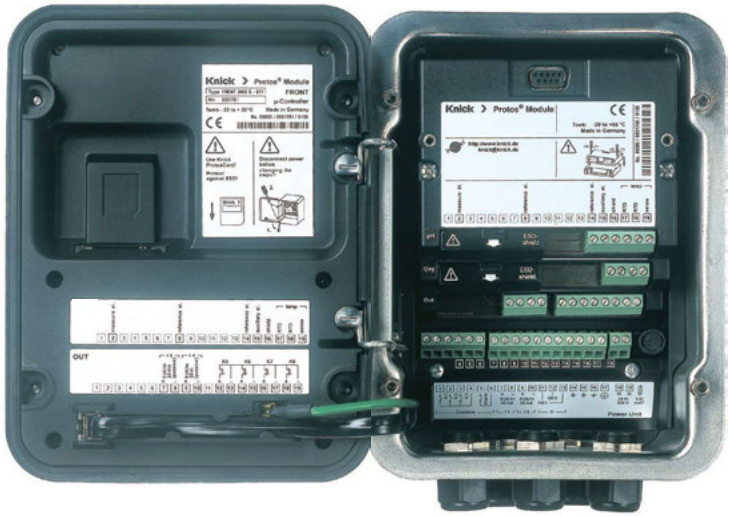
Knick

Protos II 4400(X) / Protos 3400(X) Process Analysis System

User Manual

Protos COMFF 3400(X)-085
Communication Module
Communication Unit for FOUNDATION Fieldbus



Fieldbus Foundation

Latest Product Information: www.knick.de

Returns

Please contact our Service Team before returning a defective device. Ship the cleaned device to the address you have been given.
If the device has been in contact with process medium, it must be decontaminated/disinfected before shipment. In this case, place a Declaration of Contamination in the consignment to prevent any risk to the health and safety of our service personnel. The declaration is available at:

https://www.knick-international.com/en/service/repairs/

Disposal

Please observe the applicable local or national regulations concerning the disposal of "waste electrical and electronic equipment".

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Protos COMFF 3400(X)-085 Module

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Protos COMFF 3400(X)-085 Module

Intended Use

The module is a communication unit for Foundation Fieldbus.

The COMFF 3400X-085 module is intended for operation in locations subject to explosion hazards which require equipment of Group II, device category 2(1), gas/dust.

Safety Instructions

Operation in Explosive Atmospheres: COMFF 3400X-085 Module
The module is approved for operation in explosive atmospheres.
When installing the product in a hazardous location, observe the information in the supplements to the certificates and, if applicable, the relevant control drawings.
Observe all applicable local and national codes and standards for the installation of electrical equipment in explosive atmospheres. For orientation, please refer to IEC 60079-14, EU directives 2014/34/EU and 1999/92/EC (ATEX), NFPA 70 (NEC), ANSI/ISA-RP12.06.01.

⚠ **WARNING!** Possible impairment of explosion protection.

- Modules which have already been used shall be subjected to a professional routine test before they may be operated in another type of protection.
- Prior to commissioning, the operating company must verify the intrinsic safety in accordance with the installation regulations of IEC 60079-14 for the complete interconnection of all equipment involved, including the connecting cables.
- The interconnection of Ex and non-Ex modules (mixed assembly) is not permitted.
- In hazardous locations the device shall only be cleaned with a damp cloth to prevent electrostatic charging.

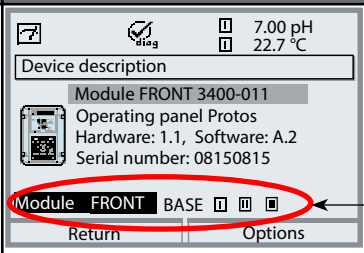
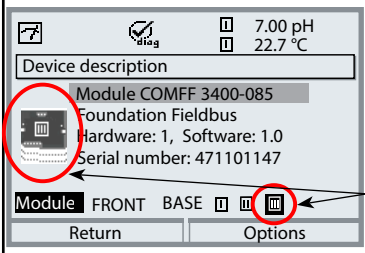
Maintenance
The Protos modules cannot be repaired by the user. For inquiries regarding module repair, please contact Knick Elektronische Messgeräte GmbH & Co. KG at www.knick.de.

Firmware Version

COMFF 3400(X)-085 module firmware: Firmware version 2.x

Module compatibility	COMFF 3400-085	COMFF 3400X-085
Protos 3400 from FRONT firmware version 7.0	x	
Protos 3400X from FRONT firmware version 7.0		x
Protos II 4400 from FRONT firmware version 1.0.0	x	
Protos II 4400X from FRONT firmware version 1.0.0		x

Query Current Device Firmware/Module Firmware
When the device is in measuring mode:
Press **menu** key, open Diagnostics menu: Device Description

Menu	Display	Device description
diag		**Device hardware and firmware version** Provides information on all modules installed: Module type and function, serial number, hardware and firmware version, and device options. Select the different modules (FRONT, BASE, slots 1 - 3) using the arrow keys.
		**Query module software** Module COMFF 3400-085, hardware and firmware version, serial number – here installed in slot 3.

Note: The display may vary depending on the device version.

Foundation Fieldbus (FF) Technology

Foundation Fieldbus (FF) is a digital communication system that connects different field devices over a common cable and integrates them into a control system. Its application range covers manufacturing, process, and building automation. As fieldbus standard according to EN 61158-2 (IEC 1158-2) the Foundation Fieldbus ensures the communication of different devices over one bus line.

Basic Properties

The "Data Link Layer" of the Fieldbus Foundation protocol defines 3 device types:

- The **Active Link Master** plans all activities as "Link Active Scheduler" (LAS). It controls the complete data traffic on the bus. Several Link Masters on one bus increase safety, but only one is active at a time.

- **Basic devices** are peripheral devices such as valves, drives, transmitters or analyzers. They can react acyclically to servicing, configuration and diagnostic tasks of the master. The Link Master cyclically reads the measurement data with status.

- **Bridges** can connect a network from different bus systems.

Foundation Fieldbus (FF) Technology

Bus Communication

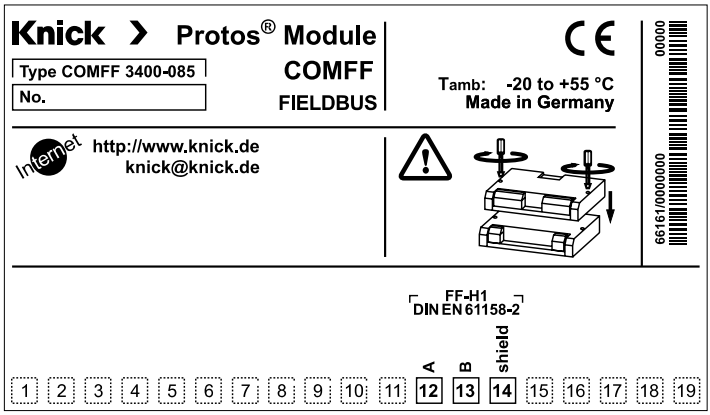
Foundation Fieldbus (FF) permits cyclic and acyclic services:

- **Cyclic Services - Scheduled Communication:**
  are used for transmission of measurement data with status information. The Link Active Scheduler maintains a list of transmission times for all data in all devices that need to be cyclically transmitted. When it is time to transmit data, the LAS issues a "Compel Data (CD)" start signal to the respective device. Upon receipt of the "Compel Data" signal, the device broadcasts the data to all devices on the fieldbus.

