WAGO-I/O-SYSTEM 750

Manual

750-469(/xxx-xxx)

2AI Thermocouple

2-Channel Analog Input Module for Thermocouples

Version 1.1.0

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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 750-469 (2AI Thermocouple) and the variants listed in the table below.

Table 1: Variants

Item Number/Variant	Designation
750-469	2AI Thermocouple/K/Diagn.
750-469/000-001	2AI Thermocouple/S/Diagn.
750-469/000-002	2AI Thermocouple/T/Diagnose
750-469/000-003	2AI ±120mV Diagn.
750-469/000-006	2AI Thermocouple/J/Diagn.
750-469/000-008	2AI Thermocouple/E/Diagn.
750-469/000-012	2AI Thermocouple/L/Diagn.
750-469/000-200	2AI Thermocouple/K/Diagn./S5*)
750-469/000-206	2AI Thermocouple/J/Diagn./S5*)
750-469/003-000	2AI Thermocouple/Free Config.
*)Data format for S5 control with FB 250	

Note

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

The I/O module 750-469 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 750-469 (2AI Thermocouple) analog input module and its 750-469/xxx-xxx variations allow thermocouples be measured in the field. It can also be used to measure voltages (mV). Depending on the operating mode, the voltage value is converted to a temperature or is directly send out by the module.

A microprocessor within the module is used for converting and linearizing the measured voltage value into.

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 analog module has 2 input channels allowing the direct connection of 2 thermocouples.
For example, 2 thermocouples can be connected either to the CAGE CLAMP® connectors +TC 1 and −TC 1 or to +TC2 and −TC 2.
The shield connection is fed directly to the carrier rail and contact is made automatically by snapping the module onto the rail.

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

The operational readiness and the trouble-free internal data bus communication of the channels are indicated via a green function LED.
A red fault LED per channel indicates a wire break or that the signal is outside the measuring range.

Note

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

The I/O module 750-469 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).

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.

Table 4: Description of Variations

Item-No.	Designation	Description
Thermocouples		
750-469	2AI Thermocouple/ K/Diagn.	2-Channel Analog Input Module , Thermocouple Type K, Diagn. Measuring range: −100 °C … +1370 °C
750-469/000-001	2AI Thermocouple/ S/Diagn.	2-Channel Analog Input Module , Thermocouple Type S, Diagn. Measuring range: −50 °C … +1700 °C
750-469/000-002	2AI Thermocouple/ T/Diagn.	2-Channel Analog Input Module , Thermocouple Type T, Diagn. Measuring range: −100 °C … +400 °C
750-469/000-006	2AI Thermocouple/ J/Diagn.	2-Channel Analog Input Module , Thermocouple Type J, Diagn. Measuring range: −100 °C … +1200 °C
750-469/000-008	2AI Thermocouple/ E/Diagn.	2-Channel Analog Input Module , Thermocouple Type E, Diagn. Measuring range: −100 °C … +1000 °C
750-469/000-012	2AI Thermocouple/ L/Diagn.	2-Channel Analog Input Module , Thermocouple Type L, Diagn. Measuring range: −100 °C … +900 °C
750-469/000-200	2AI Thermocouple/ K/Diagn./S5	2-Channel Analog Input Module , Thermocouple Type K, Diagn. Measuring range: −100 °C … +1370 °C With status information for S5-FB250
750-469/000-206	2AI Thermocouple/ J/Diagn./S5	2-Channel Analog Input Module , Thermocouple Type J, Diagn. Measuring range: −100 °C … +1200 °C With status information for S5-FB250
Voltage measuring		
750-469/000-003	2AI Voltage measuring, ±120mV/Diagn.	2-Channel Analog Input Module Voltage measuring, Diagn. Measuring range:±120 mV
Operating mode configurable with WAGO-I/O-*CHEC* or PROFIBUS- and PROFINET device description (GSD file)		
750-469/003-000	2AI Thermocouple/ Free Config.	2-Channel Analog Input Module , free configurable, Diagn. Pre-adjustment: Thermocouple Type K, Measuring range: −100 °C … +1370 °C

3.1 View

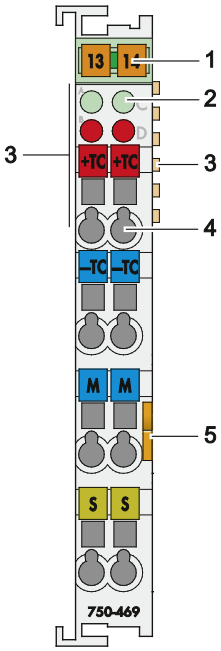

Figure 1: View

Table 5: 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.

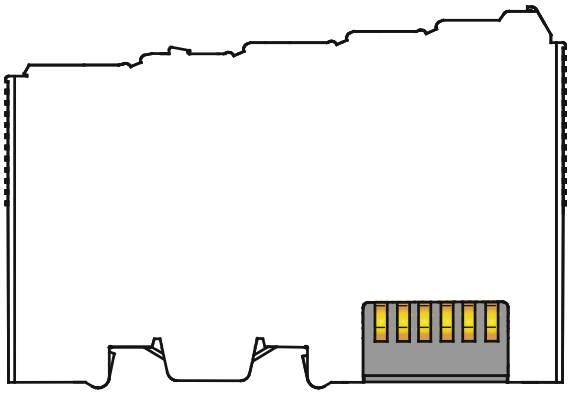

Figure 2: Data Contacts

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 750-469 has no power jumper contacts.

3.2.3 CAGE CLAMP® Connectors

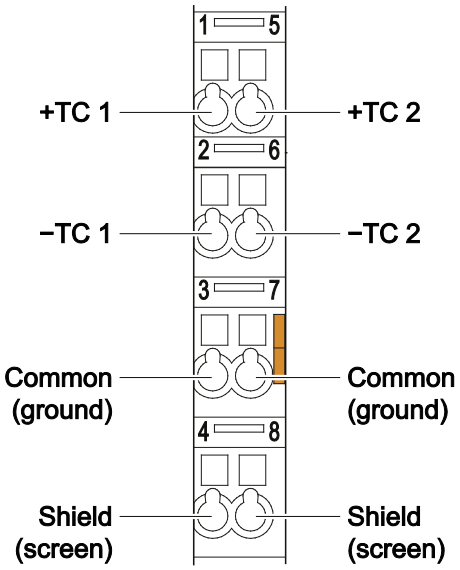

Figure 3: CAGE CLAMP® Connectors

Table 6: Legend for Figure “CAGE CLAMP® Connectors”

Channel	Designation	Connector	Function
1	+TC 1	1	Sensor 1: +TC
	−TC 1	2	Sensor 1: −TC
	Common (ground)	3	Common (ground)
	Shield (screen)	4	Shield (screen)
2	+TC 2	5	Sensor 2: +TC
	−TC 2	6	Sensor 2: −TC
	Common (ground)	7	Common (ground)
	Shield (screen)	8	Shield (screen)

NOTICE

Only use connections 3 and 7 as a signal ground!
The current between connections 3 and 7 must be less than 0.1 A. A current greater than 0.1 A can destroy the I/O module. Only use connections 3 and 7 as a signal ground.

