

# WAGO-I/O-SYSTEM 750 XTR

## Manual



## 750-469/040-000

### 2AI Thermocouple configurable /XTR

### 2-Channel Analog Input Module for Thermocouples, Configurable /XTR

Version 1.2.0

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

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

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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 750-469/040-000 (2AI Thermocouple configurable /XTR).

The I/O module 750-469/040-000 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](http://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).

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## 1.4 Number Notation

Table 1: 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 2: 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>
<b>Menu</b>	Menu items are marked in bold letters. e.g.: <b>Save</b>
>	A greater-than sign between two names means the selection of a menu item from a menu. e.g.: <b>File &gt; New</b>
<b>Input</b>	Designation of input or optional fields are marked in bold letters, e.g.: <b>Start of measurement range</b>
“Value”	Input or selective values are marked in inverted commas. e.g.: Enter the value “4 mA” under <b>Start of measurement range</b> .
<b>[Button]</b>	Pushbuttons in dialog boxes are marked with bold letters in square brackets. e.g.: <b>[Input]</b>
<b>[Key]</b>	Keys are marked with bold letters in square brackets. e.g.: <b>[F5]</b>



## 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.



### CAUTION

#### **Hot surface!**

The surface of the housing can become hot during operation. If the device was operated at high ambient temperatures, allow it to cool off before touching it.

### 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.

**NOTICE****Perform insulation tests with direct current (DC)!**

Both the supply voltage and control voltage side are capacitively coupled to the DIN rail. If the modules are mounted on the DIN rail, application of an AC voltage between the two potentials can lead to the destruction of the device.

Use only direct current (DC) for insulation testing.

To avoid destroying the device, discharge the device completely before applying the test voltage again.

### 3 Device Description

The 750-469/040-000 analog input module 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 a numeric value proportional to the temperature of the selected thermocouple.

The operating mode can be set by parameterization using the WAGO-I/O-CHECK start-up and diagnostic tool (Item No.: 759-302). The default setting is thermocouple of type K.

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<sup>®</sup> 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 assignment of the connections is described in the “Connectors” section.

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.

The meaning of the LEDs is described in the “Display Elements” section.

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#### Note



##### Use a supply module!

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

---

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#### Note



##### Mixed operation

Mixed operation (standard/XTR modules) within a node is possible when groups of modules are electrically isolated on the field side (i.e., electrically isolated power supply).

---



## Note

### **Increased interference!**

For standard-compliant application in substation instrumentation and control, telecontrol systems, railway technology or shipbuilding certified operation, field-side power supply filter 750-624/040-001 or power supply filter 750-626/040-000 are generally to be used for XTR module groups.

The I/O module can be operated with all fieldbus couplers/controllers of the WAGO-I/O-SYSTEM 750 XTR.

Observe the instructions for mixed operation when used in mixed operation behind standard fieldbus couplers/controllers.

### 3.1 View

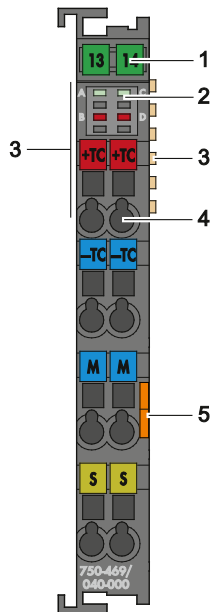


Figure 1: View

Table 3: 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.

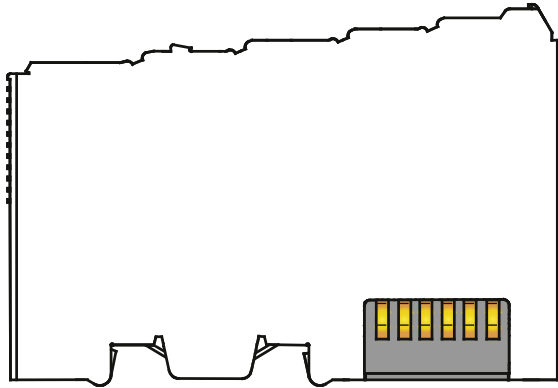


Figure 2: Data Contacts

### 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 750-469/040-000 has no power jumper contacts.

### 3.2.3 CAGE CLAMP® Connectors

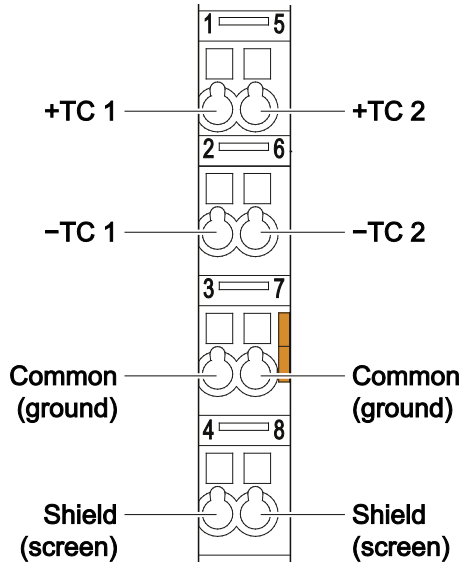


Figure 3: CAGE CLAMP® Connectors

Table 4: 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.

For further information about shielding, see system manual WAGO-I/O-SYSTEM 750 XTR, section “Connect Devices” > ... > “Shielding.”

### 3.3 Display Elements

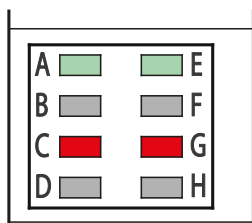


Figure 4: Display Elements

Table 5: 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
	C	Off	Normal operation
		Red	Overrange/underflow of the admissible measuring range, broken wire
2	E	Off	No operational readiness or the internal data bus communication is interrupted
		Green	Operational readiness and trouble-free internal data bus communication
	G	Off	Normal operation
		Red	Overrange/underflow of the admissible measuring range, broken wire

### 3.4 Operating Elements

The I/O module 750-469/040-000 has no operating elements.

