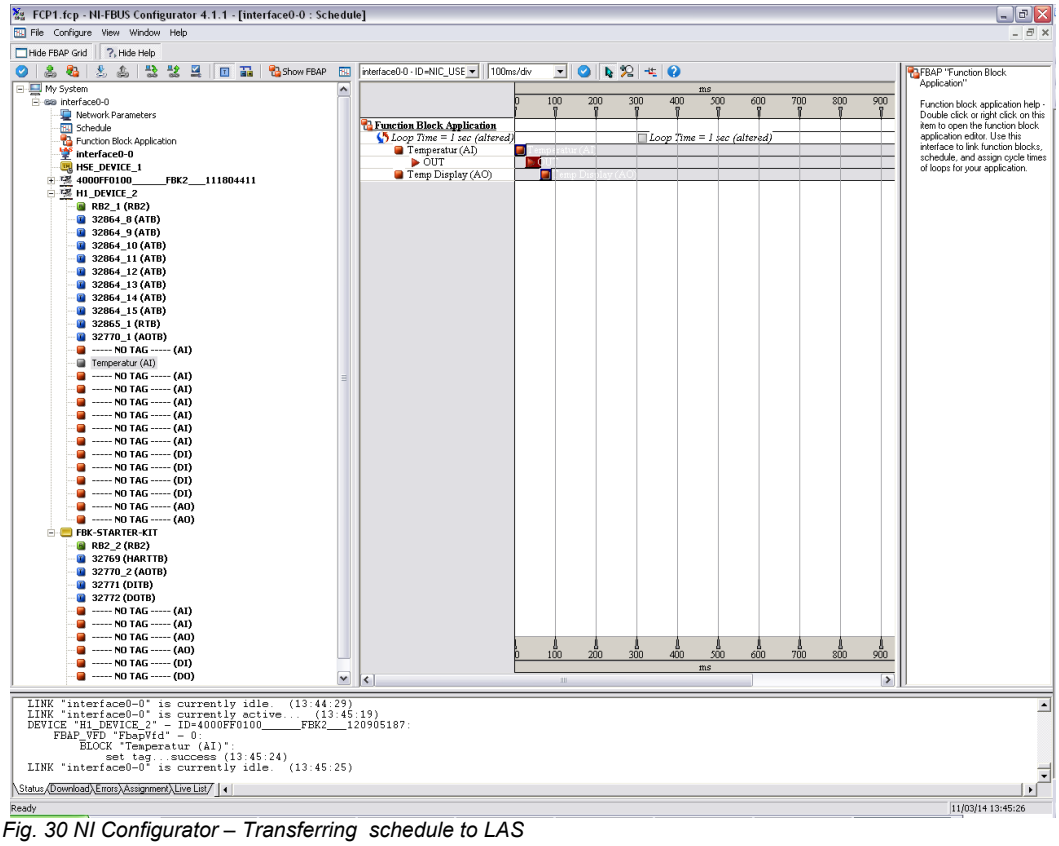


Fig. 30 NI Configurator – Transferring schedule to LAS

The implemented mA value is adjusted to the measuring range and is then calculated in the value range of the mA-output (4-20 mA).

