

WAGO-I/O-SYSTEM 750



750-461(/xxx-xxx)
2AI Pt100/RTD
2-Channel Analog Input for Resistance Sensors

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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 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

This Manual, including all figures and illustrations, is copyright-protected. Any further use of this Manual by third parties that violate pertinent copyright provisions is prohibited. Reproduction, translation, electronic and phototechnical filing/archiving (e.g., photocopying) as well as any amendments require the written consent of WAGO Kontakttechnik GmbH & Co. KG, Minden, Germany. Non-observance will involve the right to assert damage claims.

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
<i>italic</i>	Names of paths and data files are marked in italic-type. e.g.: <i>C:\Program Files\WAGO Software</i>
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 fieldbus coupler or 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.

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 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.

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 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 power supply module!

Use a power 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

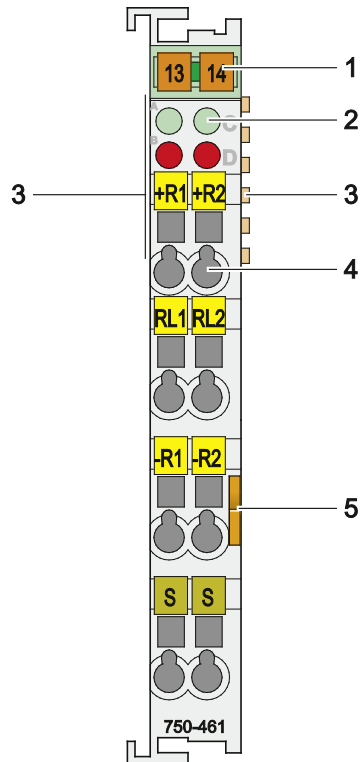


Figure 1: View

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/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. It is comprised of 6 data contacts, which are available as self-cleaning gold spring contacts.

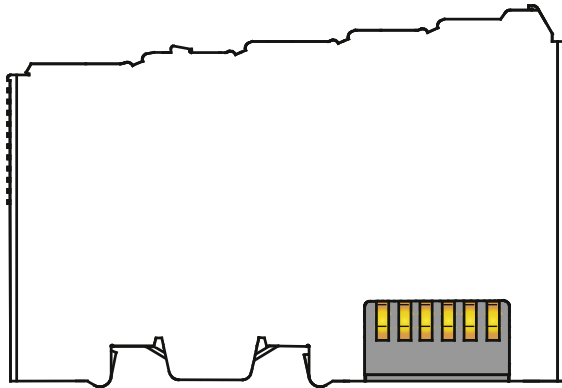


Figure 2: Data Contacts

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

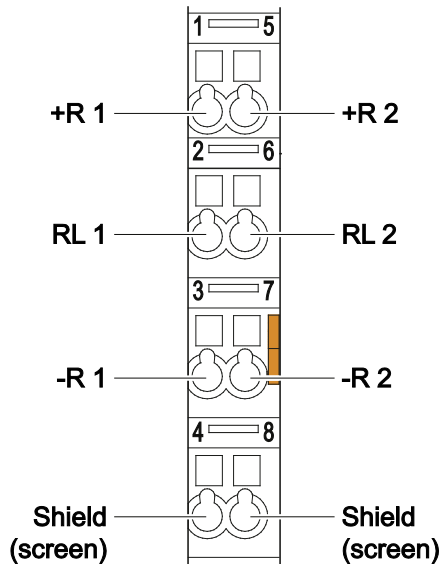


Figure 3: CAGE CLAMP® Connectors

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

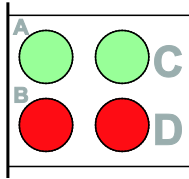


Figure 4: Display Elements

Table 6: Legend for Figure “Display Elements”

Channel	LED	State	Function	
1	A	Off	No operational readiness or the local bus communication is interrupted	
		Green	Operational readiness and trouble-free local bus communication	
	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 local bus communication is interrupted	
		Green	Operational readiness and trouble-free local bus communication	
	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