### 3.5 Schematic Diagram

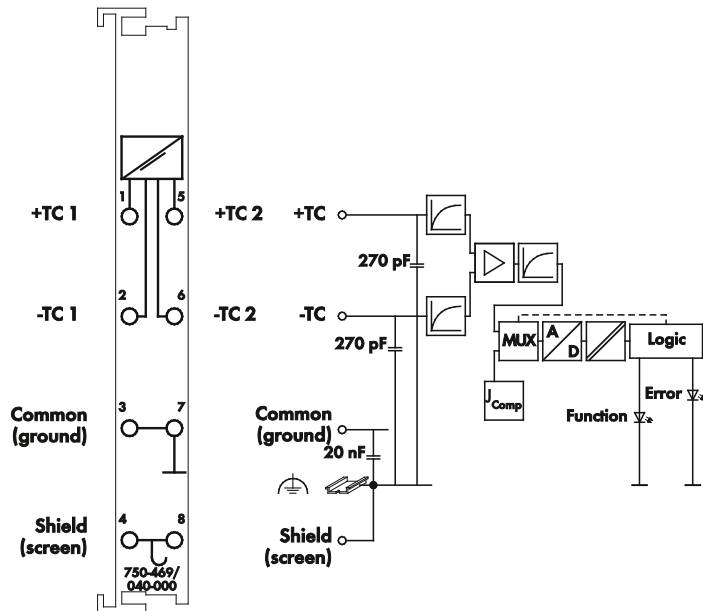


Figure 5: Schematic Diagram

## 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 6: Technical Data – Device

Width	12 mm
Height (from upper edge of DIN 35 rail)	61 mm
Length	100 mm
Weight	38.2 g
Degree of protection	IP20

### 3.6.2 Supply

Table 7: Technical Data – Supply

Current consumption, system voltage <sub>max.</sub> (5 VDC)	65 mA
Current consumption, power jumper contact <sub>typ.</sub> (24 VDC)	---
Current via power jumper contacts <sub>max.</sub>	---
Rated surge voltage	1 kV

### 3.6.3 Communication

Table 8: Technical Data – Communication

Bit width	2 × 16 bits data 2 × 8 bits control/status (optional)
-----------	----------------------------------------------------------

### 3.6.4 Inputs

Table 9: Technical Data – Inputs

Number of inputs	2
Sensor types	type K, -100 °C ... +1370 °C; type J, -100 °C ... +1200 °C; type E, -100 °C ... +1000 °C; type S, -50 °C ... +1700 °C; type T, -100 °C ... +400 °C; type L, -100 °C ... +900 °C; type N, -100 °C ... +1300 °C; type U, -25 °C ... +600 °C; type B, +600 °C ... +1800 °C; type R, 0 °C ... +1700 °C; -30 mV ... +30 mV; -60 mV ... +60 mV; -12 mV ... +120 mV
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 at 25 °C voltage input cold junction compensation	< ±6 K < ±2 K < ±4 K
Temperature coefficient	< ±0.2 K per K
Max. admissible current between the ground contacts 3 and 7	100 mA

### 3.6.5 Connection Type

Table 10: Technical Data – Field Wiring

Wire connection	CAGE CLAMP®
Cross section	0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> / AWG 24 ... 14
Stripped lengths	8 mm ... 9 mm / 0.33 in

Table 11: Technical Data – Power Jumper Contacts

Power jumper contacts	---
Voltage drop at I <sub>max.</sub>	---

Table 12: Technical Data – Data Contacts

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

### 3.6.6 Mechanical Conditions

Table 13: Technical Data – Mechanical Conditions

Vibration resistance	Max. 5g <sup>1)</sup>
----------------------	-----------------------

<sup>1)</sup> Follow the installation instructions

### 3.6.7 Climatic Environmental Conditions

Table 14: Technical Data – Climatic Environmental Conditions

Operating temperature range	-40 °C ... +70 °C
Storage temperature range	-40 °C ... +85 °C
Relative humidity <sup>1)</sup>	95 %
Elevation above sea level	
without temperature derating	0 m ... 2000 m
with temperature derating	2000 m ... 5000 m: 0.5 K per 100 m
max.	5000 m

<sup>1)</sup> Short-term condensation per Class 3K7/IEC EN 60721-3-3 and E DIN 40046-721-3 (except wind-driven precipitation, water and ice formation)

## 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](http://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 750-469/040-000 I/O modules:



Conformity Marking



cUL<sub>US</sub> UL508



Korea Certification MSIP-REM-W43-AIM750

The following Ex approvals have been granted to 750-469/040-000 I/O modules:



cUL<sub>US</sub> ANSI/ISA 12.12.01  
Class I, Div2 ABCD T4

The following Ex approvals are pending for 750-469/040-000 I/O modules:



ATEX

IECEX

The following ship approvals have been granted to 750-469/040-000 I/O modules:



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

The following ship approvals are pending for 750-469/040-000 I/O modules:



ABS (American Bureau of Shipping)





Federal Maritime and Hydrographic Agency



BV (Bureau Veritas)



DNV (Det Norske Veritas) Class B



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

750-469/040-000 I/O modules meet the following standards and guidelines:

Table 15: Climatic and Mechanical Environmental Conditions

Standard	Test Value
<b>Transport</b>	
EN 60870-2-2	Ct2(2k4) (except precipitation / water / moisture)
<b>Mechanical Environmental Conditions</b>	
EN 60870-2-2	Bm
EN 60721-3-1	1M3
EN 60721-3-3	3M5
EN 60068-2-6	Acceleration 5g
IEC 60068-2-27 Shock	15g, 11 ms, 1000 shocks per axis and direction, half-sine
	25g, 6 ms, 1000 shocks per axis and direction, half-sine
EN 50155 EN 61373	Random vibration: Category 1, classes A and B
	Shock 5g, 30 ms: Category 1, classes A and B
Shipbuilding <sup>*)</sup>	Ambient categories A ... D, H (5g, 25 Hz ... 150 Hz)
<b>Climatic Environmental Conditions</b>	
EN 60721-3-1	1K5 (except precipitation and ice formation)
EN 60721-3-3	3K7 (except wind-driven precipitation, water and ice formation)
EN 60870-2-2	C3 (except wind-driven precipitation and ice formation)
Shipbuilding <sup>*)</sup>	Ambient categories A ... D, H (-40 °C ... +70 °C)

<sup>\*)</sup> The list of ship certifications issued is available in the section "Approvals".