- **Acyclic Services - Unscheduled Communication:**
  are used for device configuration, remote maintenance and diagnostics during operation.
  All devices are given the chance to send acyclic (unscheduled) messages between transmissions of cyclic (scheduled) data. The LAS grants permission to a device to broadcast acyclic messages by issuing a "Pass Token (PT)" message. Upon receipt of the "Pass Token", the device starts data transmission.

Terminal Plate

Terminal Plate COMFF 3400-085 Module:



Attaching the Terminal Plates

The terminal plates of the lower modules can be sticked to the inner side of the door.
This facilitates maintenance and service.

Installing the Module

⚠ **CAUTION!** Electrostatic discharge (ESD).
The modules' signal inputs are sensitive to electrostatic discharge.
Take measures to protect against ESD before inserting the module and wiring the inputs.

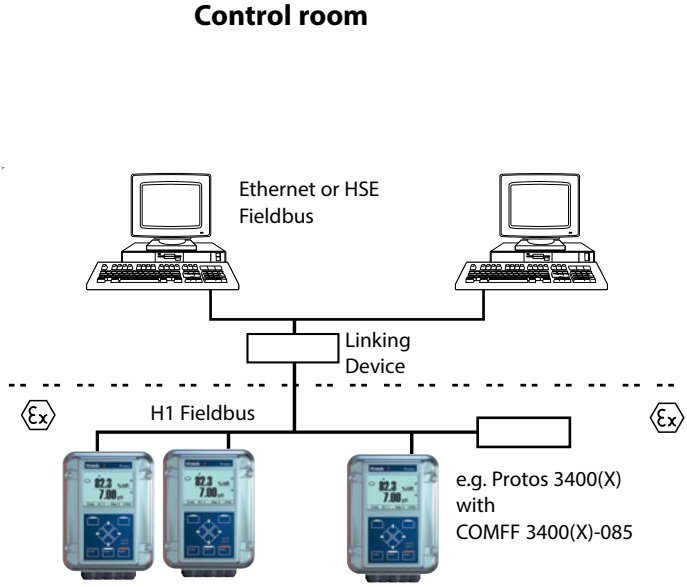
Note: Strip the insulation from the wires using a suitable tool to prevent damage.

1) Switch off the power supply to the device.
2) Open the device (loosen the 4 screws on the front).
3) Plug the module into the slot (D-SUB connector), see figure.
4) Tighten the module's fastening screws.
5) Connect the signal lines (see next page).
6) Check whether all connections are correctly wired.
7) Close the device by tightening the screws on the front.
8) Switch on the power supply.

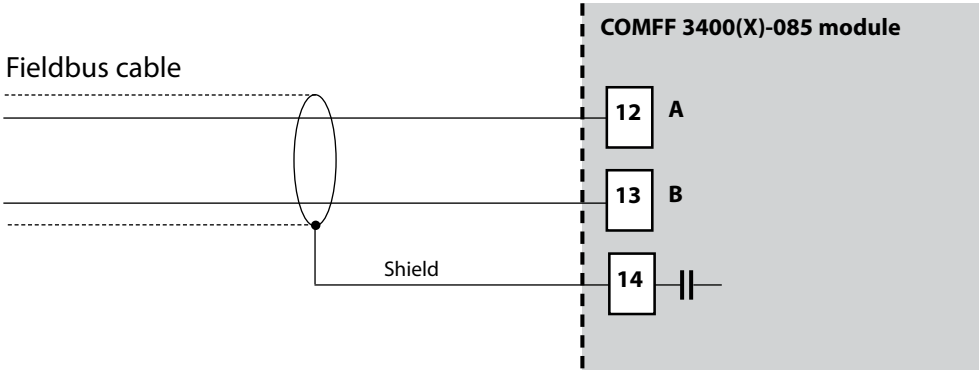
⚠ **CAUTION!** Incorrect measurement results.
Incorrect parameter setting, calibration or adjustment may result in incorrect measurements being recorded. Protos must therefore be commissioned by a system specialist, all its parameters must be set, and it must be fully adjusted.