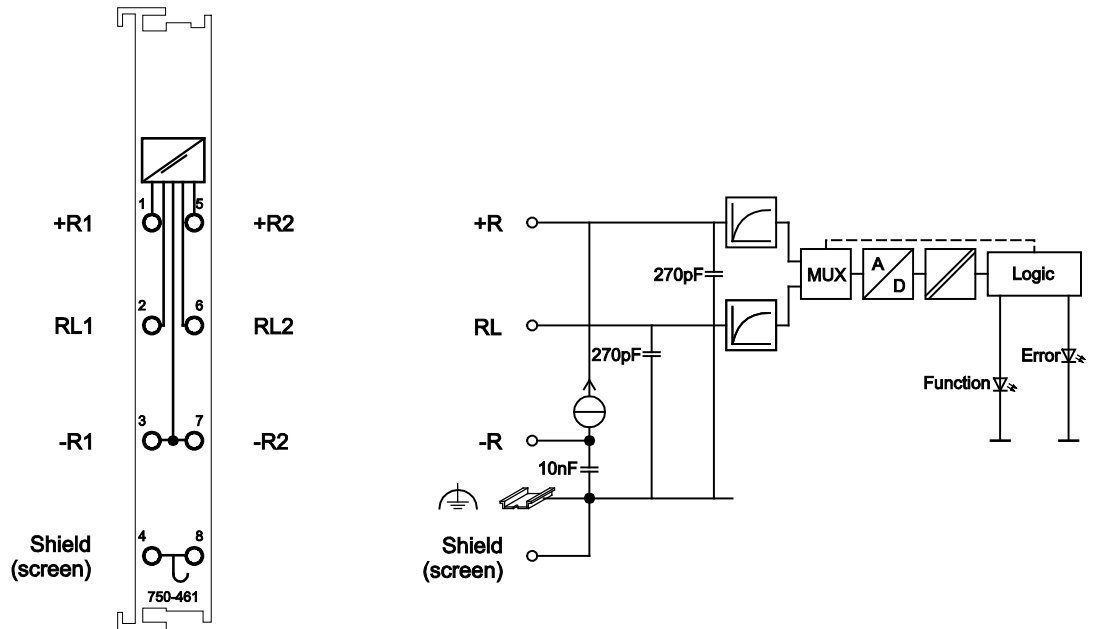


Figure 5: Schematic Diagram

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 (local 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 k Ω , 5 k Ω
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.} <small>¹⁾Time between switching on or connecting the sensor and first valid measured value</small>	4 s
For 750-461/000-006	12 s
Resolution ²⁾ <small>²⁾Over entire range</small>	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 k Ω
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

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	without temperature derating: 0 ... 2000 m; with temperature derating: 2000 ... 5000 m (0.5 K/100 m); max.: 5000 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 ≤ 25 ppm H ₂ S ≤ 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 mm ² ... 2.5 mm ² , 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

 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

 cUL_{us} ANSI/ISA 12.12.01
Class I, Div2 ABCD T4

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

										
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	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	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 750-461 and 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	¹⁾ 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'	0xFFFF	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'	0xFDA8 ²⁾	-600 ²⁾	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'	0x09C4 ³⁾	2500 ³⁾	0x42	ON
Wire break at RL		'0010.0001.0011.0100'	0x09C4 ³⁾	2500 ³⁾	0x42	ON

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

²⁾ For version 750-461/003-000, the hex. value is 0x8001, dec. value -32767

³⁾ For version 750-461/003-000, the hex. value is 0x2134, dec. value 8500

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

For the adjustable version 750-461/003-000, the process image is identical except for the hex./dec. values in the overflow and underflow.

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 k Ω .

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

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 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.

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

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



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.

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 or controller or to the previous or possibly subsequent I/O module are engaged.

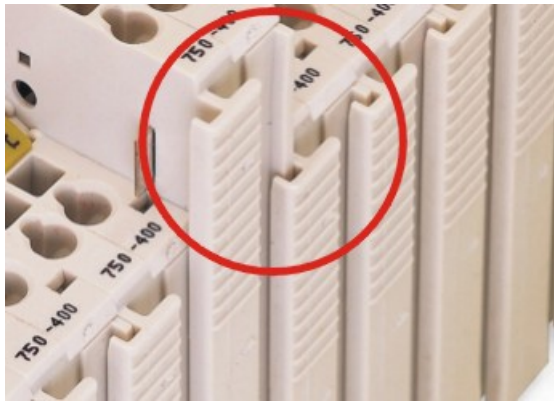


Figure 6: Insert I/O Module (Example)