7. Switch MODE_BLK to Cas / Auto

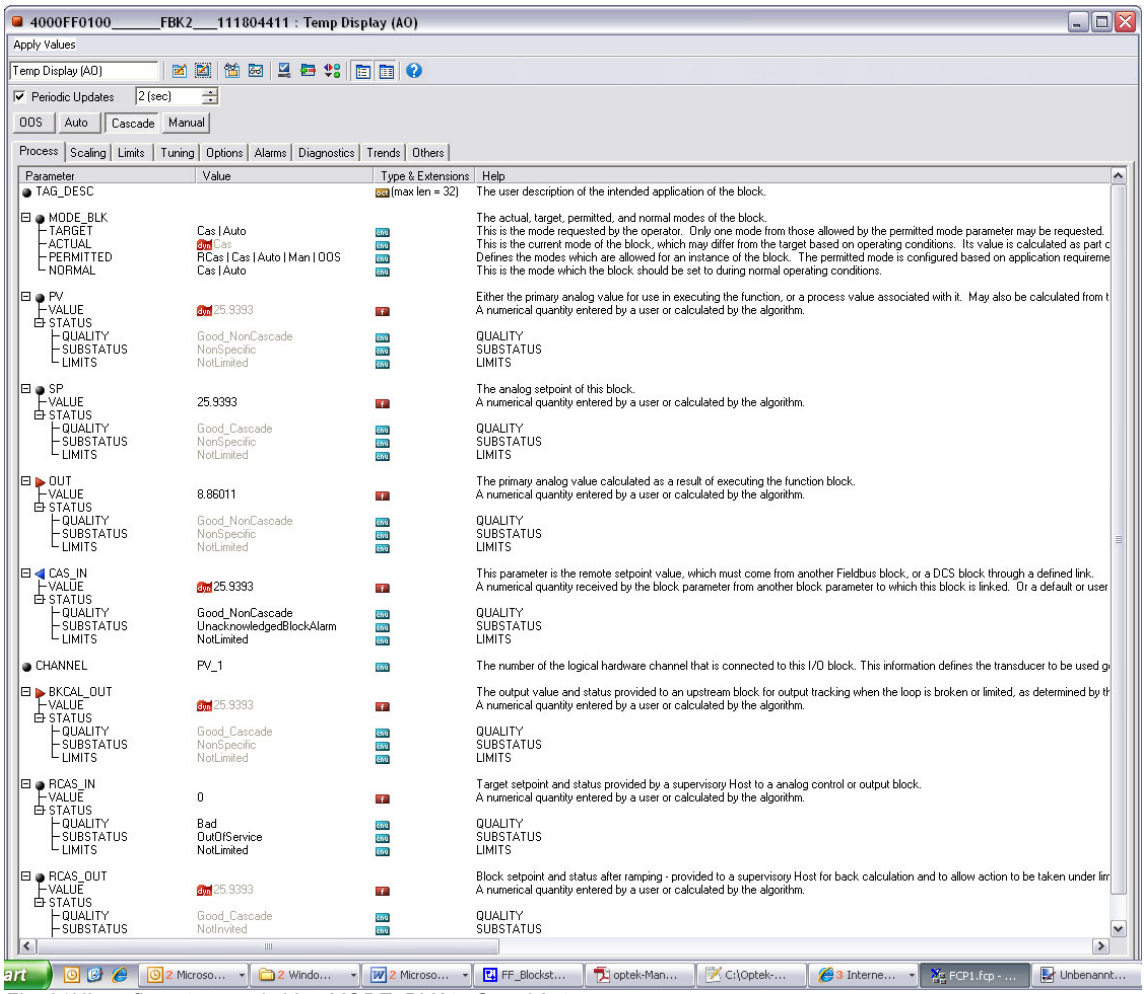


Fig. 31NI configurator – switching MODE_BLK to Cas / Auto

In the measuring function the converter will calculate automatically in the range between 0 and 1. If you want to see the real value on the display you have to use one of the linearization tables in the converter. Select the DEFINE LINEARIZATION function in the PRODUCT menu and select a linearization table to be defined.

LINEARIZATION: 01		
DEFINE NAME	L01	
	IN	OUT
01:	0.0000	-50.0000
02:	1.0000	200.000
03:		
REJECT	P01	SAVE

Fig. 32 Linearization table

7.4 Application Note: NI Configurator

Note!
Before using the fieldbus interface the converter has to be configured for your specific measuring task. Therefore please follow this instruction manual.

The first step is to import our DD-file into your configuration tool. If optek-Danulat as 0x4000FF appears as „unknown manufacturer“ in the list, a missing entry is probably the cause in the “mfr_info” file from National Instruments.