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

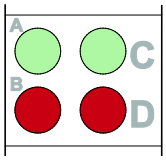

Figure 4: Display Elements

Table 7: 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	
	B	Off	Normal operation	
		Red	750-469, 750-469/000-001, -002, -006, -008, -012, -200, -206	Overrange/underflow of the admissible measuring range, broken wire
			750-469/000-003	Broken wire
2	C	Off	No operational readiness or the internal data bus communication is interrupted	
		Green	Operational readiness and trouble-free internal data bus communication	
	D	Off	Normal operation	
		Red	750-469, 750-469/000-001, -002, -006, -008, -012, -200, -206	Overrange/underflow of the admissible measuring range, broken wire
			750-469/000-003	Broken wire

3.4 Operating Elements

The I/O module 750-469 has no operating elements.

3.5 Schematic Diagram

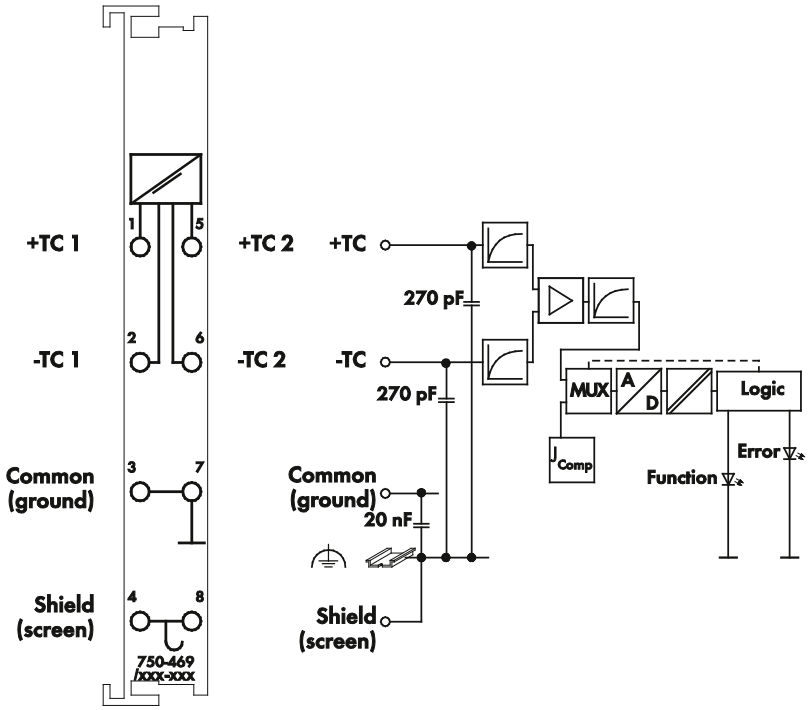

Figure 5: Schematic Diagram

NOTICE

Only use connections 3 and 7 as a signal ground!

The current between connections 3 and 7 must be less than 0.1 A. A current greater than 0.1 A can destroy the I/O module. Only use connections 3 and 7 as a signal ground.

3.6 Technical Data

3.6.1 Device

Table 8: Technical Data – Device

Width	12 mm
Height (from upper edge of DIN 35 rail)	64 mm
Length	100 mm
Weight	38.2 g

3.6.2 Supply

Table 9: Technical Data – Supply

Power supply	Via system voltage DC/DC
Max. current consumption (internal)	65 mA
Isolation	500 V system/supply

3.6.3 Inputs

Table 10: Technical Data – Inputs

Number of inputs	2
Sensor types the free configurable variation (750-469/003-000) supports all listed sensor types	Type K; −100 °C … +1370 °C (basic variation) optional variations available: type S; − 50 °C … + 1700 °C type T; − 100 °C … + 400 °C type J; − 100 °C … + 1200 °C type E; − 100 °C … + 1000 °C type L; − 100 °C … + 900 °C further configurable variants of 750-469/003-000: type B; + 600 °C … + 1800 °C type N; − 100°C … + 1300 °C type R; 0 °C … + 1700 °C type U; − 25 °C … + 600 °C Voltage measurement: − 30 mV ... + 30 mV − 60 mV ... + 60 mV − 120 mV ... + 120 mV

Table 11: Technical Data – Inputs

Internal resistance	1 MΩ
Cold junction compensation	At each pair of terminal blocks
Resolution (over entire range)	0.1 °C
Conversion time	320 ms (each channel)
Measuring error $_{25°C}$	< ±6 K (voltage input < ±2 K; cold junction compensation < ±4 K)
Temperature coefficient	< ±0.2 K/K
Max. admissible current between the ground contacts 3 and 7	100 mA

3.6.4 Communication

Table 12: Technical Data – Communication

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

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 750-469 I/O modules:

CE	Conformity Marking	
cULus	cULus	UL508
KC	Korea Certification	MSIP-REM-W43-AIM750

The following Ex approvals have been granted to the basic version and all variants of 750-469 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 750-469 I/O modules:

	ABS	BSH	BV	DNV	GL	KR	LR	PRS	RINA
750-469	x	x	x	x	x	x	x	x	x
750-469 /000-001			x	x	x	x	x	x	x
750-469 /000-002			x	x	x	x	x	x	x
750-469 /000-003			x	x	x	x	x	x	x
750-469 /000-006			x	x	x	x	x	x	x
750-469 /000-008			x	x	x	x	x	x	x
750-469 /000-012			x	x	x	x	x	x	x
750-469 /000-200			x	x	x	x	x	x	x
750-469 /000-206			x	x	x	x	x	x	x
750-469 /003-000			x	x	x	x	x	x	x

ABS (American Bureau of Shipping)

Federal Maritime and Hydrographic Agency

BV (Bureau Veritas)

DNV (Det Norske Veritas) Klasse 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

PRS (Polski Rejestr Statków)

RINA (Registro Italiano Navale)

3.8 Standards and Guidelines

All variations of 750-469 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 750-469 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

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 Standard Data Format

For the 750-469 module and its variations with standard data format, the temperature values of the sensors are represented with a resolution of 1 digit per 0.1 °C within a word (16 bits). Thus, 0 °C corresponds to the numeric value 0x0000 and 100 °C to 0x03E8 (dec. 1000).

Table 16: Process Image 750-469, 750-469/003-000, type K, with broken wire diagn.

Temperature °C	Numercial value [1]			Status-byte hex.	LED Error AI 1, 2
	binary	hex.	dec.		
< -100.0	'1111.1100.0001.1000'	0xFC18	-1000	0x41	on
-100.0	'1111.1100.0001.1000'	0xFC18	-1000	0x00	off
0.0	'0000.0000.0000.0000'	0x0000	0	0x00	off
100.0	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
200.0	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
300.0	'0000.1011.1011.1000'	0x0BB8	3000	0x00	off
400.0	'0000.1111.1010.0000'	0x0FA0	4000	0x00	off
500.0	'0001.0011.1000.1000'	0x1388	5000	0x00	off
1000.0	'0010.0111.0001.0000'	0x2710	10000	0x00	off
1200.0	'0010.1110.1110.0000'	0x2EE0	12000	0x00	off
1300.0	'0011.0010.1100.1000'	0x32C8	13000	0x00	off
1370.0	'0011.0101.1000.0100'	0x3584	13700	0x00	off
> ca.1370.0	'0011.0101.1000.0100'	> 0x3584	> 13700	0x42	on
Broken wire	'0111.1111.1111.1111'	0x7FFF	32767	0x42	on

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

Table 17: Process Image 750-469, 750-469/003-000, Type S, with broken wire diagn.