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

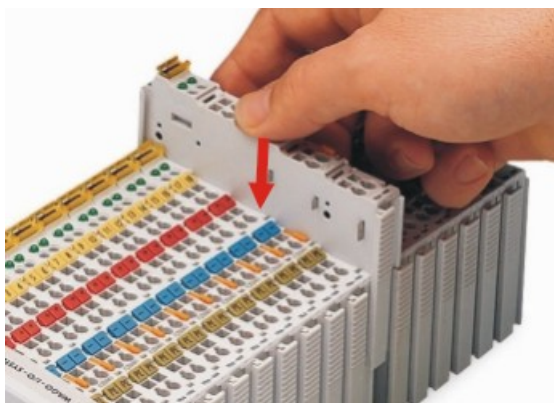


Figure 7: Snap the I/O Module into Place (Example)

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 or 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.

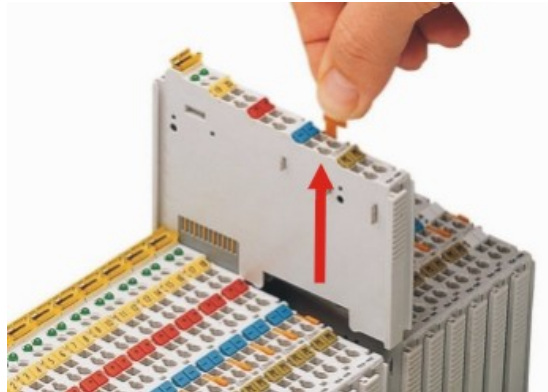


Figure 8: Removing the I/O Module (Example)

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.