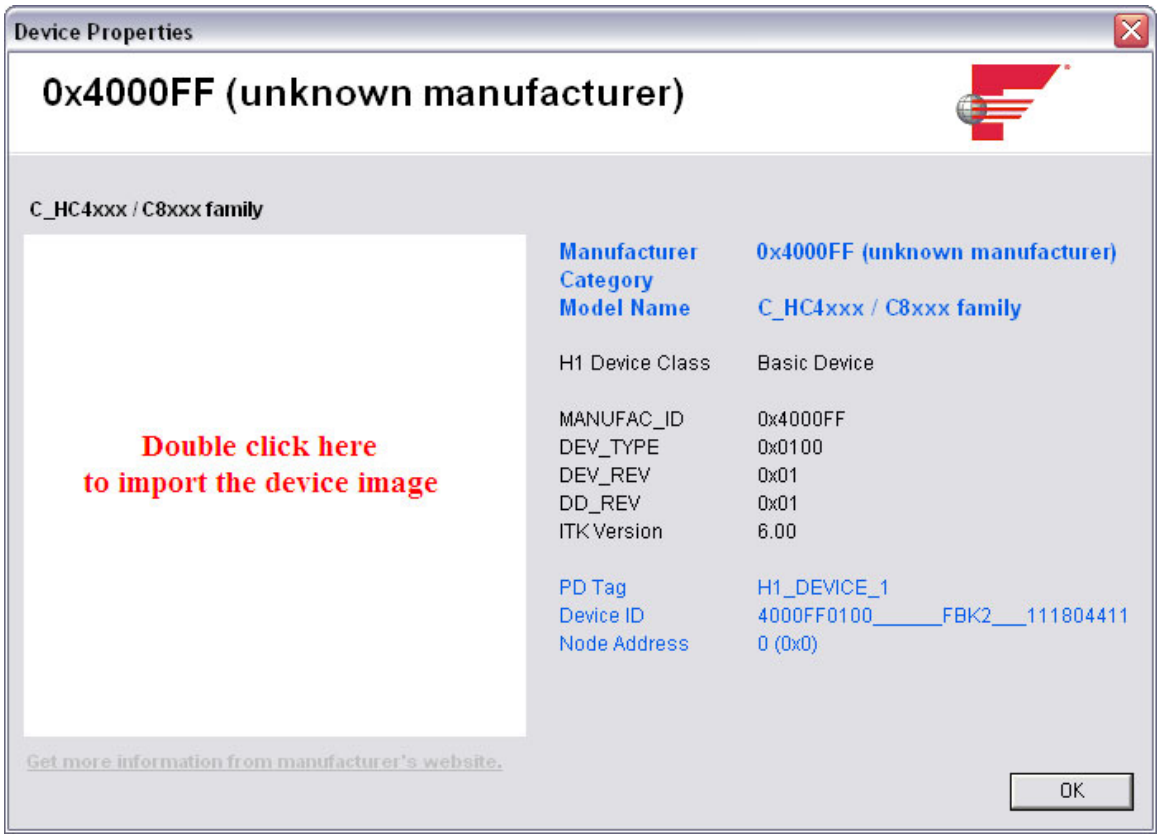


Fig. 33 0x4000FF unknown manufacturer

The following entry is probably missing:

```
;============================================================
;              4000FF ---- optek-Danulat GmbH
;============================================================

;-------------Manufacturer Infomation--------------------------
[4000FF]
MANUFAC_ID     = 4000FF
MANUFAC_NAME   = optek-Danulat GmbH
MANUFAC_URL    = http://www.optek.com

;----------------------0100--------------------------
[4000FF0100]
Category       = Analytical
DeviceType     = Inline Photometric Analyzer
DeviceClass    = Link Master
```

Fig. 34 Manufacturer information missing

Simply add this entry in your file with any text editor. The file should be stored in a standard installation path (e.g.:\Programme\National Instruments\NI-FBUS\Data)

You can also upload the file from our CD-ROM in your system. The file was removed from the NI-FBUS Configurator Version 4.1.1.

After that restart the NI-FBUS Configurator and optek-Danulat as manufacturer should be now listed.