Temperature °C	Numercial value [1]			Status-byte hex.	LED Error AI 1, 2
	binary	hex.	dec.		
< -50.0	'1111.1110.0000.1100'	0xFE0C	-500	0x41	on
-50.0	'1111.1110.0000.1100'	0xFE0C	-500	0x00	off
0.0	'0000.0000.0000.0000'	0x0000	0	0x00	off
100.0	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
200.0	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
300.0	'0000.1011.1011.1000'	0x0BB8	3000	0x00	off
400.0	'0000.1111.1010.0000'	0x0FA0	4000	0x00	off
500.0	'0001.0011.1000.1000'	0x1388	5000	0x00	off
1000.0	'0010.0111.0001.0000'	0x2710	10000	0x00	off
1500.0	'0011.1010.1001.1000'	0x3A98	15000	0x00	off
1700.0	'0100.0010.0110.1000'	0x4268	17000	0x00	off
> 1700.0	'0100.0010.0110.1000'	> 0x4268	> 17000	0x42	on
Broken wire	'0111.1111.1111.1111'	0x7FFF	32767	0x42	on

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

Table 18: Process Image 750-469, 750-469/003-000, Type T, with broken wire diagn.

Temperature °C	Numercial value [1]			Status-byte hex.	LED Error AI 1, 2
	binary	hex.	dec.		
< -100.0	'1111.1100.0001.1000'	0xFC18	-1000	0x41	on
-100.0	'1111.1100.0001.1000'	0xFC18	-1000	0x00	off
-50.0	'1111.1110.0000.1100'	0xFE0C	-500	0x00	off
0.0	'0000.0000.0000.0000'	0x0000	0	0x00	off
50.0	'0000.0001.1111.0100'	0x01F4	500	0x00	off
100.0	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
150.0	'0000.0101.1101.1100'	0x05DC	1500	0x00	off
200.0	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
250.0	'0000.1001.1100.0100'	0x09C4	2500	0x00	off
300.0	'0000.1011.1011.1000'	0x0BB8	3000	0x00	off
350.0	'0000.1101.1010.1100'	0x0DAC	3500	0x00	off
400.0	'0000.1111.1010.0000'	0x0FA0	4000	0x00	off
> 400.0	'0000.1111.1010.0000'	>0x0FA0	> 4000	0x42	on
Broken wire	'0111.1111.1111.1111'	0x7FFF	32767	0x42	on

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

Table 19: Process Image 750-469, 750-469/003-000, Type J, with broken wire diagn.

Temperature °C	Numercial value [1]			Status-byte hex.	LED Error AI 1, 2
	binary	hex.	dec.		
< -100.0	'1111.1100.0001.1000'	0xFC18	-1000	0x41	on
-100.0	'1111.1100.0001.1000'	0xFC18	-1000	0x00	off
0.0	'0000.0000.0000.0000'	0x0000	0	0x00	off
100.0	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
200.0	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
300.0	'0000.1011.1011.1000'	0x0BB8	3000	0x00	off
400.0	'0000.1111.1010.0000'	0x0FA0	4000	0x00	off
500.0	'0001.0011.1000.1000'	0x1388	5000	0x00	off
1000.0	'0010.0111.0001.0000'	0x2710	10000	0x00	off
1200.0	'0010.1110.1110.0000'	0x2EE0	12000	0x00	off
> 1200.0	'0010.1110.1110.0000'	>0x2EE0	> 12000	0x42	on
Broken wire	'0111.1111.1111.1111'	0x7FFF	32767	0x42	on

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

Table 20: Process Image 750-469, 750-469/003-000, Type E, with broken wire diagn.

Temperature °C	Numercial value [1]			Status-byte hex.	LED Error AI 1, 2
	binary	hex.	dec.		
< -100.0	'1111.1100.0001.1000'	0xFC18	-1000	0x41	on
-100.0	'1111.1100.0001.1000'	0xFC18	-1000	0x00	off
0.0	'0000.0000.0000.0000'	0x0000	0	0x00	off
100.0	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
200.0	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
300.0	'0000.1011.1011.1000'	0x0BB8	3000	0x00	off
400.0	'0000.1111.1010.0000'	0x0FA0	4000	0x00	off
500.0	'0001.0011.1000.1000'	0x1388	5000	0x00	off
600.0	'0001.0111.0111.0000'	0x1770	6000	0x00	off
700.0	'0001.1011.0101.1000'	0x1B58	7000	0x00	off
900.0	'0010.0011.0010.1000'	0x2328	9000	0x00	off
999.0	'0010.0111.0000.0110'	0x2706	9990	0x00	off
> 999.0	'0010.0111.0000.0110'	> 0x2706	> 9990	0x42	on
Broken wire	'0111.1111.1111.1111'	0x7FFF	32767	0x42	on

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

Table 21: Process Image 750-469, 750-469/003-000, Type L, with broken wire diagn.

Temperature °C	Numercial value [1]			Status-byte hex.	LED Error AI 1, 2
	binary	hex.	dec.		
< -100.0	'1111.1100.0001.1000'	0xFC18	-1000	0x41	on
-100.0	'1111.1100.0001.1000'	0xFC18	-1000	0x00	off
0.0	'0000.0000.0000.0000'	0x0000	0	0x00	off
100.0	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
200.0	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
300.0	'0000.1011.1011.1000'	0x0BB8	3000	0x00	off
400.0	'0000.1111.1010.0000'	0x0FA0	4000	0x00	off
500.0	'0001.0011.1000.1000'	0x1388	5000	0x00	off
600.0	'0001.0111.0111.0000'	0x1770	6000	0x00	off
700.0	'0001.1011.0101.1000'	0x1B58	7000	0x00	off
800.0	'0001.1111.0100.0000'	0x1F40	8000	0x00	off
900.0	'0010.0011.0010.1000'	0x2328	9000	0x00	off
> 900.0	'0010.0011.0010.1000'	> 0x2328	> 9000	0x42	on
Broken wire	'0111.1111.1111.1111'	0x7FFF	32767	0x42	on

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

Table 22: Process Image 750-469/003-000, Typ B, with broken wire diagn

Temperature °C	Numercial value			Status-byte hex.	LED Error AI 1, 2
	binary	hex.	dec.		
< 600,0	'0001.0111.0111.0000'	0x1770	6000	0x41	ein
600,0	'0001.0111.0111.0000'	0x1770	6000	0x00	aus
700,0	'0001.1011.0101.1000'	0x1B58	7000	0x00	aus
800,0	'0001.1111.0100.0000'	0x1F40	8000	0x00	aus
900,0	'0010.0011.0010.1000'	0x2328	9000	0x00	aus
1000,0	'0010.0111.0001.0000'	0x2710	10000	0x00	aus
1500,0	'0011.1010.1001.1000'	0x3A98	15000	0x00	aus
1600,0	'0011.1110.1000.0000'	0x3E80	16000	0x00	aus
1700,0	'0100.0010.0110.1000'	0x4268	17000	0x00	aus
1800,0	'0100.0110.0101.0000'	0x4650	18000	0x00	aus
> 1800,0	'0100.0110.0101.0000'	> 0x4650	> 18000	0x42	ein
Drahtbruch	'0111.1111.1111.1111'	0x7FFF	32767	0x42	ein

Table 23: Process Image 750-469/003-000, Typ U, with broken wire diagn.