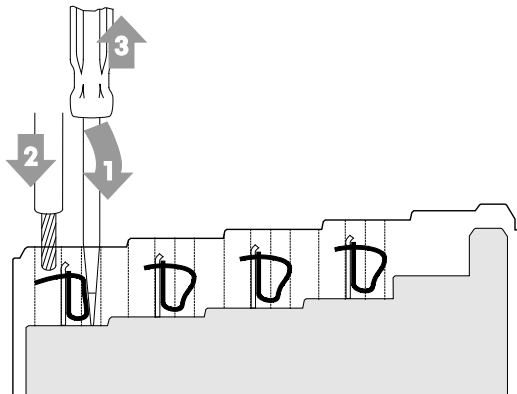


Figure 9: Connecting a Conductor to a CAGE CLAMP®

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

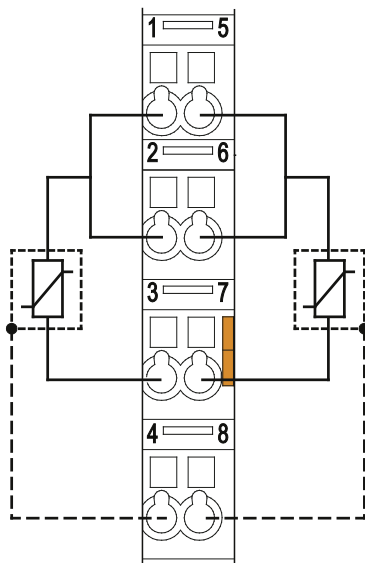


Figure 10: Example Connection 2 × RTD, 2-wire

6.2.2 2 × RTD, 3-Conductors

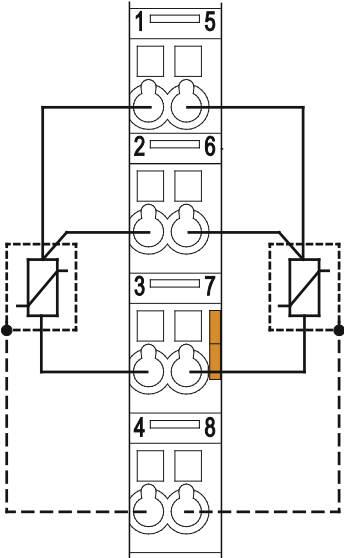


Figure 11: Example Connection 2 × RTD, 3-wire

7 Use in Hazardous Environments

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

7.1 Marking Configuration Examples

7.1.1 Marking for Europe According to ATEX and IECEx

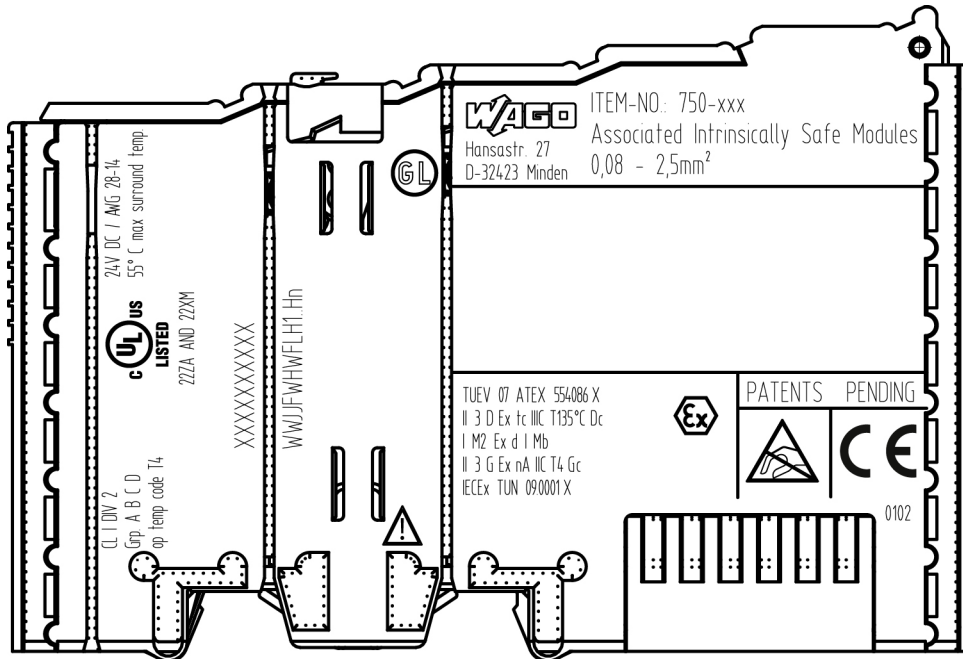


Figure 12: Marking Example According to ATEX and IECEx


TUEV 07 ATEX 554086 X 
 II 3 D Ex tc III C T135°C Dc
 I M2 Ex d I Mb
 II 3 G Ex nA IIC T4 Gc
 IECEx TUN 09.0001 X

Figure 13: Text Detail – Marking Example According to ATEX and IECEx

Table 33: 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)

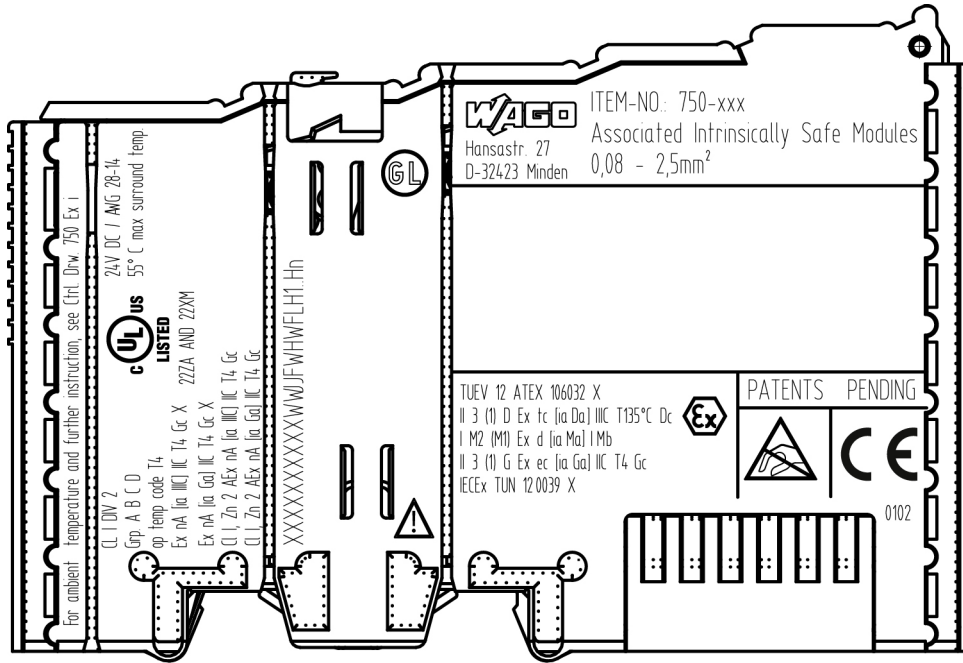


Figure 14: Marking Example for Approved Ex i I/O Module According to ATEX and IECEx

