WAGO-I/O-SYSTEM 750

Manual

750-461(/xxx-xxx)

2AI Pt100/RTD

2-Channel Analog Input Module for Resistance Sensors

Version 1.4.0

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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.

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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 750-461 (2AI Pt100/RTD) and the variants listed in the table below.

Table 1: Variants

Item number/Variant	Designation
Pt-resistance sensors	
750-461	2AI Pt100/RTD
750-461/000-003	2AI Pt1000/RTD
750-461/000-006	2AI Pt100/RTD/optimized temperature drift
750-461/000-200	2AI Pt100/RTD S5*) *)Adapted data format for S5-controller with functions block 250
750-461/025-000	2AI Pt100/RTD/T
Ni-resistance sensors	
750-461/000-004	2AI Ni100/RTD
750-461/000-005	2AI Ni1000 TK6180/ RTD
750-461/000-009	2AI Ni1000 TK5000/ RTD
resistance measuring	
750-461/000-002	2AI resistance measuring 10R-1k2
750-461/000-007	2AI resistance measuring 10R-5k0
Operating mode configurable with WAGO-I/O-*CHECK* or PROFIBUS DP and PROFINET device description (GSD file)	
750-461/003-000	2AI Pt100/free configurable
NTC- resistance sensors	
750-461/020-000	2AI NTC 20k

Note

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

The I/O module 750-461 shall only be installed and operated according to the instructions in this manual and in the manual for the used fieldbus coupler/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/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 that serve to increase the efficiency of technical progress. 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 WAGO-I/O-SYSTEM 750 in Compliance with Underlying Provisions

Fieldbus couplers, fieldbus 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 programmable 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 fieldbus coupler/controller.

Appropriate housing (per 2014/34/EU) is required when operating the WAGO-I/O-SYSTEM 750 in hazardous environments. Please note that a prototype test certificate must be obtained that confirms the correct installation of the system in a housing or switch cabinet.

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. WAGO Kontakttechnik GmbH & Co. KG will be exempted from any liability in case of changes in hardware or software as well as to non-compliant usage of devices.

Please send your request for modified and new hardware or software configurations directly to WAGO Kontakttechnik GmbH & Co. KG.

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 the device only in appropriate housings, cabinets or in electrical operation rooms!
The WAGO-I/O-SYSTEM 750 and its components are an open system. As such, install the system and its components exclusively in appropriate housings, cabinets or in electrical operation rooms. Allow access to such equipment and fixtures to authorized, qualified staff only by means of specific keys or tools.

NOTICE

Replace defective or damaged devices!
Replace defective or damaged device/module (e.g., in the event of deformed contacts), since the long-term functionality of device/module involved can no longer be ensured.

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 soiled contacts using oil-free compressed air or with ethyl alcohol and leather cloths.

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 750-461 I/O module measures resistance at field level or evaluates platinum or nickel resistance sensors.
The resistance values are converted into temperature values. A microprocessor in the I/O module linearizes the measured resistance values and converts them into a numeric value proportional to the temperature of the selected resistance sensor.

The **WAGO-I/O-*CHECK*** commissioning tool can be used to configure the required operating mode. The I/O module can also be parameterized via PROFIBUS and PROFINET device description (GSD file).
The parameterization description can be found in the appendix in Section "Configuration and Parameterization via GSD File with PROFIBUS DP and PROFINET IO."

The module has two input channels allowing the direct connection of two 2- or 3-wire resistance sensors.
For example, two 3-wire sensors can be connected either to +R1, RL1 and −R1 or to +R2, RL2 and −R2.

Each input channel of a module has a shield (screen) connection (S).
The shield connection is fed directly to the carrier rail and contact is made automatically by snapping the module onto the rail.

The assignment of the connections is described in the "Connectors" section.
Connection examples are shown in section "Connect Devices" > … > "Connection Example(s)".

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.

Note

Use a supply module!
Use a supply module for field-side power supply of downstream I/O modules.

The field voltage and the system voltage are electrically isolated from each other.

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 I/O module 750-461 can be used with all fieldbus couplers/controllers of the WAGO-I/O-SYSTEM 750 (except for the economy types 750-320, -323, -324 and -327).

3.1 View

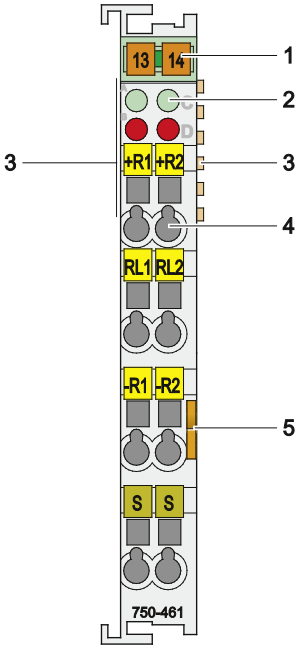

Figure 1: View

Table 4: 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	Release tab	“Mounting” > ”Inserting and Removing Devices”

3.2 Connectors

3.2.1 Data Contacts/Internal 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 internal bus. It is comprised of 6 data contacts, which are available as self-cleaning gold spring contacts.

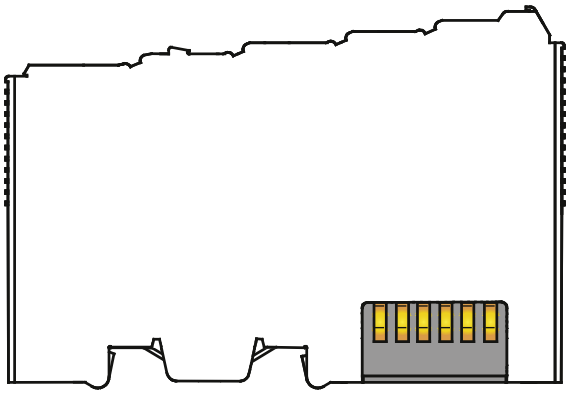

Figure 2: Data Contacts

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

Ensure that the environment is well grounded!
The devices are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the devices, ensure that the environment (persons, workplace and packing) is well grounded. Avoid touching conductive components, e.g. data contacts.

3.2.2 Power Jumper Contacts/Field Supply

The I/O module 750-461 has no power jumper contacts.

3.2.3 CAGE CLAMP® Connectors

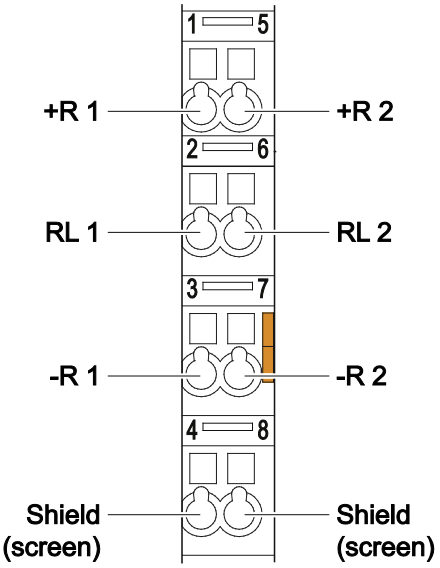

Figure 3: CAGE CLAMP® Connectors

Table 5: Legend for Figure „CAGE CLAMP® Connectors“

Channel	Designation	Connector	Function
1	+R1	1	Sensor 1: +R
	RL1	2	Sensor 1: RL
	−R1	3	Sensor 1: −R
	Shield	4	Shield (screen)
2	+R2	5	Sensor 2: +R
	RL2	6	Sensor 2: RL
	−R2	7	Sensor 2: −R
	Shield	8	Shield (screen)

Note

Use shielded signal lines!
Only use shielded signal lines for analog signals and I/O modules which are equipped with shield clamps. Only then can you ensure that the accuracy and interference immunity specified for the respective I/O module can be achieved even in the presence of interference acting on the signal cable.