Temperature °C	Numercial value [1)]			Status-byte hex.	LED Error AI 1, 2
< -25,0	'1111.1111.0000.0110'	0xFF06	-250	0x41	ein
-25,0	'1111.1111.0000.0110'	0xFF06	-250	0x00	aus
0,0	'0000.0000.0000.0000'	0x0000	0	0x00	aus
50,0	'0000.0001.1111.0100'	0x01F4	500	0x00	aus
100,0	'0000.0011.1110.1000'	0x03E8	1000	0x00	aus
200,0	'0000.0111.1101.0000'	0x07D0	2000	0x00	aus
300,0	'0000.1011.1011.1000'	0x0BB8	3000	0x00	aus
400,0	'0000.1111.1010.0000'	0x0FA0	4000	0x00	aus
500,0	'0001.0011.1000.1000'	0x1388	5000	0x00	aus
600,0	'0001.0111.0111.0000'	0x1770	6000	0x00	aus
> 600,0	'0001.0111.0111.0000'	> 0x1770	> 6000	0x42	ein
Drahtbruch	’0111.1111.1111.1111’	0x7FFF	32767	0x42	ein

*) Temperature values below 0 °C are represented in two’s complement binary form.

Table 24: Process Image 750-469/003-000, Typ N, with broken wire diagn.

Temperature °C	Numercial value [1)]			Status-byte hex.	LED Error AI 1, 2
	binary	hex.	dec.		
< -100,0	'1111.1100.0001.1000'	0xFC18	-1000	0x41	ein
-100,0	'1111.1100.0001.1000'	0xFC18	-1000	0x00	aus
0,0	'0000.0000.0000.0000'	0x0000	0	0x00	aus
100,0	'0000.0011.1110.1000'	0x03E8	1000	0x00	aus
200,0	'0000.0111.1101.0000'	0x07D0	2000	0x00	aus
300,0	'0000.1011.1011.1000'	0x0BB8	3000	0x00	aus
400,0	'0000.1111.1010.0000'	0x0FA0	4000	0x00	aus
500,0	'0001.0011.1000.1000'	0x1388	5000	0x00	aus
1000,0	'0010.0111.0001.0000'	0x2710	10000	0x00	aus
1200,0	'0010.1110.1110.0000'	0x2EE0	12000	0x00	aus
1300,0	'0011.0010.1100.1000'	0x32C8	13000	0x00	aus
> 1300,0	'0011.0010.1100.1000'	> 0x32C8	> 13000	0x42	ein
Drahtbruch	’0111.1111.1111.1111’	0x7FFF	32767	0x42	ein

*) Temperature values below 0 °C are represented in two’s complement binary form.

Table 25: Process Image 750-469/003-000, Typ R, with broken wire diagn.

Temperature °C	Numercial value [1)]			Status-byte hex.	LED Error AI 1, 2
	Binär	Hex.	Dez.		
≤ − 0,1	'1111.1111.1111.1111'	0xFFFF	− 1	0x41	ein
0,0	'0000.0000.0000.0000'	0x0000	0	0x00	aus
100,0	'0000.0011.1110.1000'	0x03E8	1000	0x00	aus
200,0	'0000.0111.1101.0000'	0x07D0	2000	0x00	aus
300,0	'0000.1011.1011.1000'	0x0BB8	3000	0x00	aus
400,0	'0000.1111.1010.0000'	0x0FA0	4000	0x00	aus
500,0	'0001.0011.1000.1000'	0x1388	5000	0x00	aus
1000,0	'0010.0111.0001.0000'	0x2710	10000	0x00	aus
1200,0	'0010.1110.1110.0000'	0x2EE0	12000	0x00	aus
1300,0	'0010.1110.1110.0000'	0x2EE0	13000	0x00	aus
1400,0	'0011.0101.1000.0100‘	0x3584	14000	0x00	aus
1500,0	'0011.1010.1001.1000‘	0x3A98	15000	0x00	aus
1600,0	'0011.1110.1000.0000‘	0x3E80	16000	0x00	aus
1700;0	'0100.0010.0110.1000‘	0x4268	17000	0x00	aus
> 1700,0	'0100.0010.0110.1000‘	> 0x4268	> 17000	0x42	ein
Drahtbruch	’0111.1111.1111.1111’	0x7FFF	32767	0x42	ein

*) Temperature values below 0 °C are represented in two’s complement binary form.

4.2 Data Format with Status Information for S5 – FB 250 in Data Word

For the 750-469/000-200 and 750-469/000-206 variations, the temperature values of the sensors are represented with a resolution of 1 digit per 0.125 °C within a word (16 bits). Thus, 0 °C corresponds to the numeric value 0x0000 and 100 °C to 0x0320 (dec. 800). Diagnostic information is indicated in the 3 low bits.

Table 26: Process Image 750-469/000-200, Type K, with broken wire diagn.

Temperature °C	Numercial value [1]				Status-byte hex.	LED Error AI 1, 2
	binary	XFÜ	hex.	dec.		
< ca.-100.0	'1111.1100.1101.1	001'	0xFCD9	-807	0x41	on
-100.0	'1111.1100.1110.0	000'	0xFCE0	-800	0x00	off
-50.0	'1111.1110.0111.0	000'	0xFE70	-400	0x00	off
0.0	'0000.0000.0000.0	000'	0x0000	0	0x00	off
50.0	'0000.0001.1001.0	000'	0x0190	400	0x00	off
100.0	'0000.0011.0010.0	000'	0x0320	800	0x00	off
200.0	'0000.0110.0100.0	000'	0x0640	1600	0x00	off
400.0	'0000.1100.1000.0	000'	0x0C80	3200	0x00	off
600.0	'0001.0010.1100.0	000'	0x12C0	4800	0x00	off
800.0	'0001.1001.0000.0	000'	0x1900	6400	0x00	off
1000.0	'0001.1111.0100.0	000'	0x1F40	8000	0x00	off
1200.0	'0010.0101.1000.0	000'	0x2580	9600	0x00	off
1370.0	'0010.1010.1101.0	000'	0x2AD0	10960	0x00	off
> ca.1370.0	'0010.1010.1101.1	001'	> 0x2AD9	> 10969	0x42	on
Broken wire	'0111.1111.1111.1	010'	0x7FFA	32762	0x42	on

[1] Status information: X: not used, F: short-circuit, broken wire, Ü: overrange
[2] Temperature values below 0 °C are represented in two's complement binary form.