TUEV 12 ATEX 106032 X
 II 3 (1) D Ex tc [ia Da] IIC 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 120039 X



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

Table 34: 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)

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

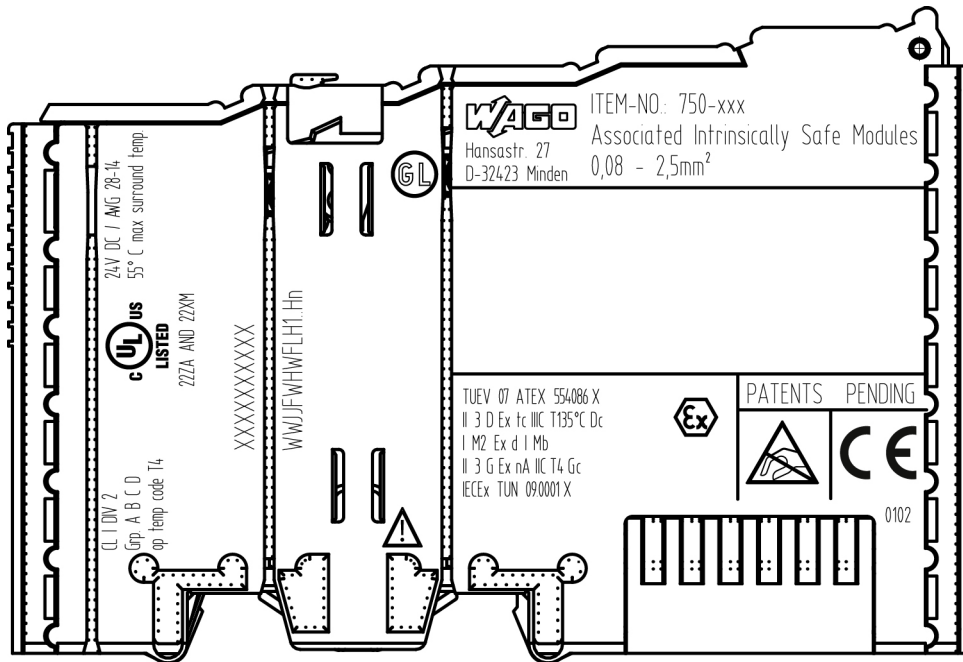


Figure 16: Marking Example According to NEC

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

Figure 17: Text Detail – Marking Example According to NEC 500

Table 35: 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

CI I, Zn 2 AEx nA [ia Ga] IIC T4 Gc

Figure 18: Text Detail – Marking Example for Approved Ex i I/O Module According to NEC 505

Table 36: Description of Marking Example for Approved Ex i I/O Module According to NEC 505

Marking	Description
CI 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)

CI I, Zn 2 AEx nA [ia IIIC] IIC T4 Gc

Figure 19: Text Detail – Marking Example for Approved Ex i I/O Module According to NEC 506

Table 37: Description of Marking Example for Approved Ex i I/O Modules According to NEC 506

Marking	Description
CI 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 20: Text Detail – Marking Example for Approved Ex i I/O Modules According to CEC 18 attachment J

Table 38: 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

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 $0\text{ °C} \leq T_a \leq +55\text{ °C}$ or $-20\text{ °C} \leq T_a \leq +60\text{ °C}$ for components with extension number .../025-xxx or $-40\text{ °C} \leq T_a \leq +70\text{ °C}$ 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.

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 module 750-461 (2AI Pt100/RTD) and the variant 750-461 (003-000) via GSD file:

- PROFIBUS DP 750-333(/0xx-000): \geq Firmware Version 19
 - PROFIBUS DP 750-833(/0xx-000): \geq Firmware Version 18
 - PROFINET IO 750-375(/025-000): \geq Firmware Version 01
 - PROFINET IO 750-377(/025-000): \geq 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 Configuration of the RS-232/RS-485 Interface

8.1.1.1 PROFIBUS DP Fieldbus Coupler/Controller 750-333(/0xx-000), 750-833(/0xx-000), PROFINET IO Fieldbus Coupler (750-370)

When using the aforementioned PROFIBUS-DP and PROFINET-IO fieldbus devices, the process image size is configured by selecting the corresponding PI module type.