3.3 Display Elements

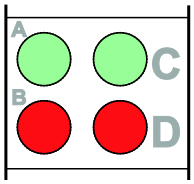

Figure 4: Display Elements

Table 6: Legend for Figure “Display Elements”

Channel	LED	State	Function	
1	A	Off	No operational readiness or the internal data bus communication is interrupted	
		Green	Operational readiness and trouble-free internal data bus communication	
1	B	Off	Normal operation	
		Red	750-461, 750-461/000-003, -004, -005, -006, -009 /020-000, 025-000	Overrange/underflow of the admissible measuring range, broken wire
			750-461/000-200	Overrange of the admissible measuring range, broken wire
			750-461/000-002	Overrange of the admissible measuring range
			750-461/000-007	Overrange of the admissible measuring range
2	C	Off	No operational readiness or the internal data bus communication is interrupted	
		Green	Operational readiness and trouble-free internal data bus communication	
2	D	Off	Normal operation	
		Red	750-461, 750-461/000-003, -004, -005, -006, -009 /020-000, 025-000	Overrange/underflow of the admissible measuring range, broken wire
			750-461/000-200	Overrange of the admissible measuring range, broken wire
			750-461/000-002	Overrange of the admissible measuring range
			750-461/000-007	Overrange of the admissible measuring range

3.4 Operating Elements

The I/O module 750-461 has no operating elements.

3.5 Schematic Diagram

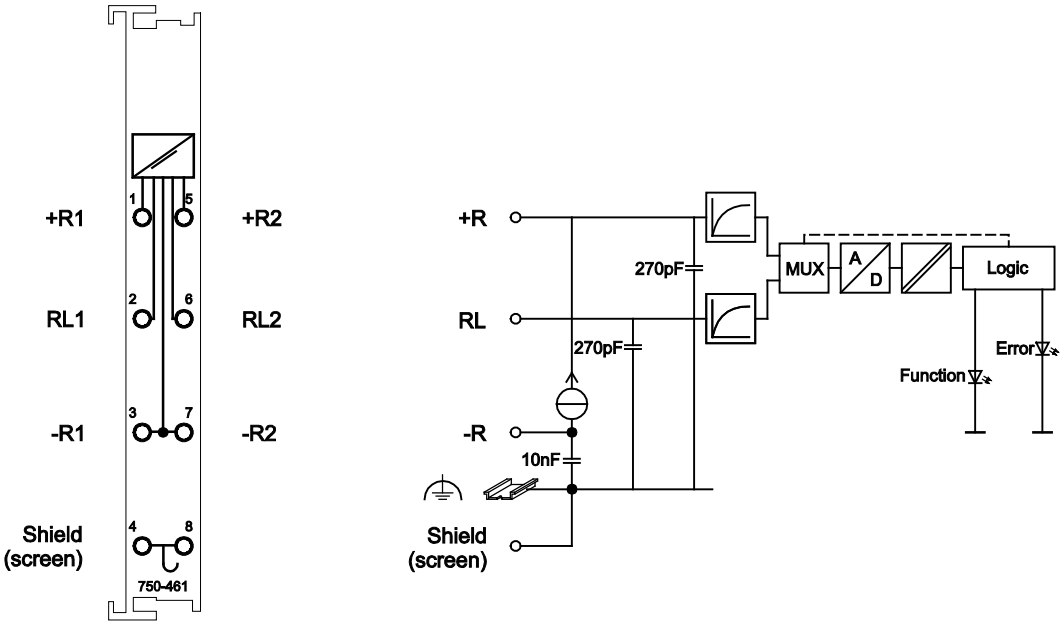

Figure 5: Schematic Diagram

3.6 Technical Data

3.6.1 Device Data

Table 7: Technical Data — Device

Width	12 mm
Height (from top edge of DIN-35 rail)	64 mm
Depth	100 mm
Weight	approx. 52.5 g

3.6.2 Power Supply

Table 8: Technical Data – Power Supply

Voltage Supply	via system voltage (DC/DC)
Current consumption, system voltage$_{typ.}$ (5 VDC)	80 mA
Current consumption, power jumper contact$_{max.}$ (24 VDC)	---
Voltage via power jumper contacts	---
Current via power jumper contacts$_{max}$	---
Isolation (peak value)	500 V system/field side

Differing technical data (power supply) for the 750-461/020-000 model:

Table 9: Technical Data – Power Supply

Voltage Supply	via system voltage (DC/DC)
Current consumption, system voltage$_{typ.}$ (5 VDC)	65 mA
Current consumption, power jumper contact$_{max.}$ (24 VDC)	---
Voltage via power jumper contacts	---
Current via power jumper contacts$_{max}$	---
Isolation (peak value)	500 V system/field side

3.6.3 Communication

Table 10: Technical Data, Communication

Data width, internal (internal data bus) 2-channel operation	2 × 16 bit data 2 × 8 bit control/status (optional)

3.6.4 Inputs

Table 11: Technical Data – Inputs (RTD Model 750-461)

Number of inputs	2
Sensor types	
Basic version	Pt100
Optional versions that can be ordered for	Pt1000, Ni100, Ni1000 TK6180, Ni1000 TK5000, resistance measurement.
Setting over software WAGO-I/O-CHECK or GSD file	Resistance sensors: Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni1000 TK6180 Resistance: 1,2 kΩ, 5 kΩ
Sensor connection	3-wire connection (default), 2-wire connection
Temperature range	
Pt	−200–+850 °C
Ni100, Ni1000 TK6180	−60 °C … +250 °C
Ni1000 TK5000	−30 °C … +122 °C
Ni120	−80 °C … +320 °C
Measuring current$_{typ.}$	0.5 mA
Conversion time	320 ms (per channel)
for 750-461/000-006	960 ms (per channel)
Response delay[1)]$_{max.}$ [1)] Time between switching on or connecting the sensor and first valid measured value	4 s
For 750-461/000-006	12 s
Resolution[2)] [2)] Over entire range	0.1 °C
Measuring error at 25 °C	< ±0.2 % of full scale value
Temperature coefficient	< ±0.01 %/K of full scale value
For 750-461/000-006	< ±0.001 %/K of full scale value

Differing technical data (inputs) for 750-461/020-000 model:

Table 12: Technical Data – Inputs for 750-461/020-000 Model

Sensor types	NTC 20 kOhm
Sensor connection	2-conductor connection
Temperature range	−30 °C … +130 °C
Measuring current$_{typ.}$ (at 25 °C)	0.05 mA
Measuring Errors	0.5 K … 3.0 K (as a function of temperature)
Temperature coefficient	< ±0.002 %/K of full scale value

3.6.5 Climatic Environmental Conditions

Table 13: Technical Data – Climatic Environmental Conditions

Operating temperature range	0 °C … 55 °C
Operating temperature range for components with extended temperature range (750-xxx/025-xxx)	−20 °C … +60 °C
Storage temperature range	−25 °C … +85 °C
Storage temperature range for components with extended temperature range (750-xxx/025-xxx)	−40 °C … +85 °C
Relative humidity	Max. 5 % … 95 % without condensation
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

3.6.6 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 – Data Contacts

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

3.7 Approvals

Information

More information about approvals.
Detailed references to the approvals are listed in the document “Overview Approvals **WAGO-I/O-SYSTEM 750**”, which you can find via the internet under: www.wago.com > SERVICES > DOWNLOADS > Additional documentation and information on automation products > WAGO-I/O-SYSTEM 750 > System Description.

The following approvals have been granted to the basic version and all variants of 750-461 I/O modules:

 Conformity Marking

 cULus UL508

The following approval has been granted for the standard 750-461 I/O modules version and for all its variants, except for the /000-006 variant:

 Korea Certification MSIP-REM-W43-AIM750

The following Ex approvals have been granted to the basic version and all variants of 750-461 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

 cULus ANSI/ISA 12.12.01

Class I, Div2 ABCD T4

The following ship approvals have been granted to the variations 750-461 listed below:

	ABS	BSH	BV	DNV	GL	KR	Lloyd's Register	NK	RINA	RINA
750-461	x	x	x	x	x	x	x	x	x	x
750-461 /000-002			x	x	x	x	x	x	x	x
750-461 /000-003			x	x	x	x	x	x	x	x
750-461 /000-004			x	x	x	x	x	x	x	x
750-461 /000-005			x	x	x	x	x	x	x	x
750-461 /000-006			x	x	x	x	x	x	x	x
750-461 /000-007			x	x	x	x	x	x	x	x
750-461 /000-009			x	x	x	x		x	x	x
750-461 /000-200			x	x	x	x	x	x	x	x
750-461 /003-000			x	x	x	x	x	x	x	x
750-461 /020-000			x	x	x	x		x	x	x
750-461 /025-000					x					

ABS (American Bureau of Shipping)

Federal Maritime and Hydrographic Agency

BV (Bureau Veritas)

DNV (Det Norske Veritas) Class B

GL (Germanischer Lloyd) Cat. A, B, C, D (EMC 1)

KR (Korean Register of Shipping)

	LR (Lloyd's Register)	Env. 1, 2, 3, 4
	NKK (Nippon Kaiji Kyokai)	
	PRS (Polski Rejestr Statków)	
	RINA (Registro Italiano Navale)	

3.8 Standards and Guidelines

All variations of 750-461 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

The I/O modules 750-461 meet the following requirements on emission and immunity of interference:

EMC marine applications-Immunity to interference	acc. to DNV GL
EMC marine applications-Emission of interference	acc. to DNV GL

4 Process Image

The I/O module transfers 16 bits per channel of measured data and, optionally, 8 status bits to the fieldbus coupler/controller. Access to the status bits depends on the specific fieldbus system.

