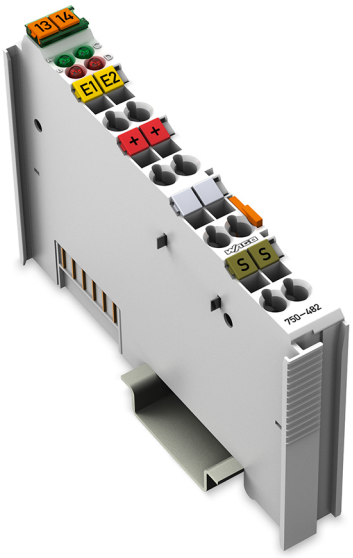
TECHDOCS

Manual

WAGO I/O System 750



750-482(/xxx-xxx)

2AI 4-20mA 12 Bit S.E. HART

2-Channel Analog Input; 4 … 20 mA; HART

Version 1.2.0

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Every conceivable measure has been taken to ensure the accuracy and completeness of this documentation. However, as errors can never be fully excluded, we always appreciate any information or suggestions for improving the documentation.

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We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally protected by trademark or patent.

WAGO is a registered trademark of WAGO Verwaltungsgesellschaft mbH.

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1 Notes about this Documentation

Note

Always retain this documentation!
This documentation is part of the product. Therefore, retain the documentation during the entire service life of the product. Pass on the documentation to any subsequent user. In addition, ensure that any supplement to this documentation is included, if necessary.

1.1 Validity of this Documentation

This documentation is only applicable to the I/O module 750-482 (2AI 4-20mA 12 Bit S.E. HART) and the variants listed in the table below.

Table 1: Variants

Item Number/Variant	Designation
750-482	2AI 4-20mA 12 Bit S.E. HART
750-482/025-000	2AI 4-20mA 12 Bit S.E. HART T
750-482/000-300	2AI 4-20mA 12 Bit S.E. HART S7[1)]

[1)] Data format for S7 control

Note

Documentation Validity for Variants
Unless otherwise indicated, the information given in this documentation applies to listed variants.

The I/O module 750-482 shall only be installed and operated according to the instructions in this manual and in the manual for the used fieldbus coupler or controller.

NOTICE

Consider power layout of the WAGO I/O System 750!
In addition to these operating instructions, you will also need the manual for the used fieldbus coupler or controller, which can be downloaded at www.wago.com. There, you can obtain important information including information on electrical isolation, system power and supply specifications.

1.2 Copyright

1.3 Symbols

⚠ DANGER

Personal Injury!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ DANGER

Personal Injury Caused by Electric Current!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Personal Injury!
Indicates a moderate-risk, potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Personal Injury!
Indicates a low-risk, potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Damage to Property!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

NOTICE

Damage to Property Caused by Electrostatic Discharge (ESD)!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

Note

Important Note!
Indicates a potential malfunction which, if not avoided, however, will not result in damage to property.

Information

Additional Information:
Refers to additional information which is not an integral part of this documentation (e.g., the Internet).

1.4 Number Notation

Table 2: Number Notation

Number Code	Example	Note
Decimal	100	Normal notation
Hexadecimal	0x64	C notation
Binary	'100' '0110.0100'	In quotation marks, nibble separated with dots (.)

1.5 Font Conventions

Table 3: Font Conventions

Font Type	Indicates
italic	Names of paths and data files are marked in italic-type. e.g.: *C:\Program Files\WAGO Software*
Menu	Menu items are marked in bold letters. e.g.: **Save**
>	A greater-than sign between two names means the selection of a menu item from a menu. e.g.: **File** > **New**
Input	Designation of input or optional fields are marked in bold letters, e.g.: **Start of measurement range**
“Value”	Input or selective values are marked in inverted commas. e.g.: Enter the value “4 mA” under **Start of measurement range**.
[Button]	Pushbuttons in dialog boxes are marked with bold letters in square brackets. e.g.: **[Input]**
[Key]	Keys are marked with bold letters in square brackets. e.g.: **[F5]**

2 Important Notes

This section includes an overall summary of the most important safety requirements and notes that are mentioned in each individual section. To protect your health and prevent damage to devices as well, it is imperative to read and carefully follow the safety guidelines.

2.1 Legal Bases

2.1.1 Subject to Changes

WAGO Kontakttechnik GmbH & Co. KG reserves the right to provide for any alterations or modifications. WAGO Kontakttechnik GmbH & Co. KG owns all rights arising from the granting of patents or from the legal protection of utility patents. Third-party products are always mentioned without any reference to patent rights. Thus, the existence of such rights cannot be excluded.

2.1.2 Personnel Qualifications

All sequences implemented on WAGO I/O System 750 devices may only be carried out by electrical specialists with sufficient knowledge in automation. The specialists must be familiar with the current norms and guidelines for the devices and automated environments.

All changes to the coupler or controller should always be carried out by qualified personnel with sufficient skills in PLC programming.

2.1.3 Use of the 750 Series in Compliance with Underlying Provisions

Fieldbus couplers, controllers and I/O modules found in the modular WAGO I/O System 750 receive digital and analog signals from sensors and transmit them to actuators or higher-level control systems. Using controllers, the signals can also be (pre-) processed.

The devices have been developed for use in an environment that meets the IP20 protection class criteria. Protection against finger injury and solid impurities up to 12.5 mm diameter is assured; protection against water damage is not ensured. Unless otherwise specified, operation of the devices in wet and dusty environments is prohibited.

Operating the WAGO I/O System 750 devices in home applications without further measures is only permitted if they meet the emission limits (emissions of interference) according to EN 61000-6-3. You will find the relevant information in the section “Device Description” > “Standards and Guidelines” in the manual for the used device.

Appropriate housing (per 2014/34/EU) is required when operating the WAGO I/O System 750 in hazardous environments. Please observe the installation

regulations! Please note that a prototype test certificate must be obtained that confirms the correct installation of the system in a housing or switch cabinet.

The implementation of safety functions such as EMERGENCY STOP or safety door monitoring must only be performed by the F I/O modules within the modular WAGO I/O System 750. Only these safe F I/O modules ensure functional safety in accordance with the latest international standards. WAGO's interference-free output modules can be controlled by the safety function.

2.1.4 Technical Condition of Specified Devices

The devices to be supplied ex works are equipped with hardware and software configurations, which meet the individual application requirements. These modules contain no parts that can be serviced or repaired by the user. The following actions will result in the exclusion of liability on the part of WAGO Kontakttechnik GmbH & Co. KG:

- Repairs,
- Changes to the hardware or software that are not described in the operating instructions,
- Improper use of the components.

Further details are given in the contractual agreements. Please send your request for modified and new hardware or software configurations directly to WAGO Kontakttechnik GmbH & Co. KG.

2.1.4.1 Disposal

2.1.4.1.1 Electrical and Electronic Equipment

Electrical and electronic equipment may not be disposed of with household waste. This also applies to products without this symbol.

Electrical and electronic equipment contain materials and substances that can be harmful to the environment and health. Electrical and electronic equipment must be disposed of properly after use.
WEEE 2012/19/EU applies throughout Europe. Directives and laws may vary nationally.

Environmentally friendly disposal benefits health and protects the environment from harmful substances in electrical and electronic equipment.

- Observe national and local regulations for the disposal of electrical and electronic equipment.
- Clear any data stored on the electrical and electronic equipment.
- Remove any added battery or memory card in the electrical and electronic equipment.
- Have the electrical and electronic equipment sent to your local collection point.

Improper disposal of electrical and electronic equipment can be harmful to the environment and human health.

2.1.4.1.2 Packaging

Packaging contains materials that can be reused.
PPWD 94/62/EU and 2004/12/EU packaging guidelines apply throughout Europe. Directives and laws may vary nationally.

Environmentally friendly disposal of the packaging protects the environment and allows sustainable and efficient use of resources.

- Observe national and local regulations for the disposal of packaging.
- Dispose of packaging of all types that allows a high level of recovery, reuse and recycling.

Improper disposal of packaging can be harmful to the environment and wastes valuable resources.

2.2 Safety Advice (Precautions)

For installing and operating purposes of the relevant device to your system the following safety precautions shall be observed:

DANGER

Do not work on devices while energized!
All power sources to the device shall be switched off prior to performing any installation, repair or maintenance work.

DANGER

Install device in only one suitable enclosure!
The device is an open system. Install the device in a suitable enclosure. This enclosure must:

- Guarantee that the max. permissible degree of pollution is not exceeded.
- Offer adequate protection against contact.
- Prevent fire from spreading outside of the enclosure.
- Offer adequate protection against UV irradiation.
- Guarantee mechanical stability
- Restrict access to authorized personnel and may only be opened with tools

DANGER

Ensure disconnect and overcurrent protection!
The device is intended for installation in automation technology systems. Disconnect protection is not integrated. Connected systems must be protected by a fuse.
Provide suitable disconnect and overcurrent protection on the system side!

DANGER

Ensure a standard connection!
To minimize any hazardous situations resulting in personal injury or to avoid failures in your system, the data and power supply lines shall be installed according to standards, with careful attention given to ensuring the correct terminal assignment. Always adhere to the EMC directives applicable to your application.

NOTICE

Ensure proper contact with the DIN-rail!
Proper electrical contact between the DIN-rail and device is necessary to maintain the EMC characteristics and function of the device.

NOTICE

Replace defective or damaged devices!
Replace defective or damaged device/module (e.g., in the event of deformed contacts).

NOTICE

Protect the components against materials having seeping and insulating properties!
The components are not resistant to materials having seeping and insulating properties such as: aerosols, silicones and triglycerides (found in some hand creams). If you cannot exclude that such materials will appear in the component environment, then install the components in an enclosure being resistant to the above-mentioned materials. Clean tools and materials are imperative for handling devices/modules.

NOTICE

Clean only with permitted materials!
Clean housing and soiled contacts with propanol.

NOTICE

Do not use any contact spray!
Do not use any contact spray. The spray may impair contact area functionality in connection with contamination.

NOTICE

Do not reverse the polarity of connection lines!
Avoid reverse polarity of data and power supply lines, as this may damage the devices involved.

NOTICE

Avoid electrostatic discharge!

The devices are equipped with electronic components that may be destroyed by electrostatic discharge when touched. Please observe the safety precautions against electrostatic discharge per DIN EN 61340-5-1/-3. When handling the devices, please ensure that environmental factors (personnel, work space and packaging) are properly grounded.

3 Device Description

The Analog Input Module 750-482 (2AI 4-20mA 12 Bit S.E. HART) processes analog signals with the norm value of 4 mA ... 20 mA.

The I/O module also enables digital communication to be carried out with HART-enabled field devices (Highway Addressable Remote Transducer).

The I/O module has 2 input channels and enables field signals to be received via the HART 1+ and HART 1− and HART 2+ and HART 2− connections. Typically, the current values are measured at these connections, but at the same time the HART signals can also be coupled and decoupled on an alternating voltage basis.

The channels have a common reference potential and a shield connection.
The shield connection is fed directly to the carrier rail and contact is made automatically by snapping the module onto the rail.

The channels are not electrically isolated from one another.

Two-conductor transducers, which do not have their own power supply, such as adjustable resistances, pressure, flow and level meters, can be connected directly.
The transducers are directly supplied from the I/O module.

In order to connect the 0 V line when using 3-conductor transducers, a 75x-604 or –614 Field Side Connection Module must be plugged in next to the HART I/O module, providing the 0 V potential for the field level.

The input signal is electrically isolated and is transmitted with a resolution of 12 bits.

Simple parameterization of the HART I/O module for 6 different operating modes enables the I/O module to be used optimally for 4 different types of application.

Table 4: Types of Application

Types of Application for the HART I/O Module	
1	Programmable fieldbus controllers can communicate with HART devices from IEC61131-3 programs using the “WagoLibHART_0x.lib” PLC library.
2	FDT tool routing to the DTM of the connected HART device is possible with a number of WAGO ETHERNET controllers and the 759-359 ModbusTCP/HART Gateway.
3	Up to 4 HART dynamic variables (PV, SV, TV, QV) can be incorporated in the cyclic process image of the 750-333 PROFIBUS Coupler or 750-833 PROFIBUS Controller by parameterization via GSD (device master data) or WAGO-I/O-*CHECK* 2.
4	When using the 750-333 PROFIBUS DP/V1 Coupler or 750-833 PROFIBUS Controller and the 759-360 PROFIBUS/HART Gateway DTM, FDT tool routing is possible to the DTM of the connected HART device.

The operating status of the channels is indicated by a green status LED per channel.
A red error LED per channel indicates a wire break, a short circuit or that the signal is outside the measuring range.
The meaning of the LEDs is described in the “Display Elements” section.

The I/O module 750-482 (2AI 4-20mA 12 Bit S.E. HART) receives the 24 V voltage supply for the field level from an upstream I/O module or from the fieldbus coupler/controller via blade-formed power jumper contacts. It then provides these potentials to subsequent I/O modules via spring-formed power jumper contacts.

Note

Use supply modules for ground (earth)!
The I/O module has no power jumper contacts for receiving and transmitting the earth potential. Use a supply module when an earth potential is needed for the subsequent I/O modules.

NOTICE

Do not exceed maximum values via power contacts!
The maximum current that can flow through the power jumper contacts is 10 A. The power jumper contacts can be damaged and the permissible operating temperature can be exceeded by higher current values.
When configuring the system, do not exceed the permissible maximum current value. If there is a higher power requirement, you must use an additional supply module to provide the field voltage.

NOTICE

Avoid short circuit
A short circuit between the "HART+" connectors and ground can destroy the module. Therefore, make sure that no grounded part of the field device housing comes into contact with the "HART+" connector, for example, during installation.

With consideration of the power jumper contacts, the individual modules can be arranged in any combination when configuring the fieldbus node.
An arrangement in groups within the group of potentials is not necessary.

The HART I/O module can be used with all couplers and controllers of the WAGO-I/O-SYSTEM 750 listed in the following table “Compatibility List”.

Table 5: Compatibility List

Bus System	Fieldbus Coupler/ Controller	Item No.	Hard-ware Version	Soft-ware Version	Max. Number of Modules	Function *)
ETHERNET TCP/IP	Programmable Fieldbus Controllers	750-841	03	07	8	(1), (5)
		750-842	04	12	8	(1), (5)
		750-871	01	01	8	(1), (5)
		750-872	01	01	8	(1), (5)
		750-872/ 020-000	01	07	8	(1), (5)
		750-873	01	01	8	(1), (5)
		750-880	06	03	8	(1), (5)
CANopen	Programmable Fieldbus Controllers	750-837	07	12	8	(1)
		750-838	02	12	8	(1)
DeviceNet	Programmable Fieldbus Controllers	750-806	04	09	8	(1)
LON	Programmable Fieldbus Controllers	750-819	xx	09	8	(1)
PROFIBUS	Fieldbus Coupler	750-333	12	From 13	8	(2), (3), (4)
	Programmable Fieldbus Controllers	750-833	12	From 10	8	(1), (2), (3), (4)
PROFINET	Fieldbus Coupler	750-375	01	03	8	(6)
		750-377	01	03	8	(6)
BACnet	Programmable Fieldbus Controllers	750-830	01	01	8	(1)
KNX	Programmable Fieldbus Controllers	750-849	xx	From 01	8	(1)

Other Fieldbus Coupler/Controller on request.

***) Functions:**

(1)	WAGO-I/O-PRO CAA (CODESYS) PLC library „WagoLibHART_0x.lib“
(2)	Cyclic Profibus communication with HART dynamic variables
(3)	Acyklic Profibus communication with HART Toolrouting FDT/DTM or eddl/SimaticPDM
(4)	PROFIBUS/HART Gateway DTM 759-360
(5)	ModbusTCP/HART Gateway DTM 759-359
(6)	Cyclic Profinet communication with HART dynamic variables

3.1 View

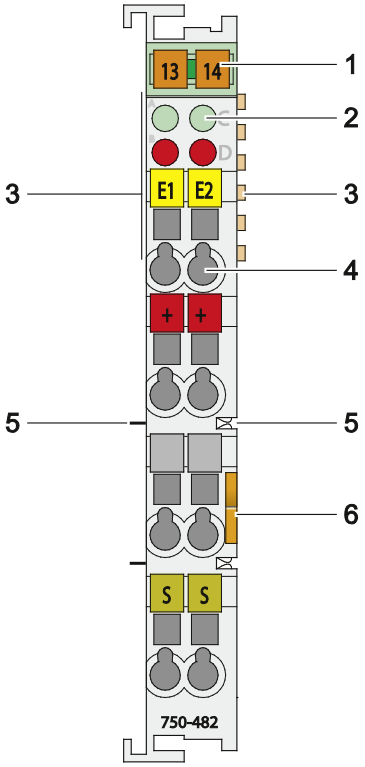

Figure 1: View

Table 6: Legend for Figure “View”

Pos.	Description	Details See Section
1	Marking possibility with Mini-WSB	---
2	Status LEDs	“Device Description” > “Display Elements”
3	Data contacts	“Device Description” > “Connectors”
4	CAGE CLAMP® connectors	“Device Description” > “Connectors”
5	Power jumper contacts	“Device Description” > “Connectors”
6	Release tab	“Mounting” > “Inserting and Removing Devices”

3.2 Connectors

3.2.1 Data Contacts/Local Bus

Communication between the fieldbus coupler/controller and the I/O modules as well as the system supply of the I/O modules is carried out via the local bus. The contacting for the local bus consists of 6 data contacts, which are available as self-cleaning gold spring contacts.

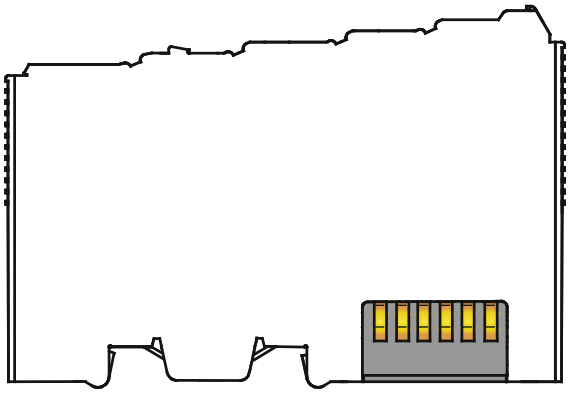

Figure 2: Data Contacts

NOTICE

Do not place the I/O modules on the gold spring contacts!
Do not place the I/O modules on the gold spring contacts in order to avoid soiling or scratching!

NOTICE

Pay attention to potential equalization from the environment!
The devices are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the devices, please ensure that environmental factors (personnel, work space and packaging) are properly equalized. Do not touch any conducting parts, e.g., data contacts.

3.2.2 Power Jumper Contacts/Field Supply

⚠ CAUTION

Risk of injury due to sharp-edged blade contacts!
The blade contacts are sharp-edged. Handle the I/O module carefully to prevent injury. Do not touch the blade contacts.

The I/O module 750-482 has 2 self-cleaning power jumper contacts that supply and transmit power for the field side. The contacts on the left side of the I/O module are designed as blade contacts and those on the right side as spring contacts.

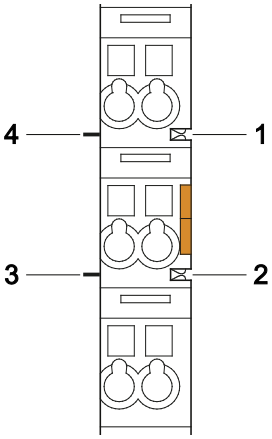

Figure 3: Power Jumper Contacts

Table 7: Legend for Figure “Power Jumper Contacts”

Contact	Type	Function
1	Spring contact	Potential transmission (U_v) for field supply
2	Spring contact	Potential transmission (0 V) for field supply
3	Blade contact	Potential feed-in (0 V) for field supply
4	Blade contact	Potential feed-in (U_v) for field supply

NOTICE

Do not exceed maximum values via power contacts!
The maximum current that can flow through the power jumper contacts is 10 A. The power jumper contacts can be damaged and the permissible operating temperature can be exceeded by higher current values.
When configuring the system, do not exceed the permissible maximum current value. If there is a higher power requirement, you must use an additional supply module to provide the field voltage.

Note

Use supply modules for ground (earth)!

The I/O module has no power jumper contacts for receiving and transmitting the earth potential. Use a supply module when an earth potential is needed for the subsequent I/O modules.