Table 39: Configuration PROFIBUS DP and PROFINET IO (750-370)

PI module type	Representatives of the module type	PI data type	Instances	
			Inp.	Outp.
75x-652 ser. interf. 8 bytes	75x-652	Unsigned8[2], OctetString [6]	1	1
75x-652 ser. interf. 24 bytes		Unsigned8[2], OctetString [22]		
75x-652 ser. interf. 48 bytes		Unsigned8[2], OctetString [46]		
PFC 75x-652 ser. Interf. ^{*)}		n/a	n/a	n/a

^{*)} only available for 750-833(/0xx-000)

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

When using the aforementioned PROFIBUS-DP and PROFINET-IO fieldbus couplers, the process image size is configured by selecting the corresponding PI module/submodule type.

Table 40: Configuration PROFINET IO (750-375(/025-000), 750-377(/025-000))

PI module type	Representatives of the module type	PI submodule type	Process image length	PI data type	Instances	
					Inp.	Outp.
75x-652 serial interface	75x-652	{UINT8[2], UINT8[6]} I/O	8 bytes	Unsigned8[2], OctetString [6]	1	1
		{UINT8[2], UINT8[22]} I/O	24 bytes	Unsigned8[2], OctetString [22]		
		{UINT8[2], UINT8[46]} I/O	48 bytes	Unsigned8[2], OctetString [46]		

8.1.2 Configuration of the RS-232/RS-485 Serial Interface

With the exception of the RTS lead and follow-on time and the DMX start channel number, the GSD file can be used to provide the I/O module on the “PROFIBUS DP” and “PROFINET IO” fieldbus devices with all operating parameters.

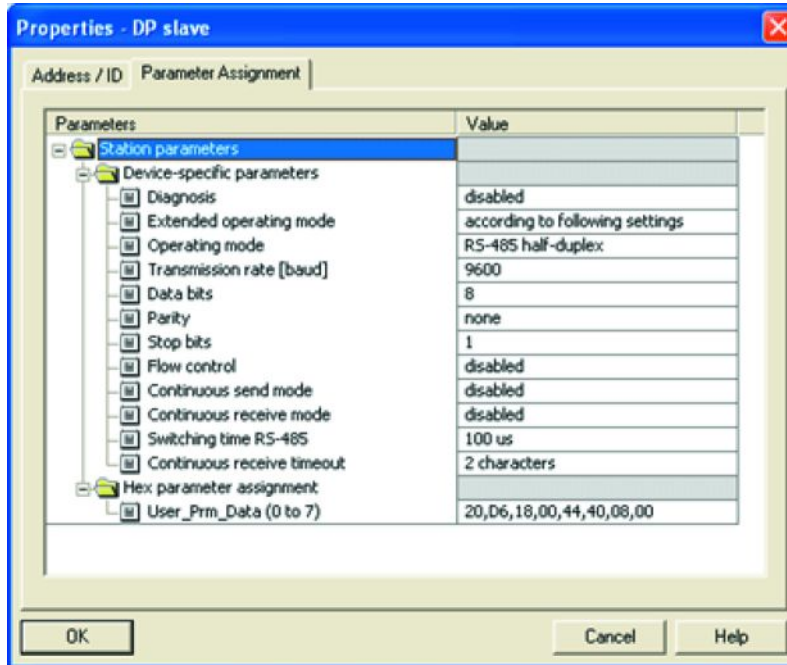


Figure 21: Example of the PROFIBUS DP Fieldbus Coupler/Controller Configuration Dialog