The I/O module 750-469/040-000 meets the following EMC standards as these standards relate to the I/O module:

Table 16: EMC – Immunity to Interference

Standard	Test Value
<b>Electrostatic Discharge</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-2</li> <li>• EN 60255-22-2</li> <li>• IEEE C37.90.3</li> </ul>	8 kV (contact discharge) 8 kV (air discharge)
<b>High-frequency Electromagnetic Fields</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-3 + A1: + A2</li> <li>• EN 60255-22-3</li> <li>• IEEE C37.90.2</li> </ul>	20 V/m (80 MHz ... 1 GHz) 10 V/m (1 GHz ... 3 GHz)
<b>Fast Electrical Transient Disturbances / Burst</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-4</li> <li>• EN 60255-22-4</li> <li>• IEEE C37.90.1</li> </ul>	4 kV
<b>Surge Voltage / Surge</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-5</li> <li>• EN 60255-22-5</li> </ul>	1 kV (conductor/conductor) 2 kV (conductor/ground)
<b>Conducted Disturbances, Induced by High-frequency Fields</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-6</li> <li>• EN 60255-22-6</li> </ul>	10 V (150 kHz ... 80 MHz)
<b>Magnetic Fields With Electrical Frequencies</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-8</li> </ul>	300 A/m continuous / 1000 A/m for 1 s
<b>Pulse-shaped Magnetic Fields</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-9 + A1</li> </ul>	300 A/m
<b>Damped Oscillatory Magnetic Fields</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-10 + A1</li> </ul>	100 A/m
<b>Voltage Dips, Short-term Interruptions and Voltage Fluctuations</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-11</li> </ul>	Standard not applicable
<b>Damped Sinusoidal Oscillations</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-12</li> </ul>	1 kV (conductor/conductor) 2 kV (conductor/ground)
<b>Harmonics and Interharmonics</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-13 + A1</li> </ul>	Standard not applicable
<b>Conducted Asymmetric Disturbances</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-16 + A1 + A2</li> </ul>	30 V continuous 300 V for 1 s
<b>Line Frequency Disturbances</b>	
<ul style="list-style-type: none"> <li>• EN 60255-22-7</li> </ul>	Standard not applicable
<b>Alternating Components of the Voltage to DC Line Connections</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-17+A2</li> </ul>	15 %

Table 16: EMC – Immunity to Interference

Standard	Test Value
<b>Damped Oscillatory Waves</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-18 + A1</li> <li>• EN 60255-22-1</li> <li>• IEEE C37.90.1</li> </ul>	1.25 kV conductor/conductor 2.5 kV conductor/ground
<b>Voltage Dips, Short-term Interruptions and Voltage Fluctuations to DC Supply Inputs</b>	
<ul style="list-style-type: none"> <li>• EN 61000-4-29</li> <li>• EN 60255-11</li> </ul>	Standard not applicable
<b>Harmonics</b>	
<ul style="list-style-type: none"> <li>• Shipbuilding<sup>*)</sup></li> </ul>	Standard not applicable

<sup>\*)</sup> The list of ship certifications issued is available in the section “Approvals”.

Table 17: EMC – Emission of Interference

Standard	Test Value <sup>*)</sup>
<b>Enclosure Emission of Interference</b>	
<ul style="list-style-type: none"> <li>• EN 61000-6-3 + A1</li> <li>• EN 55022 Class B</li> </ul>	30 dB( $\mu$ V/m), QP, 30 MHz ... 230 MHz 37 dB( $\mu$ V/m), QP, 230 MHz ... 1 GHz 70 dB( $\mu$ V/m), Peak, 1 GHz ... 3 GHz 50 dB( $\mu$ V/m), AV, 1 GHz ... 3 GHz 74 dB( $\mu$ V/m), Peak, 3 GHz ... 6 GHz 54 dB( $\mu$ V/m), AV, 3 GHz ... 6 GHz
<ul style="list-style-type: none"> <li>• EN 61000-6-4 + A1</li> <li>• EN 60255-26</li> <li>• EN 55011 + A1 Class A</li> <li>• EN 55022 Class A</li> </ul>	40 dB( $\mu$ V/m), QP, 30 MHz ... 230 MHz 47 dB( $\mu$ V/m), QP, 230 MHz ... 1 GHz 76 dB( $\mu$ V/m), Peak, 1 GHz ... 3 GHz 56 dB( $\mu$ V/m), AV, 1 GHz ... 3 GHz 80 dB( $\mu$ V/m), Peak, 3 GHz ... 6 GHz 60 dB( $\mu$ V/m), AV, 3 GHz ... 6 GHz
<ul style="list-style-type: none"> <li>• Shipbuilding<sup>**) (EMC 1)</sup></li> </ul>	80 dB( $\mu$ V/m) ... 50 dB( $\mu$ V/m), QP, 150 kHz ... 300 kHz 50 dB( $\mu$ V/m) ... 34 dB( $\mu$ V/m), QP, 0.3 MHz ... 30 MHz 54 dB( $\mu$ V/m), QP, 30 MHz ... 2 GHz 24 dB( $\mu$ V/m), QP, 156 MHz ... 165 MHz
<ul style="list-style-type: none"> <li>• Shipbuilding<sup>**) (EMC 2)</sup></li> </ul>	80 dB( $\mu$ V/m) ... 50 dB( $\mu$ V/m), QP, 150 kHz ... 30 MHz 60 dB( $\mu$ V/m) ... 54 dB( $\mu$ V/m), QP, 30 MHz ... 100 MHz 54 dB( $\mu$ V/m), QP, 100 MHz ... 2 GHz 24 dB( $\mu$ V/m), QP, 156 MHz ... 165 MHz