3.2.3 CAGE CLAMP® Connectors

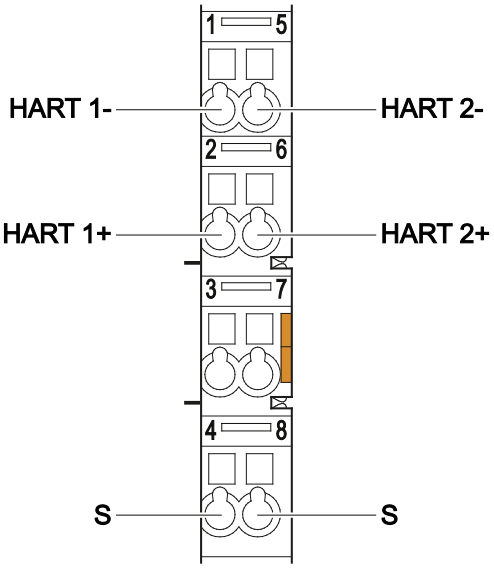

Figure 4: CAGE CLAMP® Connectors

Table 8: Legend for Figure “CAGE CLAMP® Connectors”

Channel	Designation	Connector	Function
1	HART 1−	1	Sensor 1: Connection HART −
	HART 1+	2	Sensor 1: Connection HART +
	S	4	Shield (screen)
2	HART 2−	5	Sensor 2: Connection HART −
	HART 2+	6	Sensor 2: Connection HART +
	S	8	Shield (screen)

3.3 Display Elements

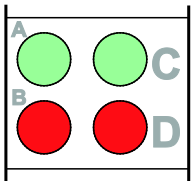

Figure 5: Display Elements

Table 9: Legend for Figure “Display Elements”

Chan-nel	Designation	LED	State	Function
1	Function HART 1	A	Green	Ready for operation: Power-On completed successfully; local bus communication
			Off	No operational readiness
	Error HART 1	B	1 × flashing (red)	Power-On: Hardware and software initialization
			Red	Error: Wire break, short circuit, overload
			Off	No error
2	Function HART 2	C	Green	Ready for operation: Power-On completed successfully; local bus communication
			Off	No operational readiness
	Error HART 2	D	1 × flashing (red)	Power-On: Hardware and software initialization
			Red	Error: Wire break, short circuit, overload
			Off	No error

3.4 Schematic Diagram

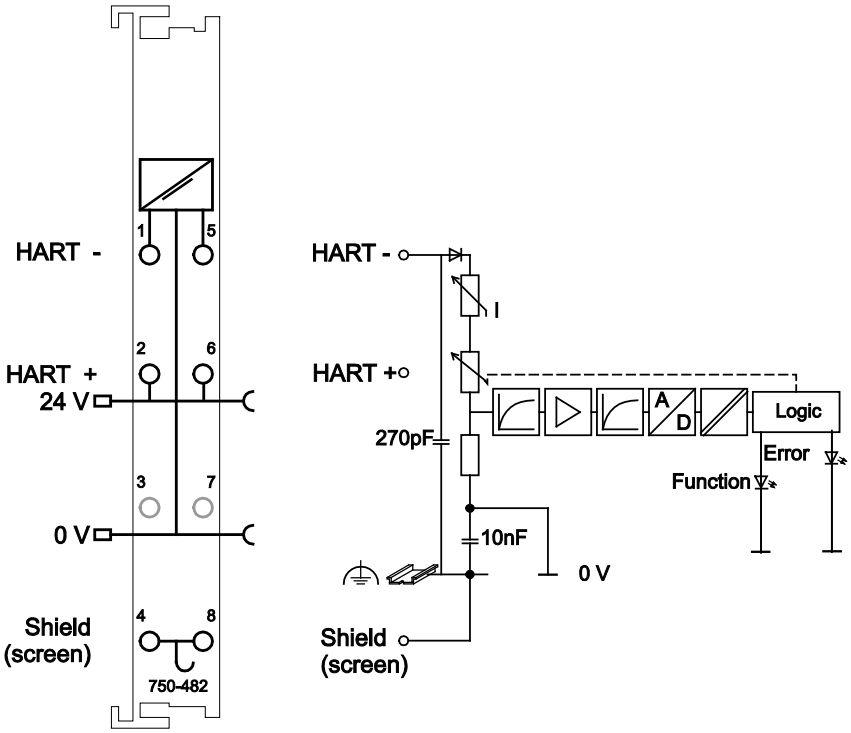

Figure 6: Schematic Diagram

3.5 Technical Data

3.5.1 Device

Table 10: Technical Data – Device

Width	12 mm
High (from upper edge of DIN 35 rail)	64 mm
Length	100 mm
Weight	Approx. 53 g

3.5.2 Supply

Table 11: Technical Data – Supply

Voltage Supply	Via system voltage local bus DC/DC, ~10 mA without sensor supply
Input current	< 65 mA
Input voltage $_{max.}$	24 V
Input voltage drop	(I_{meas} < 28 mA): not linear, as protected against overload $U = 0.9\ V + 270\ \Omega \times I_{meas}$
Isolation	500 V system/supply

3.5.3 Communication

Table 12: Technical Data – Communication

Data width	2 × 2 bytes data or 2 × 2 bytes data + 2n × 4 bytes data (n = number of dynamic variables) or 2 × 2 bytes data + 6 bytes mailbox

3.5.4 Inputs

Table 13: Technical Data – Inputs

Number of inputs	2
Signal current	4 mA … 20 mA
HART input filter	100 Hz
Resolution of the A/D converter	12 bit
Conversion time (typ.)	10 ms
Measuring error 25°C	0.1 % of final value (non-linarity)
Temperature coefficient	< ±0.01 % / K of full scale value
Line break detection	I_{meas} < 3.10 mA
Short circuit detection	I_{meas} > 22 mA
Overvoltage protection	30 V, reverse polarity protected
Diagnostics	Wire break, measuring range overflow

Table 13: Technical Data – Inputs

Sensor connection	2-wire
HART devices per channel	1 device (single-drop, no multi-drop)
HART modems per channel	1 modem (no multiplex)

3.5.5 Connection Type

Table 14: Technical Data – Field Wiring

Wire connection	CAGE CLAMP®
Cross section	0.08 mm² … 2.5 mm², AWG 28 … 14
Stripped lengths	8 mm … 9 mm / 0.33 in

Table 15: Technical Data – Power Jumper Contacts

Power jumper contacts	Blade/spring contact, self-cleaning

Table 16: Technical Data – Data Contacts

Data contacts	Slide contact, hard gold plated, self-cleaning

3.5.6 Climatic Environmental Conditions

Table 17: Technical Data – Climatic Environmental Conditions

Surrounding air temperature (operation)	0 °C … 55 °C
Surrounding air temperature (operation) for components with extended temperature range (750-xxx/025-xxx)	−20 °C … +60 °C
Surrounding air temperature (storage)	−25 °C … +85 °C
Surrounding air temperature (storage) for components with extended temperature range (750-xxx/025-xxx)	−40 °C … +85 °C
Operating altitude	0 … 2000 m
Relative humidity	Max. 5 % … 95 % without condensation
Pollution degree	2
Protection type	IP20
Resistance to harmful substances	Acc. to IEC 60068-2-42 and IEC 60068-2-43
Maximum pollutant concentration at relative humidity < 75 %	$SO_2 \leq 25$ ppm $H_2S \leq 10$ ppm
Special conditions	• Ensure that additional measures for components are taken, which are used in an environment involving: – dust, caustic vapors or gases – ionizing radiation • Ensure that the permissible temperature range of the connecting cable is correct dimensioned depending on the installation position and current intensity, because the clamping point temperature at 10 A can be up to 25 °C above the expected surrounding air temperature.

3.6 Approvals

The following approvals have been granted to the basic version and all variants of 750-482 I/O modules:

Conformity Marking

UL508

The following approvals have been granted to the basic version of 750-482 I/O modules and to all its variants, except for the 750-482/000-300 variant:

Korea Certification MSIP-REM-W43-AIM750

The following Ex approvals have been granted to the basic version and all variants of 750-482 I/O modules:

TÜV 07 ATEX 554086 X

I M2 Ex d I Mb
II 3 G Ex nA IIC T4 Gc
II 3 D Ex tc IIIC T135°C Dc

IECEx TUN 09.0001 X

Ex d I Mb
Ex nA IIC T4 Gc
Ex tc IIIC T135°C Dc

$_{C}UL_{US}$ ANSI/ISA 12.12.01

Class I, Div2 ABCD T4

3.7 Standards and Guidelines

750-482 I/O modules meet the following requirements on emission and immunity of interference:

EMC CE-Immunity to interference	EN 61000-6-2
EMC CE-Emission of interference	EN 61000-6-4

4 Process Image

The HART I/O Module provides the fieldbus coupler/controller with a different amount of process data depending on the operating mode set.

Some fieldbus systems process status information on the input channel with the help of a status byte.

This status byte can be displayed using the WAGO-I/O-*CHECK* commissioning tool but processing by the coupler/controller is optional; i.e., access to or evaluation of the status information depends on the respective fieldbus system.

Note

Mapping of the Process Image in the Fieldbus System!
Mapping the process data of some I/O modules (or their variations) into the process image is specific to the fieldbus coupler/controller used. This information, as well as the specific configuration for relevant control/status bytes is located in the section “Fieldbus-Specific Configuration of Process Data.” This section describes the process image of the particular coupler/controller.

For pure 4 mA … 20 mA analog values the HART module transmits 16-bit measured values and optionally 8 status bits on each channel.

4.1 Standard I/O Module 750-482

The digitalized measured value is transmitted to the process image of the coupler/controller in a data word (16 bits) as an input byte 0 (low) and input byte 1 (high).

This value is mapped with a resolution of 13 bits on Bit B2 ... B14.

Status information, which can be evaluated in the event of a fault, is contained in the two least significant bits (B0 and B1). If the measurement is above the measuring range, Bit B0 is set = 1, and if the measurement is below the measuring range or if a wire breaks, Bit B0 and B1 are set = 1.

The input voltage range for the measured values of 4 mA to 20 mA is scaled to the numerical range from 0x0000 to 0x7FFD.

Table 18: Process Values for the HART Module

Input Current 4 mA … 20 mA	Numeric Value				Status Byte Hex.	LED Error AI 1, 2
	Binary Measured Value	*) F O	Hex.	Dec.		
<3	'0000.0000.0000.00	11'	0x0003	3	0x41	on
<4	'0000.0000.0000.00	00'	0x0000	0	0x00	off
4	'0000.0000.0000.00	00'	0x0000	0	0x00	off
6	'0001.0000.0000.00	00'	0x1000	4096	0x00	off
8	'0010.0000.0000.00	00'	0x2000	8192	0x00	off
10	'0011.0000.0000.00	00'	0x3000	12288	0x00	off
12	'0100.0000.0000.00	00'	0x4000	16384	0x00	off
14	'0101.0000.0000.00	00'	0x5000	20480	0x00	off
16	'0110.0000.0000.00	00'	0x6000	24576	0x00	off
18	'0111.0000.0000.00	00'	0x7000	28672	0x00	off
20	'0111.1111.1111.11	00'	0x7FFC	32764	0x00	off
>20	'0111.1111.1111.11	00'	0x7FFC	32764	0x00	off
>22	'0111.1111.1111.11	01'	0x7FFD	32765	0x42	on

*) Status bits: F = Cable Break, O = Overrun

4.1.1 2 AI 4-20 mA + 6-Byte Mailbox

In the “2AI + 6-byte mailbox” operating mode the HART module provides the fieldbus coupler/controller with a 12-byte input and output process image via one logical channel.

1 control byte (C0) and 1 status byte (S0) are used to monitor the data flow.

The data is mapped in the cyclic process image of the connected coupler/controller. However, the HART commands can then be implemented by the “WagoLibHart_0x.lib” PLC library. The data is tunneled to the application via a mailbox and decoded by means of the library so that evaluation and processing take place directly at the application level.

The IEC application can be implemented in the connected programmable fieldbus controller (PFC) of the fieldbus node with the WAGO-I/O-*PRO* programming tool or, if a fieldbus coupler is connected, in the superimposed controller.

Table 19: Input Process Image

Input Process Image		
Offset	**Designation of Bytes**	**Remark**
0	S0	Status byte
1	Internal Use	used internally
2	MBX_RES	Mailbox response data
3		
4		
5		
6		
7		
8	AI0	Analog input data Channel 1
9		
10	AI1	Analog input data Channel 2
11		

Table 20: Output Process Image

Output Process Image		
Offset	**Designation of Bytes**	**Remark**
0	C0	Controlbyte
1	Internal Use	used internally
2	MBX_REQ	Mailbox request data
3		
4		
5		
6		
7		
8	-	not used
9		
10		
11		

Table 21: Control Byte C0

Control Byte C0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
-	-	-	-	-	-	-	-

Table 22: Status Byte S0

Status Byte S0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
-	General fault (Bit 0 or Bit 1 or Bit 3 or Bit 4)	-	Short circuit Channel 2	Cable break Channel 2	-	Short circuit Channel 1	Cable break Channel 1

4.1.2 2 AI 4-20 mA, 1 HART Variable per Channel

With the PROFIBUS DP/V1 Fieldbus Coupler 750-333 or Fieldbus Controller 750-833, when one HART dynamic variable per channel is incorporated (optionally PV, SV, TV, QV), the PROFIBUS telegram has a size of 12 bytes.

Table 23: PROFIBUS Telegram, 1 HART Variable per Channel

PROFIBUS Telegram (1 Variable per Channel)		
Offset	**Designation of Bytes**	**Remark**
0	AI0	Analog input data Channel 1
1		
2	HV0_0	1st HART variable Channel 1
3		
4		
5		
6	AI1	Analog input data Channel 2
7		
8	HV1_0	1st HART variable Channel 2
9		
10		
11		

4.1.3 2 AI 4-20 mA, 2 HART Variables per Channel

With the PROFIBUS DP/V1 Fieldbus Coupler 750-333 or Fieldbus Controller 750-833, when two HART dynamic variables per channel are incorporated (optionally PV, SV, TV, QV), the PROFIBUS telegram has a size of 20 bytes.

Table 24: PROFIBUS Telegram, 2 HART Variables per Channel

PROFIBUS Telegram (2 Variables per Channel)		
Offset	**Designation of Bytes**	**Remark**
0	AI0	Analog input data Channel 1
1		
2	HV0_0	1st HART variable Channel 1
3		
4		
5		
6	HV0_1	2nd HART variable Channel 1
7		
8		
9		
10	AI1	Analog input data Channel 2
11		
12	HV1_0	1st HART variable Channel 2
13		
14		
15		
16	HV1_1	2nd HART variable Channel 2
17		
18		
19		

4.1.4 2 AI 4-20 mA, 3 HART Variables per Channel

With the PROFIBUS DP/V1 Fieldbus Coupler 750-333 or Fieldbus Controller 750-833, when three HART dynamic variables per channel are incorporated (optionally PV, SV, TV, QV), the PROFIBUS telegram has a size of 28 bytes.

Table 25: PROFIBUS Telegram, 3 HART Variables per Channel

PROFIBUS Telegram (3 Variables per Channel)		
Offset	**Designation of Bytes**	**Remark**
0	AI0	Analog input data Channel 1
1		
2	HV0_0	1st HART variable Channel 1
3		
4		
5		
6	HV0_1	2nd HART variable Channel 1
7		
8		
9		
10	HV0_2	3rd HART variable Channel 1
11		
12		
13		
14	AI1	Analog input data Channel 2
15		
16	HV1_0	1st HART variable Channel 2
17		
18		
19		
20	HV1_1	2nd HART variable Channel 2
21		
22		
23		
24	HV1_2	3rd HART variable Channel 2
25		
26		
27		

4.1.5 2 AI 4-20 mA, 4 HART Variables per Channel

With the PROFIBUS DP/V1 Fieldbus Coupler 750-333 or Fieldbus Controller 750-833, when four HART dynamic variables per channel are incorporated (optionally PV, SV, TV, QV), the PROFIBUS telegram has a size of 36 bytes.

Table 26: PROFIBUS Telegram, 4 HART Variables per Channel

PROFIBUS Telegram (4 Variables per Channel)		
Offset	**Designation of Bytes**	**Remark**
0	AI0	Analog input data Channel 1
1		
2	PV0	Primary variable Channel 1
3		
4		
5		
6	SV0	Secondary variable Channel 1
7		
8		
9		
10	TV0	Tertiary variable Channel 1
11		
12		
13		
14	QV0	Quaternary variable Channel 1
15		
16		
17		
18	AI1	Analog input data Channel 2
19		
20	PV1	Primary variable Channel 2
21		
22		
23		
24	SV1	Secondary variable Channel 2
25		
26		
27		
28	TV1	Tertiary variable Channel 2
29		
30		
31		
32	QV1	Quaternary variable Channel 2
33		
34		
35		

4.1.6 AI 4-20 mA + Acyclic PROFIBUS Services

With the PROFIBUS DP/V1 Fieldbus Coupler 750-333 or Fieldbus Controller 750-833, only the two cyclic AI process values are mapped into the process image of the connected coupler in the “2AI + acyclic PROFIBUS services” mode.

HART-via-DPV1-services are passed on using acyclic Profibus services.

Table 27: PROFIBUS Telegram, Acyclic PROFIBUS Services

PROFIBUS Telegram (Acyclic PROFIBUS Services)		
Offset	**Designation of Bytes**	**Remark**
0	AI0	Analog input data Channel 1
1		
2	AI1	Analog input data Channel 2
3		

Depending on how the PROFIBUS coupler/controller is parameterized using the GSD, the control and status bytes can also be transmitted via PROFIBUS in addition to the data bytes provided by the HART I/O module.

Information

Additional Information about PROFIBUS DP/V1 750-333 or 750-833
You can read a detailed description of this in the PROFIBUS DP/V1 Fieldbus Coupler 750-333 manual or Fieldbus Controller manual in the section “750-333 Fieldbus Coupler” or “750-833 Fieldbus Controller”/“Configuring and Parameterizing the I/O Modules”/“Analog I/O Modules”/“2 AI Modules”.
You will find these manuals on the Internet at:
www.wago.com → *Services* → *Downloads* → *Additional documentation and information on automation products* → *WAGO-I/O-SYSTEM 750* → *Fieldbus Coupler and Programmable Fieldbus Controller*

The status bytes provide status information on the input channels. This can also be displayed using the WAGO-I/O-*CHECK* commissioning tool.

Table 28: Control Byte C0/C1

Control Byte C0/C1							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
-	-	-	-	-	-	-	-

Table 29: Status Byte S0/S1

Status Byte S0/S1							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
-	General fault (Bit 0 or Bit 1)	-	-	-	-	Short circuit Channel 1, 2	Cable break Channel 1, 2

4.2 Version 750-482/000-300

For version 750-482/000-300, the digitalized measured value is depicted with a resolution of 16 bits.

For the measured value, the input current range 1.18 mA … 22.81 mA is scaled to the numerical value range of –4864 (0xED00) … 32511 (0x7EFF).

Table 30: Version 750-482/000-300 Process Values

Input Current [mA]	Numeric Value			Status Byte Hex.	LED Error AI 1, 2
	Binary Measured Value	Hex.	Dec.		
< 1.18	‘1000.0000.0000.0000’	16x8000	–32768	0x41	ON
1.18	‘1110.1101.0000.0000’	16xED00	–4864	0x00	OFF
4	‘0000.0000.0000.0000’	16x0000	0	0x00	OFF
5	‘0000.0110.1100.0000’	16x06C0	1728	0x00	OFF
6	‘0000.1101.1000.0000’	16x0D80	3456	0x00	OFF
8	‘0001.1011.0000.0000’	16x1B00	6912	0x00	OFF
10	‘0010.1000.1000.0000’	16x2880	10368	0x00	OFF
12	‘0011.0110.0000.0000’	16x3600	13824	0x00	OFF
14	‘0100.0011.1000.0000’	16x4380	17280	0x00	OFF
16	‘0101.0001.0000.0000’	16x5100	20736	0x00	OFF
18	‘0101.1110.1000.0000’	16x5E80	24192	0x00	OFF
20	‘0110.1100.0000.0000’	16x6C00	27648	0x00	OFF
22.81	‘0111.1110.1111.1111’	16x7EFF	32511	0x00	OFF
> 22.81	‘0111.1111.1111.1111’	16x7FFF	32767	0x42	ON

In the “2AI 4 – 20mA + 6 Byte Mailbox” and “2AI 4 – 20mA + Acyclic PROFIBUS Services”, the overflow or underflow is transferred via the status byte as for the standard I/O module 750-482.

5 Mounting

DANGER

Do not work when devices are energized!
High voltage can cause electric shock or burns.
Switch off all power to the device prior to performing any installation, repair or maintenance work.

CAUTION

Risk of injury due to sharp-edged blade contacts!
The blade contacts are sharp-edged. Handle the I/O module carefully to prevent injury. Do not touch the blade contacts.

NOTICE

Do not contaminate contacts!
Contamination may negatively impact the functionality of data and power jumper contacts. Do not touch the contacts. Avoid contaminating the contacts.

NOTICE

Do not place the I/O modules on the gold spring contacts!
Do not place the I/O modules on the gold spring contacts in order to avoid soiling or scratching!

NOTICE

Pay attention to potential equalization from the environment!
The devices are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the devices, please ensure that environmental factors (personnel, work space and packaging) are properly equalized. Do not touch any conducting parts, e.g., data contacts.