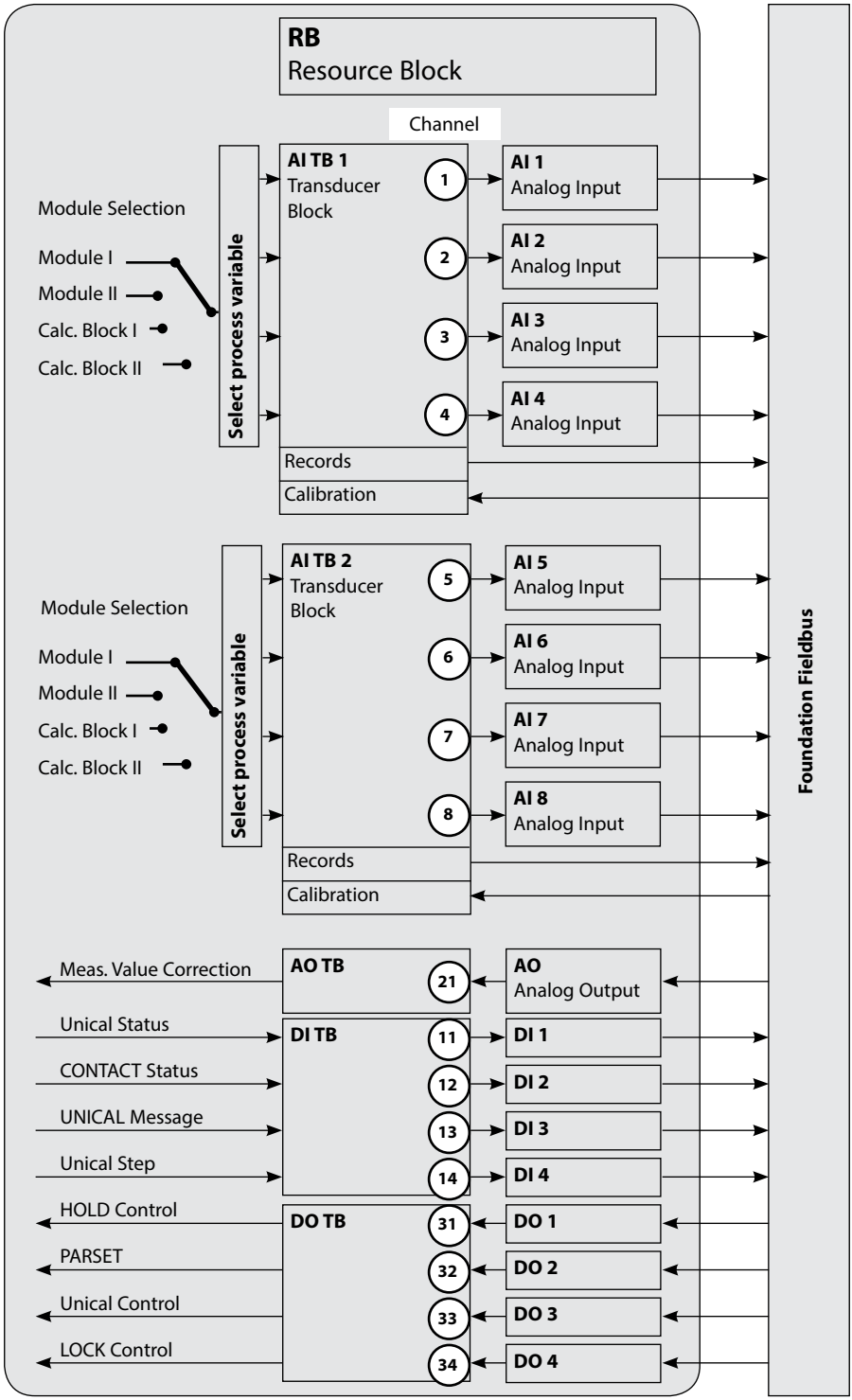
Foundation Fieldbus Installation

Basic build-up of a PROFIBUS system:



Electrical connection between module and Foundation Fieldbus is in accordance with FISCO (Fieldbus Intrinsically Safe Concept, www.fieldbus.org).




RB
Resource Block
Channel
AI TB 1
Transducer
Block
1
2
3
4
AI 1
Analog Input
AI 2
Analog Input
AI 3
Analog Input
AI 4
Analog Input
Records
Calibration
Module Selection
Module I
Module II
Calc. Block I
Calc. Block II
Select process variable
AI TB 2
Transducer
Block
5
6
7
8
AI 5
Analog Input
AI 6
Analog Input
AI 7
Analog Input
AI 8
Analog Input
Records
Calibration
Module Selection
Module I
Module II
Calc. Block I
Calc. Block II
Select process variable
Foundation Fieldbus
Meas. Value Correction
AO TB
21
AO
Analog Output
Unical Status
CONTACT Status
UNICAL Message
Unical Step
DI TB
11
12
13
14
DI 1
DI 2
DI 3
DI 4
HOLD Control
PARSET
Unical Control
LOCK Control
DO TB
31
32
33
34
DO 1
DO 2
DO 3
DO 4

Communication Model

See diagram on previous side

All variables and parameters of the transmitter are assigned to blocks.

Resource Block (RB)
Describes the transmitter characteristics (manufacturer, device name, operating status, general status).

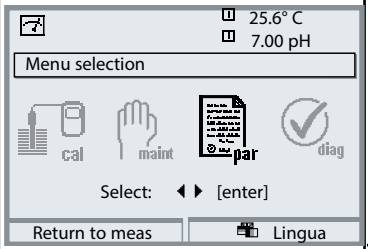
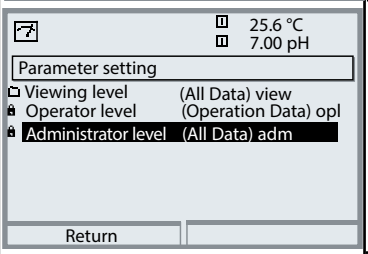
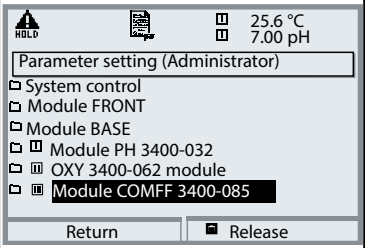
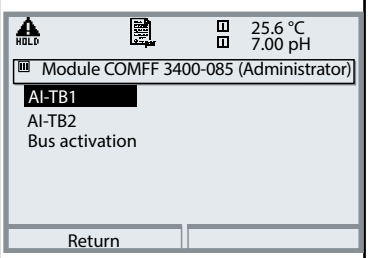
Analog Input Block (AI)
2 x 4 Analog Input Function Blocks provide for cyclic transmission of measured values (currently measured value with status, alarm limits, freely selectable process variable from up to 2 measuring modules).

Analog Input Transducer Block (AI TB)
Provides for acyclic data transmission. Calibration, configuration, and maintenance commands coming from the control station are processed in the Transducer Block. The sensor signal is first preprocessed in the Transducer Block. From here, the measured value is sent to the Analog Input Blocks where it can be further processed (limit values, scaling).

Connections (Channels)
The communication model shows the channel numbers for connecting the function blocks to the Transducer Blocks.

AI-TB Configuration on the Device

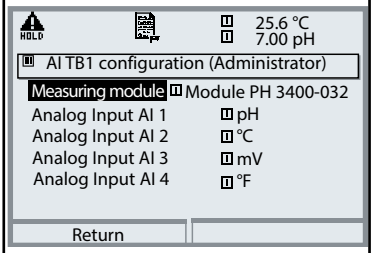
Assigning process variables to Analog Input Blocks on the device

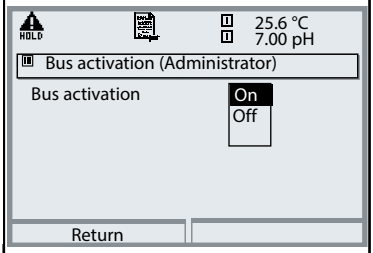
Menu	Display	Assigning process variables to Analog Input Blocks
par		**Open parameter setting** From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, confirm by pressing **enter**.
		**Administrator level:** Access to all functions, also passcode setting. Releasing or blocking a function for access from the Operator level.
		**Select module.** Protos permits variable equipment with 2 measuring modules (and FF module). The available process variables are assigned via "AI-TB configuration".
		**Select AI-TB block:** Assign a module to an AI-TB block. The AI-TB block includes 4 Analog Input blocks to each of which you can assign a process variable from the module.

Note: The display may vary depending on the device version.

AI-TB Configuration on the Device

Assigning process variables to Analog Input Blocks on the device

Menu	Display	Assigning process variables to Analog Input Blocks
par		**Select AI-TB configuration:** Assign each process variable to one of the 4 Analog Input Blocks per TB. (See Page 19) ***NOTICE!*** The assignments made here also apply to the FF configuration for the connection of Analog Input Blocks to the channels of the AI Transducer Blocks! Be sure to make identical settings!

Menu	Display	Bus activation
par		**Bus Activation** On: Access control by DCS (Control system programming required by customer!) Off: Device access via passcode or signature (Audit Trail) as usual **Note:** If access control has inadvertently been activated, the device must be separated from the FF bus to make the menu accessible again.

Note: The display may vary depending on the device version.