Note

Mapping of process data in the process image of fieldbus systems
The representation of the I/O modules' process data in the process image depends on the fieldbus coupler/controller used. Please take this information as well as the particular design of the respective control/status bytes from the section "Fieldbus Specific Design of the Process Data" included in the description concerning the process image of the fieldbus coupler/controller used.

4.1 I/O Modules with Pt Resistance Sensors

Table 16: I/O Modules with Pt Resistance Sensors

750-461	Evaluation Pt100 Measuring range: −200 °C to +850 °C
750-461/000-003	Evaluation Pt1000 Measuring range: −200 °C to +850 °C
750-461/000-006	Evaluation Pt100, optimized temperature drift (0.001 %/K, conversion time 960 ms) Measuring range: −200 °C to +850 °C
750-461/000-200	Evaluation Pt100, with status information for S5-FB250 in the data word Measuring range: −200 °C to +850 °C
750-461/025-000	Evaluation Pt100, extended temperature range Measuring range: −200 °C to +850 °C

4.1.1 Pt100

The I/O modules 750-461and the versions 750-461/000-006 and 750-461/025-000 calculate the resistance values of Pt100 sensors and output the data as temperature values. The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000). The possible numeric range corresponds to the defined temperature range of -200 °C to +850 °C for Pt100 sensors.

Table 17: Process Image, Pt100, with Wire Break Diagnostics

Temperature °C	Resistance Ω	Numeric value [1]			Status Byte Hex.	LED Error AI 1, 2
		Binary	Hex.	Dec.		
< −200.0	10.00	'1000.0000.0000.0001'	0x8001	−32767	0x41	ON
−200.0	18.49	'1111.1000.0011.0000'	0xF830	−2000	0x00	OFF
−100.0	60.25	'1111.1100.0001.1000'	0xFC18	−1000	0x00	OFF
0.0	100.00	'0000.0000.0000.0000'	0x0000	0	0x00	OFF
100.0	138.50	'0000.0011.1110.1000'	0x03E8	1000	0x00	OFF
200.0	175.84	'0000.0111.1101.0000'	0x07D0	2000	0x00	OFF
500.0	280.90	'0001.0011.1000.1000'	0x1388	5000	0x00	OFF
750.0	360.47	'0001.1101.0100.1100'	0x1D4C	7500	0x00	OFF
800.0	375.51	'0001.1111.0100.0000'	0x1F40	8000	0x00	OFF
850.0	390.26	'0010.0001.0011.0100'	0x2134	8500	0x00	OFF
> 850.0	> 390.26	'0010.0001.0011.0100'	0x2134	8500	0x42	ON
Wire break at R_L		'0010.0001.0011.0100'	0x2134	8500	0x42	ON

The measured value can exceed a decimal range of -2000 to +8500 before limitation takes effect.

4.1.2 Pt1000

The 750-461/000-003 version calculates the resistance values of Pt1000 sensors and outputs the data as temperature values. The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000). The possible numeric range corresponds to the defined temperature range of -200 °C to +850 °C for Pt1000 sensors.

Table 18: Process Image, Pt1000, with Wire Break Diagnostics

Temperature °C	Resistance Ω	Numeric value [1]			Status Byte Hex.	LED Error AI 1, 2
		Binary	Hex.	Dec.		
< −200.0	100.00	'1000.0000.0000.0001'	0x8001	−32767	0x41	ON
−200.0	184.93	'1111.1000.0011.0000'	0xF830	−2000	0x00	OFF
−100.0	602.54	'1111.1100.0001.1000'	0xFC18	−1000	0x00	OFF
0.0	1000.00	'0000.0000.0000.0000'	0x0000	0	0x00	OFF
100.0	1385.00	'0000.0011.1110.1000'	0x03E8	1000	0x00	OFF
200.0	1758.40	'0000.0111.1101.0000'	0x07D0	2000	0x00	OFF
500.0	2808.96	'0001.0011.1000.1000'	0x1388	5000	0x00	OFF
750.0	3604.65	'0001.1101.0100.1100'	0x1D4C	7500	0x00	OFF
800.0	3755.09	'0001.1111.0100.0000'	0x1F40	8000	0x00	OFF
850.0	3902.62	'0010.0001.0011.0100'	0x2134	8500	0x00	OFF
> 850.0	> 3902.62	'0010.0001.0011.0100'	0x2134	8500	0x42	ON
Wire break at R_L		'0010.0001.0011.0100'	0x2134	8500	0x42	ON

1) Temperature values below 0 °C are represented in two's complement binary.

The measured value can exceed a decimal range of -2000 to +8500 before limitation takes effect.

4.1.3 Pt100 with Status Information for S5-FB250 in the Data Word

The 750-461/000-200 version outputs the resistance values of the Pt100 sensors directly. The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 14. When an S5 system is used as the master controller, this data can be directly evaluated using the FB250 function block.

Table 19: Process Image, Pt100

Temperature °C	Resistance Ω	Numeric value [2] with status information [1]				Status Byte Hex.	LED Error AI 1, 2
		Binary	[*] XFÜ	Hex.	Dec.		
	10	'0000.0011.0011.0	000'	0x0330	819	0x00	OFF
−200.0	20	'0000.0110.0110.0	000'	0x0660	1638	0x00	OFF
−185.0	25	'0000.1000.0000.0	000'	0x0800	2048	0x00	OFF
−125.0	50	'0001.0000.0000.0	000'	0x1000	4096	0x00	OFF
0.0	100	'0010.0000.0000.0	000'	0x2000	8192	0x00	OFF
266.0	200	'0100.0000.0000.0	000'	0x4000	16384	0x00	OFF
560.0	300	'0110.0000.0000.0	000'	0x6000	24576	0x00	OFF
850.0	390	'0111.1100.1100.1	000'	0x7CC8	32949	0x00	OFF
	800	'1111.1111.1111.1	000'	0xFFF8	65535	0x00	OFF
	> 800	undefined				0x00	OFF
	> approx.1200	'0001.0000.0001.0	001'	0x1011	4113	0x42	ON

[1] Status information: X: not used, F: short circuit, wire break, Ü: overrange
[2] Temperature values below 0 °C are represented in two's complement binary.
“approx.” indicates non-calibrated data.

4.2 I/O Modules with Ni Resistance Sensors

Table 20: I/O Modules with Ni Resistance Sensors

750-461/000-004	Evaluation Ni100 Measuring range: −60 °C to +250 °C
750-461/000-005	Evaluation Ni1000 TK6180 Measuring range: −60 °C to +250 °C
750-461/000-009	Evaluation Ni1000 TK5000 Measuring range: −30 °C to +122 °C

4.2.1 Ni100

The 750-461/000-004 version calculates the resistance values of Ni100 sensors and outputs the data as temperature values. The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000). The possible numeric range corresponds to the defined temperature range of -60 °C to +250 °C for type Ni100 sensors.