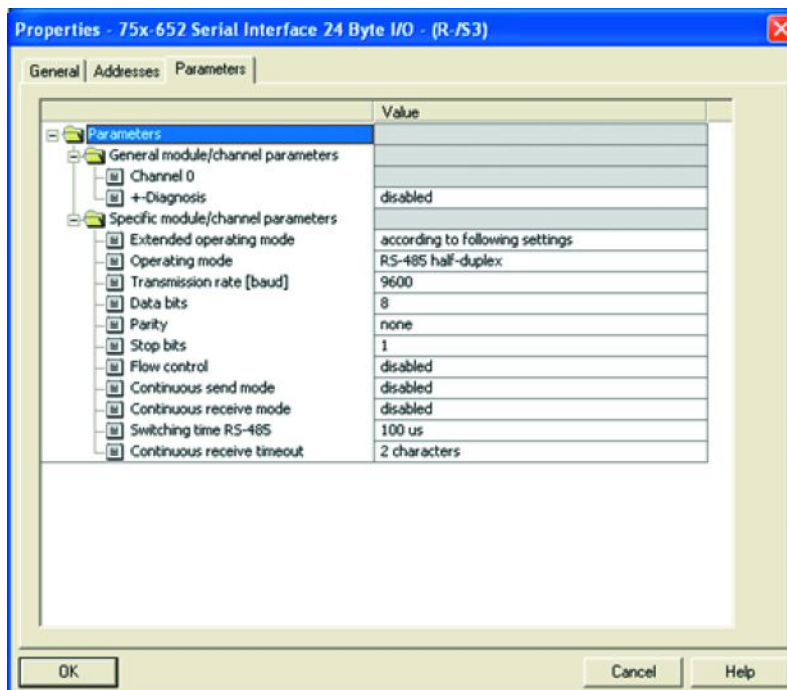


Figure 22: Example of the 750-370 Fieldbus Coupler Configuration Dialog

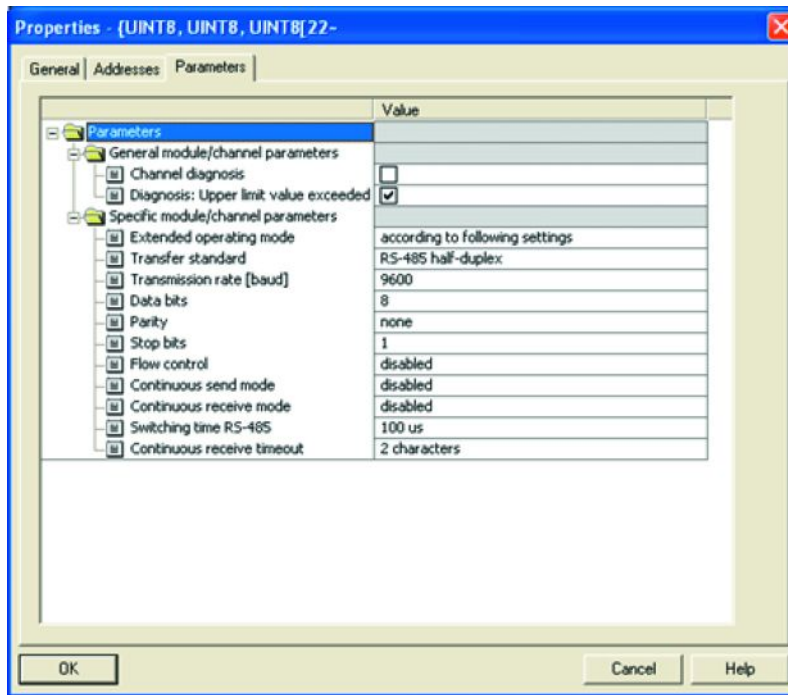


Figure 23: Example of the 750-375(/025-000) and 750-377(/025-000) Fieldbus Coupler Configuration Dialog

8.1.2.1 All PROFIBUS DP and PROFINET IO Fieldbus Couplers/Controllers

NOTICE

Component damage due to incorrect voltage level!

Incorrectly selected voltage levels can destroy the device!

Note when switching between operating modes that RS-232 and RS-485 use different voltage levels.

Switch off connected devices before changing operating modes!
Make sure that devices you connect support the voltage level of the current operating mode!