For Copy: Individual Settings

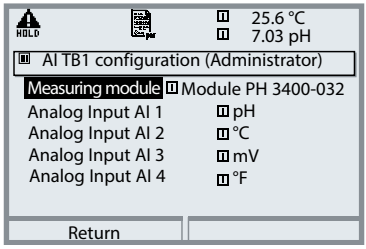
Assigning process variables to Analog Input Blocks on the device

AI Block		Process variable assigned
AI-TB1	Selected measuring module	
	Analog Input Block AI 1	
	Analog Input Block AI 2	
	Analog Input Block AI 3	
	Analog Input Block AI 4	
AI-TB2	Selected measuring module	
	Analog Input Block AI 5	
	Analog Input Block AI 6	
	Analog Input Block AI 7	
	Analog Input Block AI 8	

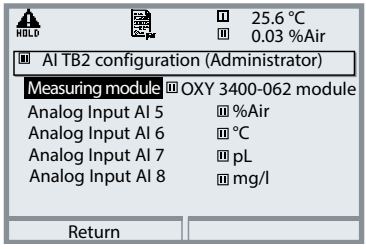
Offline Configuration

The AI blocks are divided into two groups (AI Transducer Blocks) which are each assigned to one measuring module. This allows control of functions in the measuring modules. If there is only one measuring module, both AI TBs can be assigned to the same module so that they can output more measured values cyclically. In this exemplary configuration there is a PH 3400-032 module in slot [I], an OXY 3400-062 module in slot [II], and the COMFF 3400-085 module in slot [III].

You can assign individual process variables from the selected measuring module to the different AI channels.

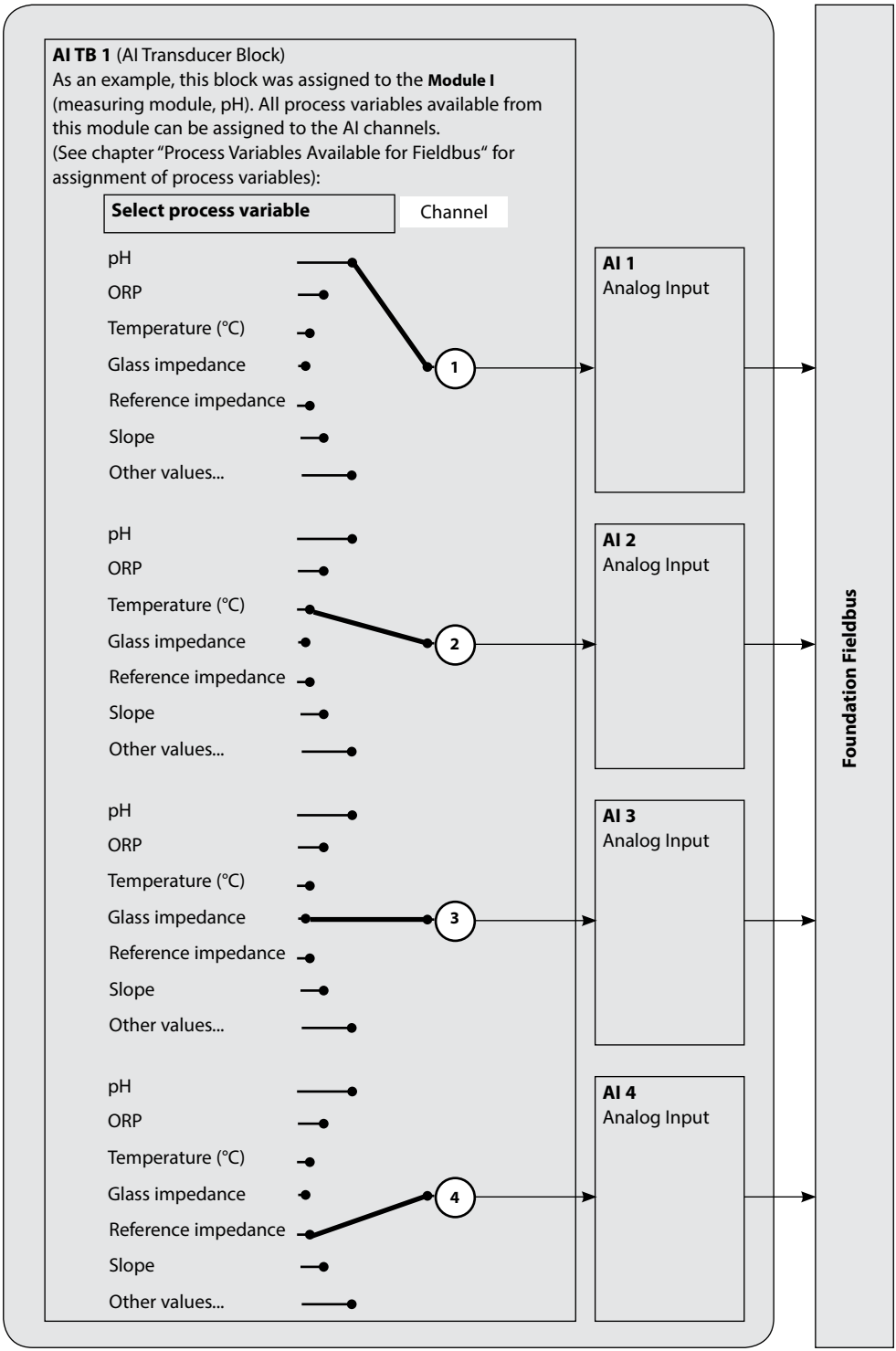


Example 1:
AI-TB1 is assigned to the pH 3400-032 module, therefore all process variables of the pH module are available for AI1 to AI4.



Example 2:
AI-TB2 is assigned to the OXY 3400-062 module,
therefore all process variables of the Oxy module are available for AI5 to AI8.

Bus communication on the Foundation Fieldbus can only function properly when during online configuration the blocks in the control system are set in accordance with the AI-TB configurations selected in the device configuration. The modular Protos does not allow permanent assignment of process variables to AIs - any available module can be located in one of the three slots, which cannot be recognized from the control system.
Therefore you cannot preconfigure the device offline per DD from the control system.