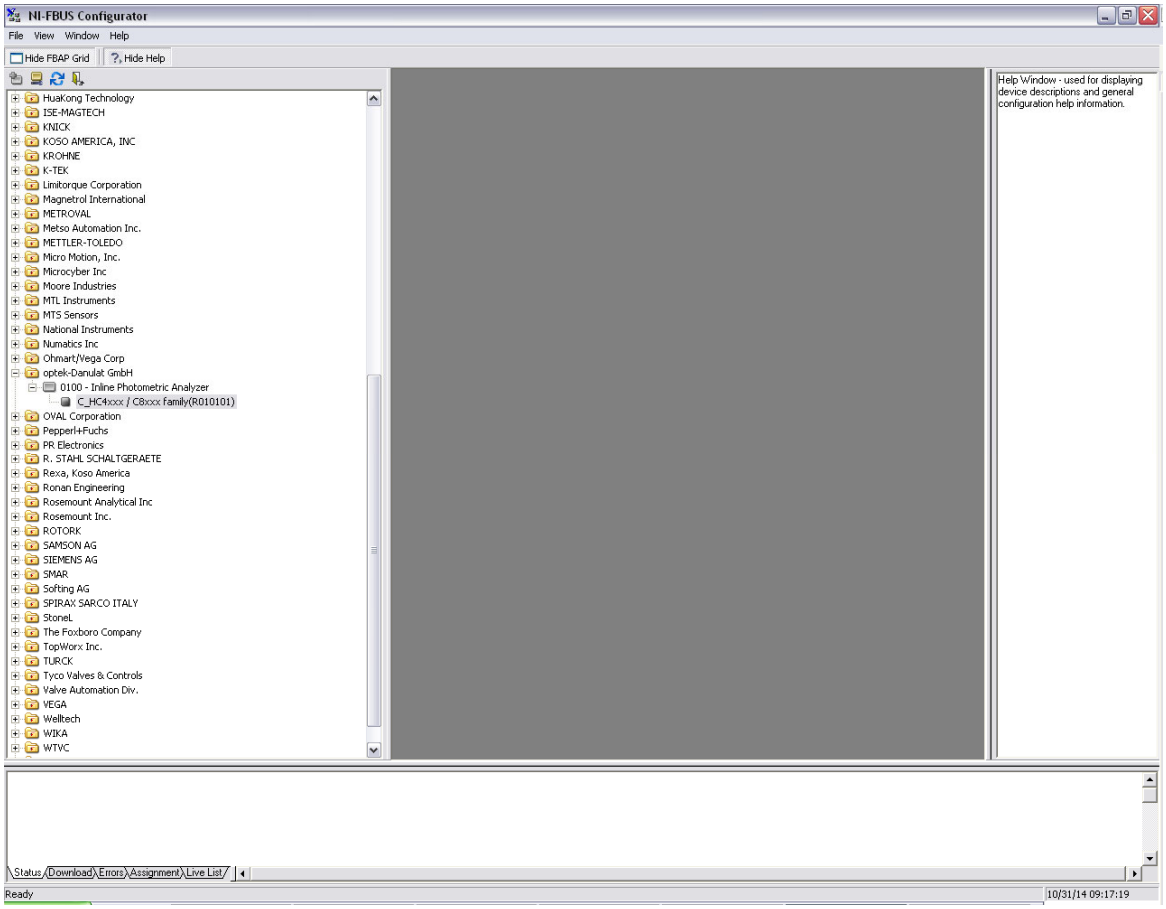


Fig. 35 optek-Danulat listed in the NI-FBUS configurator

Finally upload the missing Device Image in the device properties of our converter. The File is located on the CD-ROM: “optek-C4000-C8000-Foundation_Fieldbus.jpg”