Table 17: EMC – Emission of Interference

Standard	Test Value <sup>*)</sup>
<b>Conducted Emission of Interference – Line Connection AC Voltage</b>	
<ul style="list-style-type: none"> <li>• EN 61000-6-3 + A1</li> <li>• EN 55022 Class B</li> </ul>	Standard not applicable
<ul style="list-style-type: none"> <li>• EN 61000-6-4 + A1</li> <li>• EN 55011 + A1 Class A</li> </ul>	Standard not applicable
<b>Conducted Emission of Interference – Line Connection</b>	
• Shipbuilding <sup>**) (EMC 1)</sup>	96 dB(μV) ... 50 dB(μV), 10 kHz ... 150 kHz 60 dB(μV) ... 50 dB(μV), 150 kHz ... 350 kHz 50 dB(μV), 0.35 MHz ... 30 MHz
• Shipbuilding <sup>**) (EMC 2)</sup>	120 dB(μV) ... 69 dB(μV), 10 kHz ... 150 kHz 79 dB(μV), 150 kHz ... 500 kHz 73 dB(μV), 0.5 MHz ... 30 MHz
<b>Conducted Emission of Interference – Line Connection DC Voltage</b>	
<ul style="list-style-type: none"> <li>• EN 61000-6-3 + A1</li> <li>• EN 60255-26</li> <li>• EN 55022 Class A</li> </ul>	79 dB(μV) QP, 0.15 MHz ... 0.5 MHz 66 dB(μV) AV, 0.15 MHz ... 0.5 MHz 73 dB(μV) QP, 0.5 MHz ... 30 MHz 60 dB(μV) AV, 0.5 MHz ... 30 MHz

<sup>\*)</sup> QP = Quasi Peak Detector; AV = Average Detector

<sup>\*\*) If necessary, please find different data in the section “Approval” (regarding approval for EMC 1 or EMC 2).</sup>

## 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 Configurable I/O Module 750-469/040-000

The operating mode of I/O module 750-469/040-000 can be configured using the WAGO-I/O-CHECK commissioning tool. The default setting is Thermocouple Type K.

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

Table 18: Setting Options for I/O Module 750-469/040-000

Selection box	Possible settings	
Sensor Type	L: -100 °C ... +900 °C K: -100 °C ... +1370 °C *) J: -100 °C ... +1200 °C E: -100 °C ... +1000 °C T: -100 °C ... +400 °C S: -50 °C ... +1700 °C N: -100 °C ... +1300 °C U: -25 °C ... +600 °C B: +600 °C ... +1800 °C R: 0 °C ... +1700 °C ±30 mV / ±60 mV / ±120 mV	
Check Lower Range	OFF	Status bit 0 is not used when falling below the measuring range.
	ON <sup>*)</sup>	Status bit 0 is used when falling below the measuring range.
State bits	OFF <sup>*)</sup>	No display of status indicators
	ON	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 Timer	OFF	Watchdog timer not enabled.
	ON <sup>*)</sup>	Watchdog timer enabled. If not process data is exchanged with the fieldbus coupler/controller, the green LEDs go out.
Amount Sign	OFF <sup>*</sup>	Two's complement representation
	ON	Amount/sign representation
Filter Constants	12.5 Hz – 640 ms / 50 Hz – 320 ms *)/ 100 Hz – 160 ms / 200 Hz – 80 ms	
Cold Junction Compensation	OFF	Do not compensate for cold junction temperature
	ON <sup>*)</sup>	Compensate for cold junction temperature
Wire Break Detection	OFF	Wire break monitoring disabled
	ON <sup>*)</sup>	Wire break monitoring enabled
User Scaling	OFF <sup>*)</sup>	User scaling disabled
	ON	User scaling enabled
WAGO Scaling	OFF	WAGO scaling disabled
	ON <sup>*)</sup>	WAGO scaling enabled

<sup>\*)</sup> Default setting

To adjust the offset and gain values of the user and manufacturer scaling, the following input fields are available in WAGO-I/O-CHECK:

Table 19: 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](http://www.wago.com).

## 4.2 Types

The temperature values of the sensors are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).

Table 20: Process Image Type K, With Wire Break Diagnostics

Temperature °C	Numeric value <sup>1)</sup>			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
> approx. 1370.0	'0011.0101.1000.0100'	> 0x3584	> 13700	0x42	ON
Wire break	'0111.1111.1111.1111'	0x7FFF	32767	0x42	ON

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



Table 21: Process Image Type S, With Wire Break Diagnostics

Temperature °C	Numeric value <sup>1)</sup>			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	0x41	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
Wire break	'0111.1111.1111.1111'	0x7FFF	32767	0x42	ON

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

Table 22: Process Image Type T, With Wire Break Diagnostics

Temperature °C	Numeric value <sup>1)</sup>			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
< approx. -100.1	'1111.1100.0001.0111'	0xFC17	-1001	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	0x42	OFF
> 400.0	'0000.1111.1010.0000'	> 0x0FA0	> 4000	0x42	ON
Wire break	'0111.1111.1111.1111'	0x7FFF	32767	0x42	ON

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

Table 23: Process Image Type J, With Wire Break Diagnostics

Temperature °C	Numeric value <sup>1)</sup>			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
< -100	'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
Wire break	'0111.1111.1111.1111'	0x7FFF	32767	0x42	ON