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

Table 41: Specific Module / Channel Parameters for 75x-652

GSD File		WAGO-I/O-CHECK	
Description	Value	Selection box	Value
Enhanced operating mode	according to the following settings	Operating Mode	(no equivalent)
	DMX half-duplex/250k	Operating Mode	DMX half-duplex/250k
Mode	RS-232	Operating Mode	RS-232
	RS-485 half-duplex ^{*)}	Operating Mode	RS-485 half-duplex ^{*)}
	RS-422 full-duplex	Operating Mode	RS-422 full-duplex
	Data exchange RS-422	Operating Mode	Data exchange RS-422

Table 41: Specific Module / Channel Parameters for 75x-652

GSD File		WAGO-I/O-CHECK	
Description	Value	Selection box	Value
Baud rate [Baud]	300	Transmission Rate [Baud]	300
	1200	Transmission Rate [Baud]	1200
	2400	Transmission Rate [Baud]	2400
	4800	Transmission Rate [Baud]	4800
	9600 ^{*)}	Transmission Rate [Baud]	9600
	19200	Transmission Rate [Baud]	19200
	38400	Transmission Rate [Baud]	38400
	57600	Transmission Rate [Baud]	57600
	115200	Transmission Rate [Baud]	115200
	600	Transmission Rate [Baud]	600
Data bits	8 ^{*)}	Data Bits	8 ^{*)}
	7	Data Bits	7
Parity	None ^{*)}	Parity	None ^{*)}
	Odd	Parity	Odd
	Straight	Parity	Straight
Stop bits	1 ^{*)}	Stop Bits	1 ^{*)}
	2	Stop Bits	2
Flow control	Deactivated ^{*)}	Flow Control	Disabled ^{*)}
	XON/XOFF	Flow Control	XON/XOFF
	RTS/CTS	Flow Control	RTS/CTS
	RTS, lead/follow-on time	Flow Control	RTS, lead/follow-on time
Continuous send	Lock ^{*)}	Continuous Send Mode	Disabled ^{*)}
	Release	Continuous Send Mode	Release
Continuous receive	Lock ^{*)}	Continuous Receive Mode	Disabled ^{*)}
	Release	Continuous Receive Mode	Release
Switching time RS-485	100 µs ^{*)}	Switchover Time RS-485	100 µs ^{*)}
	2 characters	Switchover Time RS-485	2 Characters
	4 characters	Switchover Time RS-485	4 Characters
Monitoring time con. receive	2 characters ^{*)}	Continuous Receive Timeout	2 Characters ^{*)}
	4 characters	Continuous Receive Timeout	4 Characters

^{*)} Default setting
con. = continuous

8.1.2.2 PROFIBUS DP Fieldbus Coupler/Controller 750-333(/0xx-000), 750-833(/0xx-000), PROFINET IO Fieldbus Coupler 750-370

The aforementioned fieldbus couplers/controllers allow module-specific configuration of behavior at diagnosis.

Table 42: General Module / Channel Parameters

Parameter	Value	Explanation
Diagnostics channel x (x = 0)	0 (lock) ^{*)}	The fieldbus coupler/controller signals a diagnosis if the I/O module reports the event: "Overflow (input buffer)" Diagnostics reported by the I/O module do not lead to the signaling of a diagnosis by the fieldbus coupler/ controller.
	1 (release)	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 Coupler 750-375(/025-000), 750-377(/025-000)

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

Table 43: General Module / Channel Parameters

Parameter	Value	Explanation
Channel diagnostics Channel x (x = 0)	0 (lock) ^{*)}	The fieldbus coupler signals a diagnosis if the I/O module reports the event: “Overflow (input buffer)” Diagnostics reported by the I/O module do not lead to the signaling of a diagnosis or an entry in the diagnostics database by the fieldbus coupler.
	1 (release)	Diagnostics reported by the I/O module with activated station diagnostics and error type for the corresponding signal channel lead to dispatch of a diagnostic interrupt. The respective error is entered by the fieldbus coupler in the diagnostics database.
Diagnostics: Top user limit value exceeded Channel x (x = 0)	0 (lock)	The fieldbus coupler signals a diagnosis if the I/O module reports the event: “Overflow (input buffer)” Diagnostics reported by the I/O module do not lead to the signaling of a diagnosis or an entry in the diagnostics database by the fieldbus coupler.
	1 (released) ^{*)}	Diagnostics reported by the I/O module with activated channel diagnostics and error type for the corresponding signal channel lead to dispatch of a diagnostic interrupt. The respective error is entered by the fieldbus coupler in the diagnostics database.

^{*)} Default settings

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