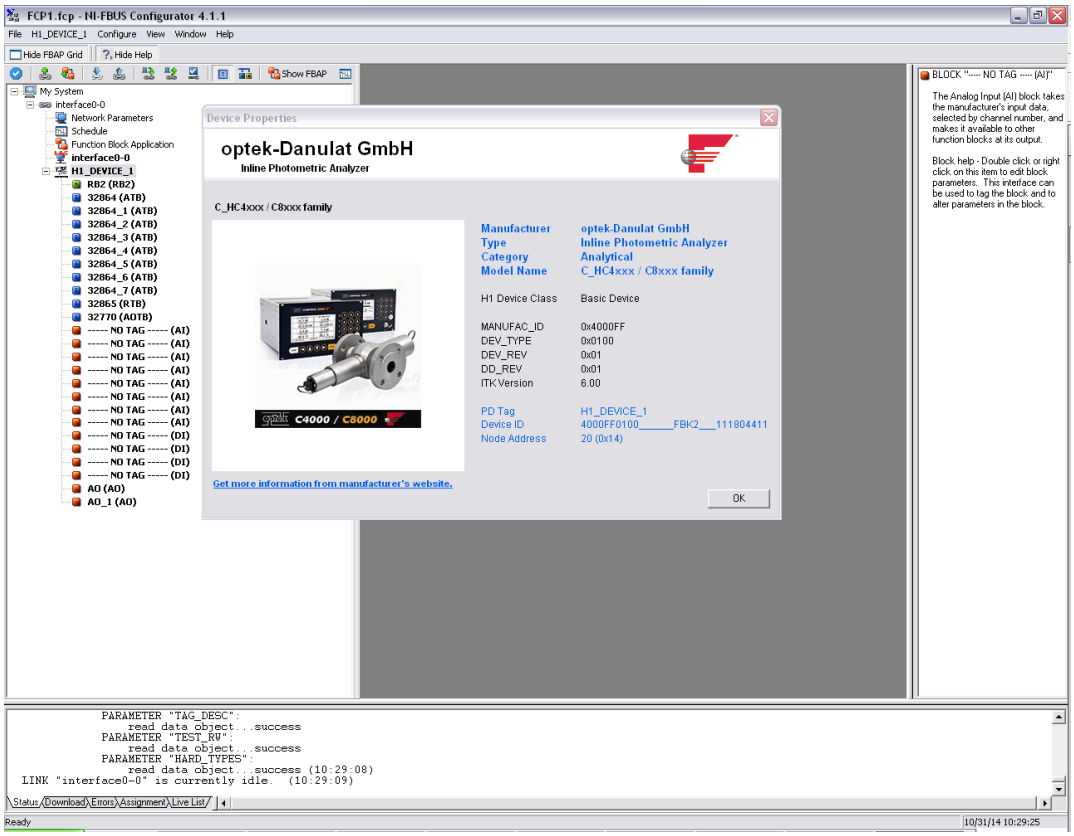


Fig. 36 upload device image of optek converter

Afterwards make a restart of the NI-FBUS Configurator and you should find a new device in the address range between 248 – 251.

Fig. 37 optek device image

The system recognizes the device and automatically assigns a PD-TAG and an address. Both could be changed manually. Select the right mouse button on the device and choose “Update Attributes”.