NOTICE

Follow the installation instructions!
Only install this device in dry, indoor rooms.
Do not install the device on or in the vicinity of easily flammable materials!

5.1 Mounting Sequence

Fieldbus couplers, controllers and I/O modules of the WAGO I/O System 750 are snapped directly on a carrier rail in accordance with the European standard EN 60175 (DIN 35).

The reliable positioning and connection is made using a tongue and groove system. Due to the automatic locking, the individual devices are securely seated on the rail after installation.

Starting with the fieldbus coupler or controller, the I/O modules are mounted adjacent to each other according to the project design. Errors in the design of the node in terms of the potential groups (connection via the power contacts) are recognized, as the I/O modules with power contacts (blade contacts) cannot be linked to I/O modules with fewer power contacts.

NOTICE

Insert I/O modules only from the proper direction!
All I/O modules feature grooves for power jumper contacts on the right side. For some I/O modules, the grooves are closed on the top. Therefore, I/O modules featuring a power jumper contact on the left side cannot be snapped from the top. This mechanical coding helps to avoid configuration errors, which may destroy the I/O modules. Therefore, insert I/O modules only from the right and from the top.

Note

Don't forget the bus end module!
Always plug a bus end module (750-600) onto the end of the fieldbus node! You must always use a bus end module at all fieldbus nodes with WAGO I/O System 750 fieldbus couplers or controllers to guarantee proper data transfer.

5.2 Inserting and Removing Devices

5.2.1 Inserting the I/O Module

1. Position the I/O module in such a way that the groove and spring are connected to the preceding and following components.

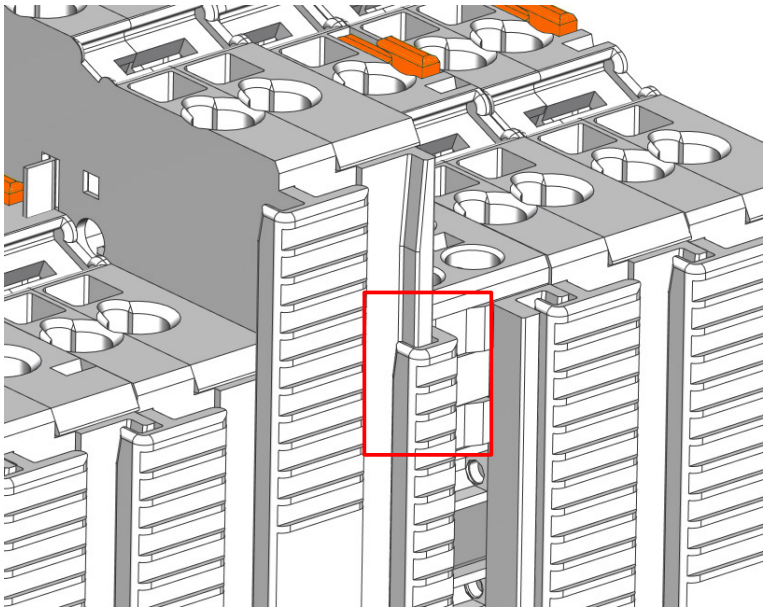

Figure 7: Inserting I/O Module (Example)

2. Press the I/O module into the assembly until the I/O module snaps into the carrier rail.

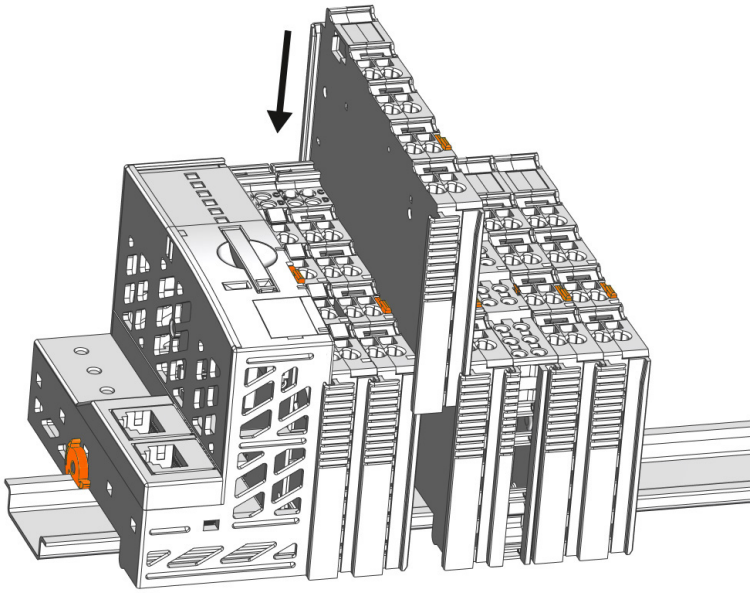

Figure 8: Snap the I/O Module into Place (Example)

3. Check that the I/O module is seated securely on the carrier rail and in the assembly. The I/O module must not be inserted crooked or askew.

Once the I/O module has snapped into place, the electrical connections for the data contacts and power contacts (if any) to the head station or to the preceding and, if applicable, following I/O module are established.

5.2.2 Removing the I/O Module

1. Remove the I/O module from the assembly by pulling the release tab.

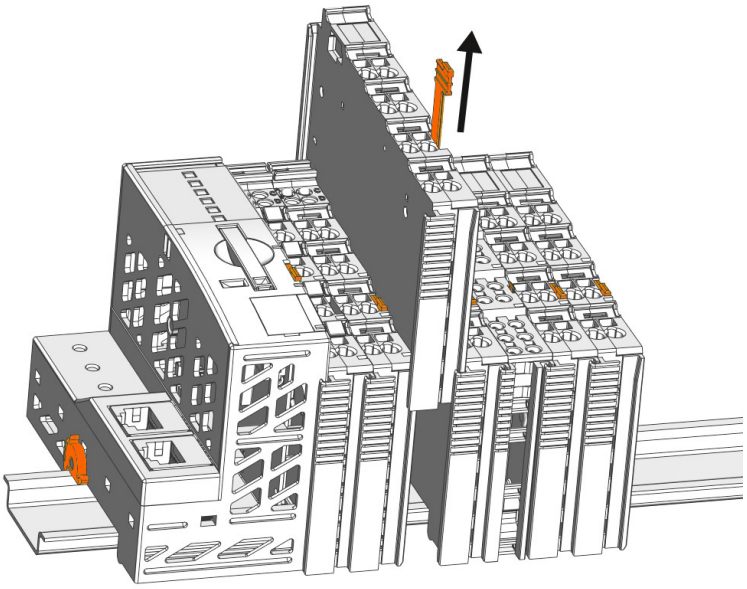

Figure 9: Removing the I/O Module (Example)

Electrical connections for data or power jumper contacts are disconnected when removing the I/O module.

6 Connect Devices

6.1 Connecting a Conductor to the CAGE CLAMP®

The WAGO CAGE CLAMP® connection is appropriate for solid, stranded and finely stranded conductors.

Note

Only connect one conductor to each CAGE CLAMP®!
Only one conductor may be connected to each CAGE CLAMP®.
Do not connect more than one conductor at one single connection!

If more than one conductor must be routed to one connection, these must be connected in an up-circuit wiring assembly, for example using WAGO feed-through terminals.

1. For opening the CAGE CLAMP® insert the actuating tool into the opening above the connection.
2. Insert the conductor into the corresponding connection opening.
3. For closing the CAGE CLAMP® simply remove the tool. The conductor is now clamped firmly in place.

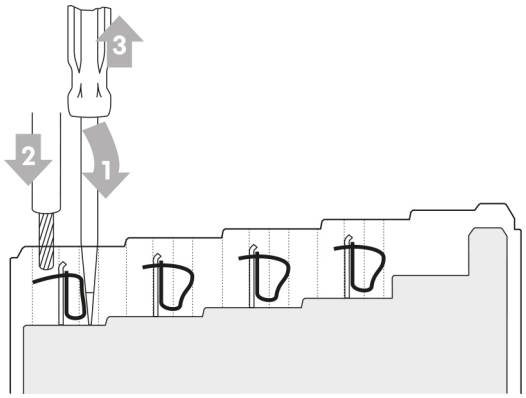

Figure 10: Connecting a Conductor to a CAGE CLAMP®

NOTICE

Avoid short circuit
A short circuit between the "HART+" connectors and ground can destroy the module. Therefore, make sure that no grounded part of the field device housing comes into contact with the "HART+" connector, for example, during installation.

6.2 Connection Examples

The example connections of a passive 2- and 3-conductor HART sensor, as well as an active 24 VDC and an active 230 VAC HART sensor, are shown graphically below.

In summary, the following graphic shows an example of the connection view and the circuit diagrams of the potential feed module 750-614, which is required to connect passive 3-conductor HART sensors as well as active HART sensors, and of the HART I/O module 750-482.

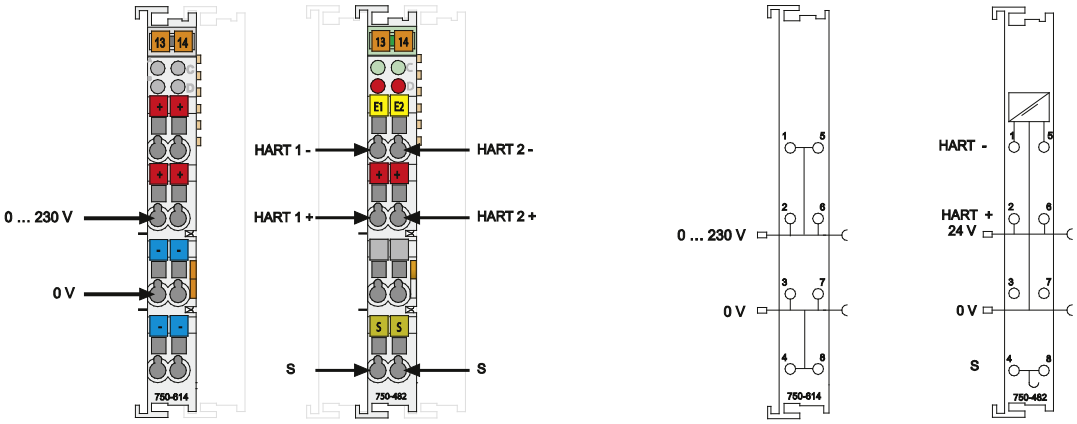

Figure 11: Connection views and circuit diagrams of I/O modules 750-614 and 750-482

6.2.1 Connecting Passive HART Sensors

6.2.1.1 Connecting a 2-Conductor HART Sensor

One or two passive 2-conductor HART sensors can be connected directly to the HART+ and HART- connections. The passive sensors are supplied with 24 VDC directly from the I/O module.

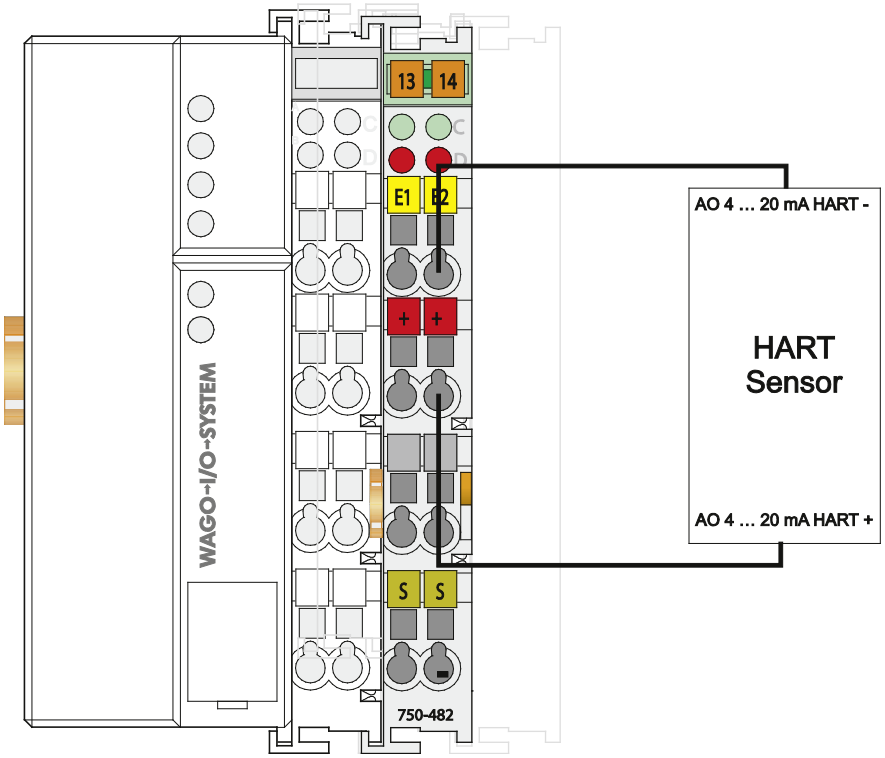

Figure 12: Connecting a passive 2-conductor HART sensor

6.2.1.2 Connecting a 3-Conductor HART Sensor

To connect one or two passive 3-conductor HART sensors to the HART module 750-482, a WAGO potential amplification module (item number 750-604 or 750-614) must be connected upstream for the 0 V potential.

The HART+ and HART- sensors are connected to the HART+ and HART- terminal points of the HART module 750-482. The passive sensors are supplied with 24 VDC directly from the I/O module.

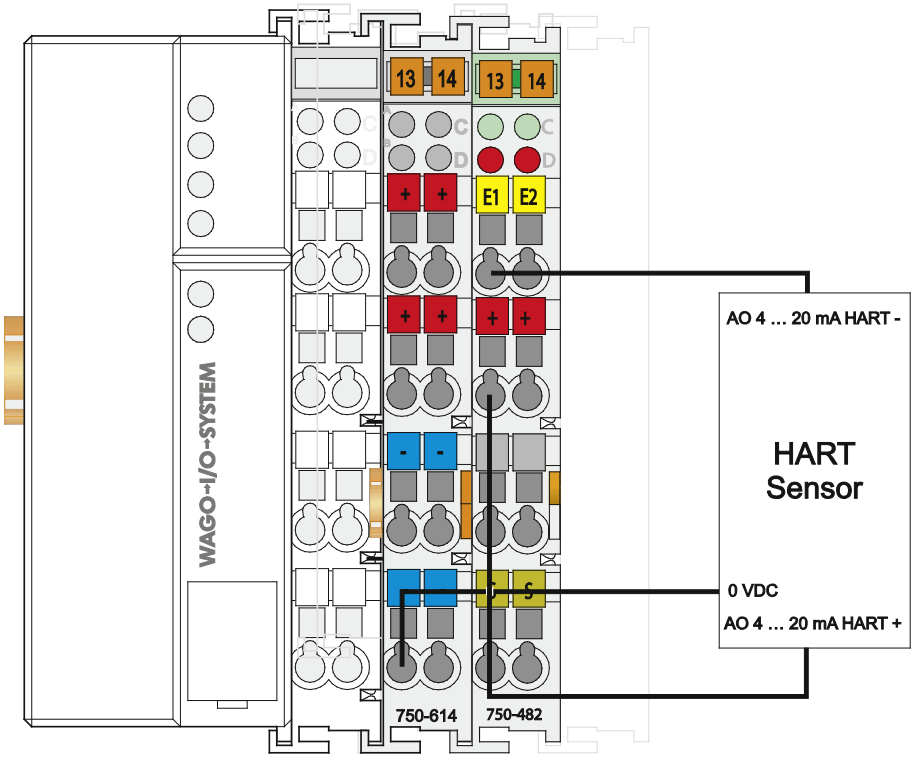

Figure 13: Connecting a passive 3-conductor HART sensor

6.2.2 Connecting Active HART Sensors

To connect active HART sensors to the HART module 750-482, a WAGO potential amplification module (item number 750-604 or 750-614) is used, as with the passive 3-conductor HART sensors.

Commensurate with the HART sensor voltage (24 VDC or 230 VAC), the HART sensors are fed either directly from the potential amplification module with 24 VDC or externally with 230 VAC. In both cases, the potential amplification module provides the 0 V potential for connecting the HART sensors.

The HART+ sensor is connected to the HART+ terminal point of the HART module 750-482.

6.2.2.1 Connecting an Active 24 VDC HART Sensor

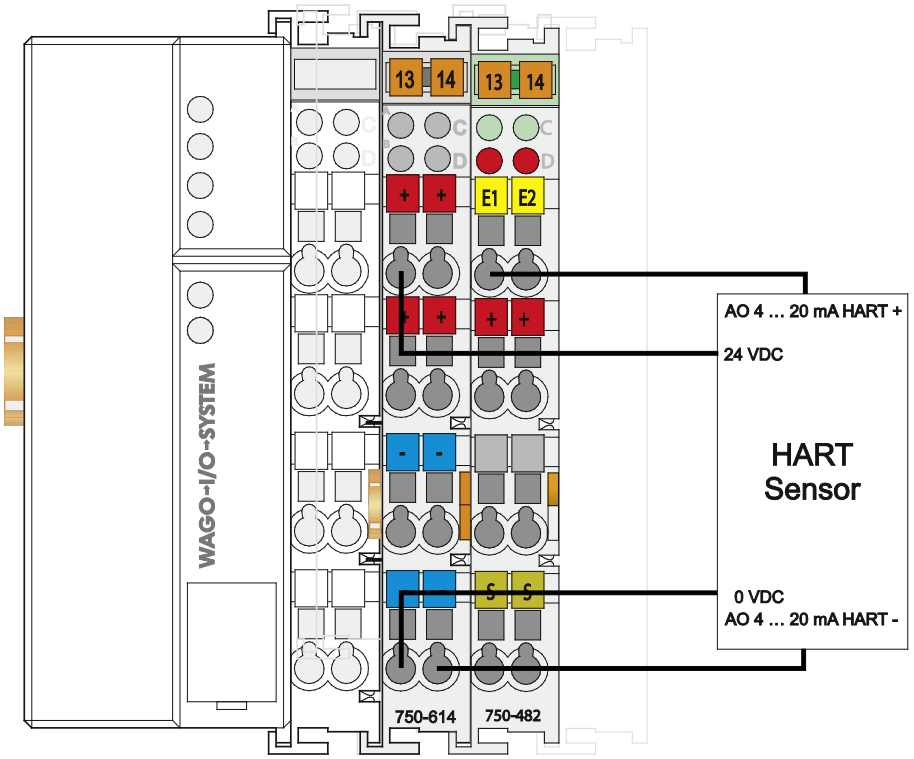

Figure 14: Connecting an active 24 VDC HART sensor

6.2.2.2 Connecting an active 230 VAC HART Sensor

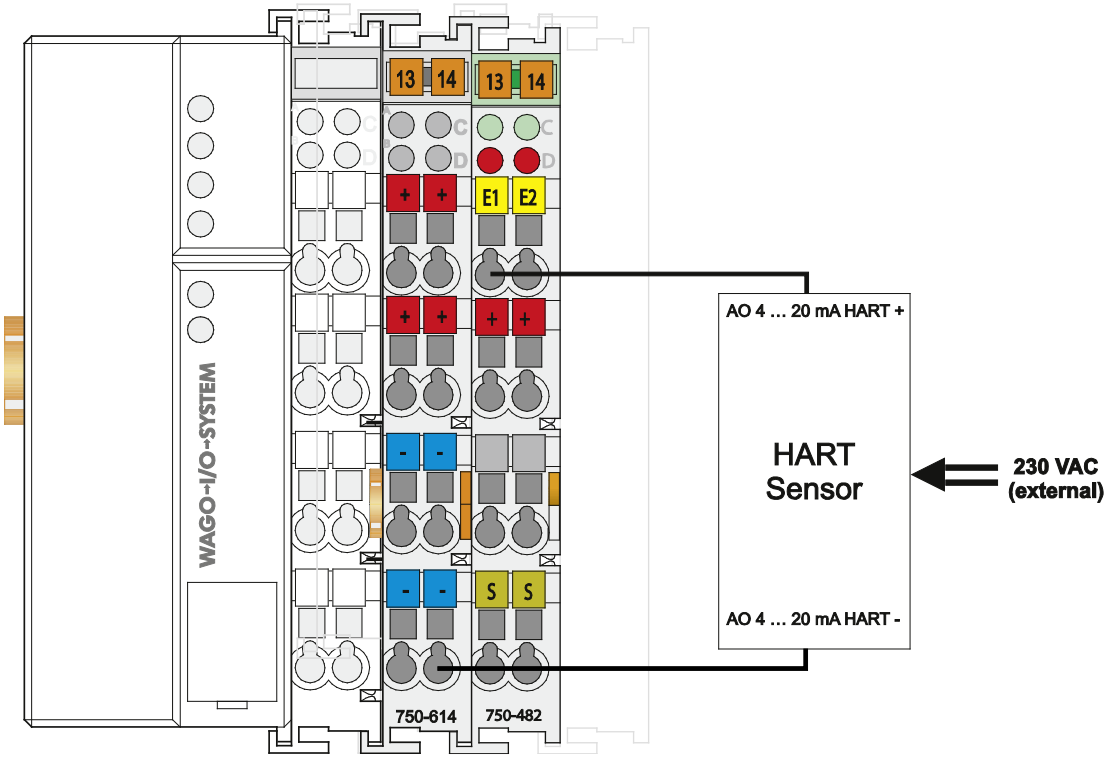

Figure 15: Connecting an active 230 VAC HART sensor

7 Function Description

HART (Highway Addressable Remote Transducer) is an established variant of digital field communication, which has been introduced as an industry standard and which also enables multivariable field devices to be supported and used in systems with conventional 4 mA to 20 mA technology. Typical applications are transducers for the measurement of mechanical and electrical variables.