AI TB 1 (AI Transducer Block)
As an example, this block was assigned to the Module I (measuring module, pH). All process variables available from this module can be assigned to the AI channels.
(See chapter "Process Variables Available for Fieldbus" for assignment of process variables):
Select process variable
Channel
pH
ORP
Temperature (°C)
Glass impedance
Reference impedance
Slope
Other values...
1
AI 1
Analog Input
2
AI 2
Analog Input
3
AI 3
Analog Input
4
AI 4
Analog Input
Foundation Fieldbus

Initial Commissioning

1. Supply the device with power.
2. Open the configuration program of the control system.
3. Load CFF file and DD.
   After the first connection establishment, the device answers as follows:

Device ID COMFF 3400-085_____0000000000001020D48_____0000000000

4. Assign the desired name (PD_TAG) to the field device.

Setting the Resource Block (RB) parameters

5. Set the MODE_BLK. TARGET to Auto.

Setting the Analog Input Block (AI) parameters

6. Set MODE_BLK. TARGET to OOS (Out Of Service).
7. Select the desired process variable from the CHANNEL parameter (Observe parameter setting of FRONT module!).
8. Select the unit belonging to the process variable from the XD_SCALE parameter.
9. Select the unit belonging to the process variable from the OUT_SCALE parameter.
10. Set the LIN_TYPE linearization type to Direct and transmit the changes.
11. If these steps are not properly executed, the "Block Configuration Error" is generated when the block is set to "Auto".
    Using the NI-FBUS Configurator from National Instruments, for example, you can graphically connect the function blocks and then load the system configuration in the device.
12. Download all data and parameters to the field device.
13. Set the target modes of all Analog Input Blocks to "Auto".

Analog Input Blocks

Analog Input Blocks
The module provides 8 analog input blocks (AI 1 ... AI 8).
An Analog Input Block contains the signal processing options for the process variable supplied from the Transducer Block.
The following parameters are available:

Example:
In the Protos AI 1 is set to pH value, AI 2 is set to temperature:

Settings in AI 1:

Parameter	Value
CHANNEL	Module 1 – Channel 1 (pH)
XD_SCALE, UNITS_INDEX	pH
OUT_SCALE, UNITS_INDEX	pH
L_TYPE	Direct
MODE_BLK, ACTUAL	Auto

Settings in AI 2:

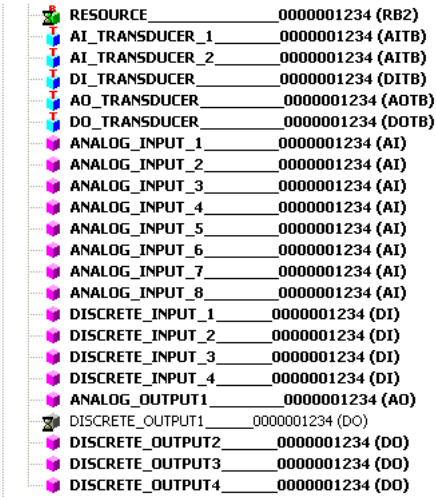
Parameter	Value
CHANNEL	Module 1 – Channel 2 (°C)
XD_SCALE, UNITS_INDEX	°C
OUT_SCALE, UNITS_INDEX	°C
L_TYPE	Direct
MODE_BLK, ACTUAL	Auto

NOTICE!
When connecting the AIs to the AI TBs, you must select the process variable (measurement unit) corresponding to the measured value selected in the Protos (see Page 15).
A faulty setting causes a Block Configuration Error in the AI function block.

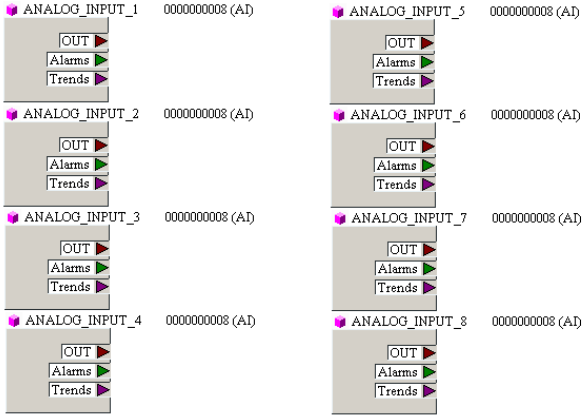
Configuration of AI TB

(Example: Configuration via NI-FBUS Configurator / National Instruments)

After connection of the Protos COMFF 3400-085 module to the Foundation Fieldbus the NI-FBUS Configurator shows this block overview (default setting: Fieldbus address 22)



Move all required AI blocks to the Function Block Application and start Download Configuration.



Configuration with Foundation Fieldbus

Commissioning on the Foundation Fieldbus
Only when the COMFF 3400-085 module is competently configured, can the Foundation Fieldbus communication function properly. Different configuration tools from different manufacturers are available (e.g. NI-FBUS Configurator / National Instruments). They can be used to configure the device and the Foundation Fieldbus.

Note:
Be sure to observe the operating instructions and the menu guidance of the control system or the configuration tool during installation and configuration via the control system.

Installing the DD (Device Description):
During initial installation the device description (*.cff, *.sym and *.ffo) must be installed in the control system .
For network projecting, you require the CFF file (Common File Format).

These files can be obtained from:

- the included CD
- internet: www.knick.de
- Foundation Fieldbus: www.fieldbus.org.

Identifying the Transmitter
There are several possibilities to identify a FF transmitter in the network.
The most important one is the "Device Identifier" or DEV_ID. It consists of the manufacturer ID, device type and serial number of the transmitter.

Corresponding to example given on Page 18, "Offline Configuration"

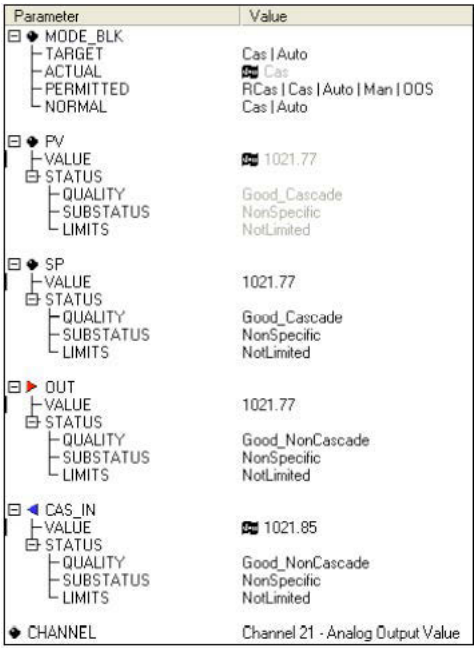
For parameter changes, you must set MODE_BLK/TARGET to OOS (Out of Service) since otherwise the error message NIF_ERR_WRONG_MODE_FOR_ REQUEST would appear for [Write Changes].