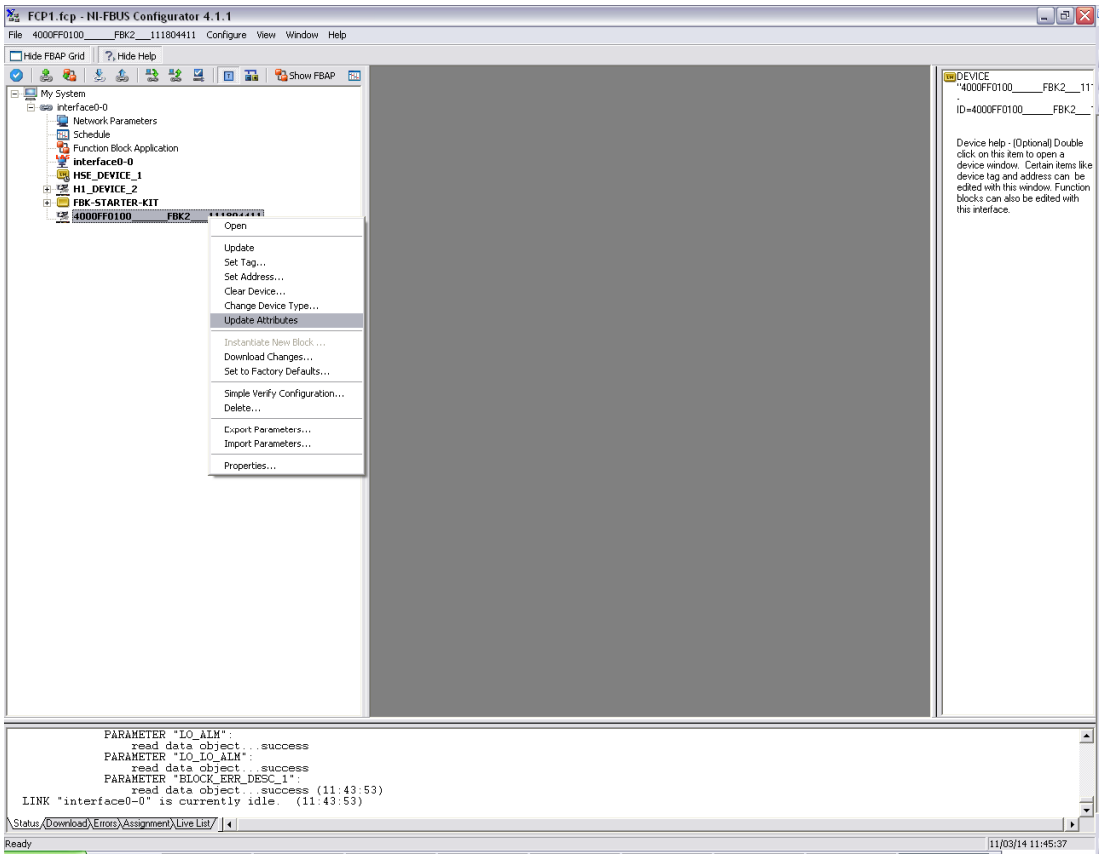


Fig. 38 Change PD-TAG and address, step 1

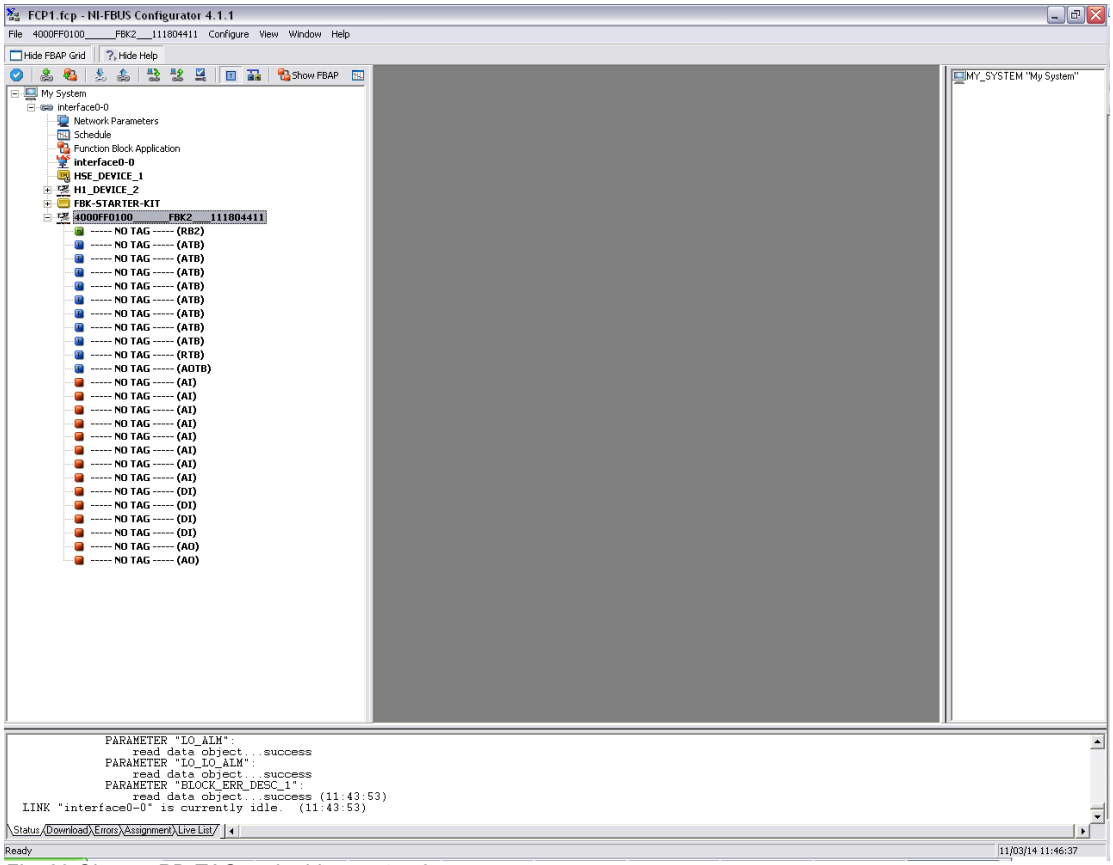


Fig. 39 Change PD-TAG and address, step 2

7.5 Application Note: Emerson Field Communicator (375, 475)

Note!
Before using the fieldbus interface the converter has to be configured for your specific measuring task. Therefore please follow this instruction manual.

The first step is to import our DD-file into your configuration tool. If optek-Danulat GmbH is not shown in the Field Communicator Toolkit from Emerson, optek is not listed in the manufacturer list.