The HART protocol works using the FSK process (Frequency Shift Keying) in accordance with the Bell 202 communications standard. Here, the digital signal, which is made up of the two frequencies 1200 Hz (logic 1) and 2200 Hz (logic 0), is sinusoidally superimposed on the analog current signal. By coding the digital signal with zero mean value, additional information can be transmitted at the same time without affecting the analog signal transmission. This information can come from the field device and be intended for the process control system or for maintenance (e.g., process variable, device status). However, information can also be written to the field device – acyclically – for parameterization or configuration.

Along with the simplex channel for the current signal (analog controller → field device), the HART protocol therefore also provides a half-duplex channel for two-way communication.

Further advantages of HART are simple construction, maintenance and application as well as flexible data access via up to two operator control units (PC and hand terminal). HART field devices and also HART masters are compatible with 4-20 mA technology. HART field devices can therefore be used with non-HART-compatible masters and vice-versa. This provides the great advantage that the user can upgrade his system with HART modules step-by-step.

In the as-supplied state of the HART I/O module; i.e., in the default operating mode, the HART device can be accessed directly from an IEC61131-3 program via the I/O module. In this case, HART communication is achieved very easily by means of the pre-prepared PLC library “WagoLibHART_0x.lib”, which is provided by WAGO as a free download.

FDT tool routing to the DTM of the connected HART device is possible in default operating mode for connecting the I/O module to various WAGO ETHERNET controllers with the help of the 759-359 ModbusTCP/HART Gateway DTM.

With the simple parameterization of the HART I/O module via GSD (device master data) or WAGO-I/O-*CHECK*, 4 operating modes can be selected specially for using the HART I/O module in PROFIBUS systems, in which up to 4 HART dynamic variables (PV, SV, TV, QV) can be incorporated in the cyclic process image.

When using the PROFIBUS DP/V1 Coupler 750-333 or Controller 7509-833, FDT tool routing to the DTM of the connected HART device is likewise possible in a further operating mode in conjunction with the 759-360 PROFIBUS/HART Gateway DTM.

Information

Additional Information about HART Technology

You will find more detailed information on HART technology on the HART Communication Foundation website (HCF user organization) at:
www.hartcomm.org

8 Operating Modes

The HART I/O module can be used with various operating modes depending on connection and parameterization.

Table 31: Overview of Operating Modes

Operating Mode	On Fieldbus Coupler/Controller	Use
2 AI + 6 bytes mailbox (Default)	All compatible Fieldbus couplers/controllers 75x-xxx *)	1) With “WagoLibHART_0x.lib” PLC library
	750-841 ETHERNET TCP/IP Fieldbus controller	2) With ModbusTCP/HART Gateway 759-359
2 AI + 1 HART variable per Channel	PROFIBUS DP/V1 Fieldbus coupler 750-333 or Fieldbus controller 750-833	3) With HART dynamic variables
2 AI + 2 HART variables per Channel		
2 AI + 3 HART variables per Channel		
2 AI + 4 HART variables per Channel		
2 AI + acyclic PROFIBUS services		4) With PROFIBUS/HART Gateway 759-360

*) see table “Compatibility List”

In the as-supplied state, the HART I/O module is configured in the default operating mode as a 2-channel analog input module for 4 mA … 20 mA signals with HART functionality. In this default operating mode the I/O module can be connected to all WAGO couplers and controllers listed in the table “Compatibility List”. In this case, HART communication is enabled by a 6-byte mailbox, which is incorporated with the analog values in the cyclic process image.

In addition, five further operating modes can be set up specially for connecting to the PROFIBUS DP/V1 Fieldbus Coupler 750-333 or Fieldbus Controller 750-833.

The section “Description of Operation” following the section on parameterization and a short introduction to the FDT/DTM concept and HART via PROFIBUS, describes the individual operating modes in the appropriate applications in more detail together with a description of the communications process and brief commissioning instructions in each case.

8.1 Setting the Operating Mode Parameters

Depending on the fieldbus used, the HART I/O module can either be parameterized using the “759-302 WAGO-I/O-*CHECK*” commissioning tool for WAGO-I/O-SYSTEM 750 or, for PROFIBUS, using the GSD files (device master

data) for PROFIBUS with installation program / Series 750, 752 and 755 (Item No.: 750-910).

Table 32: Setting the Operating Mode Parameters

Fieldbus Coupler/Controller Connection	Parameter Setting Via:
All *)	759-302 WAGO-I/O-*CHECK*
PROFIBUS DP/V1 Fieldbus Coupler 750-333 or Fieldbus Controller 750-833	750-910 GSD (Device Master Data)

*) see table “Compatibility List”

8.1.1 Setting Up using WAGO-I/O-*CHECK*

It is only necessary to set the parameters of the HART I/O module using WAGO-I/O-*CHECK* when the default operating mode (2AI + 6-byte mailbox) has been changed to the “PROFIBUS operating mode” (2 AI + acyclic PROFIBUS services) and is then to be changed back to the default mode. Changing to a “PROFIBUS mode” or between PROFIBUS modes is typically carried out within a PROFIBUS system using GSD in preference.

Note

Restriction of Settings for PROFIBUS Operating Mode!
This changeover and operation with other than a PROFIBUS Coupler 750-333 or Controller 750-833 is not yet possible at the present time for “PROFIBUS operating modes” (2 AI + 1, 2, 3 or 4 HART variables per channel).
A HART I/O module that has once been set up for HART dynamic variables using GSD files can therefore currently only be operated with a PROFIBUS Coupler 750-333 or Controller 750-833.
It is then possible to restore the default state of the HART I/O module using WAGO-I/O-*CHECK* and the PROFIBUS Coupler 750-333 or Controller 750-833. When doing so it must be ensured that the parameters of the PROFIBUS Coupler 750-333 or Controller 750-833 are not set using GSD files.

Information

Additional Information for the order of WAGO-I/O-*CHECK*
You can order the WAGO-I/O-*CHECK* commissioning tool for the WAGO-I/O-SYSTEM 750 from WAGO Kontakttechnik GmbH & Co. KG under the item number 759-302.

1. Connect a Communication cable 750-920 between your coupler/controller and an available port on your computer.

NOTICE

Fieldbus Node must be without power!
The Communication cable 750-920 shall not be connected or removed when the system is energized; i.e., there shall be no power to the coupler/controller!

2. After installing WAGO-I/O-*CHECK* via the installation wizard, open it.
3. Go to the **Settings** menu and click **[Communication].**
   A “Communications settings” dialog box will open.
   In this window under **Connection** select “Serial ports (COM, USB, Bluetooth, ...)” and under **Port** “COM1: Communications port”.
   Then confirm this selection by clicking **[OK].**
4. Switch on the supply voltage to your coupler/controller.
5. When the coupler/controller has booted up click **[Identify]** on the toolbar.
   The set-up of your fieldbus node will be automatically detected and shown graphically in the node view and also in the navigation bar as a tree structure.
6. Move the mouse pointer to the graphical representation of the HART I/O module or to the I/O module designation “0750-0482” in the tree structure and select **Settings** from the context menu (right mouse button).

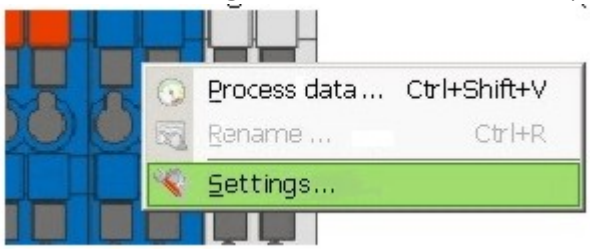

Figure 16: WAGO-I/O-*CHECK* context menu „Settings“

7. In the dialog window that opens for making the settings select the required operating mode and then click **[Write].**

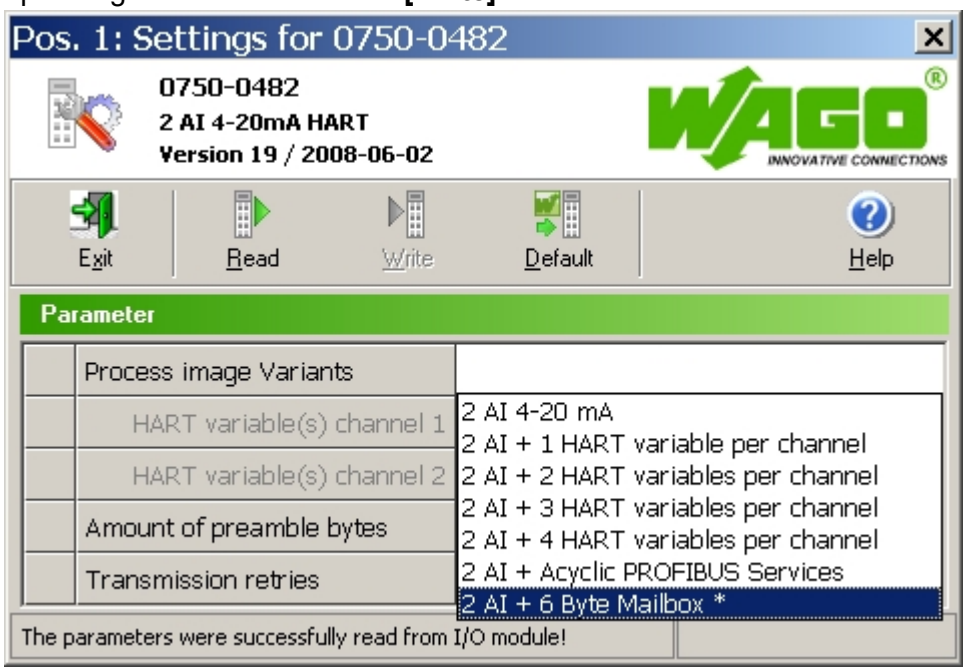

Figure 17: WAGO-I/O-*CHECK* Dialog Window “Settings for 0750-0482”

When the parameters have been set successfully, this will be indicated by a message.

Figure 18: WAGO-I/O-*CHECK* Message for Successfully Parameterizing

Information

Additional Information about WAGO-I/O-*CHECK*

You will find a detailed description of the functions and use of the commissioning tool in the 759-302 WAGO-I/O-*CHECK* manual on the Internet under:
www.wago.com

8.1.2 Setting Up via GSD

When connecting to a PROFIBUS DP/V1 Fieldbus Coupler 750-333 or Controller 750-833, assuming that the HART I/O module is supplied in the default operating mode, the mode must be changed over accordingly. The parameters for the required operating mode can be set using the GSD files.

Information

Additional Information for Download the GSD Files
The GSD files can be downloaded free of charge from the WAGO website at: **www.wago.com** → Support → Additional documentation and information on automation products → WAGO Software → WAGO-I/O-PRO / CODESYS.

You can find the link to “Libraries” in the column “Additional Information” on the right side.

Before setting the parameters however, the components of the PROFIBUS system, which define the structure of the input and output process image, must first be configured.

The GSD files for PROFIBUS are read in or installed by the configuration software used. These provide the characteristic device data necessary for configuration, particulars of their communications capability and other information. The size of the process images is then determined by the compiled configuration data.

Information

Additional Information on Installing the GSD Files
Please refer to the documentation for the configuration software which you are using for information on installing the GSD files.

The required operating mode for the HART I/O module can be selected and specified right at the configuration stage.

Further data for the HART I/O module can then be specified in a parameterization dialog box corresponding to the selected module.

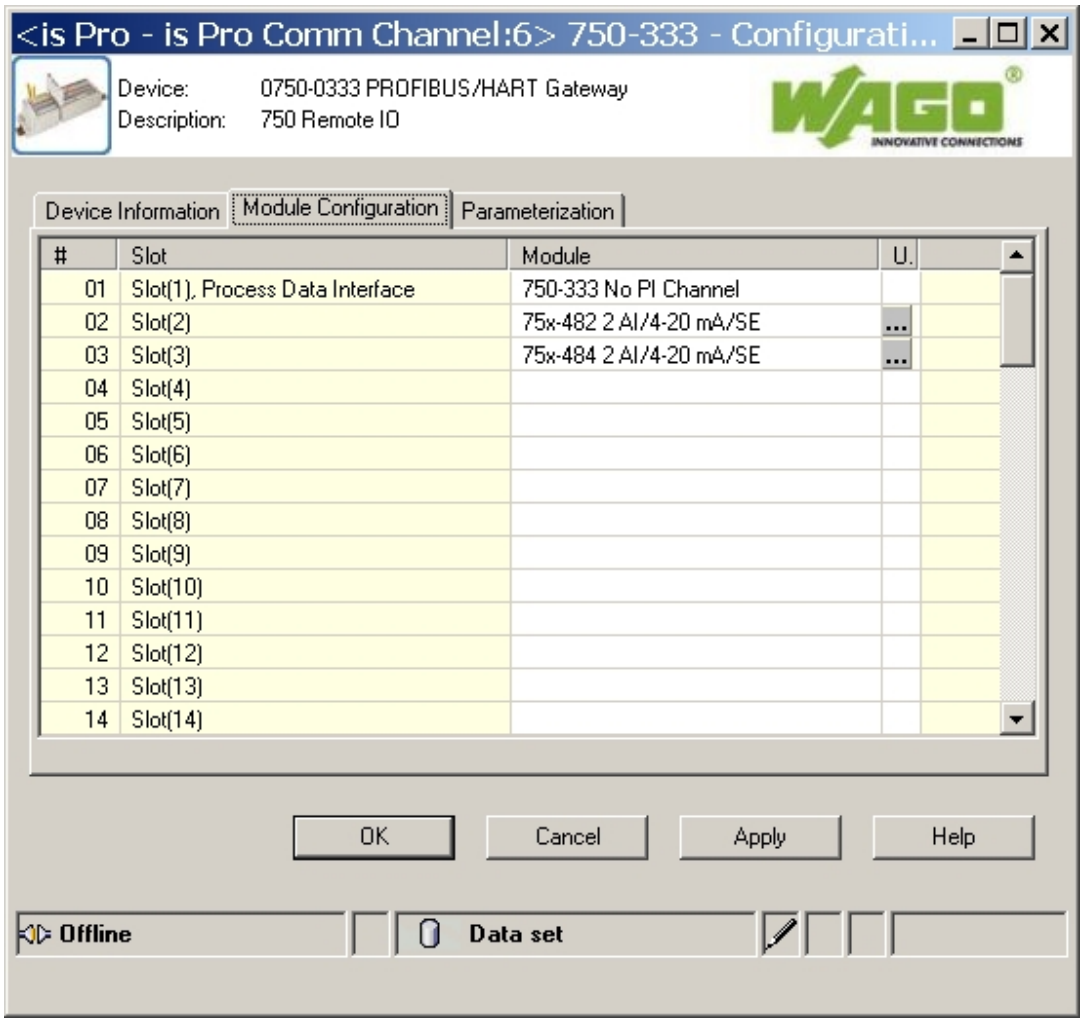

Figure 19: GSD Configuration

To open the parameterization dialog to the selected module, click on the button with three points **[...]** in the “UsrPrm” (User Parameter) column.

Depending on the selected operating mode, various set-up options, which are listed in the following tables, are provided in the dialog box which then opens.

75x-482 2AI/4-20 mA/SE

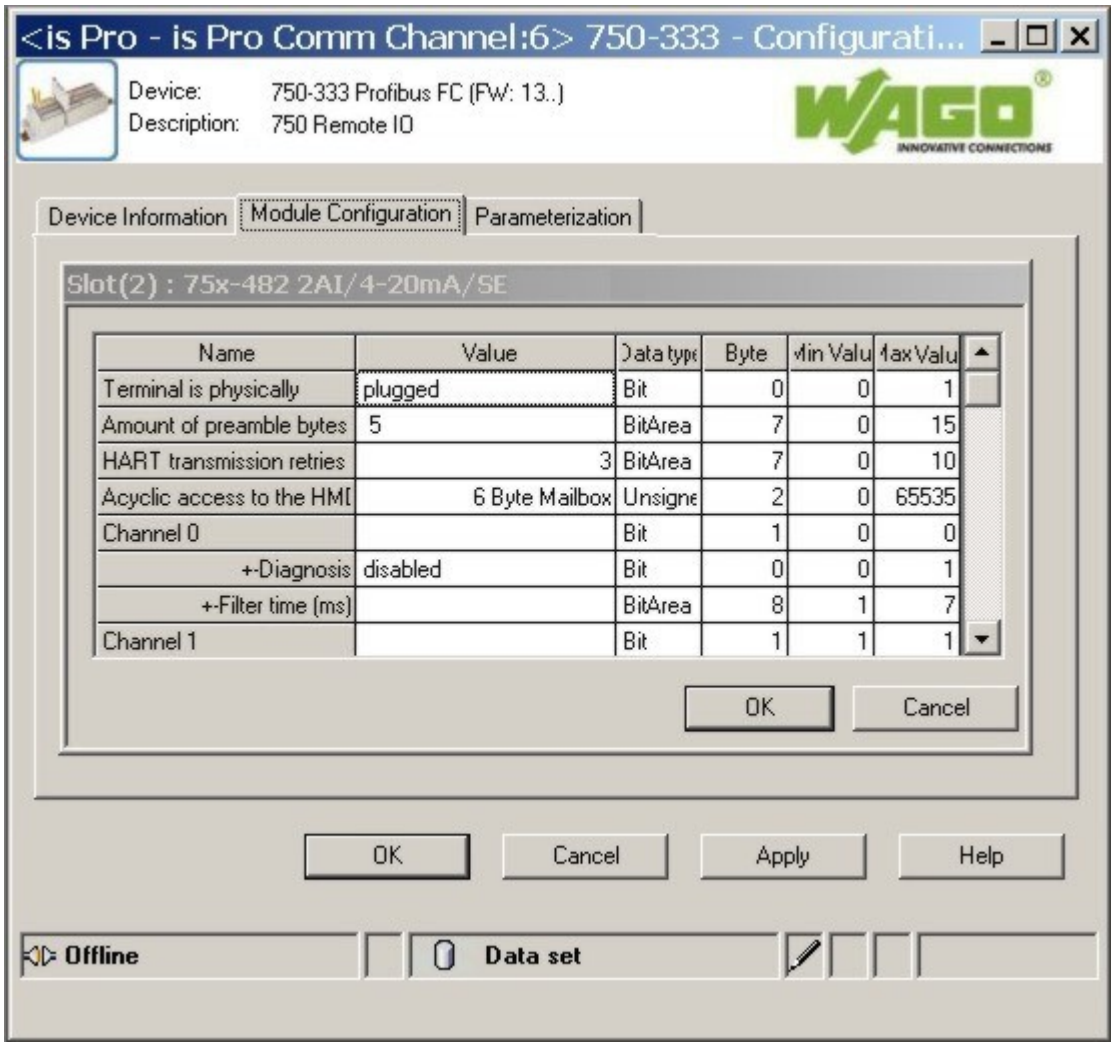

Figure 20: Parameterization dialog for selecting 75x-482 2AI/4-20 mA/SE

Parameters for all Operating Modes

Table 33: General Parameter Data

Parameter	Value	Description
Terminal is physically	• Plugged*) • Unplugged	• I/O module is physically plugged in • I/O module is not physically plugged in
Amount of preamble bytes	5*) to 20	Number of preamble bytes. The value must be increased in the event of communications problems.
HART transmission retries	0*) to 10	Number of retries for HART telegram transmissions. The value must be increased in the event of communications problems
Channel 0/1 + Diagnosis	• Disabled*) • Enabled	• Diagnostics for Channel 1 / 2 are deactivated • Diagnostics for Channel 1 / 2 are activated
+ Filter time (ms)	10 ms to 640 ms	Analog filter time for the input Channel 1/2

*) Default value

Selection Parameters for 75x-482 2AI/(1, 2, 3)x2 HV)

Table 34: Parameter Data for the HART Variables

Parameter	Value	Description
HART Value Channel 0/1	1×2 HV: • PV*) • SV •TV •QV	1 HART variable Channel 1 / 2; • first variable • second variable • third variable • fourth variable
	2×2 HV: • PV, SV*) • PV, TV • SV, TV • PV, QV • SV, QV • TV, QV	2 HART variables Channel 1 / 2; • first and second variable • first and third variable • second and third variable • first and fourth variable • second and fourth variable • third and fourth variable
	3×2 HV: • PV, SV, TV*) • PV, SV, QV • PV, TV, QV • SV, TV, QV	3 HART variables Channel 1 / 2; • first, second and third variable • first, second and fourth variable • first, third and fourth variable • second, third and fourth variable
	4×2 HV: • PV, SV, TV, QV*)	4 HART variables Channel 1 / 2; • first, second, third and fourth variable

PV	=	first Variable	(Primary Variable),
SV	=	second Variable	(Secondary Variable),
TV	=	third Variable	(Tertiary Variable),
QV	=	fourth Variable	(Quarternary Variable)

*) Default value

Selection Parameters for 75x-482 2AI/4-20 mA/SE

Table 35: Parameter Data for Acyclic Access

Parameter	Value	Description
Acyclic access to the HMDs	• Disabled*) • 12 Byte Mailbox	• Acyclic access to the HMDs (HART Master Devices) is deactivated • 12-byte mailbox for acyclic access activated

*) Default value

8.2 FDT/DTM Concept

FDT is an abbreviation for “Field Device Tool”. This is frame application software, which can be used to parameterize, configure and control fieldbus devices separately from the specific communication technologies of the different fieldbusses.