Analog_Input_1		
"Process" card:	CHANNEL	Module 1 - Channel 1
"Scaling" card:	XD_SCALE/UNITS_INDEX	pH
	OUT_SCALE/UNITS_INDEX	pH
	L_TYPE	Direct
Button	[Write Changes]	
Button	[Auto]	
Analog_Input_2		
"Process" card:	CHANNEL	Module 1 - Channel 2
"Scaling" card:	XD_SCALE/UNITS_INDEX	°C
	OUT_SCALE/UNITS_INDEX	°C
	L_TYPE	Direct
Button	[Write Changes]	
Button	[Auto]	
Analog_Input_3		
"Process" card:	CHANNEL	Module 1 - Channel 3
"Scaling" card:	XD_SCALE/UNITS_INDEX	mV
	OUT_SCALE/UNITS_INDEX	mV
	L_TYPE	Direct
Button	[Write Changes]	
Button	[Auto]	
Analog_Input_4		
"Process" card:	CHANNEL	Module 1 - Channel 4
"Scaling" card:	XD_SCALE/UNITS_INDEX	Mohm
	OUT_SCALE/UNITS_INDEX	Mohm
	L_TYPE	Direct
Button	[Write Changes]	
Button	[Auto]	

Analog_Input_5		
"Process" card:	CHANNEL	Module 2 - Channel 1
"Scaling" card:	XD_SCALE/UNITS_INDEX	%
	OUT_SCALE/UNITS_INDEX	%
	L_TYPE	Direct
Button	[Write Changes]	
Button	[Auto]	
Analog_Input_6		
"Process" card:	CHANNEL	Module 2 - Channel 2
"Scaling" card:	XD_SCALE/UNITS_INDEX	°C
	OUT_SCALE/UNITS_INDEX	°C
	L_TYPE	Direct
Button	[Write Changes]	
Button	[Auto]	
Analog_Input_7		
"Process" card:	CHANNEL	Module 2 - Channel 3
"Scaling" card:	XD_SCALE/UNITS_INDEX	mbar
	OUT_SCALE/UNITS_INDEX	mbar
	L_TYPE	Direct
Button	[Write Changes]	
Button	[Auto]	
Analog_Input_8		
"Process" card:	CHANNEL	Module 2 - Channel 4
"Scaling" card:	XD_SCALE/UNITS_INDEX	g/l
	OUT_SCALE/UNITS_INDEX	g/l
	L_TYPE	Direct
Button	[Write Changes]	
Button	[Auto]	

An external pressure sensor can be connected to the Analog Output Block (AO) through the Foundation Fieldbus network.

Analog_Output1		
"Process" card:	CHANNEL	Channel 21 (Analog Output Value)
"Scaling" card:	XD_SCALE/EU_100	9999
	XD_SCALE/UNITS_INDEX	mbar
	OUT_SCALE/EU_100	9999
	OUT_SCALE/UNITS_INDEX	mbar
"Limits" card	SP_HI_LIM	9999
Button	[Write Changes]	
Button	[Cascade]	



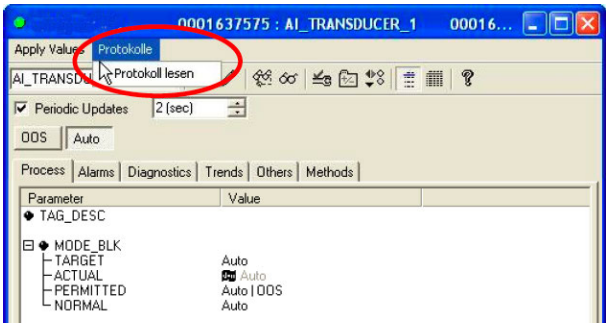
Then the AO Block should be in ACTUAL Mode Cas.
The coupled output value (AI) from the linked pressure transmitter appears at input CAS_IN.
In Cascade mode the measured OUT value is passed to the transmitter and is available to the system.
The parameter settings required for the DI and DO blocks are given on the following page.

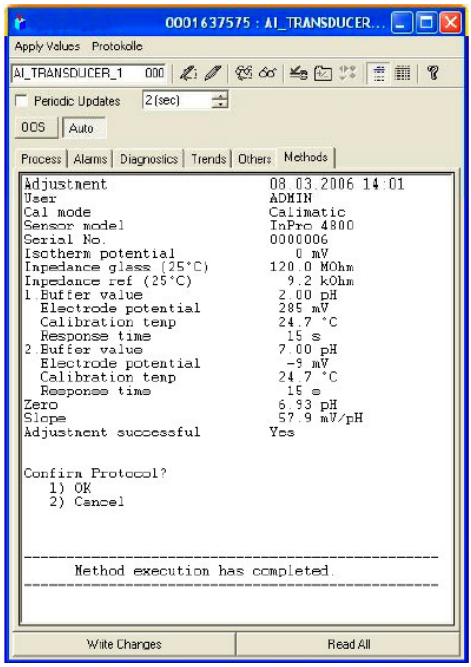
Discrete_Input_1			
"Process" card:	CHANNEL	Channel 11	Discrete Input Value
Button	[Write Changes]		
Button	[Auto]		
Discrete_Input_2			
"Process" card:	CHANNEL	Channel 12	Discrete Input Value
Button	[Write Changes]		
Button	[Auto]		
Discrete_Input_3			
"Process" card:	CHANNEL	Channel 13	Discrete Input Value
Button	[Write Changes]		
Button	[Auto]		
Discrete_Input_4			
"Process" card:	CHANNEL	Channel 14	Discrete Input Value
Button	[Write Changes]		
Button	[Auto]		
Discrete_Output1			
"Process" card:	CHANNEL	Channel 31	Discrete Output Value
Button	[Write Changes]		
Button	[Auto]		
Discrete_Output2			
"Process" card:	CHANNEL	Channel 32	Discrete Output Value
Button	[Write Changes]		
Button	[Auto]		
Discrete_Output3			
"Process" card:	CHANNEL	Channel 33	Discrete Output Value
Button	[Write Changes]		
Button	[Auto]		
Discrete_Output4			
"Process" card:	CHANNEL	Channel 34	Discrete Output Value
Button	[Write Changes]		
Button	[Auto]		

Calibration Protocols

Calibration Protocols

The protocols are transmitted in the AI TBs in binary form. The DD provides a method for converting them to a readable format. The method can be started with “Read protocol“ in the “Protocol“ menu of the AI TB.





Each AI TB of the FF module has a ring buffer which can store up to three protocols. A fourth protocol would overwrite the first protocol in that TB.
With “Read protocol“, the calibration protocol of the respective module can be read out from the AI TB. The example shows the pH protocol of AI TB1.
At the end of the method you can confirm the protocol (OK) and thus delete it from the ring buffer. After confirmation you will be informed if further data, i.e. another protocol, are available. Without confirmation (Cancel), you can re-read the protocol as often as you like.

Parameters of AI Transducer Blocks

All blocks correspond to the "FF-007-5.0 Specifications". Only the two AI-TB blocks have been extended (Index 14 ... 39). AI-TB1 and AI-TB2 can be assigned to different measuring modules in the Protos.