Table 27: Process Image 750-469/000-206, Type J, with broken wire diagn.

Temperature °C	Numercial value [1]				Status-byte hex.	LED Error AI 1, 2
	binary	XFÜ	hex.	dec.		
< -100.0	'1111.1100.1110.0	001'	0xFCE1	-799	0x41	on
-100.0	'1111.1100.1110.0	000'	0xFCE0	-800	0x00	off
-50.0	'1111.1110.0111.0	000'	0xFE70	-400	0x00	off
0.0	'0000.0000.0000.0	000'	0x0000	0	0x00	off
50.0	'0000.0001.1001.0	000'	0x0190	400	0x00	off
100.0	'0000.0011.0010.0	000'	0x0320	800	0x00	off
200.0	'0000.0110.0100.0	000'	0x0640	1600	0x00	off
400.0	'0000.1100.1000.0	000'	0x0C80	3200	0x00	off
600.0	'0001.0010.1100.0	000'	0x12C0	4800	0x00	off
800.0	'0001.1001.0000.0	000'	0x1900	6400	0x00	off
1000.0	'0001.1111.0100.0	000'	0x1F40	8000	0x00	off
1100.0	'0010.0010.0110.0	000'	0x2260	8800	0x00	off
1200.0	'0010.0101.1000.0	000'	0x2580	9600	0x00	off
> 1200.0	'0010.0101.1000.0	001'	> 0x2581	> 9601	0x42	on
Broken wire	'0111.1111.1111.1	010'	0x7FFA	32762	0x42	on

[1] Status information: X: not used, F: short-circuit, broken wire, Ü: overrange
[2] Temperature values below 0 °C are represented in two's complement binary form.

4.3 I/O Modules for Voltage Measuring (mV)

When measuring the voltage, the input range is mapped to a range of values between -18750 and +18750. Voltage values below 0 mV are represented in two's complement binary form.

For the measuring range ± 120 mV the resolution is 6.4 µV per digit.

Table 28: Process Image 750-469/000-003, mV measuring ±120 mV, with broken wire diagn.

Voltage mV	Numercial value [1]			Status-byte hex.	LED Error AI 1, 2
	binary	hex.	dec.		
< -120.0	'1011.0000.0000.0000'	0xB000	-20480	0x00	off
-120.0	'1011.0110.1100.0010'	0xB6C2	-18750	0x00	off
-90.0	'1100.1001.0001.0010'	0xC912	-14062	0x00	off
-60.0	'1101.1011.0110.0001'	0xDB61	-9375	0x00	off
-30.0	'1110.1101.1011.0001'	0xEDB1	-4687	0x00	off
0.0	'0000.0000.0000.0000'	0x0000	0	0x00	off
30.0	'0001.0010.0101.0000'	0x1250	4688	0x00	off
60.0	'0010.0100.1001.1111'	0x249F	9375	0x00	off
90.0	'0011.0110.1110.1111'	0x36EF	14063	0x00	off
120.0	'0100.1001.0011.1110'	0x493E	18750	0x00	off
> 120.0	'0111.1111.1111.1111'	0x7FFF	32767	0x00	off

[1] Voltage values below 0 mV are represented in two's complement binary form.

For the measuring range ±30 mV the resolution is 1,6 µV per digit.

Table 29: Process Image750-469/003-000, mV-measuring ±30 mV

Voltage mV	Numercial value [1)]			Status-byte hex.	LED Error AI 1, 2
	binary	hex.	dec.		
< -30,0	'1011.0000.0000.0000'	0xB000	-20480	0x00	aus
-30,0	'1011.0111.1100.0010'	0xB6C2	-18750	0x00	aus
-20,0	'1101.0000.0010.1100'	0xCF2C	-12500	0x00	aus
-10,0	'1110.1000.1001.0110'	0xE796	-6250	0x00	aus
0,0	'0000.0000.0000.0000'	0x0000	0	0x00	aus
10,0	'0001.1000.0110.1010'	0x186A	6250	0x00	aus
20,0	'0011.0000.1101.0100'	0x30D4	12500	0x00	aus
30,0	'0100.1001.0011.1110'	0x493E	18750	0x00	aus
> 30,0	'0111.1111.1111.1111'	0x7FFF	32767	0x00	aus

*) Voltage values below 0 mV are represented in two's complement binary form.

For the measuring range ±60 mV the resolution is 3,2 µV per digit.

Table 30: Process Image750-469/003-000, mV-measuring ±60 mV

Voltage mV	Numercial value [1)]			Status-byte hex.	LED Error AI 1, 2
	binary	hex.	dec.		
< -60,0	'1011.0000.0000.0000'	0xB000	-20480	0x00	aus
-60,0	'1011.0111.1100.0010'	0xB6C2	-18750	0x00	aus
-45,0	'1100.1010.0001.0001'	0xC911	-14063	0x00	aus
-30,0	'1101.1100.0110.0001'	0xDB61	-9375	0x00	aus
-15,0	'1110.1110.1011.0000'	0xEDB0	-4688	0x00	aus
0,0	'0000.0000.0000.0000'	0x0000	0	0x00	aus
15,0	'0001.0010.0101.0000'	0x1250	4688	0x00	aus
30,0	'0010.0100.1001.1111'	0x249F	9375	0x00	aus
45,0	'0011.0110.1110.1111'	0x36EF	14063	0x00	aus
60,0	'0100.1001.0011.1110'	0x493E	18750	0x00	aus
> 60,0	'0111.1111.1111.1111'	0x7FFF	32767	0x00	aus

*) Voltage values below 0 mV are represented in two's complement binary form.

4.4 Adjustable 750-469/003-000 Variation

The operating mode of the 750-469/003-000 variation can be configured using the WAGO-I/O-*CHECK* commissioning tool.

The default setting is Thermocouple Type K. In this operating mode, the I/O module has the same behavior and process values as the 750-469 basic I/O module.

The parameterization dialog in WAGO-I/O-CHECK provides the following selection boxes for possible I/O module settings:

Table 31: Setting options for I/O module 750-469/003-000

Selection box	Possible Settings	
Sensor type		TC Typ L TC Typ K* TC Typ J TC Typ E TC Typ T TC Typ N TC Typ U TC Typ B TC Typ R TC Typ S +/-30 mV +/-60 mV +/-120 mV
Check lower measurement range	deactivated	Status bit 0 is not used when falling below the measuring range.
	activated*	Status bit 0 is used when falling below the measuring range.
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. Used when the I/O module detects an error in the internal function or a wire break. Bit 2: 0
Watchdog	deactivated	Watchdog timer not enabled.
	activated*	Watchdog timer enabled. If not process data is exchanged with the fieldbus coupler/controller, the green LEDs will turn off.