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

Table 24: Process Image Type E, With Wire Break Diagnostics

Temperature °C	Numeric value <sup>1)</sup>			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
Wire break	'0111.1111.1111.1111'	0x7FFF	32767	0x42	ON

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

Table 25: Process Image Type L, With Wire Break Diagnostics

Temperature °C	Numeric value <sup>1)</sup>			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
Wire break	'0111.1111.1111.1111'	0x7FFF	32767	0x42	ON

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

Table 26: Process Image Type N, With Wire Break Diagnostics

Temperature °C	Numeric value <sup>1)</sup>			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
< -100.0	'1111 1100 0001 1000'	0xFC18	-1000	0x41	ON
-100	'1111 1100 0001 1000'	0xFC18	-1000	0x00	OFF
0	'0000 0000 0000 0000'	0x0000	0	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
1000	'0010 0111 0001 0000'	0x2710	10000	0x00	OFF
1200	'0010 1110 1110 0000'	0x2EE0	12000	0x00	OFF
1300	'0011 0010 1100 1000'	0x32C8	13000	0x00	OFF
approx. 1300	'0011 0010 1100 1000'	> 0x32C8	> 13000	0x42	ON
Wire break	'0111 1111 1111 1111'	0x7FFF	32767	0x42	ON

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

Table 27: Process Image Type U, With Wire Break Diagnostics

Temperature °C	Numeric value <sup>1)</sup>			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
< -25.0	'1111 1111 1110 0111'	< 0xFFE7	< -250	0x41	ON
-25	'1111 1111 1110 0111'	0xFFE7	-250	0x00	OFF
0	'0000 0000 0000 0000'	0x0000	0	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
600	'0001 0111 0111 0000'	0x1770	6000	0x00	OFF
approx. 600.0	'0001 0111 0111 0000'	> 0x1770	> 6000	0x42	ON
Wire break	'0111 1111 1111 1111'	0x7FFF	32767	0x42	ON

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

Table 28: Process Image Type B, With Wire Break Diagnostics

Temperature °C	Numeric value <sup>1)</sup>			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
< 600.0	'0001 0111 0111 0000'	< 0x1770	< 6000	0x41	ON
600	'0001 0111 0111 0000'	0x1770	6000	0x00	OFF
700	'0001 1011 0101 1000'	0x1B58	7000	0x00	OFF
800	'0001 1111 0100 0000'	0x1F40	8000	0x00	OFF
900	'0010 0011 0010 1000'	0x2328	9000	0x00	OFF
1000	'0010 0111 0001 0000'	0x2710	10000	0x00	OFF
1300	'0011 0010 1100 1000'	0x32C8	13000	0x00	OFF
1400	'0011 0110 1011 0000'	0x36B0	14000	0x00	OFF
1500	'0011 1010 1001 1000'	0x3A98	15000	0x00	OFF
1600	'0011 0000 0000 0000'	0x3E80	16000	0x00	OFF
1700	'0100 0010 0110 1000'	0x4268	17000	0x00	OFF
1800	'0100 0110 0101 0000'	0x4650	18000	0x00	OFF
Approx. 1800.0	'0100 0110 0101 0000'	> 0x4650	> 18000	0x42	ON
Wire break	'0111 1111 1111 1111'	0x7FFF	32767	0x42	ON

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

Table 29: Process Image Type R, With Wire Break Diagnostics

Temperature °C	Numeric value <sup>1)</sup>			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
< 0	'0000 0000 0000 0000'	< 0x0000	< 0	0x41	ON
0	'0000 0000 0000 0000'	0x0000	0	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
600	'0001 0111 0111 0000'	0x1770	6000	0x00	OFF
1000	'0010 0111 0001 0000'	0x2710	10000	0x00	OFF
1300	'0011 0010 1100 1000'	0x32C8	13000	0x00	OFF
1400	'0011 0110 1011 0000'	0x36B0	14000	0x00	OFF
1500	'0011 1010 1001 1000'	0x3A98	15000	0x00	OFF
1600	'0011 0000 0000 0000'	0x3E80	16000	0x00	OFF
1700	'0100 0010 0110 1000'	0x4268	17000	0x00	OFF
Approx. 1700.0	'0100 0010 0110 1000'	> 0x4268	> 17000	0x42	ON
Wire break	'0111 1111 1111 1111'	0x7FFF	32767	0x42	ON

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

## 4.3 Voltage Measurement (mV)

For the voltage measurement, the input range of  $-120\text{ mV}$  to  $+120\text{ mV}$  is mapped to a value range of  $-18750$  to  $+18750$  at a resolution of  $6.4\text{ }\mu\text{V}$  per digit. Voltage values below  $0\text{ mV}$  are represented in two's complement binary.

Table 30: Process Image mV Measurement  $\pm 120\text{ mV}$ 

Voltage mV	Numeric value <sup>1)</sup>			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
< -120.0	'1011.0110.1100.0010'	0xB6C2	-18750	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	'0100.1001.0011.1110'	0x493E	18750	0x00	OFF
Wire break	'0111.1111.1111.1111'	0x7FFF	32767	0x00	OFF

<sup>1)</sup> Voltage values below  $0\text{ mV}$  are represented in two's complement binary.

For the voltage measurement, the input range of  $-60\text{ mV}$  to  $+60\text{ mV}$  is mapped to a value range of  $-18750$  to  $+18750$  at a resolution of  $3.2\text{ }\mu\text{V}$  per digit.