Index	Parameter	Description
	Standard parameters	
0	AITB	
1	ST_REV	
2	TAG_DESC	
3	STRATEGY	
4	ALERT_KEY	
5	MODE_BLK	
6	BLOCK_ERR	
7	UPDATE_EVT	
8	BLOCK_ALM	
9	TRANSDUCER_DIRECTORY	
10	TRANSDUCER_TYPE	
11	XD_ERROR	
12	COLLECTION_DIRECTORY	
13	PRIMARY_VALUE	Measured value channel 1
	Manufacturer-specific extensions: Measured values	
14	SECONDARY_VALUE	Measured value channel 2
15	THIRD_VALUE	Measured value channel 3
16	FOURTH_VALUE	Measured value channel 4
	Manufacturer-specific extensions: Product calibration	
17	CAL_SAMPLE_PRD	Starts the first part of product calibration
18	CAL_SAMPLE_PRD_STORED_VAL	Shows the value stored during the first part of product calibration
19	CAL_PRODUCT	Sets the value for the second part of product calibration
20	CAL_MODE_PRD	"Mode of ... calibration"
21	CAL_RESULT	Result of calibration

Index	Parameter	Description
	Manufacturer-specific extensions: Protocols	
22	PROTOCOL_STATUS	Status
23	PROTOCOL_DATA_0	Binary protocol data, part 1
24	PROTOCOL_DATA_1	
25	PROTOCOL_DATA_2	
26	PROTOCOL_DATA_3	
27	PROTOCOL_DATA_4	
28	PROTOCOL_DATA_5	
29	PROTOCOL_DATA_6	
30	PROTOCOL_DATA_7	
31	PROTOCOL_DATA_8	
32	PROTOCOL_DATA_9	
33	PROTOCOL_DATA_A	
34	PROTOCOL_DATA_B	
35	PROTOCOL_DATA_C	
36	PROTOCOL_DATA_D	
37	PROTOCOL_DATA_E	
38	PROTOCOL_DATA_F	Binary protocol data, part 16
39	PROTOCOL_CONFIRM	Save protocol

A ring buffer for up to 3 protocols is implemented in the module
The DD includes a method for presenting the protocol in a readable manner.
This method is called in the “Protocol“ menu of the AI TB Block.

Function Block AO

Cyclic transmission of an external correction value (e.g. pressure correction for OXY 3400-062).

DI Function Blocks

DI 1: Unical Status

Bit								Meaning
7	6	5	4	3	2	1	0	
							1	Probe in MEASURE position (PROCESS)
						1		Probe in SERVICE position
					1			Service switch actuated
				1				Unical alarm
			1					Unical program active
0	0	0						No program
0	0	1						Program: Cleaning
0	1	0						Program: Cal 2point
0	1	1						Program: Cal 1point
1	0	0						Program: Parking
1	0	1						Program: USER 1
1	1	0						Program: USER 2
1	1	1						Program: Service

DI 2: CONTACTS / LOCK Status / ENABLE Request

Bit								Meaning
7	6	5	4	3	2	1	0	
							1	Contact K4 active
						1		Contact K3 active
					1			Contact K2 active
				1				Contact K1 active
			1					CAL terminates AI-TB1 (1 min or until cal record collected)
		1						CAL terminates AI-TB2 (1 min or until cal record collected)
0	0							Measuring mode
0	1							Unconfirmed enable request
1	0							Confirmed enable request
1	1							Enable

DI Function Block Unical Messages

Unical with Protos II 4400(X) from FRONT firmware version 02.xx.xx

DI 3: Unical Messages

Bit 7	6	5	4	3	2	1	0	Meaning
							1	Probe maintenance request
						1		Media adapter maintenance request
					1			Unical basic device maintenance request
				1				Medium maintenance request
			1					Probe failure
		1						Media adapter failure
	1							Unical basic device failure
1								Calibration / Communication error

Explanation of Unical Messages: Maintenance Request

Probe maintenance request	
U 231	Probe move time MEASURE (PROCESS)
U 234	Probe move time SERVICE
U 232	Proble wear counter
U 228	Probe cylinder untight
Media adapter maintenance request	
U 190	Buffer I almost empty
U 191	Buffer II almost empty
U 192	Cleaner almost empty
Maintenance request / Unical basic device	
U 233	Water pressure switch
U 229	Sensor dismount guard defective
U 235	Safety valve defective
U 248	Water valve defective (electrical)

Medium maintenance request	
U 241	Check water
U 242	Check buffer I
U 243	Check buffer II
U 244	Check cleaner
U 245	Check aux. valve I
U 246	Check aux. valve II

Unical Messages, Unical Step

Unical with Protos II 4400(X) from FRONT firmware version 02.xx.xx

Explanation of Unical Messages: Failure

Probe failure	
U 230	Probe limit position MEASURE (PROCESS)
U 227	Probe limit position SERVICE
Media adapter failure	
U 194	Buffer I empty
U 195	Buffer II empty
U 196	Cleaner empty
UNICAL basic device failure	
U 220	Compressed air switch
U 225	Probe valve defective
U 224	Unical flooded
U 221	Sensor dismounted
Calibration / Communication error	
U 251	Calibration error
U 252	Communication error

DI 4: Unical Step

Bit								Meaning
7	6	5	4	3	2	1	0	
							1	System in SINGLE_STEP
		X	X	X	X	X		Step 1 ... 30
	0							Reserved
0								Reserved

The half-automated Unical program control in Single-Step Mode can only be activated and triggered from the Protos. Control via bus is not possible, however the Single-Step Mode can be watched.

DO Function Blocks

DO 1: HOLD Control

Bit 7	6	5	4	3	2	1	0	Meaning
							1	System HOLD
						0		Reserved
					0			Reserved
				0				Reserved
			0					Reserved
		0						Reserved
	0							Reserved
0								Reserved

DO 2: PARSET

Bit 7	6	5	4	3	2	1	0	Meaning
							1	Parameter set B (internal)
				0	0	0		Parameter set not from card
				0	0	1		Parameter set 1 (card)
				0	1	0		Parameter set 2 (card)
				0	1	1		Parameter set 3 (card)
				1	0	0		Parameter set 4 (card)
				1	0	1		Parameter set 5 (card)
			0					Reserved
		0						Reserved
	0							Reserved
0								Reserved

DO Function Blocks

DO 3: Unical Control

Bit								Meaning
7	6	5	4	3	2	1	0	
							X	Reserved
						1		Probe in SERVICE position (MEASURE = 0)
					1			Manual, Time control Off (Auto, Time control On = 1)
				X				Reserved
			X					Reserved
0	0	0						No program start
0	0	1						Program: Cleaning
0	1	0						Program: Cal 2point
0	1	1						Program: Cal 1point
1	0	0						Program: Parking
1	0	1						Program: USER 1
1	1	0						Program: USER 2
1	1	1						No program start

DO 4: LOCK Control

Bit								Meaning
7	6	5	4	3	2	1	0	
						0	0	Measuring mode
						0	1	Enabled
						1	0	Busy
						1	1	Not used
					X			Reserved
				X				Reserved
			X					Reserved
		X						Reserved
	X							Reserved
X								Reserved