Table 31: Setting options for I/O module 750-469/003-000

Selection box	Possible Settings	
Number format	Two's complement*	Two's complement representation
	Sign magnitude	Amount/sign representation
Filter constant		12.5 Hz – 640 ms / 50 Hz – 320 ms */ 100 Hz – 160 ms / 200 Hz – 80 ms
Cold junction compensation	deactivated	Do not compensate for cold junction temperature
	activated*	Compensate for cold junction temperature
Wire break detection	deactivated	Wire break monitoring disabled
	activated*	Wire break monitoring enabled
User scaling	deactivated*	User scaling disabled
	activated	User scaling enabled
WAGO scaling	deactivated	WAGO scaling disabled
	activated*	WAGO scaling enabled

*default settings

In WAGO-I/O-*CHECK* the following input boxes allow you to set the offset and gain values of the user and manufacturer scaling.

Table 32: Offset/gain values

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

Information

Additional information

Detailed information about configuring this I/O module is available in the documentation for the WAGO-I/O-CHECK commissioning tools and on the Internet at www.wago.com.

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.”

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.

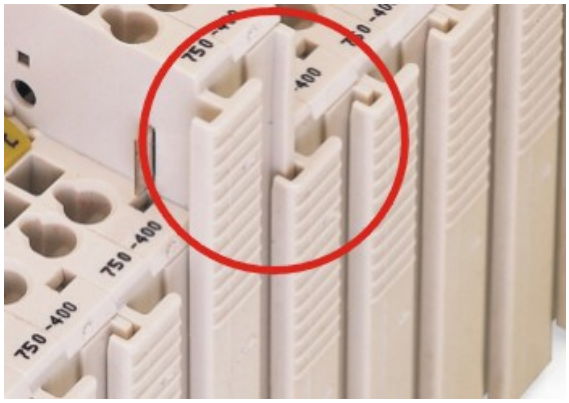

Figure 6: Insert I/O Module (Example)

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

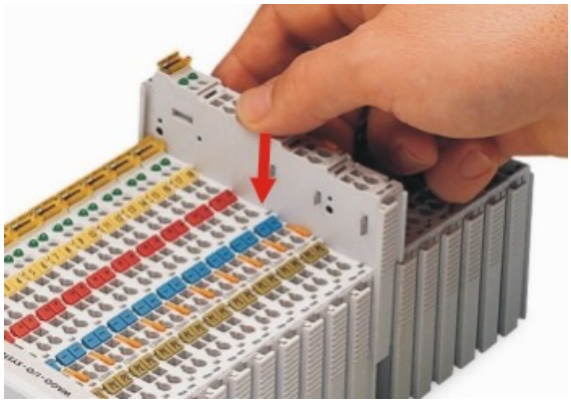

Figure 7: Snap the I/O Module into Place (Example)

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.

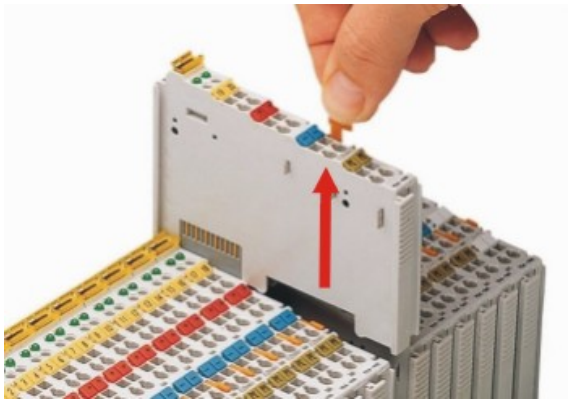

Figure 8: Removing the I/O Module (Example)

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.

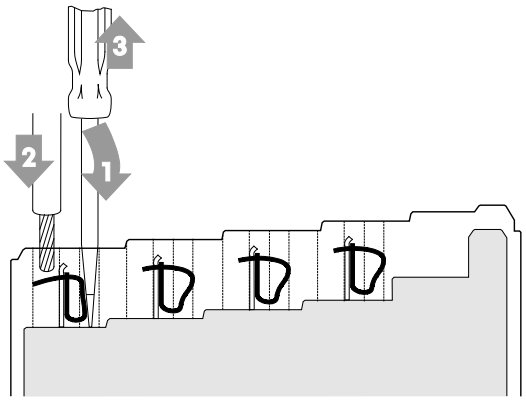

Figure 9: Connecting a Conductor to a CAGE CLAMP®

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.

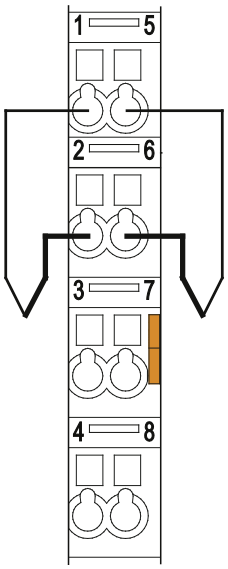

Figure 10: Connection Example

Note

Ensure good grounding practices!
When connecting the thermocouples, good grounding practices must be guaranteed between the machine and the sensors that are connected to the module. Insufficient grounding can lead to common mode voltages, which may distort the measuring result.

Due to the differential inputs, grounded and ungrounded thermocouples can be connected in the following ways.

6.2.1 Grounded Thermocouples

With grounded thermocouples, the common ground (M) can be connected to the screen (S) using an external bridge so that common mode interferences can be eliminated:

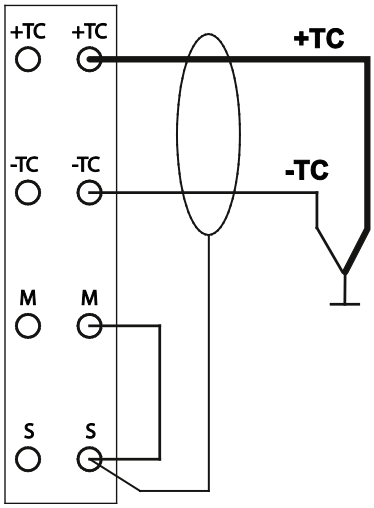

Figure 11: Connection of Grounded Thermocouple

6.2.2 Ungrounded Thermocouples

With ungrounded thermocouples, the common ground (M) can be connected both to the TC input and to the screen (S), if required, using an external bridge so that common mode interferences can be eliminated:

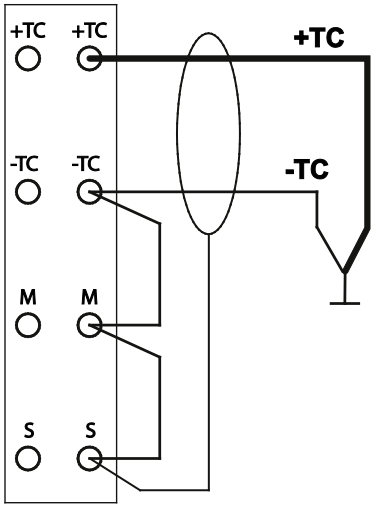

Figure 12: Connection of Ungrounded Thermocouple

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

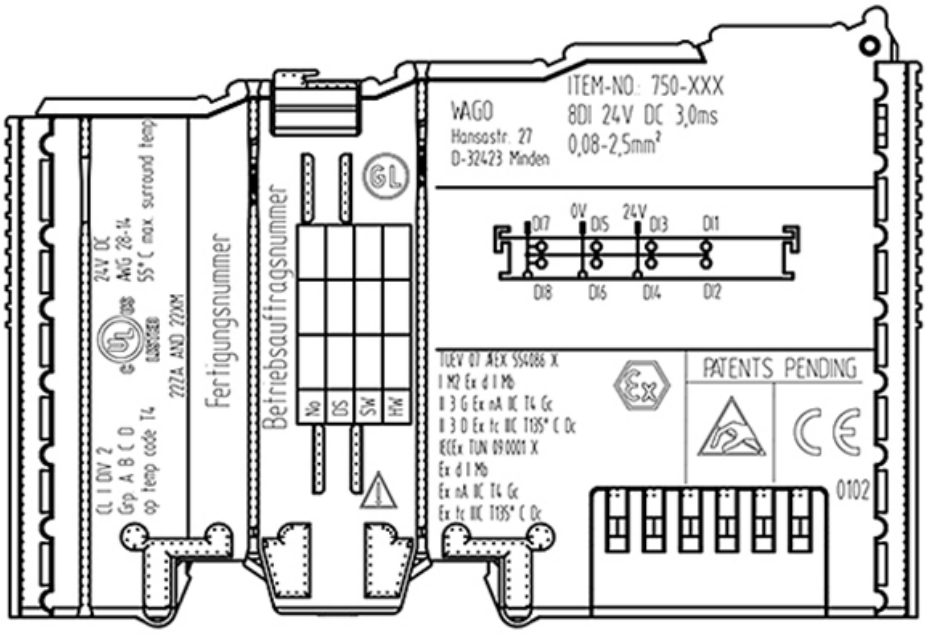

Figure 13: Side Marking Example for Approved I/O Modules According to ATEX and IECEx

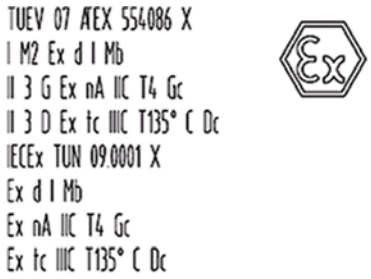

Figure 14: Text Detail – Marking Example for Approved I/O Modules According to ATEX and IECEx.

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

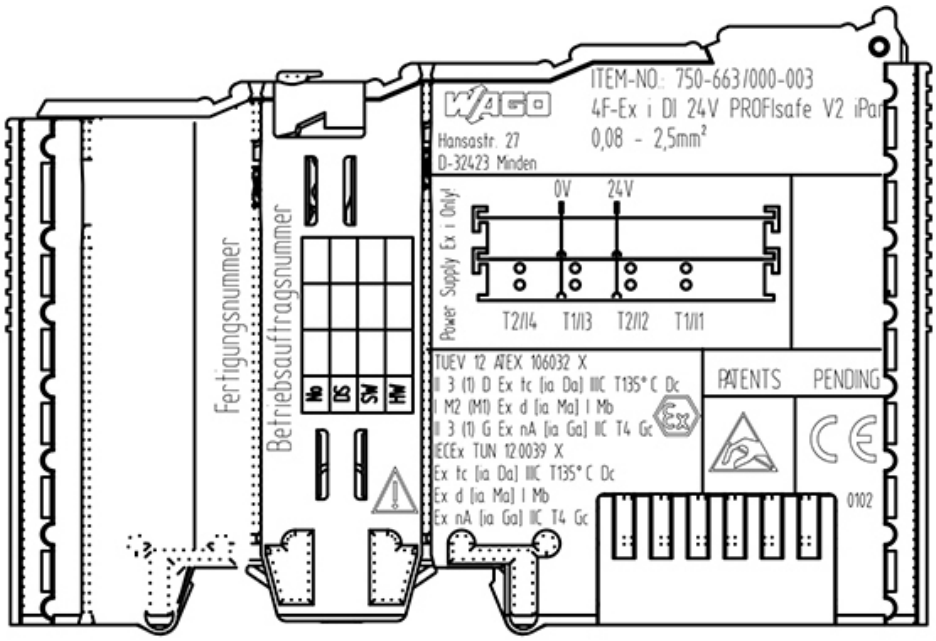

Figure 15: Side Marking Example for Approved Ex i I/O Modules According to ATEX and IECEx.

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 16: 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

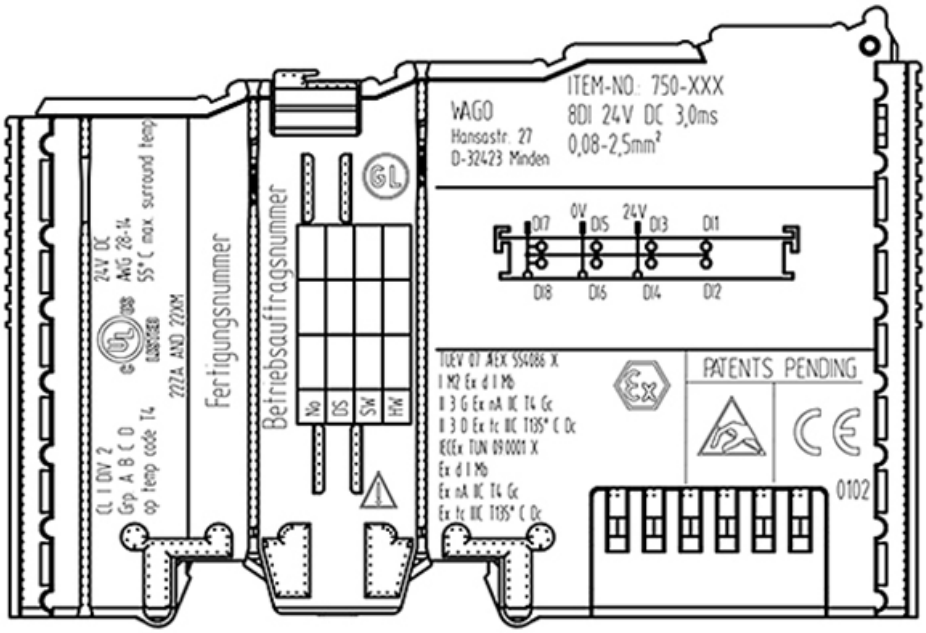

Figure 17: Side Marking Example for I/O Modules According to NEC 500

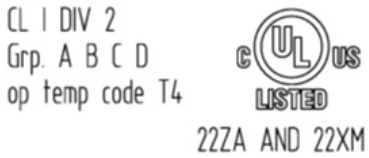

Figure 18: Text Detail – Marking Example for Approved I/O Modules According to NEC 500

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 module750-469 (2AI Thermocouple) and the variant 750-469 (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 TC Configuration

8.1.1.1 PROFIBUS DP 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: PRFOIBUS DP Configuration

GSD Entry		PI-Length/[Byte]		Data Type	Inst.
Module	Sub-Module	I	O		
75x-469 2AI/TC/OCM	n/a	4	n/a	INT16	2
75x-469 2AI/TC/OCM, PRM[1)]					
75x-469 2AI/TC/OCM RA		6	6	{UINT8, INT16}	
75x-469 2AI/TC/OCM RA, PRM[1)]					
PFC 75x-469 2AI/TC/OCM[2)]		n/a	n/a	n/a	n/a

[1)] Only valid for 75x-469 and 75x-469/003-000.
[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: PROFINET IO Configuration

GSD Entry		PI-Length/[Byte]		Data Type	Inst.
Module	Sub-Module	I	O		
75x-469(/0..-000) 2AI, TC	INT16[2] I	4	n/a	INT16	2
	{UINT8, INT16}[2] I/O	6	6	{UINT8, INT16}	

8.1.2 2AI TC 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.