Table 31: Process Image mV Measurement  $\pm 60\text{ mV}$ 

Voltage mV	Numeric value <sup>1)</sup>			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
< -60.0	'1011.0110.1100.0010'	< 0xB6C2	< -18750	0x00	OFF
-60.0	'1011 0110 1100 0010'	B6C2	-18750	0x00	OFF
-50.0	'1100 0010 1111 0111'	C2F7	-14062	0x00	OFF
-30.0	'1101 1011 0110 0001'	DB61	-9375	0x00	OFF
-10.0	'1111 0011 1100 1011'	F3CB	-4687	0x00	OFF
0.0	'0000 0000 0000 0000'	0000	0	0x00	OFF
10.0	'0000 1100 0011 0101'	0C35	4688	0x00	OFF
30.0	'0010 0100 1001 1111'	249F	9375	0x00	OFF
50.0	'0011 1101 0000 1001'	3D09	14063	0x00	OFF
60.0	'0100 1001 0011 1110'	493E	18750	0x00	OFF
> 60.0	> '0100.1001.0011.1110'	> 0x493E	> 18750	0x00	OFF
Wire break	'0111.1111.1111.1111'	0x7FFF	32767	0x00	OFF

<sup>1)</sup> Voltage values below  $0\text{ mV}$  are represented in two's complement binary.

For the voltage measurement, the input range of  $-30\text{ mV}$  to  $+30\text{ mV}$  is mapped to a value range of  $-18750$  to  $+18750$  at a resolution of  $1.6\text{ }\mu\text{V}$  per digit.

Table 32: Process Image mV Measurement  $\pm 30$  mV

Voltage mV	Numeric value <sup>1)</sup>			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
< -30.0	'0000.0000.0000.0000'	0000	0	0x00	OFF
-30	'1011 0110 1100 0010'	B6C2	-18750	0x00	OFF
-20	'1100 1111 0010 1100'	CF2C	-12500	0x00	OFF
-10	'1110 0111 1001 0110'	E796	-6250	0x00	OFF
-5	'1111 0011 1100 1011'	F3CB	-3125	0x00	OFF
0	'0000 0000 0000 0000'	0000	0	0x00	OFF
5	'0000 1100 0011 0101'	0C35	3125	0x00	OFF
10	'0001 1000 0110 1010'	186A	6250	0x00	OFF
20	'0011 0000 1101 0100'	30D4	12500	0x00	OFF
30	'0100 1001 0011 1110'	493E	18750	0x00	OFF
> 30.0	>'0100.1001.0011.1110'	> 0x493E	> 18750	0x00	OFF
Wire break	'0111.1111.1111.1111'	0x7FFF	32767	0x00	OFF

<sup>1)</sup> Voltage values below 0 mV are represented in two's complement binary.

## 5 Mounting

### 5.1 Mounting Sequence

Fieldbus couplers/controllers and I/O modules of the WAGO-I/O-SYSTEM 750/753 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 750-600/040-000 onto the end of the fieldbus node! You must always use this bus end module at all fieldbus nodes with the WAGO I/O System 750 XTR fieldbus couplers/controllers to guarantee proper data transfer.

For vibration loads > 4g, observe the following installation instructions:

- Use pan-head screws or blind rivets at least every 60 mm (12 mm pin spacing) to secure the DIN rail.
- Make the open conductor length between strain relief and wire connection as short as possible.
- Use the reinforced end stop 249-197.



## 5.2 Inserting and Removing Devices



### CAUTION

#### Hot surface!

The surface of the housing can become hot during operation. If the device was operated at high ambient temperatures, allow it to cool off before touching it.

### 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.

### NOTICE

#### Observe operating temperature!

XTR I/O modules may be operated below  $-20\text{ }^{\circ}\text{C}$ , but not wired and/or reconnected.

### 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.

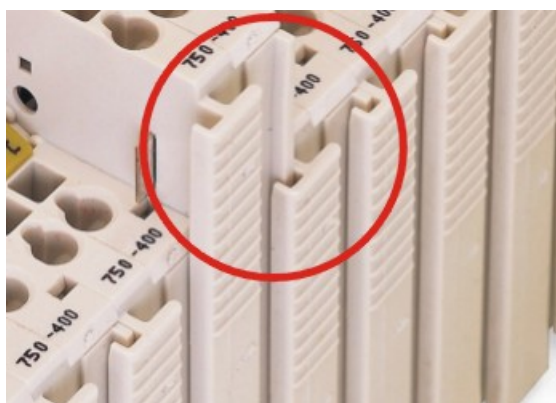


Figure 6: Insert I/O Module (Example)

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

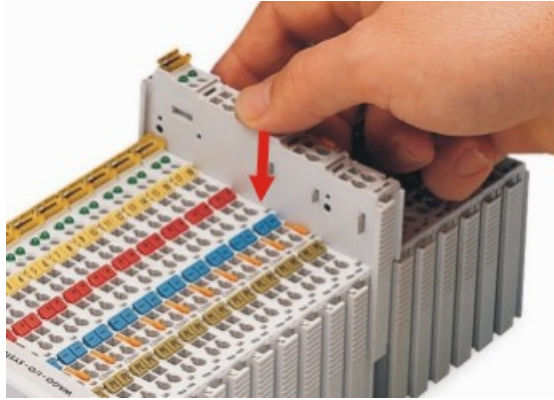


Figure 7: Snap the I/O Module into Place (Example)

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.

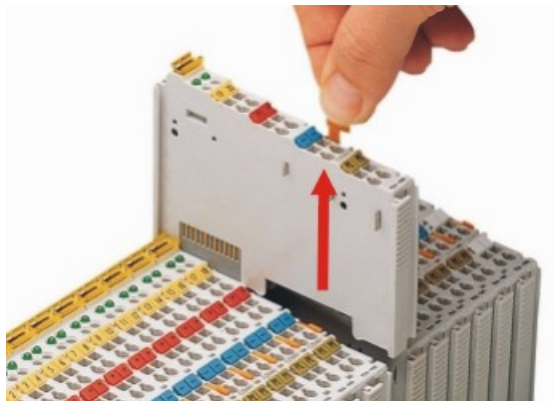


Figure 8: Removing the I/O Module (Example)

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.