In order to establish communication with the individual devices in an FDT application and from there to be able to access the adjustable device parameters, the application requires an addition in the form of a software component for each field device.

The specific functions and dialogs of a field device for parameterization, diagnosis and maintenance, including the user interface, are reproduced in such a software component, which is referred to as a DTM (Device Type Manager).

Comparable with device driver software, the DTM is supplied with the device by the device manufacturer and installed on the PC by the user. The DTM is subsequently loaded into the FDT frame application from where it is executed.

FDT/DTM is an open concept, which encourages a uniform operating concept within an overall control program in which individual components from different manufacturers can work together.

WAGO provides a simple and convenient FDT frame application in the form of the “759 370 WAGOframe FDT Frame Application” software.

Information

Additional Information about *WAGOframe*

Please read the “759 370 *WAGOframe* FDT Frame Application” manual for detailed information on the installation and use of the “759-370 *WAGOframe*” Software. You will find this on the Internet at:

www.wago.com

By means of special gateway DTMs, the frame application is additionally provided with further communications functions for connecting the host system to the particular fieldbusses used (e.g., HART, PROFIBUS).

WAGO provides gateway DTMs for PROFIBUS (759-360 Profibus/HART Gateway DTM) and MODBUS TCP (759-359 ModbusTCP/HARTGatewayDTM) for this purpose.

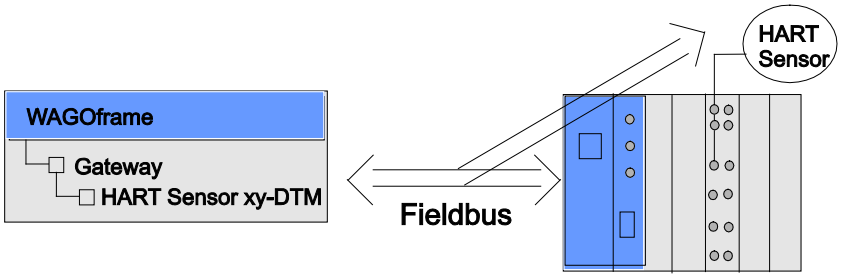

Figure 21: FDT/DTM Communication Principle

Information

Additional Information about the Download of the HARTGatewayDTMs

The gateway DTMs for PROFIBUS (759-360 Profibus/HARTGatewayDTM) and MODBUS TCP (759-359 ModbusTCP/HARTGatewayDTM) are available for downloading free of charge from the Internet at:

www.wago.com

Information

Additional Information about the FDT Technology

You will find more detailed information on FDT technology on the FDT-Group website at:

www.fdt-group.org

8.3 HART on PROFIBUS

The PROFIBUS specification provides an open solution especially for incorporating HART in PROFIBUS systems. Here, the HART protocol is taken

into account in the specification as a PROFIBUS profile, which is also referred to as “HART on PROFIBUS” for short.

This solution includes the use of the PROFIBUS communications mechanisms without change to the PROFIBUS protocol and services, the PDUs or the state machines and functional characteristics.

The HART client application is integrated within a PROFIBUS master and the HART master within a PROFIBUS slave, the latter serving as a multiplexer and handling the communication with the HART devices.

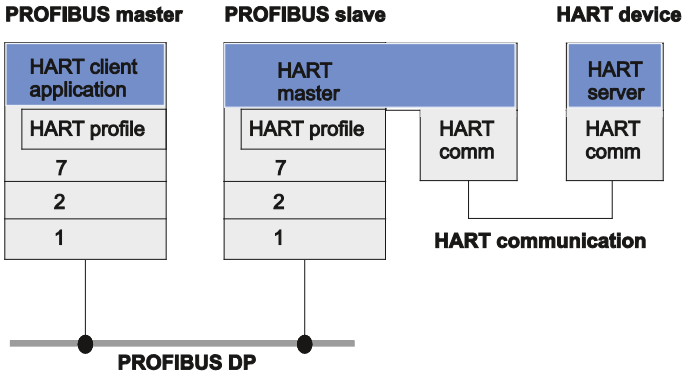

Figure 22: Operation of HART Devices via PROFIBUS

9 Commissioning

The principle of operation of the HART I/O module is described in more detail in the following sub-sections with regard to the various types of application and operating modes.

- **Application type 1:**
  Operation with PLC library “WagoLibHART_0x.lib” when connected to any of the 75x-xxx couplers/controllers listed in the table “Compatibility List”.
  (Default operating mode 2AI + 6-byte mailbox)

- **Application type 2:**
  Operation with the 759-359 Modbus TCP/HART Gateway using FDT/DTM when connected to the 750-841 ETHERNET TCP/IP Controller.
  (Default operating mode 2AI + 6-byte mailbox)

- **Application type 3:**
  Operation with HART dynamic variables when connected to the PROFIBUS DP/V1 Coupler 750-333 or Controller 750-833.
  (Operating modes 2AI + 1, 2, 3, 4 HART variables per channel)

- **Application type 4:**
  Operation with the 759-360 PROFIBUS/HART Gateway using FDT/DTM when connected to the PROFIBUS DP/V1 Coupler 750-333 or Controller 750-833.
  (Operating mode 2AI + acyclic PROFIBUS services)

9.1 With PLC Library on All Compatible 75x-xxx Fieldbus Couplers/Controllers

With the default parameter settings “2 AI + 6-Byte Mailbox”, the HART I/O module can be used with all WAGO fieldbus couplers/controllers 75x-xxx of the WAGO-I/O-SYSTEM with HART functionality, which are listed in the Section “Compatibility List”.

Note

Note the maximum number of connectable I/O modules!
Because of the process data capacity of the HART I/O module, please be sure to take into account the corresponding maximum number of modules that can be connected when using a WAGO fieldbus coupler/controller 75x-xxx. You can find this number in the table “Compatibility List”.

In the cyclic process image of the fieldbus coupler/controller, the HART I/O module appears as a 1-channel I/O module whose process values consist of the analog values and a 6-byte mailbox. HART communication can then take place via the mailbox.

Note

Library for HART functionality required!
To use the HART functionality, it is necessary to install and incorporate the WAGO HART library “WagoLibHART_0x.lib” in the PLC application.

Information

More information for downloading the library
You can download the “WagoLibHART_0x.lib” library on the WAGO homepage at: **www.wago.com**
Enter the search term “WagoLibHART”.

9.1.1 Communication on 75x-xxx via PLC Library

Communication between the 75x-xxx fieldbus couplers/controllers and the HART I/O module is achieved using the “WagoLibHART_0x.lib” library.

This library enables easy access to the 6-byte mailbox of the I/O module and provides the necessary HART commands, which can then be executed locally from the PLC application.

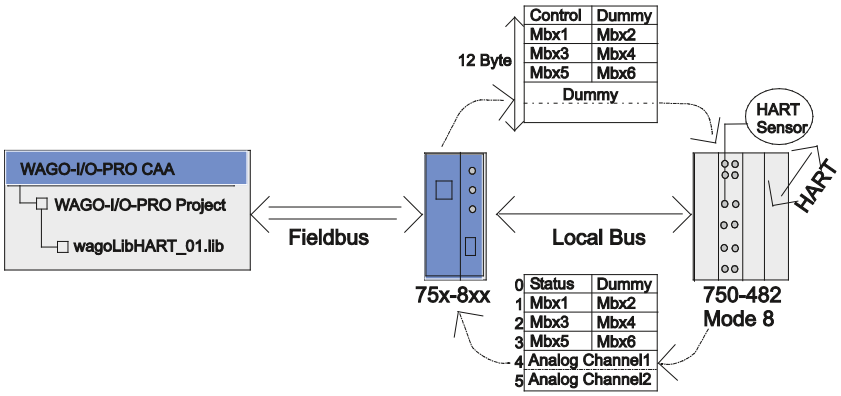

Figure 23: Communication Example on the 75x-8xx Controller via WagoLibHART_0x.lib

Information

More information about the application
You can read a detailed description with a clear application example for the “WagoLibHART_0x.lib“ library with WAGO-I/O-PRO CAA in the respective application note that describes the HARD application using this library.
You can download this application note from the WAGO homepage at: **www.wago.com**
Enter the search term “WagoLibHART”.

9.1.2 Startup on the 75x-xxx via PLC Library

This section describes the most important steps for commissioning the HART I/O module on a 75x-xxx fieldbus coupler/controller using the HART library.

In addition to the fully installed and connected hardware of the fieldbus node with fieldbus coupler/controller interface, it is necessary to install the following software before carrying out the operation described.

Table 36: Required Software for Startup on 75x-xxx via PLC Library

No.	Software name	Description	Item number
1	WAGO-I/O-*CHECK* (optional)	Commissioning tool for the WAGO-I/O-SYSTEM 750	759-302
2	WAGO-I/O-*PRO* CAA	Programming tool IEC 61131-3; CAA Version 2.3; CODESYS Automation Alliance	759-333
3	WagoLibHART_0x.lib	WAGO-I/O-*PRO* Libraries	Download: **www.wago.com**

When the HART I/O module is delivered, the default operating mode (2 AI + 6-byte mailbox) is preset.
If the operating mode has already been changed, e.g., the module has been used in a PROFIBUS system, the operating mode must be parameterized again for the default setting

1. Launch WAGO-I/O-*CHECK* and set the operating mode to “2 AI + 6-byte mailbox”.
   Proceed as described in the Section “Operating Modes” > … > “Setting via WAGO-I/O-*CHECK*”.

Note

WAGO-I/O-*CHECK* up to Version 3.17.1.17:

Setting Limitations for PROFIBUS Operating Modes
For the PROFIBUS operating modes “1, 2, 3 or 4 HART variable(s) per channel”, switching via WAGO-I/O-*CHECK* and operation on a fieldbus coupler other than a PROFIBUS fieldbus coupler (750-333) or controller (750-833) is not currently possible. A HART I/O module set up for HARD dynamic variables using GSD files can therefore currently only be operated with a PROFIBUS fieldbus coupler (750-333) or controller (750-833).
It is then possible to restore the default state of the HART I/O module using WAGO-I/O-*CHECK* and the PROFIBUS fieldbus coupler (750 333) or controller (750-833). Make sure that the PROFIBUS fieldbus coupler (750-333) or controller (750-833) is not parameterized using GSD files.

2. Launch WAGO-I/O-PRO CAA, select the **Resources** tab and double-click in the tree structure on **Library Manager** to open the respective dialog. Integrate the “WagoLibHART_0x.lib” library for your “IEC 61131-3” project.

You can then access the HART commands directly in your project and execute these locally from your “IEC 61131-3” application.

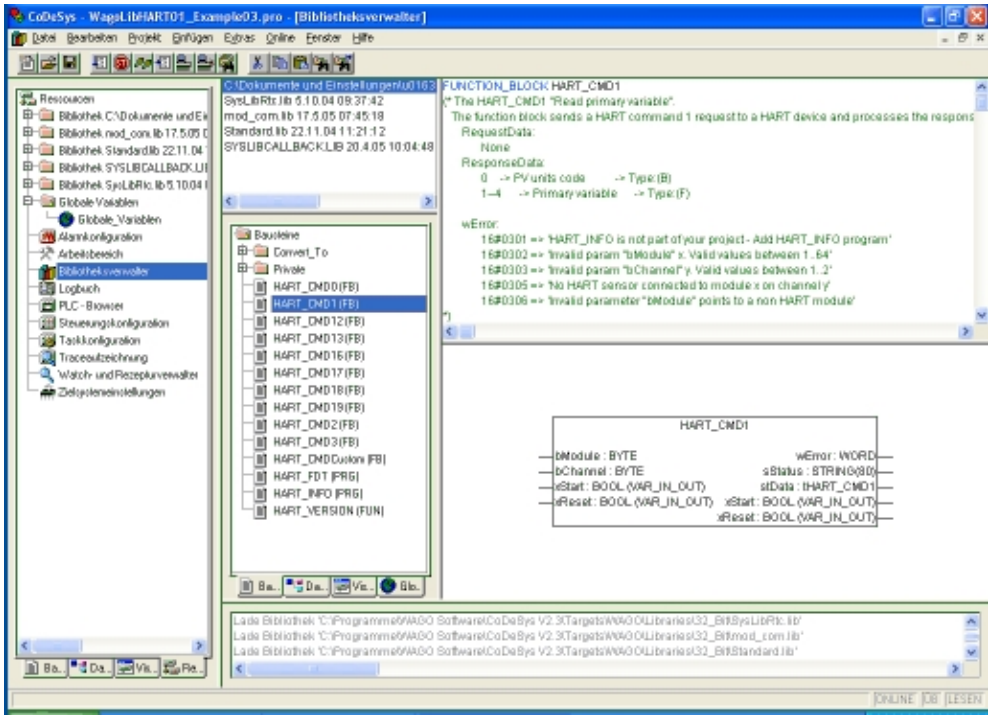

Figure 24: WAGO-I/O-PRO Project with Integrated “WagoLibHART_0x.lib” Library

Information

More information about WAGO-I/O-PRO CAA

Detailed descriptions of the functions and use of the WAGO-I/O-PRO CAA IEC 61131-3 programming tool are available in the WAGO-I/O-PRO CAA (759-333) manual on the Internet at: **www.wago.com**

9.2 FDT/DTM with the ETHERNET Controller 750-841

In the default mode “2AI + 6-byte mailbox”, when the HART I/O module is connected to a WAGO ETHERNET TCP/IP Controller 750-841, it is also possible to carry out HART communication by means of the FDT/DTM frame application “*WAGOframe*”.

Note

Consider the maximum number of modules!

Because of the process data capacity of the HART I/O module, please be sure to take into account the corresponding maximum number of modules that can be connected when using a WAGO ETHERNET Controller 750-841. You can find this number in the table “Compatibility List”.

Note

A Boot-Project for HART functionality is necessary!
In order to be able to use the HART functionality, a special boot project for Ethernet controllers must be loaded into the ETHERNET Controller 750-841. You can download this boot project and more detailed information relating to it on the WAGO website at:
www.wago.com → *Support* → *Additional documentation and information on automation products* → *Application Notes*, under the number: "*A116101*".

The device driver "ModbusTCP/HARTGatewayDTM 759-359" is available for the convenient FDT/DTM frame application "*WAGOframe*", which makes it possible to access the DTM of the connected HART device directly from this application.

Information

Additional Information about "*WAGOframe*" and "ModbusTCP/HARTGatewayDTM"
The FDT/DTM frame application "*WAGOframe*" can be ordered under Item No.: 759-370; the free "ModbusTCP/HARTGatewayDTM 759-359" can be downloaded from the WAGO website at:
www.wago.com → *Support* → *Additional documentation and information on automation products*

9.2.1 Communication on 750-841 via FDT/DTM

The "ModbusTCP/HARTGatewayDTM 759-359" and the DTM for the connected HART sensor are embedded in the *WAGOframe* FDT/DTM frame application.

Communication from the *WAGOframe* FDT/DTM frame application to the connected HART sensor takes place in three phases:

1 The DTM of the HART field device first creates a HART telegram. This is received by the WAGO ModbusTCP/HARTGatewayDTM and packed into a Modbus telegram. This is then sent to the 750-841 by means of the Modbus TCP communications DTM.

2 The Controller 750-841 acts as a gateway.
It receives the Modbus telegram, removes the HART telegram from the Modbus telegram and transfers it via the mailbox, which is incorporated into the process image of the controller. This mailbox data is then used to forward the commands to the HART I/O module by means of the local bus (KBUS).

3 The HART I/O module receives the HART telegram via the mailbox and passes it on to the HART field device.

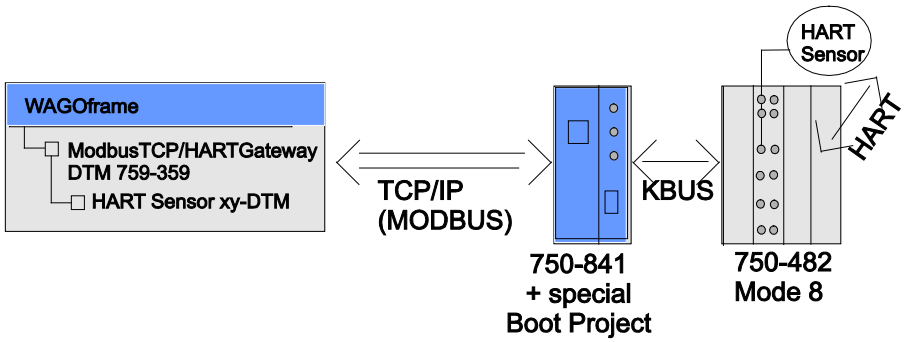

Figure 25: FDT/DTM Communication via MODBUS TCP/IP

9.2.2 Commissioning 750-841 via FDT/DTM

This section describes the most important steps for commissioning the HART I/O module on a Controller 750-841 using FDT/DTM.

Along with the fitted and wired fieldbus node hardware, which includes the connected ETHERNET controller, it is necessary to install the following software before carrying out the operations described.

Table 37: Software Required for the Commissioning on a 750-841 via FDT/DTM

Pos.	Name	Description	Item-No.:
1	WAGO-I/O-*CHECK* (optional)	Commissioning tool for the WAGO-I/O-SYSTEM 750	759-302
2	Default.prg	Special boot project for Ethernet controllers, Application note number:“A116101”	Download: www.wago.com
3	*WAGOframe*	FDT frame application for parameterization, commissioning and diagnostics of devices with DTM device drivers	759-370
4	WAGO_Modbus_TCP _DTM	DTM for MODBUS/TCP	759-359 Both Download: www.wago.com
5	WAGO_075x-08xx_DTM	DTM for the 75x-8xx controller	
6	HART device DTM (e.g., Generic HART DTM from ICS GmbH)	DTM for parameterization, commissioning and diagnostics of HART-enabled field devices	Obtainable from HART field device manufacturers

1. When the HART I/O module is delivered it is pre-configured for the default operating mode (2 AI + 6-byte mailbox).
   If this should already have been changed; e.g., if the module has been used in a PROFIBUS system, the operating mode must be re-parameterized for the default setting.
   To do this, open WAGO-I/O-*CHECK*, and set the operating mode to

“2 AI + 6-byte mailbox”.
For this purpose, proceed as described in the section “Operating Modes” > … > “Setting Up using WAGO-I/O-*CHECK*”.

Note

Restriction of Settings for PROFIBUS Operating Mode!
This changeover and operation with other than a PROFIBUS Coupler 750-333 or Controller 750-833 is not yet possible at the present time for “PROFIBUS operating modes” (2 AI + 1, 2, 3 or 4 HART variables per channel).
A HART I/O module that has once been set up for HART dynamic variables using GSD files can therefore currently only be operated with a PROFIBUS Coupler 750-333 or Controller 750-833.
It is then possible to restore the default state of the HART I/O module using WAGO-I/O-*CHECK* and the PROFIBUS Coupler 750-333 or Controller 750-833. When doing so it must be ensured that the parameters of the PROFIBUS Coupler 750-333 or Controller 750-833 are not set using GSD files.