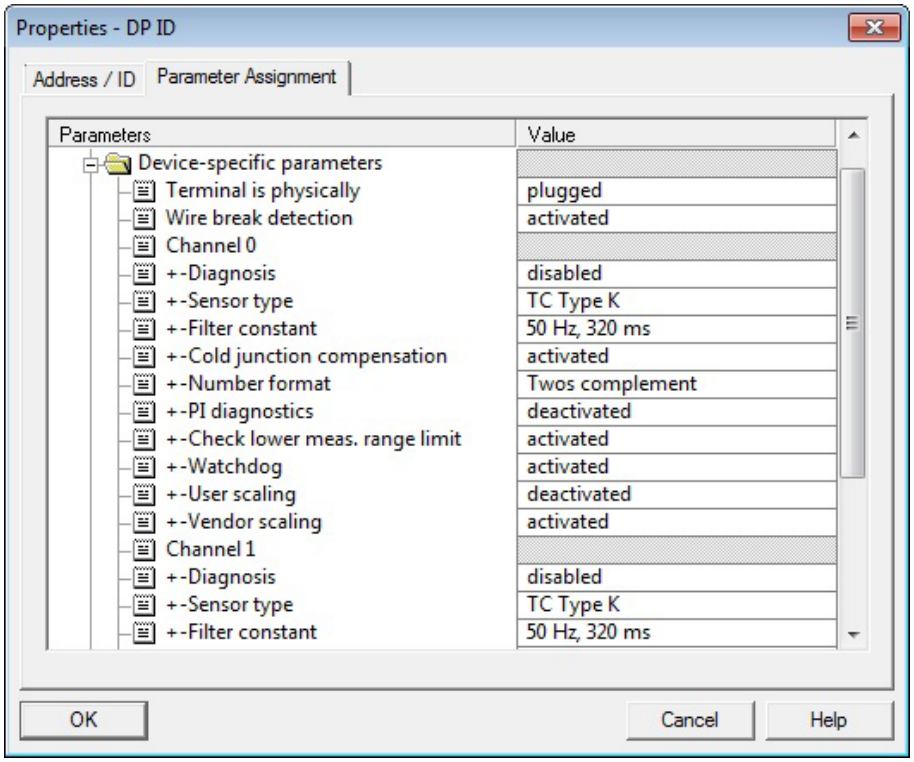

Figure 19: Example of the PROFIBUS DP Fieldbus Couplers/Controllers parameterization dialog

*) Only available for GSD entry „75x-469 2AI/TC/OCM, PRM“ and „75x-469 2AI/TC/OCM RA, PRM“.

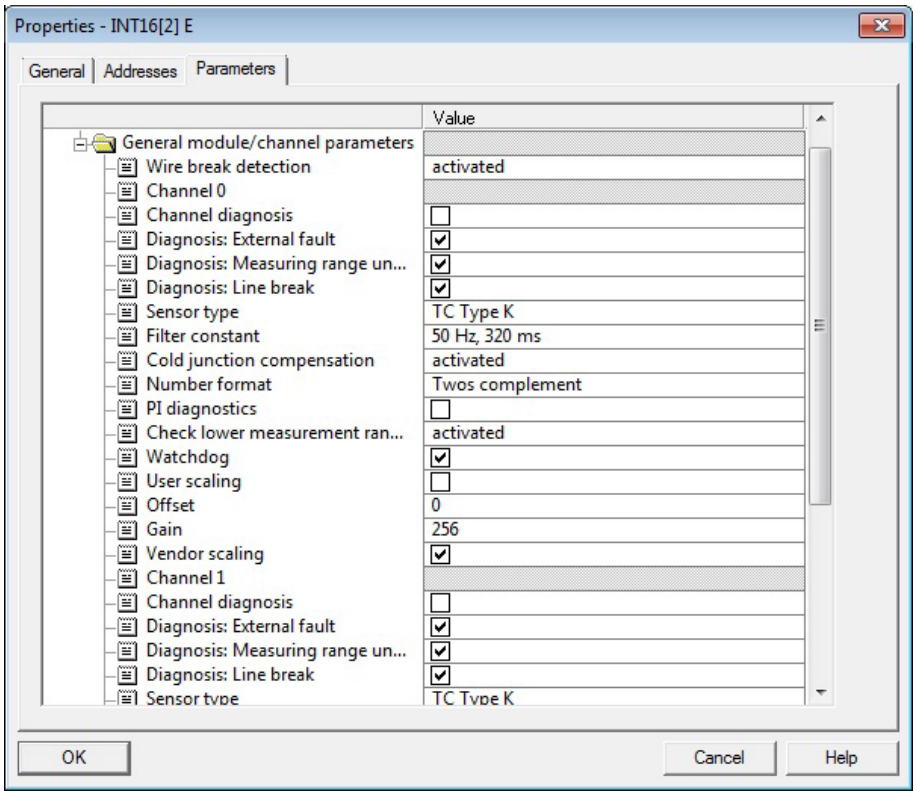

Figure 20: Example of the PROFINET IO Fieldbus Couplers parameterization dialog

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-469/003-000

Parameter	Value	WAGO I/O-*CHECK*	GSD file	
			PB-DP	PN-IO
Sensor type	TC Type L	✓	✓	✓
	TC Type K*)			
	TC Type J			
	TC Type E			
	TC Type T			
	TC Type N			
	TC Type U			
	TC Type B			
	TC Type R			
	TC Type S			
	+/-30 mV			
	+/-60 mV			
	+/-120 mV			
Filter constant	25 Hz, 640 ms	✓	✓	✓
	50 Hz, 320 ms*)			
	100 Hz, 160 ms			
	200 Hz, 80 ms			
Cold junction	activated*)	✓	✓	✓

Table 38: Specific Module/Channel parameters for 75x-469/003-000

Parameter	Value	WAGO I/O-*CHECK*	GSD file	
			PB-DP	PN-IO
	deactivated			
Wire break detection	activated*)	✓	✓	✓
	deactivated			
Number format	Twos complement*)	✓	✓	✓
	Sign magnitude			
PI diagnostics	activated	✓	✓	✓
	deactivated*)			
Check lower measurement range limit	activated*)	✓	✓	✓
	deactivated			
Watchdog	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 couplers/controllers allow module-specific parameterization of behavior at diagnosis.

Table 39: General Module/Channel parameters

Parameter	Value	Explanation
Diagnosis Channel x (x = 0…1)		The fieldbus coupler/controller signals a diagnosis if the I/O module reports the events: • External fault • Measuring range underflow • Wire break
	0 (disabled)*)	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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