Enable / Lock via DCS

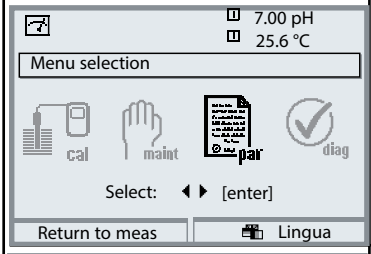
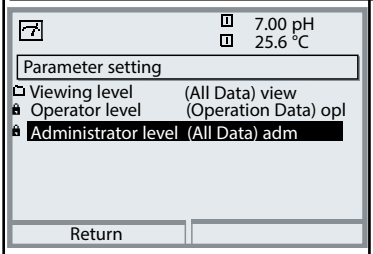
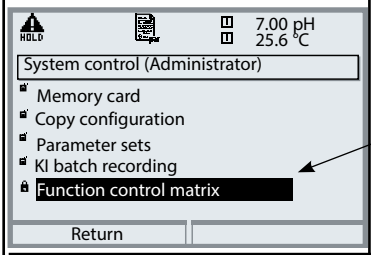
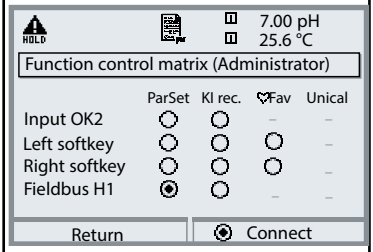
NOTICE! Control system programming required by customer

Enable / Lock Protos for on-site calibration via DCS.
The DI 1 and DO 4 function blocks are used for communicating with the DCS (control system programming required by customer).

Step 1:	The user calls the cal menu, for example, on the device. An "Enable request running ..." window appears instead of the passcode prompt. An enable request message is sent to the DCS.
Step 2:	The DCS confirms the request, still without a decision. Now, a message window opens on the control system where the plant operator selects the decision Yes/No. Until a decision is made, the display reads "Wait for enable signal from DCS ..."
Step 3:	The decision has been made: YES: The window disappears and the user is prompted to enter the passcode (or signature for AuditTrail). Now, he/she may use the menu. NO: A "Request denied!" window appears and the device returns to measuring mode.
Step 4:	After the menu system has been exited, the DCS receives a message that manual operation is terminated. This erases the authorization.

Function Control Matrix

Controlling parameter set selection / KI recorder via Fieldbus H1
Parameter setting/Administrator level/System control/Function control matrix

Menu	Display	Control via Foundation Fieldbus
par		**Open parameter setting** From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, press **enter** to confirm.
		**Administrator level:** Access to all functions, also passcode setting. Releasing or blocking a function for access from the Operator level.
		At the Administrator level: Select "System control", then "Function control matrix".
		**Function control matrix** Clear assignment: control element/function. Example: Fieldbus H1 controls the parameter set selection. **Note:** KI recorder only with Protos 3400(X) Unical with Protos II 4400(X) from FRONT firmware version 02.xx.xx

Note: The display may vary depending on the device version.

Specifications

Protos COMFF 3400(X)-085

Foundation Fieldbus FF-H1)	COMFF 3400X-085: Digital communication in hazardous areas via current modulation (Ex ia IIC)
Physical interface	According to IEC 61158-2
Transfer rate	31.25 kbits/s
Communication protocol	FF-816
Profile	FF_H1 (Foundation Fieldbus)
Bus address	Visible on the device but not adjustable
Supply voltage (FISCO)	Bus supply: 9 … 17.5 V Linear barrier: 9 … 24 V
Current consumption	< 12 mA
Max. current in case of fault (FDE)	< 17 mA
FF communication model	Certified to ITK 4.6
1 Physical Block	Device description
5 transducer blocks	Connection to signal processing
8 AI Function blocks	Output of measured values with status via the Fieldbus
4 DI function blocks	Output of messages with status via the Fieldbus
4 DO Function blocks	Control via the Fieldbus
1 AO function block	for analog compensation signals (e.g. O_2 process pressure)

Specifications

General data

Explosion protection (Ex version of module only)	See certificates or www.knick.de
RoHS conformity	According to EU directive 2011/65/EU
EMC	EN 61326-1, EN 61326-2-3 NAMUR NE 21
Emitted interference	Industrial applications* (EN 55011 Group 1 Class A)
Interference immunity	Industrial applications
Lightning protection	to EN 61000-4-5, Installation class 2
Rated operating conditions	Ambient temperature: Safe area: -20 ... 55 °C / -4 ... 131 °F Ex: -20 ... 50 °C / -4 ... 122 °F Relative humidity: 10 ... 95 % non-condensing
Transport/storage temperature	-20 ... 70 °C / -4 ... 158 °F
Screw clamp connector	Single or stranded wires up to 2.5 mm^2

* This equipment is not designed for domestic use, and is unable to guarantee adequate protection of the radio reception in such environments.

Process Variables Available for Fieldbus

Process variables which can be assigned to Analog Input Blocks (AI):

pH Modules

Measured value	Unit of measure
pH value	pH
Electrode voltage	mV
Electrode potential (ORP)	mV
rH value	rH
Glass impedance	Ohm
Reference impedance	Ohm
Temperature	°C
Temperature	°F
pH zero point	pH
pH slope	mV/pH

Calculation Block pH / pH

Measured value	Unit of measure
Delta pH value	pH
Delta ORP	mV
Delta temperature	°C

Process Variables Available for Fieldbus

Process variables which can be assigned to Analog Input Blocks (AI):

O_2 Modules

Measured value	Unit of measure
Saturation (Air)	%
Saturation (O_2)	%
Concentration	mg/l
Concentration	ppm
Volume concentration (GAS)	%
Volume concentration (GAS)	ppm
Sensor current	nA
Temperature	°C
Temperature	°F
Air pressure	mbar
O_2 partial pressure	mbar
Zero	nA
Slope	nA/mbar
Cal timer (adaptive)	h
Current input	mA

Calculation Block O_2 / O_2

Measured value	Unit of measure
Delta saturation (Air)	%
Delta saturation (O_2)	%
Delta temperature	°C
Delta O_2 concentration	mg/l
Delta O_2 concentration	ppm
Delta volume conc. (gas)	%
Delta volume conc. (gas)	ppm

Process Variables Available for Fieldbus

Process variables which can be assigned to Analog Input Blocks (AI):

pH Modules

Measured value	Unit of measure
Conductivity	µS/cm
Resistivity	Ohm/cm
Concentration	%
Concentration	g/kg
Temperature	°C
Temperature	°F
cell constant	cm^{-1}
USP value	%

Calculation Block COND/COND

Measured value	Unit of measure
Delta conductivity	µS/cm
Delta resistivity	Ohm/cm
Delta temperature	°C
Ratio	
Passage	%
Rejection	%
Deviation	%
pH value	pH

Process Variables Available for Fieldbus

Process variables which can be assigned to Analog Input Blocks (AI):

O_2 Modules

Measured value	Unit of measure
Conductivity	µS/cm
Resistivity	Ohm/cm
Concentration	%
Concentration	g/kg
Temperature	°C
Temperature	°F
Zero	S/cm
Cell factor	(value only)

Calculation Block CONDI / CONDI

Measured value	Unit of measure
Delta conductivity	µS/cm
Delta resistivity	Ohm/cm
Delta temperature	°C
Ratio	
Passage	%
Rejection	%
Deviation	%

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Protos COMFF 3400(X)-085 Module

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