Table 21: Process Image, Ni100, with Wire Break Diagnostics

Temperature °C	Resistance Ω	Numeric value [1]			Status Byte Hex.	LED Error AI 1, 2
		Binary	Hex.	Dec.		
< −60.0	< 69.16	'1000.0000.0000.0001'	0x8001	−32767	0x41	ON
−60.0	69.16	'1111.1101.1010.1000'	0xFDA8	−600	0x00	OFF
−50.0	74.26	'1111.1110.0000.1100'	0xFE0C	−500	0x00	OFF
0.0	100.00	'0000.0000.0000.0000'	0x0000	0	0x00	OFF
50.0	129.10	'0000.0001.1111.0100'	0x01F4	500	0x00	OFF
100.0	161.77	'0000.0011.1110.1000'	0x03E8	1000	0x00	OFF
150.0	198.62	'0000.0101.1101.1100'	0x05DC	1500	0x00	OFF
200.0	240.64	'0000.0111.1101.0000'	0x07D0	2000	0x00	OFF
250.0	289.13	'0000.1001.1100.0100'	0x09C4	2500	0x00	OFF
> 250.0	> 289.13	'0010.0001.0011.0100'	0x2134	8500	0x42	ON
Wire break at R_L		'0010.0001.0011.0100	0x2134'	8500	0x42	ON

[1] Process values below 0 °C are represented in two's complement binary

The measured value can exceed a decimal range of -600 to +2500 before limitation takes effect.

4.2.2 Ni1000 TK6180

The 750-461/000-005 version calculates the resistance values of Ni1000-TK6180 sensors and outputs the data as temperature values. The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000). The possible numeric range corresponds to the defined temperature range of -60 °C to +250 °C for type Ni1000 TK6180 sensors.

Table 22: Process Image, Ni1000 TK6180, with Wire Break Diagnostics

Temperature °C	Resistance Ω	Numeric value [1]			Status Byte Hex.	LED Error AI 1, 2
		Binary	Hex.	Dec.		
< −60.0	< 691.60	'1000.0000.0000.0001'	0x8001	−32767	0x41	ON
−60.0	691.60	'1111.1101.1010.1000'	0xFDA8	−600	0x00	OFF
−50.0	742.60	'1111.1110.0000.1100'	0xFE0C	−500	0x00	OFF
0.0	1000.00	'0000.0000.0000.0000'	0x0000	0	0x00	OFF
50.0	1291.00	'0000.0001.1111.0100'	0x01F4	500	0x00	OFF
100.0	1617.96	'0000.0011.1110.1000'	0x03E8	1000	0x00	OFF
150.0	1986.20	'0000.0101.1101.1100'	0x05DC	1500	0x00	OFF
200.0	2406.40	'0000.0111.1101.0000'	0x07D0	2000	0x00	OFF
250.0	2891.31	'0000.1001.1100.0100'	0x09C4	2500	0x00	OFF
> 250.0	> 2891.31	'0010.0001.0011.0100'	0x2134	8500	0x42	ON
Wire break at RL		'0010.0001.0011.0100'	0x2134	8500	0x42	ON

[1] Process values below 0 °C are represented in two's complement binary.

The measured value can exceed a decimal range of -600 to +2500 before limitation takes effect.

4.2.3 Ni1000 TK5000

The 750-461/000-009 version calculates the resistance values of Ni1000-TK5000 sensors and outputs the data as temperature values. The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000). The possible numeric range corresponds to the defined temperature range of -30 °C to +122 °C for type Ni1000 TK5000 sensors.

Table 23: Process Image, Ni1000 TK5000, with Wire Break Diagnostics

Temperature °C	Resistance Ω	Numeric value [1]			Status Byte Hex.	LED Error AI 1, 2
		Binary	Hex.	Dec.		
	< 60	'0010.0001.0011.0100'	0x2134	8500	0x42	ON
< −30.0	< 871	'1000.0000.0000.0001'	0x8001	−32767	0x41	ON
−30.0	871	'1111.1110.1101.0100'	0xFED4	−300	0x00	OFF
−10.0	956	'1111.1111.1001.1100'	0xFF9C	−100	0x00	OFF
10.0	1044	'0000.0000.0110.0100'	0x0064	100	0x00	OFF
30.0	1137	'0000.0001.0010.1100'	0x012C	300	0x00	OFF
50.0	1235	'0000.0001.1111.0100'	0x01F4	500	0x00	OFF
70.0	1337	'0000.0010.1011.1100'	0x02BC	700	0x00	OFF
90.0	1444	'0000.0011.1000.0100'	0x0384	900	0x00	OFF
122.0	2891	'0000.0100.1100.0100'	0x04C4	1220	0x00	OFF
> 122.0	> 1627	'0010.0001.0011.0100'	0x2134	8500	0x42	ON
Wire break at RL		0010.0001.0011.0100'	0x2134	8500	0x42	ON

[1] Process values below 0 °C are represented in two's complement binary.

The measured value can exceed a decimal range of -300 to +1220 before limitation takes effect.

4.3 I/O Modules for Resistance Measurement

Table 24: I/O Modules for Resistance Measurement

750-461/000-002	Resistance measurement Measuring range: 10 Ω to 1.2 kΩ
750-461/000-007	Resistance measurement Measuring range: 10 Ω to 5.0 kΩ

Note

2-conductor connection only!
Resistance measurement can only be performed in 2-wire connection technology.

4.3.1 Resistance Measurement 10 Ohm to 1.2 kOhm

The 750-461/000-002 version outputs the resistance values of the sensors directly. The resistance values are displayed at a resolution of 1 digit per 0.1 Ω in one word (16-bit). The possible numeric range corresponds to the defined measurement range of 10 Ω to 1.2 kΩ.

Table 25: Process Image (10 Ω to 1.2 kΩ)

Resistance Ω	Numeric value			Status Byte Hex.	LED Error AI 1, 2
	Binary	Hex.	Dec.		
0	'1110.1100.0000.0000'	0xEC00	−5120	00	OFF
10	'0000.0000.0110.0100'	0x0064	100	0x00	OFF
100	'0000.0011.1110.1000'	0x03E8	1000	0x00	OFF
200	'0000.0111.1101.0000'	0x07D0	2000	0x00	OFF
300	'0000.1011.1011.1000'	0x0BB8	3000	0x00	OFF
400	'0000.1111.1010.0000'	0x0FA0	4000	0x00	OFF
500	'0001.0011.1000.1000'	0x1388	5000	0x00	OFF
750	'0001.1101.0100.1100'	0x1D4C	7500	0x00	OFF
1000	'0010.0111.0001.0000'	0x2710	10000	0x00	OFF
1200	'0010.1110.1110.0000'	0x2EE0	12000	0x00	OFF
> approx. 1200	'0010.0001.0011.0100'	0x2134	8500	0x42	ON

“approx.” indicates non-calibrated data.

4.3.2 Resistance Measurement 10 Ohm to 5.0 kOhm

The 750-461/000-007 version outputs the resistance values of the sensors directly. The resistance values are displayed at a resolution of 1 digit per 0.5 Ω in one word (16-bit). The possible numeric range corresponds to the defined measurement range of 10 Ω to 5.0 kΩ.

Table 26: Process Image (10 Ω to 5.0 kΩ)

Resistance Ω	Numeric value			Status Byte Hex.	LED Error AI 1, 2
	Binary	Hex.	Dec.		
0	'1110.1100.0000.0000'	0xEC00	−5120	0x00	OFF
10	'0000.0000.0001.0100'	0x0014	20	0x00	OFF
100	'0000.0000.1100.1000'	0x00C8	200	0x00	OFF
200	'0000.0001.1001.0000'	0x0190	400	0x00	OFF
300	'0000.0010.0101.1000'	0x0258	600	0x00	OFF
1000	'0000.0111.1101.0000'	0x07D0	2000	0x00	OFF
2000	'0000.1111.1010.0000'	0x0FA0	4000	0x00	OFF
3000	'0001.0111.0111.0000'	0x1770	6000	0x00	OFF
4000	'0001.1111.0100.0000'	0x1F40	8000	0x00	OFF
5000	'0010.0111.0001.0000'	0x2710	10000	0x00	OFF
> approx. 5000	'0010.0001.0011.0100'	0x2134	8500	0x42	ON

“approx.” indicates non-calibrated data.