2. Set up an FTP connection to the Ethernet controller. The easiest way to do this is using Internet Explorer:
   For the address enter:
   ftp://<IP> where <IP> is the IP address of the controller.
   (Example: ftp://192.168.1.1)
3. In the following log-in dialog, enter the user name and password (Default: user name “admin”; password “wago”)
   You will now see a view of the folder structure for the controller, e.g.:

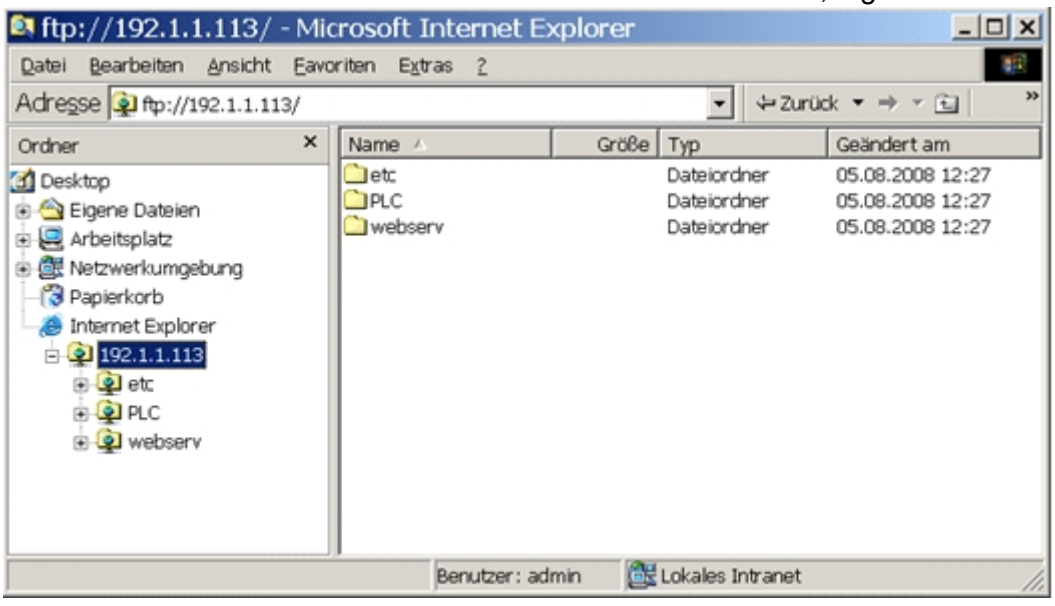

Figure 26: Ftp Access on a Fieldbus Controller

4. Now switch to the **PLC** directory and here delete the two files “default.prg” and “default.chk”.
5. Copy the special boot project files, which you have previously downloaded from the WAGO website, into this **PLC** directory.

Note

A Boot-Project for HART functionality is necessary!
In order to be able to use the HART functionality, a special boot project for Ethernet controllers must be loaded into the ETHERNET Controller 750-841. You can download this boot project and more detailed information relating to it on the WAGO website at:
www.wago.com → *Support* → *Additional documentation and information on automation products* → *Application Notes*, under the number: "*A116101*".

6. Now move the operating mode switch on your ETHERNET controller, which is to be found on the programming and configuration interface, into the upper position.
7. Open the *WAGOframe* in "Expert mode".
8. Next make sure that the "Device catalog" dialog window is shown on the right-hand side of the screen. This must be activated under **Device catalog** on the **View** menu.
   Click on **[Update]** in the "Device catalog" dialog window.
9. Open a new project using **New** on the **File** menu.
10. Make sure that the "Network view" dialog window is shown on the left-hand side of the screen. This must be activated under "Network view" on the **View** menu.
    Move the mouse to "Network" in the tree structure and click on **Add...** in the context menu (right mouse button).
    Select "WAGO Modbus TCP" in the dialog which opens and confirm the selection by clicking **[OK].**
    The entry "MODBUS TCP_DTM*" will now be added to the tree structure.
11. Click **Set up connection** on the **Device** menu. The entry "MODBUS TCP_DTM*" will now be changed to italics in the tree structure.
12. Move the mouse to "*MODBUS TCP_DTM*" in the tree structure and click on **[Add....]** in the context menu (right mouse button).
    Select "075x-08xx ModbusTCP/HART Gateway" in the dialog which opens and confirm the selection by clicking **[OK].**
    The entry "<ModbusCommChannel:-> 075x-08xx DTM*" will now be added to the tree structure.
13. Now move the mouse once again to "*MODBUS TCP_DTM*" in the tree structure and select it by clicking with the left mouse button.
    Next go to "More functions" on the **Device** menu and click on **Device list** on the sub-menu.
    A dialog window with a list of devices will open.
    Select the device with the address "0.0.0.0" by clicking on it and click **Change DTM tag/address....**
    In the new view now enter the "IP address" of your ETHERNET controller in place of the "0.0.0.0".
    Confirm your entry by clicking **[OK].**
    The IP address which you have entered will now be displayed in the list in the "ModbusTCP_DTM device list" dialog window.
    Next click on **Check devices.**
    If all parameters are correctly set, the status of the DTM will now be shown in green.

14. Now move the mouse to “<ModbusCommChannel:-> 075x-08xx DTM*” in the tree structure and click on **[Add...]** in the context menu (right mouse button).
    Select the HART DTM for your HART field device in the dialog which opens and confirm the selection by clicking **[OK].**
    A further view will appear in the dialog window in which you can now select the channel to which your HART device is connected. Select “M01_Ch01” for Channel 1 of the first plugged-in HART module or “M01_Ch02” for Channel 2.
    Confirm the selection by clicking **[OK].**
    Depending on the entry “<M01_Ch01:0>...HART DTM*” or “<M01_Ch02:0>...HART DTM*” will be added in the tree structure.
    If a HART device is connected to both channels, carry out these steps for the first channel and then again in a similar manner for the second channel.
15. Move the mouse once again to “<ModbusCommChannel:-> 075x-08xx DTM*” in the tree structure and select it by clicking with the left mouse button.
    Next go to “Set up connection” on the **Device** menu. The entry “<ModbusCommChannel:-> 075x-08xx DTM*” will now be changed to italics in the tree structure.
16. Next go to “More functions” on the **Device** menu and click on **Device list** on the sub-menu.
    A dialog window with a list of devices will open.
    Click on **[Update].**
    After a while the DTM(s) for the connected HART devices will now also be shown in green.
17. Move the mouse once again to the entry for the channel to which your HART device is connected in the tree structure and select it by clicking with the left mouse button.
    Go to the **Device** menu and click **Set up connection**. This entry will then be changed to italics in the tree structure.
    If a HART device is connected to both channels, carry out these steps for the first channel and then again in a similar manner for the second channel.
18. Move the mouse to the entry for the channel to which your HART device is connected in the tree structure and double-click it; a dialog window with the online parameterization will then open. After a short time connection symbols will be displayed after the respective parameters.

9.3 With HART Dynamic Variables on PROFIBUS DP/V1 750-333 and 750-833

When connecting to the PROFIBUS DP/V1 Coupler 750-333 or Controller 750-833, there is a choice of four operating modes, “2AI + 1, 2, 3, 4 HART variables per channel”, in which the incorporation of one, two, three or four HART variables per channel in the cyclic process image can be set up for the analog values.

Table 38: Operating Mode for PROFIBUS DP/V1

2 AI + 1 HART variable per Channel
2 AI + 2 HART variables per Channel
2 AI + 3 HART variables per Channel
2 AI + 4 HART variables per Channel

Note

Consider the maximum number of modules!
Because of the process data capacity of the HART I/O module, please be sure to take into account the corresponding maximum number of modules that can be connected when using a WAGO PROFIBUS DP/V1 Coupler 750-333 or Controller 750-833. You can find this number in the table “Compatibility List”.

With PROFIBUS, it is possible to evaluate and process further information in addition to the actual measured signal, which is output in the main variables. This additional information is then output accordingly by means of the HART dynamic variables.

Some HART field devices (sensors) provide such additional information, an example being a pressure transducer, which depending on the type of measurement also provides such data as the sensor or electronics temperature in the dynamic variables along with the actual process value (e.g., pressure, flow or level).

Information

Additional Information for the Application
You can read a detailed description with a clear application example for the PROFIBUS connection using HART dynamic variables in a superimposed CODESYS or Siemens controller in the appropriate application note, which describes the use of HART I/O modules on the PROFIBUS DP/V1 coupler. You will find this application note on the WAGO website at:
www.wago.com → *Support* → *Additional documentation and information on automation products* → *Application Notes*

9.3.1 Communication on the 750-333, -833 with Dynamic Variables

The use of the HART I/O module with a WAGO PROFIBUS DP/V1 Coupler 750-333 or Controller 750-833 is described briefly below.

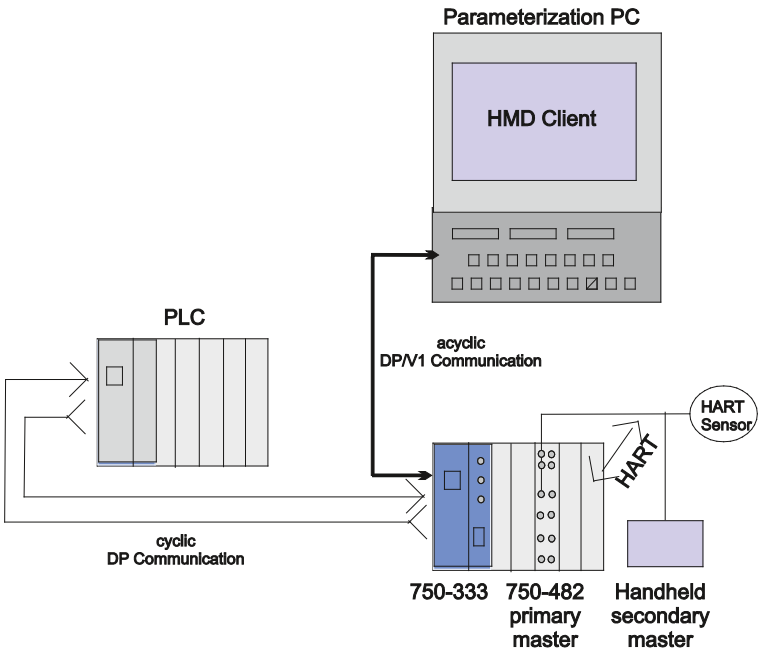

Figure 27: System Overview with a PROFIBUS Fieldbus Coupler/Controller

The WAGO fieldbus node with PROFIBUS DP/V1 coupler/controller serves as a data gatherer/distributor for the superimposed controller. The coupler/controller processes the process variables from the HART devices.

Communication on PROFIBUS takes place by means of the acyclic PROFIBUS DP/V1 commands. A prerequisite for the implementation of cyclic communication is the successful start-up of cyclic data traffic.

The final transfer of data between the HART I/O module and the connected sensor then takes place using the HART-on-Profibus protocol.

Parameterization/monitoring of the HART devices can be carried out both using a PC application in the DP/V1 leg and also using a handheld directly in the HART leg. An IEC development tool (e.g., WAGO-I/O-*PRO* CAA (Item No.: 759-333), the “SIMATIC Manager” or other) is used for the parameterization environment.

9.3.2 Commissioning on the 750-333, -833 with Dynamic Variables

This section describes the most important steps for commissioning the HART I/O module on a PROFIBUS DP/V1 fieldbus coupler 750-333 or fieldbus controller 750-833 using the dynamic variables.

Along with the installed and wired fieldbus node hardware, which includes the PROFIBUS DP/V fieldbus coupler/controller, it is necessary to install the following software before carrying out the operations described.

Table 39: Software Required for the Commissioning on a 750-333, -833 With Dynamic Variables

Pos.	Name	Description	Item-No.:
1	WAGO-I/O-*CHECK* (optional)	Commissioning tool for the WAGO-I/O-SYSTEM 750	759-302
2	GSD files for PROFIBUS with installation program / Series 750, 752 und 755	Fieldbus-specific software (e.g., GSD files for PROFIBUS)	750-910 Download: www.wago.com
3	e.g., WAGO-I/O-*PRO* CAA (SIMATIC Manager,…)	PLC development environment	759-333

A PROFIBUS Coupler 750-333 or Controller 750-833 is operated on a PROFIBUS master; e.g., on a 750-870 WAGO IPC, an S7 or another PROFIBUS master station.

In this case, WAGO-I/O-*PRO* CAA (Item No.: 759-333), the “SIMATIC Manager” or other IEC development tools can be used for the configuration software.

The following description of the configuration is by way of example. You will find the exact steps for configuring your PROFIBUS system in the documentation for the software used.

1. As is typical for a PROFIBUS application, set up the required operating mode “2 AI + 1, 2, 3 or 4 HART variables per channel” using the GSD files. You will find more detailed information on this in the section “Setting the Operating Mode Parameters – Setting Up via GSD”.
   Alternatively you can also open WAGO-I/O-*CHECK* if available. In this case, proceed as described in the section “Operating Modes” > … > “Setting Up using WAGO-I/O-*CHECK*”.
2. Start your configuration software and create your basic project.
3. When you have selected your PROFIBUS master, open the hardware configurator.
4. Now install the WAGO GSD files.
5. Incorporate the device descriptions for the WAGO-I/O-SYSTEM 750 devices in the device catalog and update them.
6. In the next step, add a “DP master system” and set the station address of the DP master interface.
7. Mark the “DP master system” and open the device catalog in order to connect the WAGO PROFIBUS DP/V1 Coupler 750-333 or Controller 750-833 you are using to the “DP master system”.
   You will find the Coupler 750-333 or Controller 750-833 in the tree structure under:
   “*PROFIBUS-DP >Other FIELD DEVICES >I/O >WAGO I/O-SYSTEM 750*”.
8. Change the address to the station address of the WAGO PROFIBUS DP/V1 coupler/controller previously set on the DIP switch.

9. Now expand the device catalog and using “Drag&Drop” add the remaining I/O modules that you have plugged into your fieldbus node on the coupler/controller.

   In doing so, you will find a total of five entries for the HART I/O Module corresponding to the operating modes.
   You will find a description of the different entries with a list of all the associated parameters in the section “Operating Modes” > … > “Setting Up via GSD”.

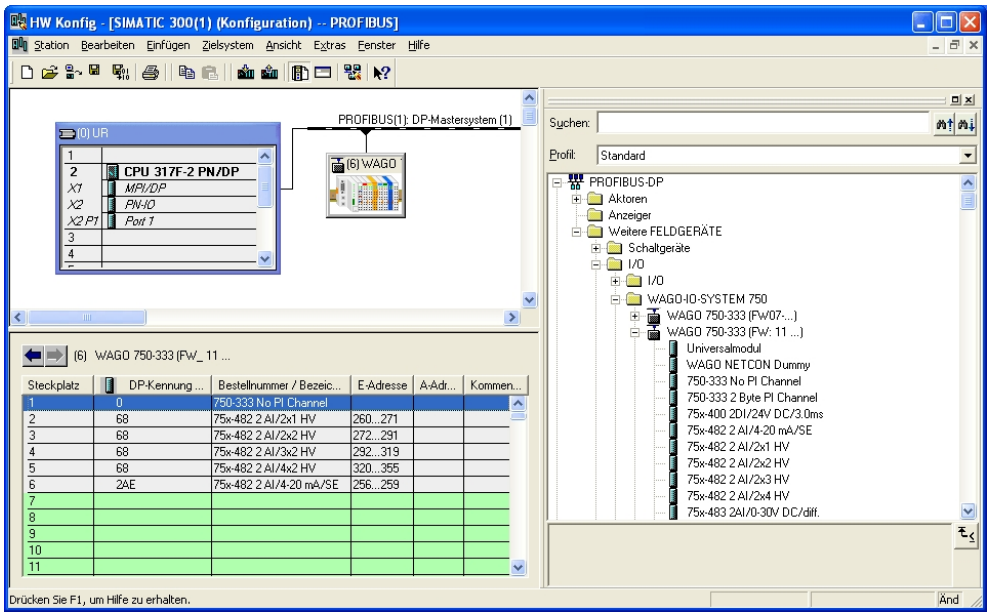

Figure 28: HW Config in STEP7

10. Select the entry corresponding to the required operating mode and incorporate this into your configuration.
11. Double-clicking on a module in the configuration tree structure will open a module-specific parameterizing dialog in which you can set the parameters for the PROFIBUS Coupler 750-333 or Controller 750-833, the HART I/O module and other parameterizable I/O modules.
    Set the required parameter data.
12. Next save and translate the network configuration and transfer the new project to the PLC.

9.4 FDT/DTM with the PROFIBUS DP/V1 750-333, 750-833

In the operating mode “2AI + acyclic PROFIBUS services”, when the HART I/O module is connected to a PROFIBUS Coupler 750-333 or Controller 750-833, it is also possible to carry out HART communication by means of the FDT/DTM frame application “*WAGOframe*”. The device driver “Profibus/HARTGatewayDTM 759-360” is available for using the FDT/DTM frame application “*WAGOframe*”, by means of which FDT tool routing from the PROFIBUS DP/V coupler/controller to the DTM of the connected HART device is possible. In this case, HART communication takes place by means of the acyclic PROFIBUS services, which are processed by a 12-byte mailbox.

Note

Consider maximum number of modules!
Because of the process data capacity of the HART I/O module, please be sure to take into account the corresponding maximum number of modules that can be connected when using a WAGO PROFIBUS DP/V1 Coupler (750-333) or Controller (750-833). You can find this number in the list of the table “Compatibility List”.

Information

Additional Information about “*WAGOframe*” and “Profibus/HARTGatewayDTM”
The FDT/DTM frame application “WAGOframe” can be ordered under Item No.: 759-370; the free “Profibus/HARTGatewayDTM 759-360” can be downloaded from the WAGO website at:
www.wago.com → *Support* → *Additional documentation and information on automation products*.

9.4.1 Communication on 750-333, -833 via FDT/DTM

The Profibus/HARTGatewayDTM 759-360 and the DTM for the connected HART sensor are embedded in the *WAGOframe* FDT/DTM frame application.

Communication from the *WAGOframe* FDT/DTM frame application to the connected HART sensor takes place in three phases:

1 The DTM of the HART field device first creates a HART telegram. This is received by the WAGO Profibus/HARTGatewayDTM and packed into a Profibus telegram. This is then sent to the 750-333 or 750-833 by means of the Profibus communications DTM.

2 The Fieldbus Coupler (750-333) or Controller (750-833) acts as a gateway. The fieldbus coupler/controller receives the Profibus DP/V telegram and transfers it via the mailbox, which is incorporated into the process image of the fieldbus coupler/controller. This mailbox data is then used to forward the commands to the HART I/O module by means of the local bus (KBUS).

3 The final transfer of data between the HART I/O module and the connected sensor then takes place using the HART-on-Profibus protocol.

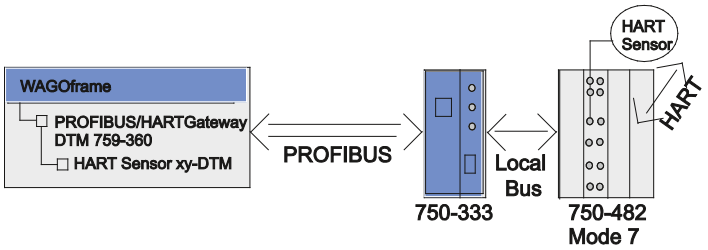

Figure 29: Example of a FDT/DTM Communication via PROFIBUS

9.4.2 Commissioning on a 750-333, -833 via FDT/DTM

This section describes the most important steps for commissioning the HART I/O module on a PROFIBUS DP/V1 Fieldbus Coupler (750-333) or Controller (750-833) using FDT/DTM.

Along with the installed and wired fieldbus node hardware, which includes the PROFIBUS DP/V1 Fieldbus Coupler (750-333) or Controller (750-833), it is necessary to install the following software before carrying out the operations described.

Table 40: Software Required for the Commissioning on a 750-333, -833 via FDT/DTM

Pos.	Name	Description	Item-No.:
1	WAGO-I/O-*CHECK* (optional)	Commissioning tool for the WAGO-I/O-SYSTEM 750	759-302
2	GSD files for PROFIBUS with installation program / Series 750, 752 and 755	Fieldbus-specific software (e.g., GSD files for PROFIBUS)	750-910 Download: **www.wago.com**
3	WAGO*frame*	FDT frame application for parameterization, commissioning and diagnostics of devices with DTM device drivers	759-370
4	WAGO_Profibus_HART _DTM 759-360	DTM for PROFIBUS	759-360 Both Download: **www.wago.com**
5	WAGO_075x-08xx_DTM	DTM for the 75x-8xx controller	Obtainable from HART field device manufacturers
6	HART device DTM(e.g., Generic HART DTM from ICS GmbH)	DTM for parameterization, commissioning and diagnostics of HART-enabled field devices	

1. As is typical for a PROFIBUS application, set up the operating mode “2 AI + acyclic PROFIBUS services” using the GSD files. You will find more detailed information on this in the section “Operating Modes“ > … > “Setting Up via GSD”.
   Alternatively you can also open WAGO-I/O-*CHECK* if available. In this case, proceed as described in the section “Operating Modes Parameters” > … > “Setting Up using WAGO-I/O-*CHECK*”.
2. Open *WAGOframe* in “Expert mode”.
3. Next make sure that the “Device catalog” dialog window is shown on the right-hand side of the screen. This must be activated under **Device catalog** on the **View** menu.
   Click on **[Update]** in the “Device catalog” dialog window.
4. Open a new project using **New** on the **File** menu.
5. Make sure that the “Network view” dialog window is shown on the left-hand side of the screen. This must be activated under **Network view** on the **View** menu. Now move the mouse to **Network** in the tree structure and

click on **Add...** in the context menu (right mouse button).
Select the device type name for your PROFIBUS master in the dialog which opens and confirm the selection by clicking **[OK].**
The name of your PROFIBUS master will now be added in the tree structure.