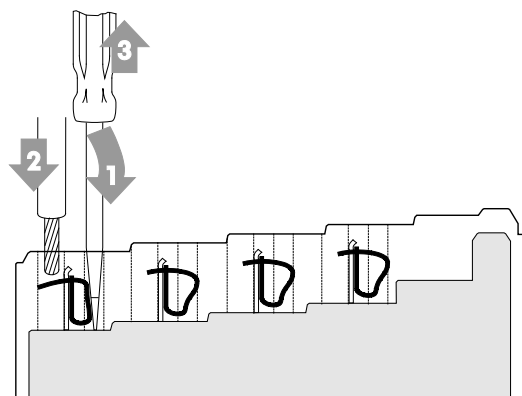


Figure 9: Connecting a Conductor to a CAGE CLAMP®

## 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.

For further information about shielding, see system manual WAGO-I/O-SYSTEM 750 XTR, section “Connect Devices” > ... > “Shielding.”

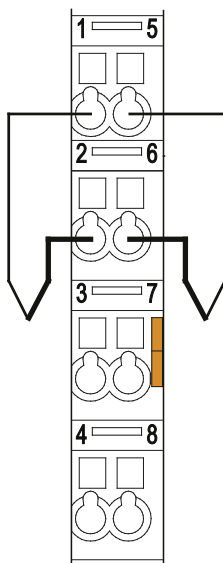


Figure 10: Connection Example

### 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:

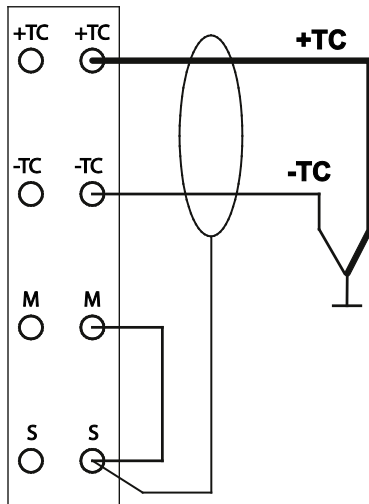


Figure 11: Connection of Grounded Thermocouple

## 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:

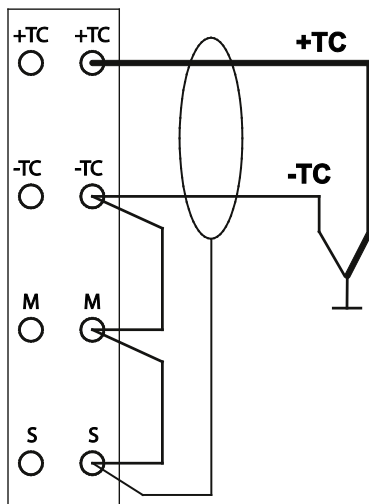


Figure 12: Connection of Ungrounded Thermocouple

## 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

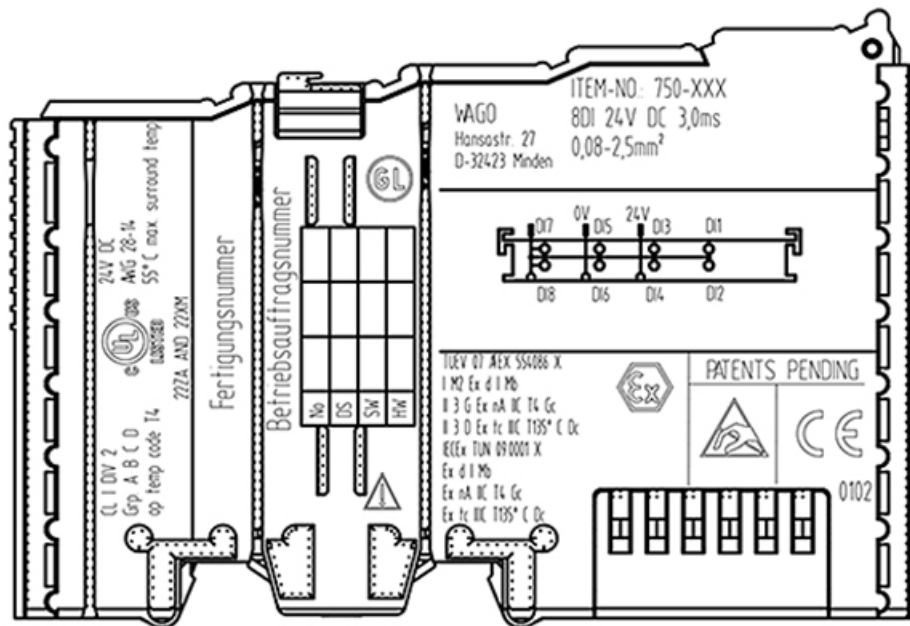


Figure 13: Side Marking Example for Approved I/O Modules According to ATEX and IECEx

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




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

Printing on Text	Description
TÜV 07 ATEX 554086 X IECEx TUN 09.0001 X	Approving authority and certificate numbers
<b>Dust</b>	
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)
<b>Mining</b>	
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
<b>Gases</b>	
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
IIIC	Explosion group of gas and vapours
T4	Temperature class: Max. surface temperature 135°C



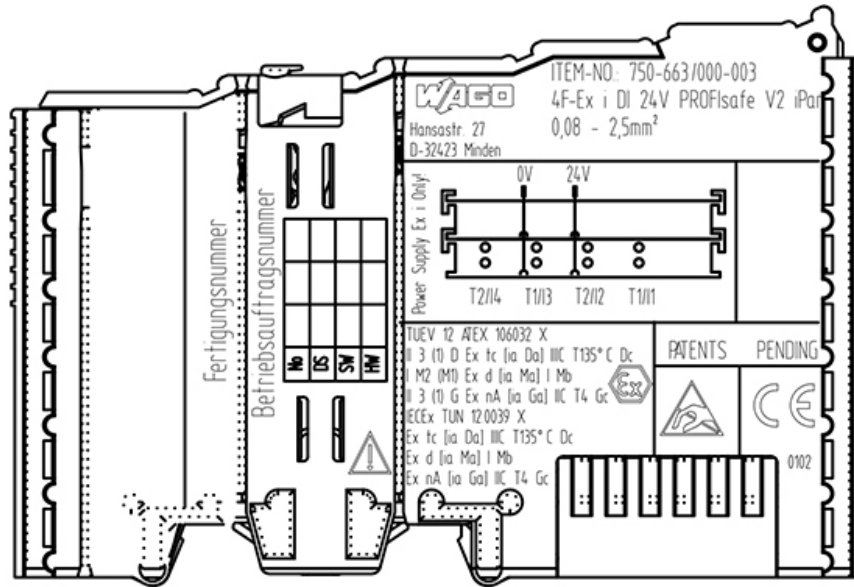


Figure 15: Side Marking Example for Approved Ex i I/O Modules According to ATEX and IECEX.