4.4 Configurable I/O Module 750-461/003-000

Table 27: Configurable I/O Module

750-461/003-000	Default setting: Pt100 configurable Measuring range: −200 °C … +850 °C

The operating mode of the I/O module version 750-461/003-000 can be freely configured using the WAGO-I/O-*CHECK* commissioning tool. The default setting is Pt100. In this mode the I/O module has the same process values as the standard I/O module 750-461.

The **WAGO-I/O-*CHECK*** commissioning tool can be used to configure the required operating mode. The I/O module can also be parameterized via PROFIBUS and PROFINET device description (GSD file).
The parameterization description can be found in the appendix in Section “Configuration and Parameterization via GSD File with PROFIBUS DP and PROFINET IO.”

The parameter dialog in WAGO-I/O-*CHECK* presents optional fields for the settings of this I/O module:

Table 28: Setting Options for I/O Module 750-461/003-000

Selection box	Possible settings	
Sensor type	RTD Pt100*, RTD Ni100, RTD Pt1000, RTD Pt500, RTD Pt200, RTD Ni1000, RTD Ni120, R 5k, R 1k2	
Connection type	2-wire	2-wire connection technology
	3-wire*	3-wire connection technology
PI diagnostics	deactivated*	No display of status indicators
	activated	Display of status indicators in the bottom 3 bits: Bit 0: Overflow. Used when the measured value lies outside the permitted range. Bit 1: Error. Is set when the I/O module detects an internal function error, or when the input is short-circuited. Bit 2: 0
Watchdog	deactivated	Watchdog timer not enabled
	activated*	Watchdog timer enabled. If no process data is exchanged with the fieldbus coupler/controller for 100 ms, the green LEDs go out.
Number format	Two's complement*	Two's complement representation
	Sign magnitude	Amount/sign representation
Filter constant	12.5 Hz, 500 ms / 25 Hz, 250 ms* / 50 Hz, 125 ms / 60 Hz, 110 ms / 100 Hz, 65 ms / 200 Hz, 32 ms / 400 Hz, 15 ms	
Overrange protection	deactivated	No limiting of the output value
	activated*	If a temperature of 850 °C is exceeded, the status bits are set and the output value limited to 850 °C.
User scaling	deactivated*	User scaling disabled
	activated	User scaling enabled
WAGO scaling	deactivated	WAGO scaling disabled
	activated*	WAGO scaling enabled

*Default setting

The following input fields are available in WAGO-I/O-*CHECK* for adjusting the offset and gain values for user and WAGO scaling:

Table 29: I/O Module 750-461/003-000, Offset and Gain Values

Input field	…	Offset	Gain
User scaling	…	0x0000	0x0100
WAGO scaling	…	0x0000	0x00A0

The following input fields are provided in WAGO-I/O-*CHECK* for hardware matching of the I/O module:

Table 30: I/O Module 750-461/003-000, Input Fields for Hardware Matching

Input field	Settings
Offset	0xECF0
Gain	0x2700
2-Wire Offset	0x0180

4.5 I/O Module for NTC Resistance Sensors

Table 31: I/O Module for NTC Resistance Measurement

750-461/020-000	NTC 20 kOhm Measuring range: −30 °C … +130 °C

The measured resistance values are converted and output as temperature values for evaluation of the NTC 20 kOhm resistance sensors. All temperature values are represented in a standard numerical format. The possible numeric range corresponds to the defined temperature range for the sensors of −30 °C … +130 °C.

At the NTC 20 kOhm setting, the sensor temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16 bits). As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to 0x03E8 (dec. 1000).

Temperatures below 0 °C are represented in two's complement binary.

Table 32: Process Image for Version 750-461/020-000

Temperature °C	Resistance Ω	Numeric value [1]			Status Byte Hex.	LED Error AI 1, 2
		Binary	Hex.	Dec.		
< ca. −30.0	> 414.70	'0000.1000.0101.0110'	0x2134	8500	0x42	ein
−30.0	414.70	'1111.1110.1101.0100'	0xFED4	−300	0x00	aus
0.0	70.20	'0000.0000.0000.0000'	0x0000	0	0x00	aus
25.0	20.00	'0000.0000.1111.1010'	0x00FA	250	0x00	aus
50.0	6.72	'0000.0001.1111.0100'	0x01F4	500	0x00	aus
100.0	1.12	'0000.0011.1110.1000'	0x03E8	1000	0x00	aus
130.0	0.46	'0000.0101.0001.0100'	0x0514	1300	0x00	aus
> ca. 130.0	< 0.46	'1000.0000.0000.0001'	0x8001	−32767	0x41	ein

[1] Temperature values below 0 °C are represented in two's complement binary.

The measured value can exceed a decimal range of −300 … +1300 before limitation takes effect.

5 Mounting

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 50022 (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/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.

⚠ 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.

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/controllers to guarantee proper data transfer.

5.2 Inserting and Removing Devices

NOTICE

Perform work on devices only if they are de-energized!
Working on energized devices can damage them. Therefore, turn off the power supply before working on the devices.

5.2.1 Inserting the I/O Module

1. Position the I/O module so that the tongue and groove joints to the fieldbus coupler/controller or to the previous or possibly subsequent I/O module are engaged.

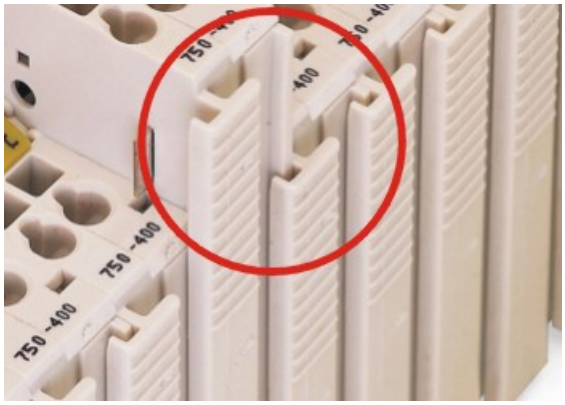

Figure 6: Insert I/O Module (Example)

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

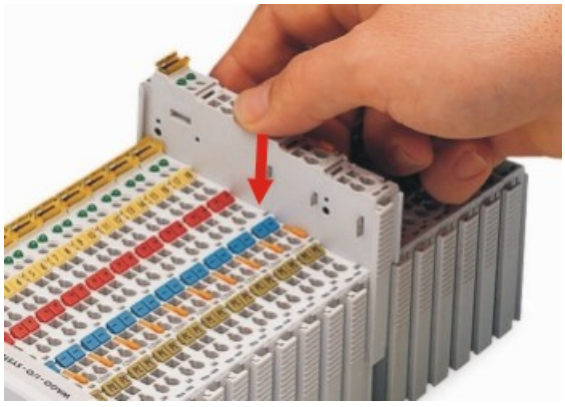

Figure 7: Snap the I/O Module into Place (Example)

With the I/O module snapped in place, the electrical connections for the data contacts and power jumper contacts (if any) to the fieldbus coupler/controller or to the previous or possibly subsequent 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.

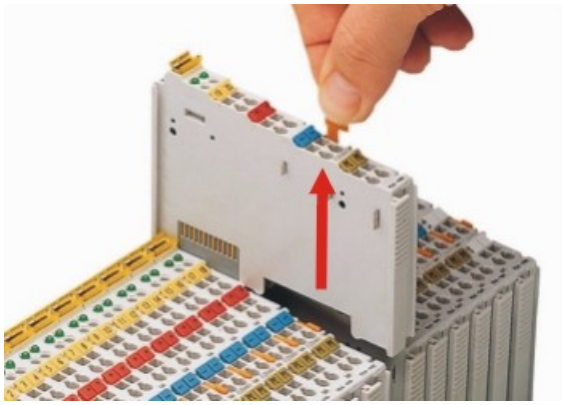

Figure 8: Removing the I/O Module (Example)

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.

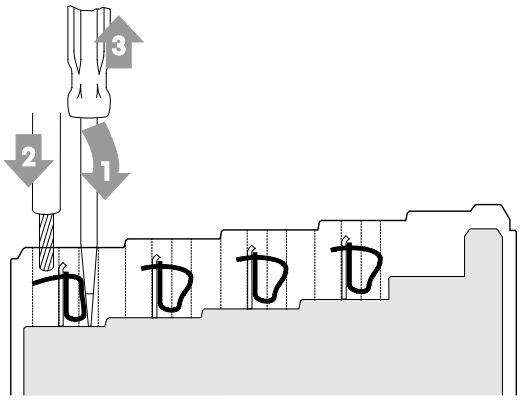

Figure 9: Connecting a Conductor to a CAGE CLAMP®

6.2 Connection Examples

Note

Use shielded signal lines!
Only use shielded signal lines for analog signals and I/O modules which are equipped with shield clamps. Only then can you ensure that the accuracy and interference immunity specified for the respective I/O module can be achieved even in the presence of interference acting on the signal cable.