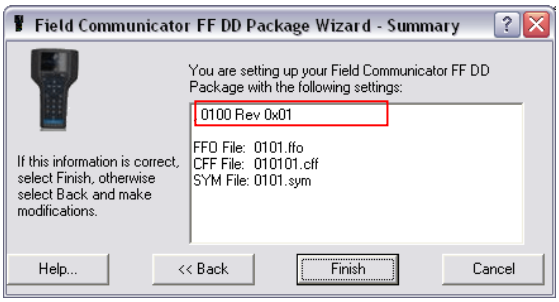


Fig. 40 Field Communicator Toolkit – manufacturer name unknown

We recommend not to start with the converting. First add the following line in the XML – file “ManufacturerIDTable.xml”:

```
<Manufacturer ID="0x4000FF" Name="optek-Danulat
```

Save the file in the register of the Emerson Toolkit:
e.g.: C:\Programme\Field Communicator FF Toolkit

An adjusted file can be found on the CD-ROM: ManufacturerIDTable.xml

After adding the line, open the wizard again and finish the converting of the DD file for the Field Communicator with the “Finish” button.

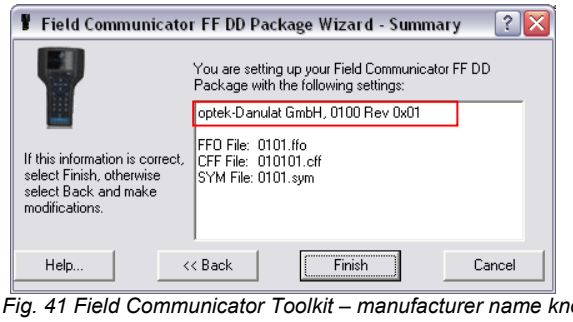
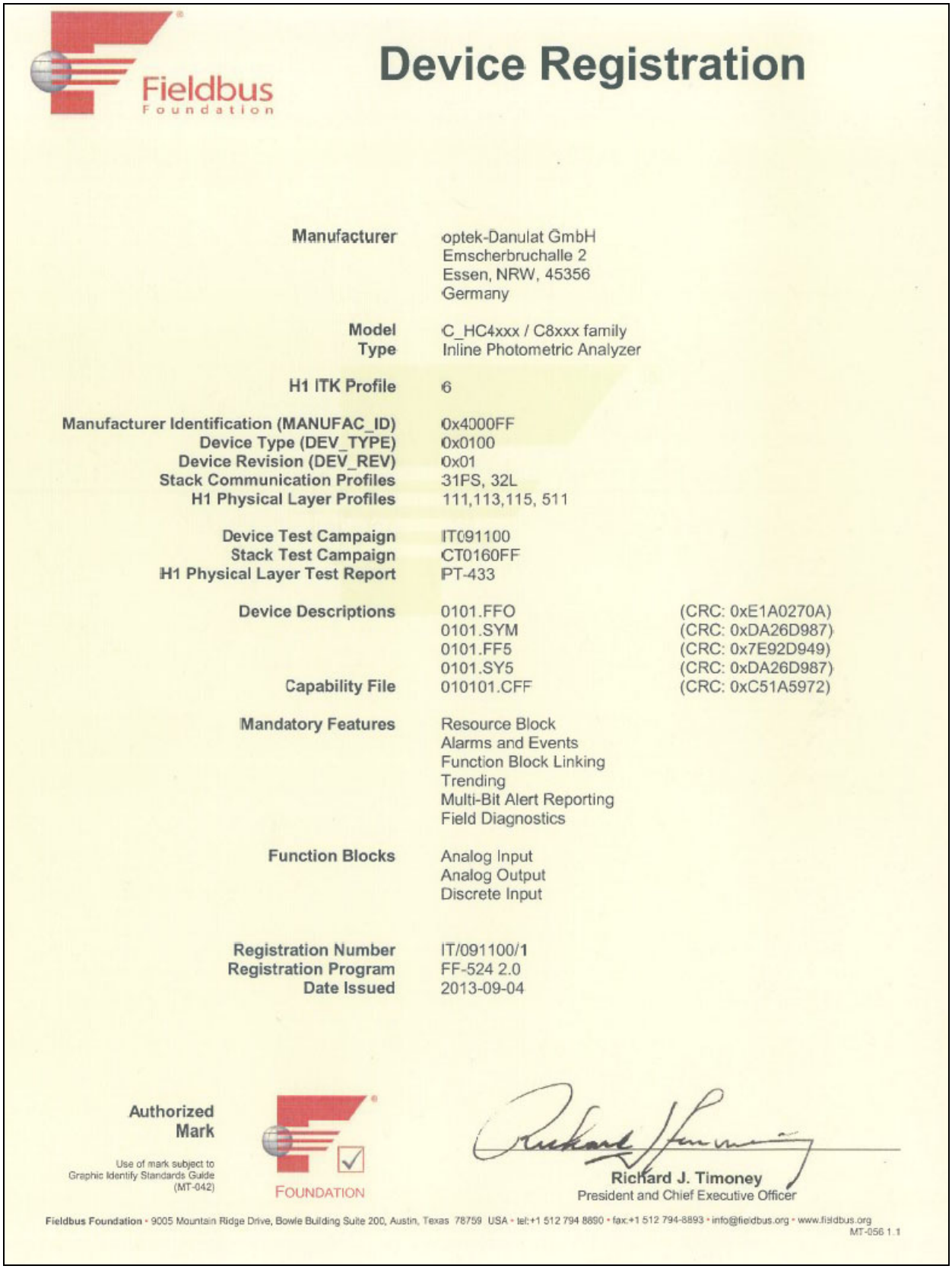