6. Move the mouse to the device type name of your PROFIBUS master in the tree structure and select it by clicking with the left mouse button.
   Next go to the **Device** menu and click **Offline parameterization**.
   On the **FDL parameters** tab of the dialog window which opens enter the baud rate: “12 MBaud” and click on **Set default values**.
   Confirm your entries by clicking **[OK].**
7. Click **Set up connection** on the **Device** menu. The device type name of your PROFIBUS master will now be changed to italics in the tree structure.
8. Move the mouse to the device type name of your PROFIBUS master in the tree structure and click on **Add...** in the context menu (right mouse button).
   Select “0750-0333 PROFIBUS/HART Gateway” in the dialog which opens and confirm the selection by clicking **[OK].**
   The entry for the PROFIBUS/HART communications DTM will now be added in the tree structure.
9. Move the mouse once again to the device type name of your PROFIBUS master in the tree structure and select it by clicking with the left mouse button.
   Next go to **More functions** on the **Device** menu and click on **Device list** on the sub-menu.
   A dialog window with a list of devices will open.

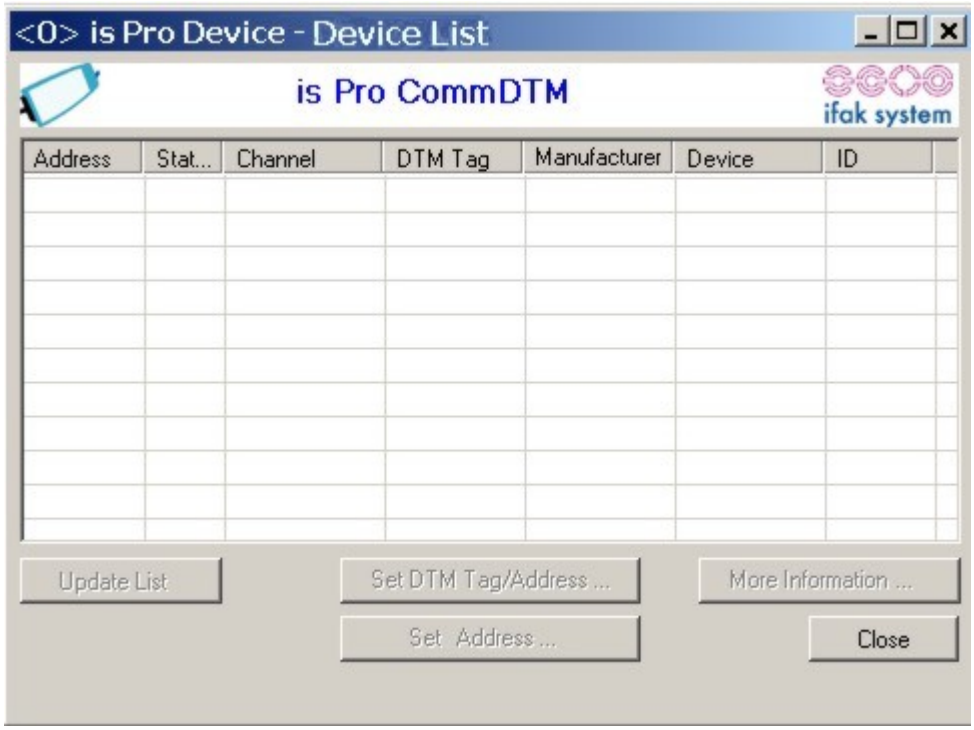

Figure 30: Dialog Window “Device List”

10. Select the device with the address 126 by clicking on it and click [**Set DTM Tag/Address...**].
    Now, instead of the 126, enter the station address, which is physically set by the two rotary decade switches (decimal) on your PROFIBUS

coupler/controller, for the “DP slave address” in the new view.
Confirm your entry by clicking **[Close].**

11. Use the mouse to select the communications DTM in the tree structure and right click on **Configuration** in the context menu.
A dialog window opens with three registers: **Device Information**, **Module Configuration**, and **Parameterization**.

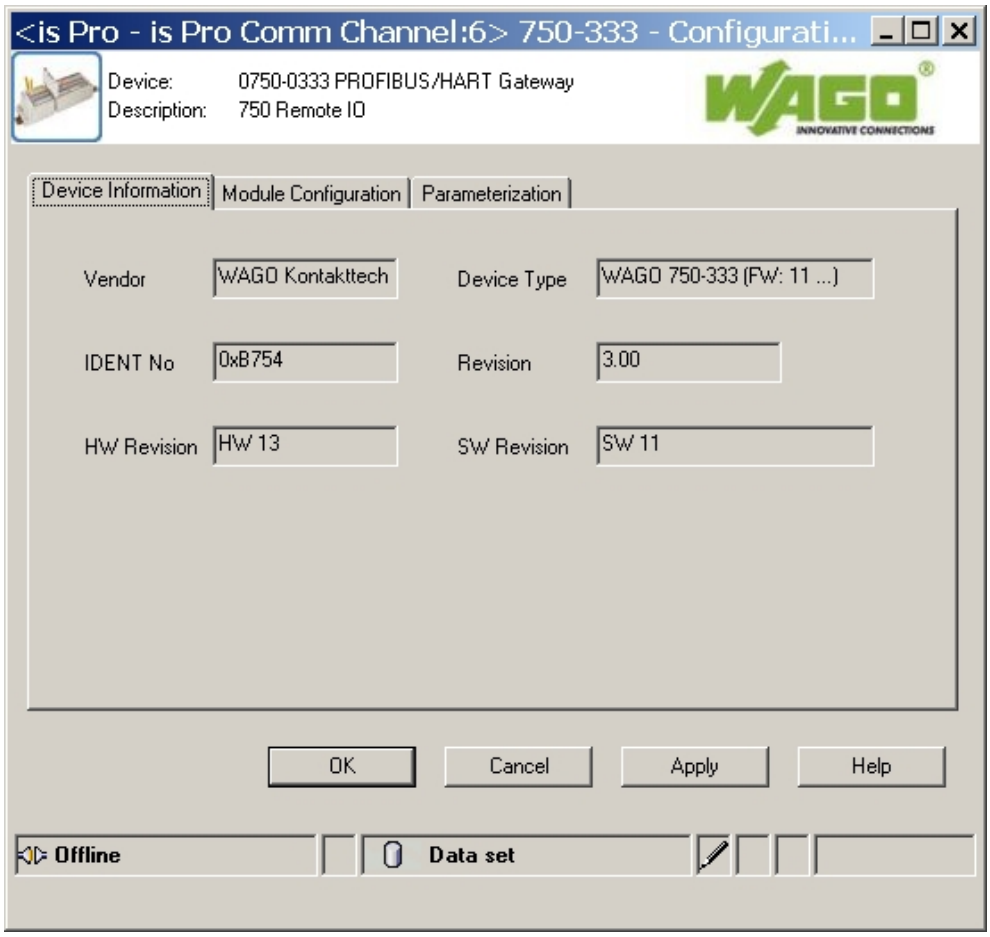

Figure 31: Dialog Window 750-333 Configuration, Register Device Information

12. Select the register **Module Configuration** and identify for Slot(2) ... Slot(x) which module is physically plugged in to its fieldbus node. Pay attention to all I/O modules that deliver process data in the process image.
Slot(1) has been predefined with the fieldbus coupler/controller.
For module configuration, a drop down menu of all available I/O modules can be found in the **Module** column.
After the node configuration is complete, confirm by clicking **[Apply].**

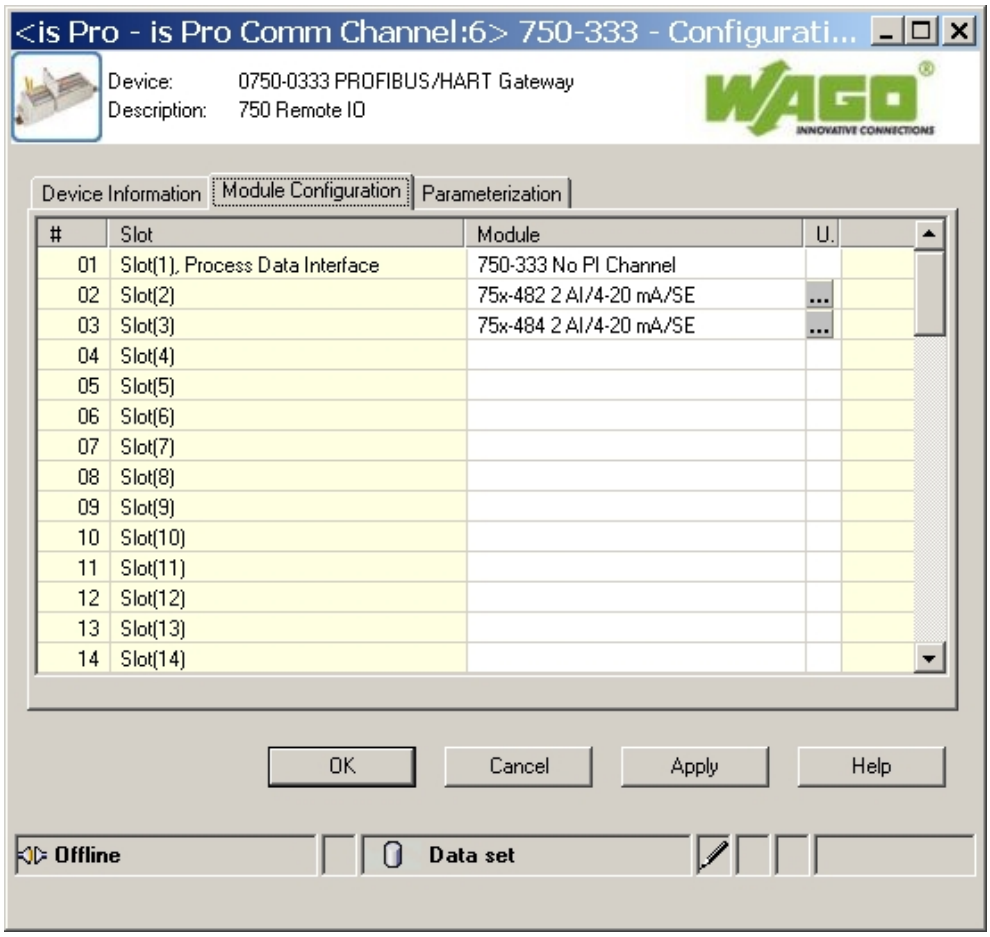

Figure 32: Dialog Window 750-333 Configuration, Register Module Configuration

13. Select the register **Parameterization** and open a dialog view in which you can make additional parameter changes.
Confirm the changes made here by clicking **[Apply]**.

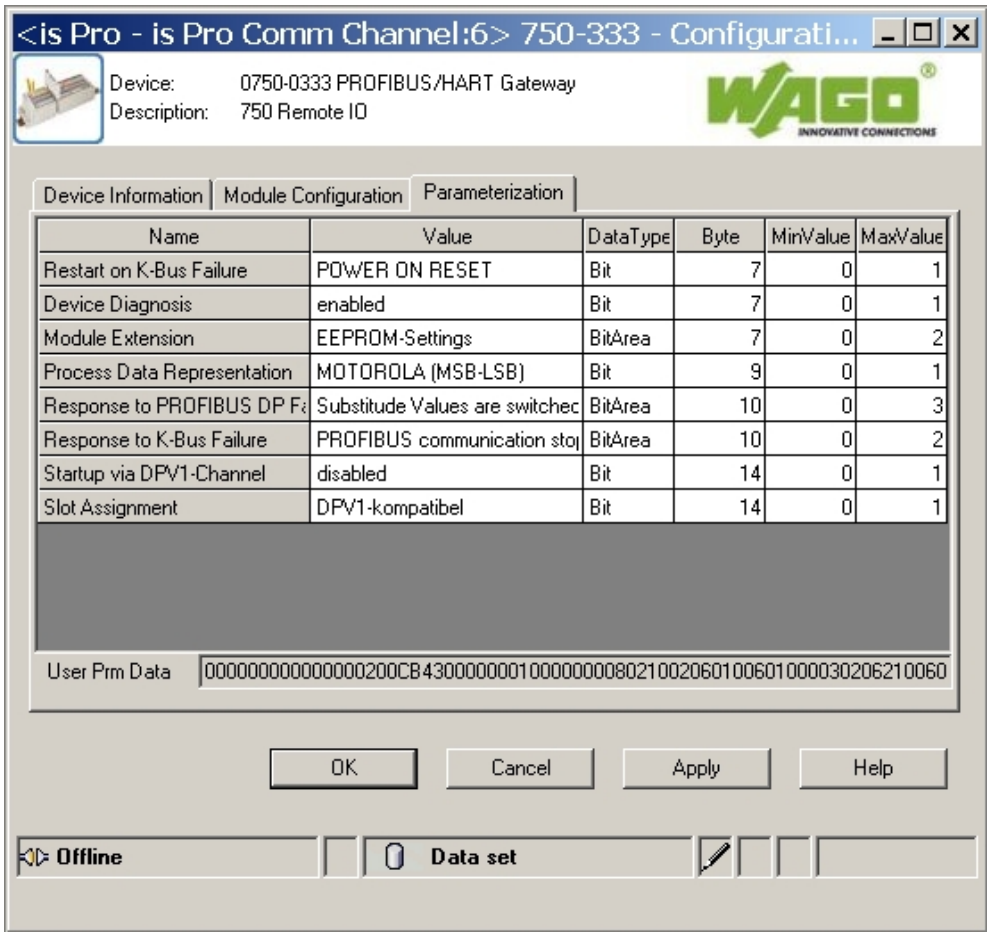

Figure 33: Dialog Window 750-333 Configuration, Register Parameterization

14. When configuration is completed, close the configuration dialog window.
15. Use the mouse to select the communications DTM in the tree structure and right click on **Offline Parameterization** in the context menu.
You will see a dialog window in which you can set the DTM parameters for each module.

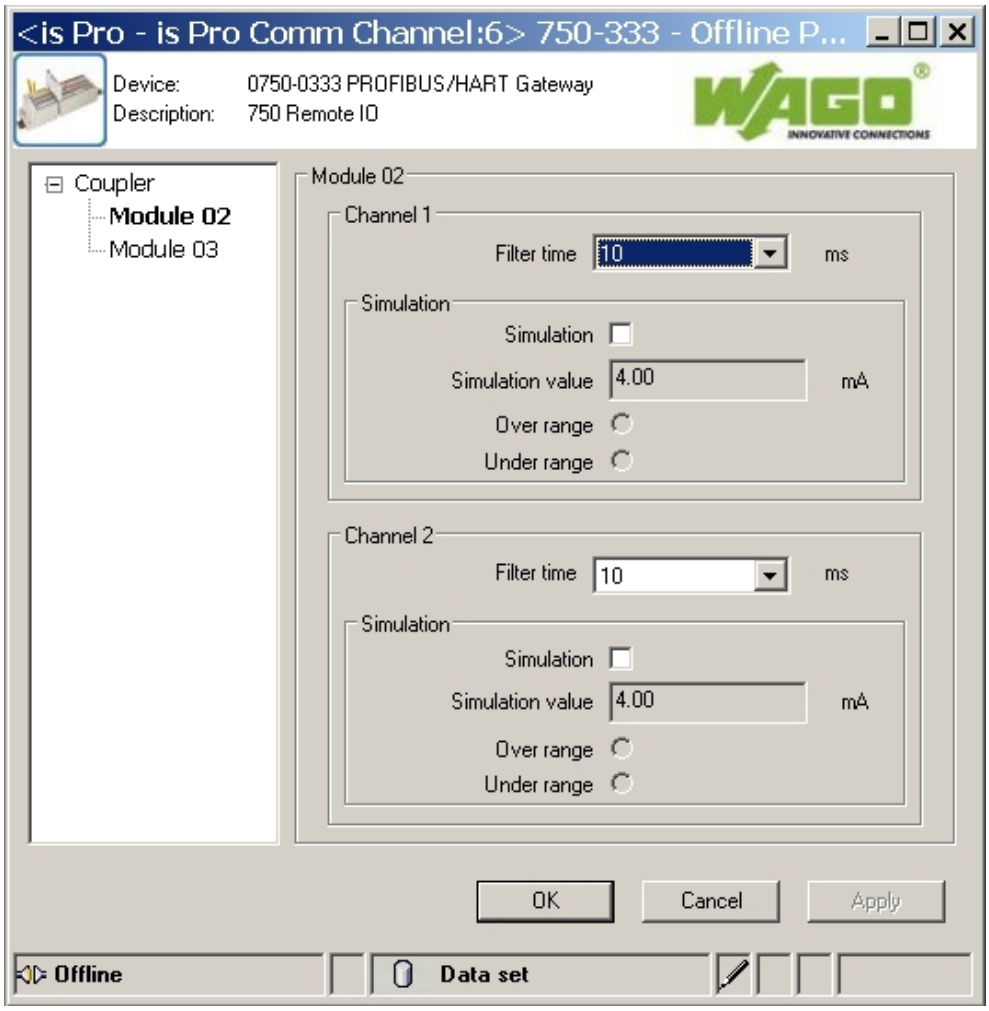

Figure 34: Dialog Window DTM Parameters

16. Select the desired module from the left side of the tree structure; the displayed module number corresponds to the slot in the structure – module 01 is the bus coupler.
    The right side contains the parameterization dialog for this module.
17. Set the desired parameter for each channel separately, such as
    - the analog **Filter time** for the input channel (10 ms ... 640 ms),
    - the **Simulation** mode activation, and
    - the **Simulation value** setting with the **Over range** or **Under range** selection.

    When the simulation is activated, the selected simulation value is output as a process value. When selecting an overflow or underflow, the overflow or underflow is overlaid (last 2 bits), as output in the status byte.

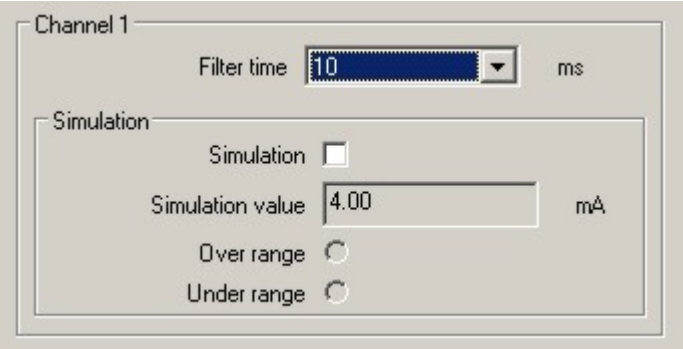

Figure 35: Dialog Window Detail: Setting for Channel 1

18. Proceed in the same manner for all additional modules. When parameter settings are complete, confirm by clicking **[OK].**
19. Move the mouse to the entry for the PROFIBUS/HART communications DTM in the tree structure, select it by clicking with the left mouse button, and then click **Set up connection** on the **Device** menu. The entry for the communications DTM will now be changed to italics in the tree structure. At the same time, the BF LED on your PROFIBUS fieldbus coupler will go off. (You can also carry out the following steps using offline parameterization. In this case it will also still be possible to set up a connection retrospectively).
20. Now move the mouse once again to the entry for the communications DTM in the tree structure and right click on **Add...** in the context menu.
    Select the HART DTM for your HART field device in the dialog which opens and confirm the selection by clicking **[OK]**.
    A further view will appear in the dialog window in which you can now select the channel to which your HART device is connected.

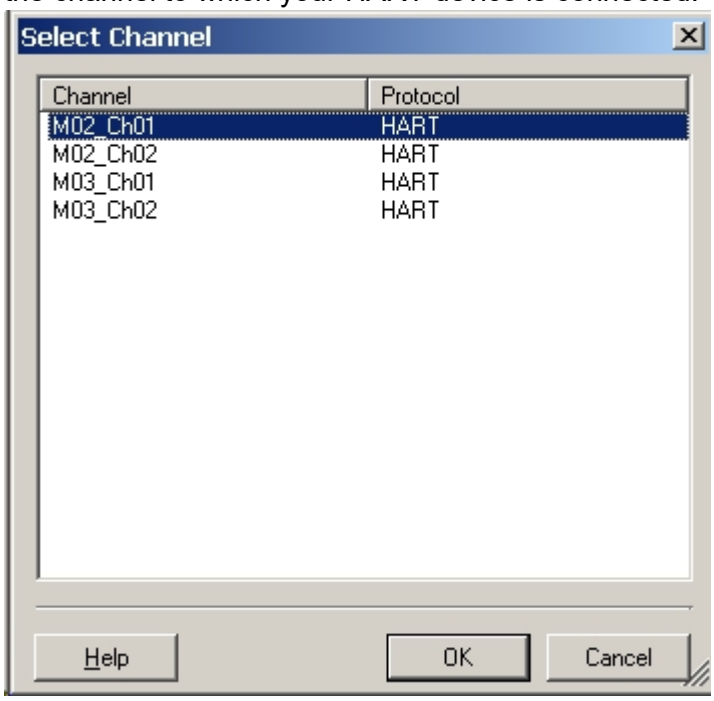

Figure 36: Channel Selection Dialog Window

21. Select “M01_Ch01” for Channel 1 of the first plugged-in HART module or “M01_Ch02” for Channel 2.
    Confirm the selection by clicking **[OK]**.