6.2.1 2 × RTD, 2-Conductors

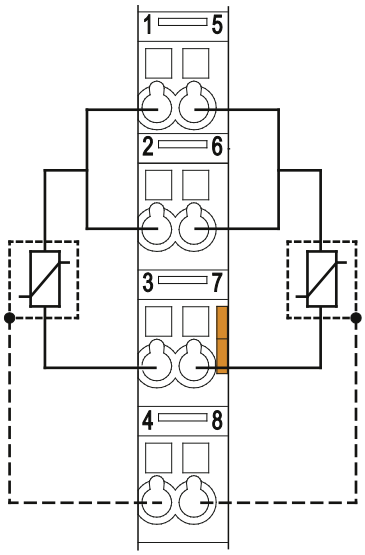

Figure 10: Example Connection 2 × RTD, 2-wire

6.2.2 2 × RTD, 3-Conductors

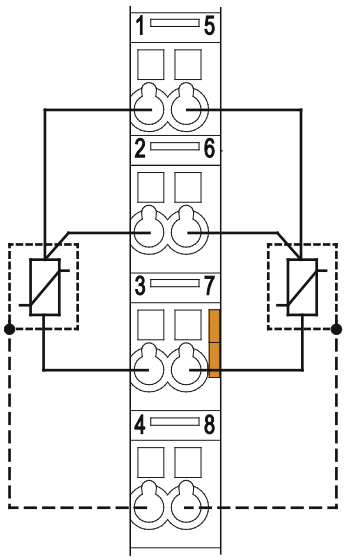

Figure 11: Example Connection 2 × RTD, 3-wire

7 Use in Hazardous Environments

The **WAGO-I/O-SYSTEM 750** (electrical equipment) is designed for use in Zone 2 hazardous areas.

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.

7.1 Marking Configuration Examples

7.1.1 Marking for Europe According to ATEX and IEC-Ex

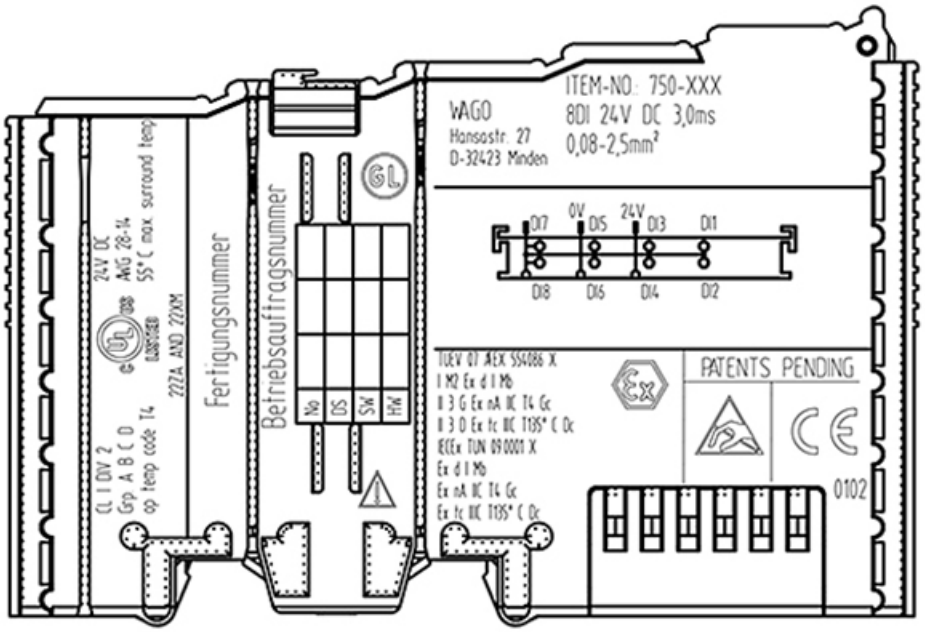

Figure 12: Side Marking Example for Approved I/O Modules According to ATEX and IECEx

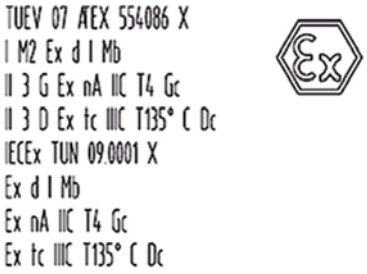

Figure 13: Text Detail – Marking Example for Approved I/O Modules According to ATEX and IECEx.

Table 33: Description of Marking Example for Approved I/O Modules According to ATEX and IECEx

Marking	Description
TÜV 07 ATEX 554086 X IECEx TUN 09.0001 X	Approving authority and certificate numbers
Dust	
II	Equipment group: All except mining
3D	Category 3 (Zone 22)
Ex	Explosion protection mark
tc Dc	Type of protection and equipment protection level (EPL):protection by enclosure
IIIC	Explosion group of dust
T 135°C	Max. surface temperature of the enclosure (without a dust layer)
Mining	
I	Equipment group: Mining
M2	Category: High level of protection
Ex	Explosion protection mark
d Mb	Type of protection and equipment protection level (EPL): Flameproof enclosure
I	Explosion group for electrical equipment for mines susceptible to firedamp
Gases	
II	Equipment group: All except mining
3G	Category 3 (Zone 2)
Ex	Explosion protection mark
nA Gc	Type of protection and equipment protection level (EPL): Non-sparking equipment
nC Gc	Type of protection and equipment protection level (EPL): Sparking apparatus with protected contacts. A device which is so constructed that the external atmosphere cannot gain access to the interior
IIC	Explosion group of gas and vapours
T4	Temperature class: Max. surface temperature 135°C

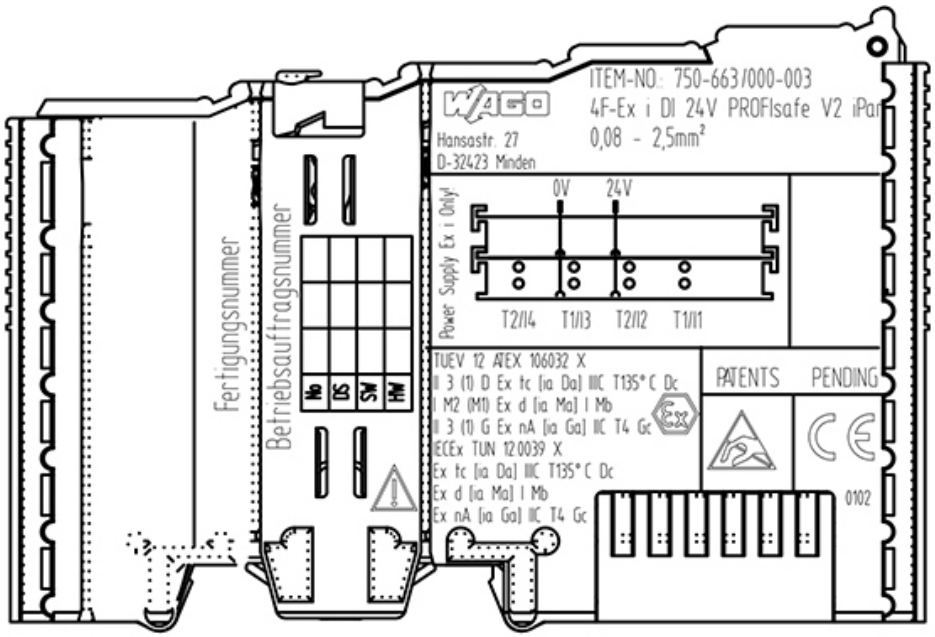

Figure 14: Side Marking Example for Approved Ex i I/O Modules According to ATEX and IECEx.