Fig. 41 Field Communicator Toolkit – manufacturer name known

7.6 FOUNDATION Fieldbus™ Certificate



Fieldbus Foundation

Device Registration

Manufacturer	optek-Danulat GmbH Emscherbruchalle 2 Essen, NRW, 45356 Germany	
Model	C_HC4xxx / C8xxx family	
Type	Inline Photometric Analyzer	
H1 ITK Profile	6	
Manufacturer Identification (MANUFAC_ID)	0x4000FF	
Device Type (DEV_TYPE)	0x0100	
Device Revision (DEV_REV)	0x01	
Stack Communication Profiles	31PS, 32L	
H1 Physical Layer Profiles	111,113,115, 511	
Device Test Campaign	IT091100	
Stack Test Campaign	CT0160FF	
H1 Physical Layer Test Report	PT-433	
Device Descriptions	0101.FFO	(CRC: 0xE1A0270A)
	0101.SYM	(CRC: 0xDA26D987)
	0101.FF5	(CRC: 0x7E92D949)
	0101.SY5	(CRC: 0xDA26D987)
Capability File	010101.CFF	(CRC: 0xC51A5972)
Mandatory Features	Resource Block Alarms and Events Function Block Linking Trending Multi-Bit Alert Reporting Field Diagnostics	
Function Blocks	Analog Input Analog Output Discrete Input	
Registration Number	IT/091100/1	
Registration Program	FF-524 2.0	
Date Issued	2013-09-04	

Authorized Mark

Use of mark subject to Graphic Identity Standards Guide (MT-042)

FOUNDATION

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President and Chief Executive Officer

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MT-056 1.1

Fig. 42 FOUNDATION Fieldbus™ certification

8 EU declaration of conformity

Herewith we

optek-Danulat GmbH, Emscherbruchallee 2, 45356 Essen, Germany,

declare under our sole responsibility, that the following measuring systems each comprising one converter of the series

Control 4000 (C4XXX with X=0..6);
Control 8000 (C8XXX with X=0..8);
Haze Control (HC 4XXX, X=0..6)

and one or several sensors of the series

AF16, AF26, AF45, AF46, TF16-N, DTF16, ASD12, ASD25, AS16, AS56, ACF60, ACS60

have been developed, constructed and manufactured in conformity with the requirements of the European directives 2014/30/EU, 2014/35/EU and 2011/65/EU, 2015/863/EU (including the amendments valid at the time of this declaration).

The assessment is based on the application of the standards:

EU Directives	Description	Standards
2014/30/EU	EMV Directive	EN 61326-1:2013 EN 61326-2-3:2013 EN 61326-2-5:2013
2014/35/EU	Low Voltage Directive	EN 61010-1:2010 EN 61010-1-2010/A1:2019/AC:2019-04 EN 61010-1:2010/A1:2019
2011/65/EU, 2015/863/EU	RoHS Directive	EN IEC 63000:2018

Essen, 2022/05/29

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Managing Director

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