Depending on the entry “<M01_Ch01>...HART DTM*” or “<M01_Ch01>...HART DTM*” will be added in the tree structure.
If a HART device is connected to both channels, carry out these steps for the first channel and then again in a similar manner for the second channel.

22. Move the mouse to the entry for the channel to which your HART device is connected in the tree structure, select it by clicking with the left mouse button, and then click **Set up connection** on the **Device** menu. This entry will now be changed to italics in the tree structure.
If a HART device is connected to both channels, carry out these steps for the first channel and then again in a similar manner for the second channel.
23. Move the mouse once again to the entry for the communications DTM in the tree structure and select it by clicking with the left mouse button.
Next go to **More functions** on the **Device** menu and click on **Device list** on the sub-menu.
A dialog window with a list of devices will open.
Click on **[Update List].**
After a while the DTM(s) for the connected HART devices will be shown in green.

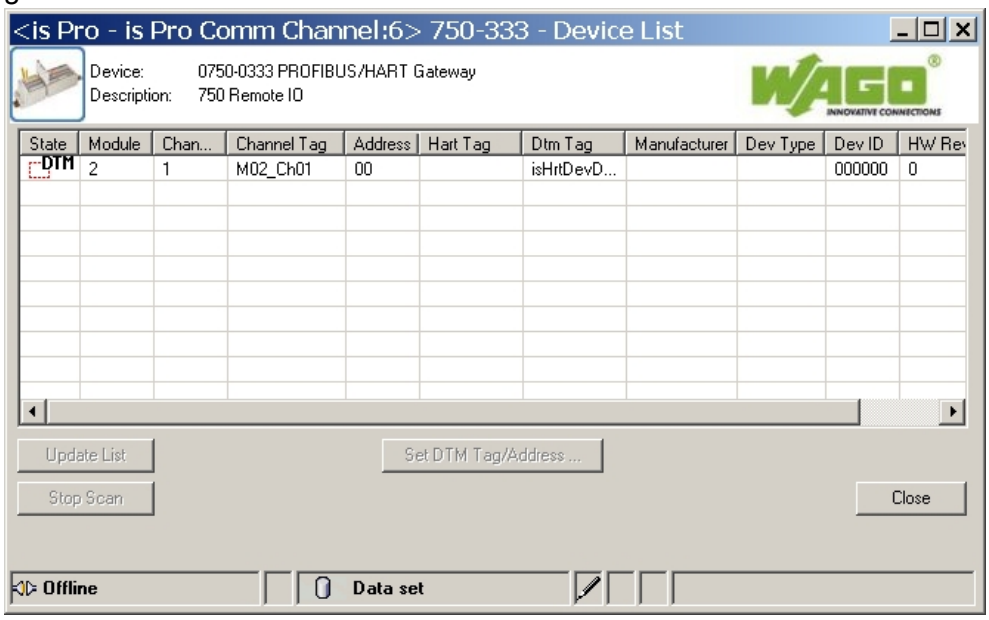

Figure 37: Dialog Window Device List, Update

24. Move the mouse to the entry for the channel to which your HART device is connected in the tree structure and double-click it; a dialog window with the online parameterization will then open. After a short time, connection symbols will be displayed after the respective parameters.

10 Use in Hazardous Environments

The **WAGO I/O SYSTEM 750** (electrical equipment) is designed for use in Zone 2 hazardous areas and shall be used in accordance with the marking and installation regulations.

The following sections include both the general identification of components (devices) and the installation regulations to be observed. The individual subsections of the “Installation Regulations” section must be taken into account if the I/O module has the required approval or is subject to the range of application of the ATEX directive.

10.1 Marking Configuration Examples

10.1.1 Marking for Europe According to ATEX and IECEx

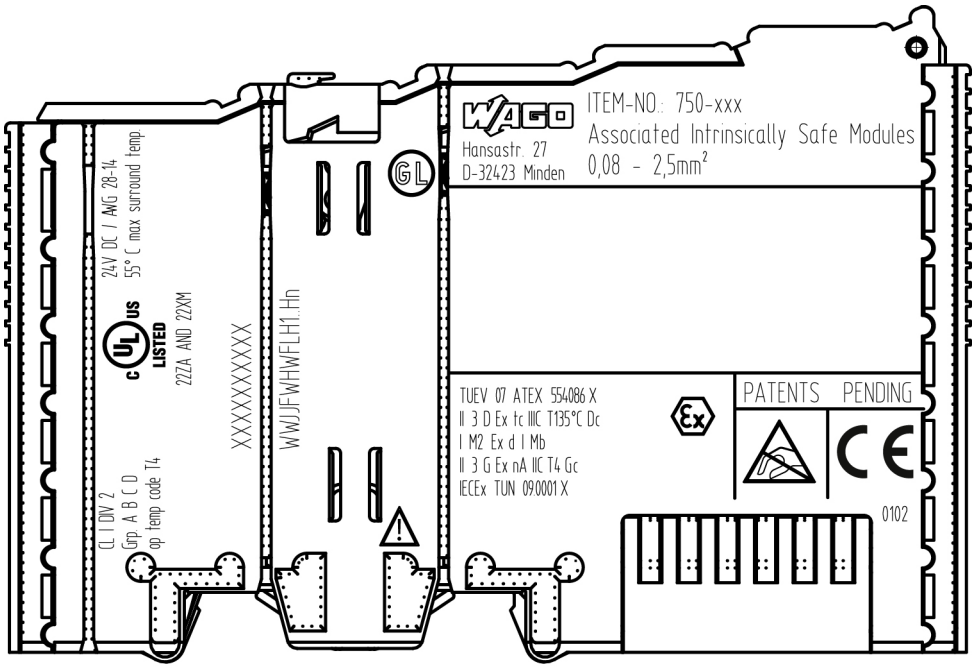

Figure 38: Marking Example According to ATEX and IECEx

Figure 39: Text Detail – Marking Example According to ATEX and IECEx

Table 41: Description of Marking Example According to ATEX and IECEx

Marking	Description
TUEV 07 ATEX 554086 X IECEx TUN 09.0001 X	Approving authority resp. certificate numbers
Dust	
II	Equipment group: All except mining
3 D	Category 3 (Zone 22)
Ex	Explosion protection mark
tc	Type of protection: Protection by enclosure
IIIC	Explosion group of dust
T135°C	Max. surface temperature of the enclosure (without a dust layer)
Dc	Equipment protection level (EPL)
Mining	
I	Equipment group: Mining
M2	Category: High level of protection
Ex	Explosion protection mark
d	Type of protection: Flameproof enclosure
I	Explosion group for electrical equipment for mines susceptible to firedamp
Mb	Equipment protection level (EPL)
Gases	
II	Equipment group: All except mining
3 G	Category 3 (Zone 2)
Ex	Explosion protection mark
nA	Type of protection: Non-sparking equipment
IIC	Explosion group of gas and vapours
T4	Temperature class: Max. surface temperature 135 °C
Gc	Equipment protection level (EPL)

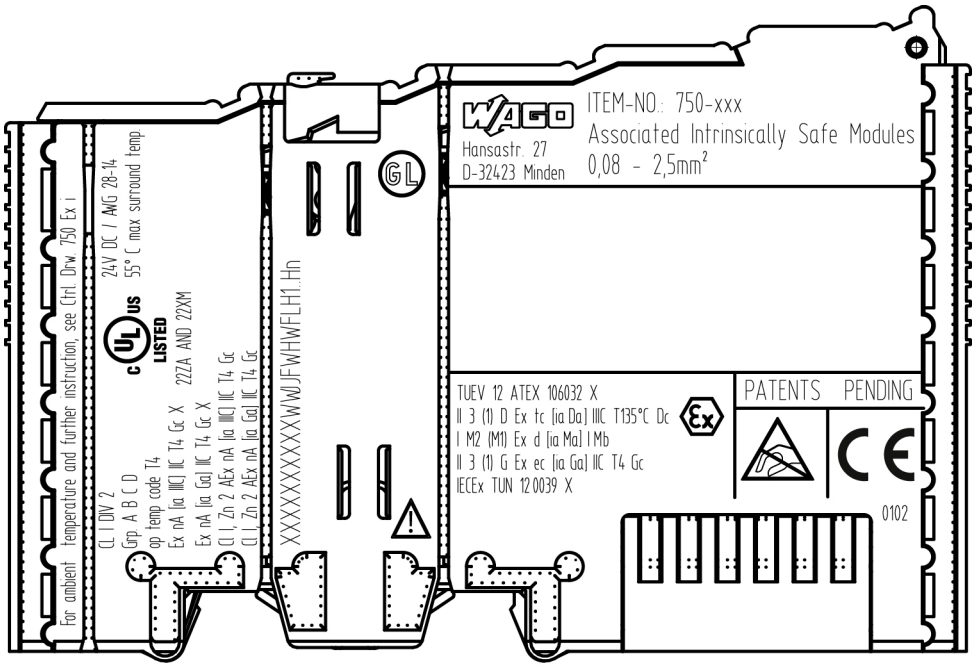

Figure 40: Marking Example for Approved Ex i I/O Module According to ATEX and IECEx

TUEV 12 ATEX 106032 X
II 3 (1) D Ex tc [ia Da] IIIC T135°C Dc
I M2 (M1) Ex d [ia Ma] I Mb
II 3 (1) G Ex ec [ia Ga] IIC T4 Gc
IECEx TUN 12 0039 X

Figure 41: Text Detail – Marking Example for Approved Ex i I/O Module According to ATEX and IECEx

Table 42: Description of Marking Example for Approved Ex i I/O Module According to ATEX and IECEx

Marking	Description
TUEV 12 ATEX 106032 X IECEx TUN 12 0039 X	Approving authority resp. certificate numbers
Dust	
II	Equipment group: All except mining
3 (1) D	Category 3 (Zone 22) equipment containing a safety device for a category 1 (Zone 20) equipment
Ex	Explosion protection mark
tc	Type of protection: Protection by enclosure
[ia Da]	Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 20
IIIC	Explosion group of dust
T135°C	Max. surface temperature of the enclosure (without a dust layer)
Dc	Equipment protection level (EPL)
Mining	
I	Equipment Group: Mining
M2 (M1)	Category: High level of protection with electrical circuits which present a very high level of protection
Ex	Explosion protection mark
d	Type of protection: Flameproof enclosure
[ia Ma]	Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety electrical circuits
I	Explosion group for electrical equipment for mines susceptible to firedamp
Mb	Equipment protection level (EPL)
Gases	
II	Equipment group: All except mining
3 (1) G	Category 3 (Zone 2) equipment containing a safety device for a category 1 (Zone 0) equipment
Ex	Explosion protection mark
ec	Equipment protection by increased safety “e”
[ia Ga]	Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 0
IIC	Explosion group of gas and vapours
T4	Temperature class: Max. surface temperature 135 °C
Gc	Equipment protection level (EPL)

10.1.2 Marking for the United States of America (NEC) and Canada (CEC)

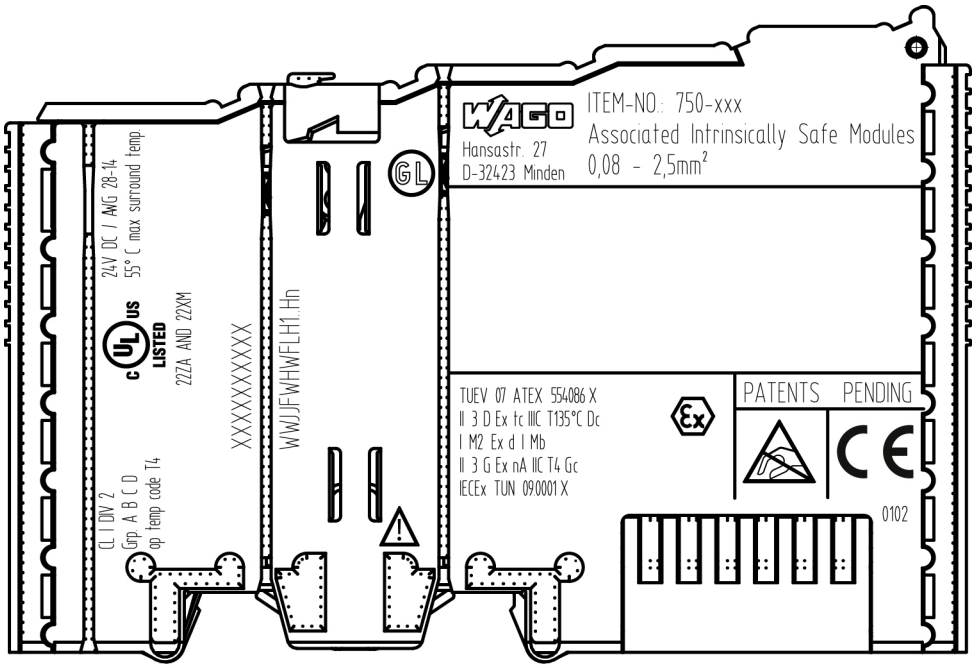

Figure 42: Marking Example According to NEC

CL I DIV 2
Grp. A B C D
op temp code T4

Figure 43: Text Detail – Marking Example According to NEC 500

Table 43: Description of Marking Example According to NEC 500

Marking	Description
CL I	Explosion protection (gas group)
DIV 2	Area of application
Grp. A B C D	Explosion group (gas group)
op temp code T4	Temperature class

Figure 44: Text Detail – Marking Example for Approved Ex i I/O Module According to NEC 505

Table 44: Description of Marking Example for Approved Ex i I/O Module According to NEC 505

Marking	Description
Cl I,	Explosion protection group
Zn 2	Area of application
AEx	Explosion protection mark
nA	Type of protection
[ia Ga]	Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 20
IIC	Group
T4	Temperature class
Gc	Equipment protection level (EPL)

Figure 45: Text Detail – Marking Example for Approved Ex i I/O Module According to NEC 506

Table 45: Description of Marking Example for Approved Ex i I/O Modules According to NEC 506

Marking	Description
Cl I,	Explosion protection group
Zn 2	Area of application
AEx	Explosion protection mark
nA	Type of protection
[ia IIIC]	Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 20
IIC	Group
T4	Temperature class
Gc	Equipment protection level (EPL)

Ex nA [ia IIIC] IIC T4 Gc X
Ex nA [ia Ga] IIC T4 Gc X

Figure 46: Text Detail – Marking Example for Approved Ex i I/O Modules According to CEC 18 attachment J

Table 46: Description of Marking Example for Approved Ex i I/O Modules According to CEC 18 attachment J

Marking	Description
Dust	
Ex	Explosion protection mark
nA	Type of protection
[ia IIIC]	Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 20
IIC	Group
T4	Temperature class
Gc	Equipment protection level (EPL)
X	Symbol used to denote specific conditions of use
Gases	
Ex	Explosion protection mark
nA	Type of protection
[ia Ga]	Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 0
IIC	Group
T4	Temperature class
Gc	Equipment protection level (EPL)
X	Symbol used to denote specific conditions of use

10.2 Installation Regulations

For the installation and operation of electrical equipment in hazardous areas, the valid national and international rules and regulations which are applicable at the installation location must be carefully followed.

10.2.1 Special Notes including Explosion Protection

The following warning notices are to be posted in the immediately proximity of the WAGO I/O SYSTEM 750 (hereinafter “product”):

WARNING – DO NOT REMOVE OR REPLACE FUSED WHILE ENERGIZED!

WARNING – DO NOT DISCONNECT WHILE ENERGIZED!

WARNING – ONLY DISCONNECT IN A NON-HAZARDOUS AREA!

Before using the components, check whether the intended application is permitted in accordance with the respective printing. Pay attention to any changes to the printing when replacing components.

The product is an open system. As such, the product must only be installed in appropriate enclosures or electrical operation rooms to which the following applies:

- Can only be opened using a tool or key
- Inside pollution degree 1 or 2
- In operation, internal air temperature within the range of 0 °C ≤ Ta ≤ +55 °C or −20 °C ≤ Ta ≤ +60 °C for components with extension number …/025-xxx or −40 °C ≤ Ta ≤ +70 °C for components with extension number …/040-xxx
- Minimum degree of protection: min. IP54 (acc. to EN/IEC 60529)
- For use in Zone 2 (Gc), compliance with the applicable requirements of the standards EN/IEC/ABNT NBR IEC 60079-0, -7, -11, -15
- For use in Zone 22 (Dc), compliance with the applicable requirements of the standards EN/IEC/ABNT NBR IEC 60079-0, -7, -11, -15 and -31
- For use in mining (Mb), minimum degree of protection IP64 (acc. EN/IEC 60529) and adequate protection acc. EN/IEC/ABNT NBR IEC 60079-0 and -1
- Depending on zoning and device category, correct installation and compliance with requirements must be assessed and certified by a “Notified Body” (ExNB) if necessary!

Explosive atmosphere occurring simultaneously with assembly, installation or repair work must be ruled out. Among other things, these include the following activities

- Insertion and removal of components
- Connecting or disconnecting from fieldbus, antenna, D-Sub, ETHERNET or USB connections, DVI ports, memory cards, configuration and programming interfaces in general and service interface in particular:
  - Operating DIP switches, coding switches or potentiometers
  - Replacing fuses

Wiring (connecting or disconnecting) of non-intrinsically safe circuits is only permitted in the following cases

- The circuit is disconnected from the power supply.
- The area is known to be non-hazardous.

Outside the device, suitable measures must be taken so that the rated voltage is not exceeded by more than 40 % due to transient faults (e.g., when powering the field supply).

Product components intended for intrinsically safe applications may only be powered by 750-606 or 750-625/000-001 bus supply modules.

Only field devices whose power supply corresponds to overvoltage category I or II may be connected to these components.

10.2.2 Special Notes Regarding ANSI/ISA Ex

For ANSI/ISA Ex acc. to UL File E198726, the following additional requirements apply:

- Use in Class I, Division 2, Group A, B, C, D or non-hazardous areas only
- ETHERNET connections are used exclusively for connecting to computer networks (LANs) and may not be connected to telephone networks or telecommunication cables
- **WARNING** – The radio receiver module 750-642 may only be used to connect to external antenna 758-910!
- **WARNING** – Product components with fuses must not be fitted into circuits subject to overloads!
  These include, e.g., motor circuits.
- **WARNING** – When installing I/O module 750-538, “Control Drawing No. 750538” in the manual must be strictly observed!

Information

Additional Information
Proof of certification is available on request.
Also take note of the information given on the operating and assembly instructions.
The manual, containing these special conditions for safe use, must be readily available to the user.

11 Appendix: Information for Hart Library

To enable Hart communication, a HART library must be used which provides the required Hart commands for the selected system.

Prior WAGO fieldbus controllers (CODESYS) and PROFIBUS systems (via DPV1-to-Hart) are supported.

11.1 CODESYS Library

For the WAGO fieldbus controller, WAGO provides a CODESYS library that offers a multiplicity of Hart commands that are simple to use from a CODESYS program perspective.

The library contains all “Universal Commands” and “Common Practice Commands.” This library is constantly being improved and already contains several common “Device Specific Commands.”

Information

Additional information for downloading the library
The library can be downloaded from the WAGO Internet site at **www.wago.com** → Support → Additional documentation and information on automation products → WAGO Software → WAGO-I/O-PRO / CODESYS → *(right column, “Additional Information”:)* Libraries → “WagoLibHART_03.lib” or by entering the following into the address bar of the web browser:
WagoLibHART_03.lib:
http://www.wago.com/wagoweb/documentation/app_note/libraries/WagoLibHART_03.lib
WagoLibHART_05.lib:
https://www.wago.com/de/d/APP_WagoLibHART_05

Information

Additional information about the library and the HART commands
A detailed description of the library, as well as the implemented HART commands, can be found at: **www.wago.com** → Support → Documentation → *(left navigation bar:)* Application Notes → Total Overview → “A116100” → Documentation (PDF) or by entering the following into the address bar of the web browser:
http://www.wago.com/wagoweb/documentation/app_note/a1161/a116100d.pdf

11.2 PROFIBUS Gateway

When using a PROFIBUS fieldbus coupler/controller, one option is to use a HartToDpv1 gateway, which several manufacturers offer.

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