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 nA [ia Ga] IIC T4 Gc
IECEx TUN 12.0039 X
Ex tc [ia Da] IIIC T135° C Dc
Ex d [ia Ma] I Mb
Ex nA [ia Ga] IIC T4 Gc

Figure 15: Text Detail – Marking Example for Approved Ex i I/O Modules According to ATEX and IECEx.

Table 34: Description of Marking Example for Approved Ex i I/O Modules According to ATEX and IECEx

Marking	Description
TÜV 07 ATEX 554086 X IECEx TUN 09.0001X TÜV 12 ATEX 106032 X IECEx TUN 12.0039 X	Approving authority and 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
3(2)D	Category 3 (Zone 22) equipment containing a safety device for a category 2 (Zone 21) equipment
Ex	Explosion protection mark
tc Dc	Type of protection and equipment protection level (EPL): protection by enclosure
[ia Da]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 20
[ib Db]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 21
IIIC	Explosion group of dust
T 135°C	Max. surface temperature of the enclosure (without a dust layer)
Mining	
I	Equipment Group: Mining
M2 (M1)	Category: High level of protection with electrical circuits which present a very high level of protection
Ex d Mb	Explosion protection mark with Type of protection and equipment protection level (EPL): 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

Table 34: Description of Marking Example for Approved Ex i I/O Modules According to ATEX and IECEx

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
3(2)G	Category 3 (Zone 2) equipment containing a safety device for a category 2 (Zone 1) equipment
Ex	Explosion protection mark
nA Gc	Type of protection and equipment protection level (EPL): Non-sparking equipment
[ia Ga]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 0
[ia Gb]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 1
IIC	Explosion group of gas and vapours
T4	Temperature class: Max. surface temperature 135°C

7.1.2 Marking for America According to NEC 500

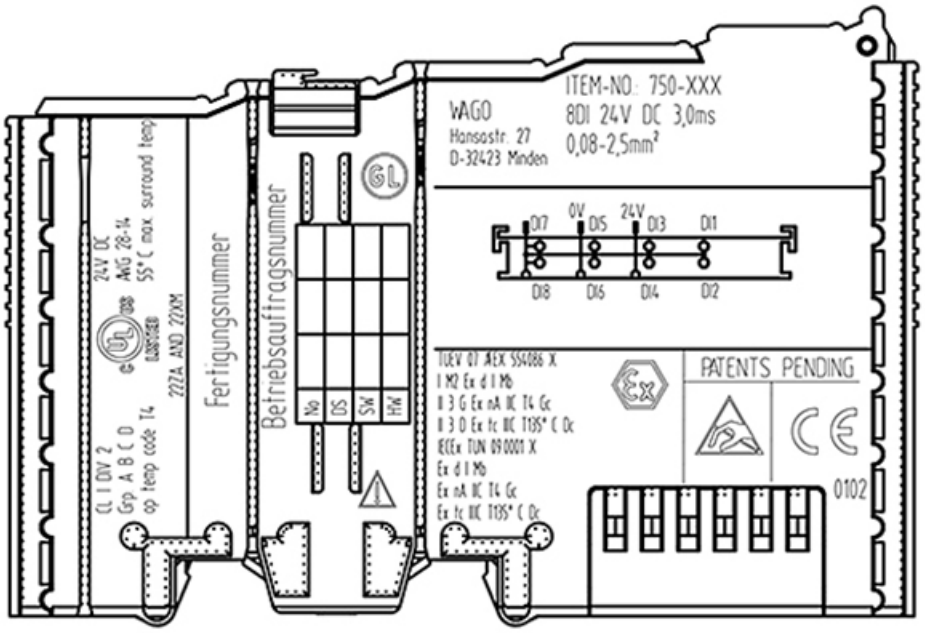

Figure 16: Side Marking Example for I/O Modules According to NEC 500

Figure 17: Text Detail – Marking Example for Approved I/O Modules According to NEC 500

Table 35: Description of Marking Example for Approved I/O Modules According to NEC 500

Marking	Description
CL I	Explosion protection group (condition of use category)
DIV 2	Area of application
Grp. ABCD	Explosion group (gas group)
Op temp code T4	Temperature class

7.2 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.

7.2.1 Special Notes Regarding 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
- 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, -11, -15
- For use in Zone 22 (Dc), compliance with the applicable requirements of the standards EN/IEC/ABNT NBR IEC 60079-0, -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.

7.2.2 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.

8 Appendix

8.1 Configuration and Parameterization using a GSD File with PROFIBUS DP and PROFINET IO

Note

Requirement

A fieldbus coupler/controller must be used to parameterize the I/O module750-461 (2AI Pt100/RTD) and the variant 750-461 (2AI Pt100/RTD 003-000) via GSD file:

- PROFIBUS DP 750-333(/0xx-000): ≥ Firmware Version 19
- PROFIBUS DP 750-833(/0xx-000): ≥ Firmware Version 18
- PROFINET IO 750-375(/025-000): ≥ Firmware Version 01
- PROFINET IO 750-377(/025-000): ≥ Firmware Version 01

Note

Behavior after Overwriting with WAGO-I/O-*CHECK*!
If WAGO-I/O-*CHECK* is used to overwrite a parameterization made with the GSD file, the I/O module operates with the WAGO-I/O-*CHECK* settings until the 750-333 and 750-833 Fieldbus Couplers/Controllers are restarted.
After restart, the I/O module is re-parameterized via PROFIBUS using the GSD settings.

8.1.1 2AI RTD Configuration

8.1.1.1 PROFIBUS DP Fieldbus Couplers/Controllers 750-333(/0xx-000), 750-833(/0xx-000)

When using the aforementioned PROFIBUS DP fieldbus devices, the process image size is configured by selecting the corresponding GSD entry.

Table 36: PROFIBUS DP Configuration

GSD Entry		PI-Length/[Byte]		Data Type	Inst.
Module	Sub-Module	I	O		
75x-461 2AI/RTD	n/a	4	n/a	INT16	2
75x-461 2AI/RTD, PRM[1)]					
75x-461 2AI/RTD RA		6	6	{UINT8, INT16}	
75x-461 2AI/RTD RA, PRM[1)]					
PFC 75x-461 2AI/RTD[2)]		n/a	n/a	n/a	n/a

[1)] Only valid for 75x-461 and 75x-164/003-000.
[2)] Only available for 750-833(/0xx-000).

8.1.1.2 PROFINET IO Fieldbus Couplers 750-375(/025-000), 750-377(/025-000)

When using the aforementioned PROFINET IO fieldbus couplers, the process image size is configured by selecting the corresponding GSD entry.

Table 37: Configuration PROFINET IO

GSD Entry		PI-Length/[Byte]		Data Type	Inst.
Module	**Sub-Module**	**I**	**O**		
75x-461(/0..-000) 2AI, RTD	INT16[2] I	4	n/a	INT16	2
	{UINT8, INT16}[2] I/O	6	6	{UINT8, INT16}	

8.1.2 2AI RTD Parameterization

The I/O module can be supplied with all operating parameters when selecting the module entry in the GSD file on the PROFIBUS DP*) and PROFINET IO fieldbus devices.

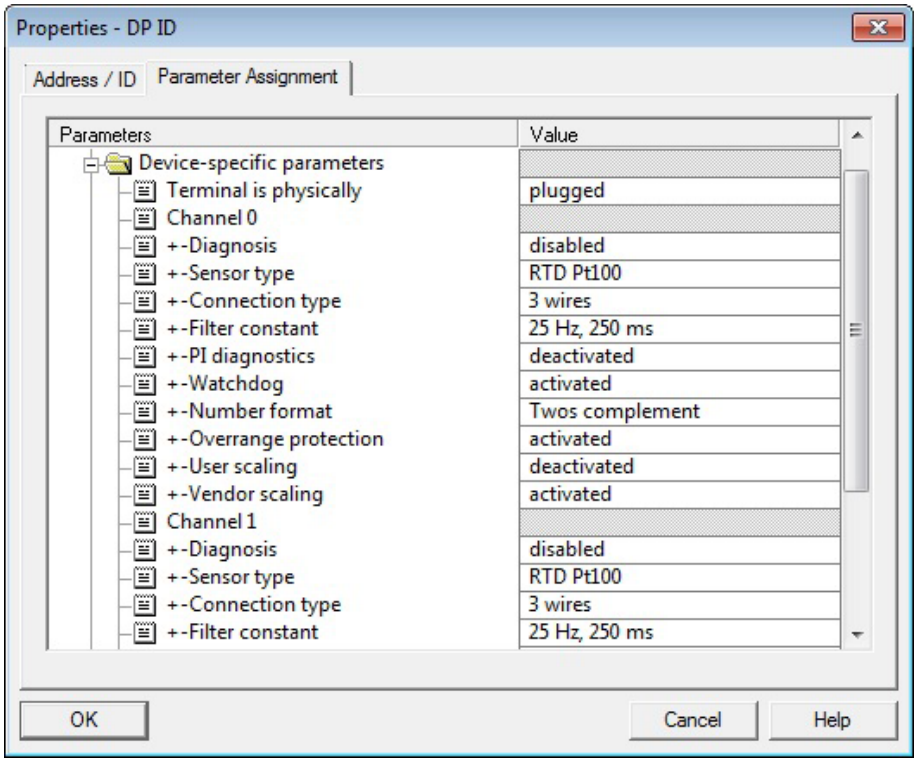

Figure 18: Example of the PROFIBUS DP fieldbus Couplers/Controllers parameterization dialog

*) Only available for GSD entry „75x-461 2AI/RTD, PRM“ and „75x-461 2AI/RTD RA, PRM“

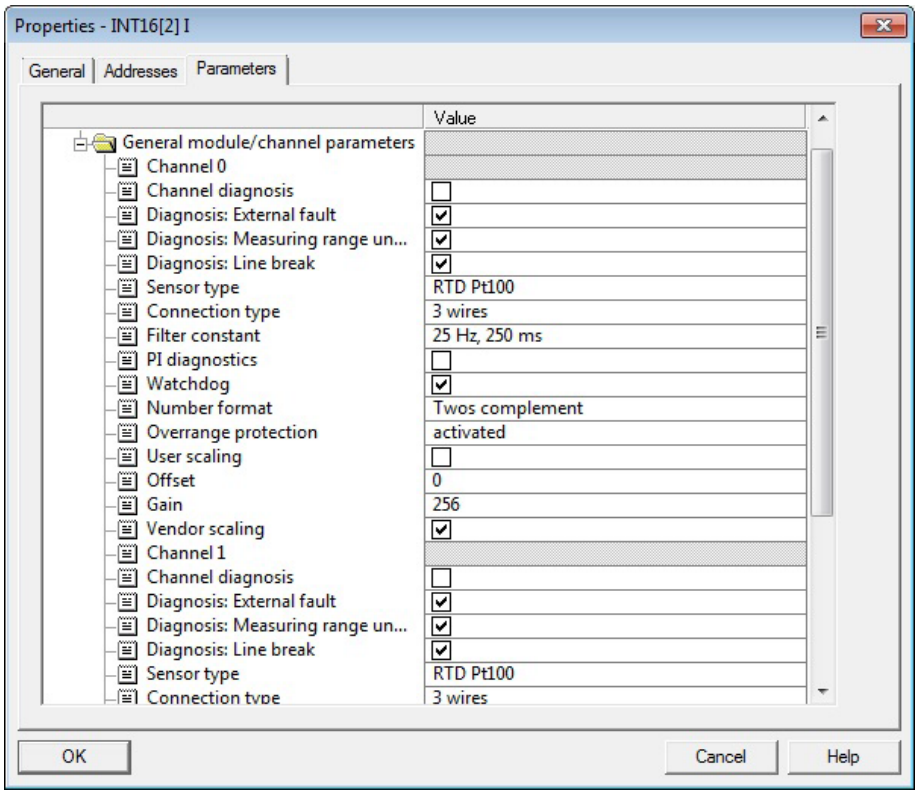

Figure 19: Example of the PROFINET IO Fieldbus Couplers parameterization dialog

8.1.2.1 All PROFIBUS DP and PROFINET IO Fieldbus Couplers/Controllers

The following assignment applies to the parameters of the I/O module when using PROFIBUS DP and PROFINET IO fieldbus devices.

Table 38: Specific Module/Channel parameters for 75x-461/003-000

Parameter	Value	WAGO I/O-*CHECK*	GSD file	
			PB-DP	PN-IO
Sensor type	RTD Pt100	✓	✓	✓
	RTD Ni100			
	RTD Pt1000			
	RTD Pt500			
	RTD Pt200			
	RTD Ni1000			
	RTD Ni120			
	R 5k			
	R 1k2			
Connection type	3 wires*)	✓	✓	✓
	2 wires			
PI diagnostics	activated	✓	✓	✓
	deactivated*)			
Watchdog	activated*)	✓	✓	✓
	deactivated			
Number format	Twos complement*)	✓	✓	✓
	Sign magnitude			

Table 38: Specific Module/Channel parameters for 75x-461/003-000

Parameter	Value	WAGO I/O-*CHECK*	GSD file	
			PB-DP	PN-IO
Filter	activated*)	✓	✓	✓
	deactivated			
Filter constant	12.5 Hz, 500 ms	✓	✓	✓
	25 Hz, 250 ms*)			
	50 Hz, 125 ms			
	60 Hz, 110 ms			
	100 Hz, 65 ms			
	200 Hz, 32 ms			
	400 Hz, 15 ms			
Overrange protection	activated*)	✓	✓	✓
	deactivated			
User scaling	activated	✓	✓	✓
	deactivated*)			
Offset	0x0000 (0)*)	✓	–	✓
Gain	0x0100 (256)*)	✓	–	✓
Vendor scaling	activated*)	✓	✓	✓
	deactivated			

*) Default setting

8.1.2.2 PROFIBUS DP Fieldbus Couplers/Controllers 750-333(/0xx-000), 750-833(/0xx-000)

The aforementioned fieldbus coupler/ controller allow module-specific parameterization of behavior at diagnosis.

Table 39: General Module/Channel parameters

Parameter	Value	Explanation
Diagnosis Channel x (x = 0…1)	0 (disabled)*)	The fieldbus coupler/controller signals a diagnosis if the I/O module reports the events: • External fault • Measuring range underflow • Wire break Diagnostics reported by the I/O module do not lead to the signaling of a diagnosis by the fieldbus coupler/controller.
	1 (enabled)	Diagnostics reported by the I/O module lead to the signaling of a diagnosis by the fieldbus coupler/controller.

*) Default setting

8.1.2.3 PROFINET IO Fieldbus Couplers 750-375(/025-000), 750-377(/025-000)

The aforementioned fieldbus couplers allow module-specific parameterization of behavior at diagnosis.

Table 40: General Module/Channel parameters

Parameter	Value	Explanation
Channel diagnosis Channel x (x = 0…1)	0 (false)*)	Any errors that may occur on the respective signal channel do not cause transmission of a diagnostic alarm nor entry in the diagnostics database of the station proxy.
	1 (true)	Any errors that may occur on the respective signal channel and the error type explicitly released entail transmission of a diagnostic alarm. The respective error leads to an entry in the diagnostics database of the station proxy.
Diagnosis: External fault Channel x (x = 0…1)	0 (false)	An external fault on the respective signal channel does not lead to transmission of a diagnostic alarm nor to entry in the diagnostics database of the station proxy.
	1 (true)*)	Provided that the channel diagnostics of the respective signal channel has been activated, an external fault leads to transmission of a diagnostic alarm and entry in the diagnostics database of the station proxy.
Diagnosis: Measuring range underflow Channel x (x = 0…1)	0 (false)	An undershot on the respective signal channel does not lead to transmission of a diagnostic alarm nor entry in the diagnostics database of the station proxy.
	1 (true)*)	Provided that the channel diagnostics of the respective signal channel has been activated, an undershoot leads to transmission of a diagnostic alarm and entry in the diagnostics database of the station proxy.
Diagnosis: Wire break Channel x (x = 0…1)	0 (false)	A wire break on the respective signal channel does not lead to transmission of a diagnostic alarm nor to entry in the diagnostics database of the station proxy.
	1 (true)*)	Provided that the channel diagnostics of the respective signal channel has been activated, a wire break leads to transmission of a diagnostic alarm and entry in the diagnostics database of the station proxy.

*) Default settings

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