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

Inscription Text	Description
TÜV 07 ATEX 554086 X IECEx TUN 09.0001X	Approving authority and certificate numbers
TÜV 12 ATEX 106032 X IECEx TUN 12.0039 X	
<b>Dust</b>	
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)
<b>Mining</b>	
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

<b>Gases</b>	
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

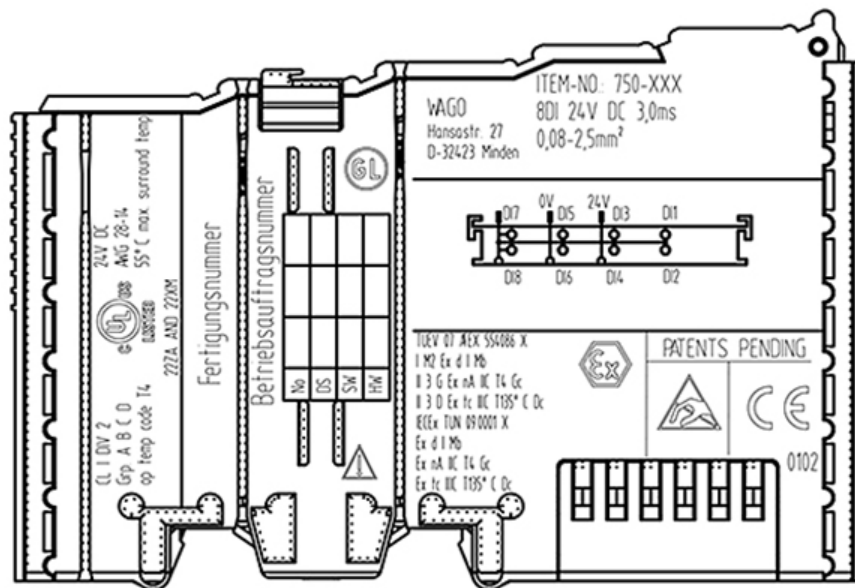


Figure 17: Side Marking Example for I/O Modules According to NEC 500

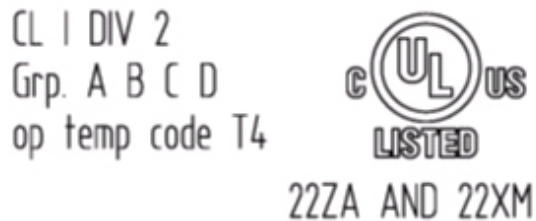


Figure 18: Text Detail – Marking Example for Approved I/O Modules According to NEC 500

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

Printing on Text	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 Conditions for Safe Use (TÜV 14 ATEX 148929 X)

1. The modules of the WAGO-I/O-SYSTEM 750-\*\*\* have to be erected in such a way, that corresponding to EN 60079-15 a degree of protection of at least IP 54 according to EN 60529 is achieved.
2. Measures have to be taken, external to the modules, to provide a transient protection that ensures that the rated voltage, connected to the power supply terminals, is not exceeded by more than 40 %.
3. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted if no explosive atmosphere exists. This although applies for the all switches, interfaces (Fieldbus, Ethernet, Serial) and the SD-card.
4. The ambient temperature range is:  $0\text{ °C} \leq T_{\text{amb}} \leq +60\text{ °C}$   
The ambient temperature range for modules with suffix extension /025-\*\*\*\* is:  $-20\text{ °C} \leq T_{\text{amb}} \leq +60\text{ °C}$

## 7.2.2 Special Conditions for Safe Use (ATEX Certificate TÜV 12 ATEX 106032 X)

1. For use as Gc- or Dc-apparatus (in zone 2 or 22) the Field bus Independent I/O Modules WAGO-I/O-SYSTEM 750-\*\*\* Ex i shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) EN 60079-0, EN 60079-11, EN 60079-15 and EN 60079-31. For use as group I electrical apparatus M2 the apparatus shall be erected in an enclosure that ensures a sufficient protection according to EN 60079-0 and EN 60079-1 and the degree of protection IP64. The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExNB.
2. Measures have to be taken outside of the device that the rating voltage is not being exceeded of more than 40 % because of transient disturbances.
3. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes. The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded.
4. For the type the following shall be considered: The Interface circuits shall be limited to overvoltage category I/II (non mains/mains circuits) as defined in EN 60664-1.

### 7.2.3 Special Conditions for Safe Use (IEC-Ex Certificate TUN 14.0035X)

1. The modules of the WAGO-I/O-SYSTEM 750-\*\*\* have to be erected in such a way, that corresponding to IEC 60079-15 a degree of protection of at least IP 54 according to IEC 60529 is achieved.
2. Measures have to be taken, external to the modules, to provide a transient protection that ensures that the rated voltage, connected to the power supply terminals, is not exceeded by more than 40 %.
3. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted if no explosive atmosphere exists. This although applies for the all switches, interfaces (Fieldbus, Ethernet, Serial) and the SD-card.
4. The ambient temperature range is:  $0\text{ °C} \leq T_{amb} \leq +60\text{ °C}$   
The ambient temperature range for modules with suffix extension /025-\*\*\*\* is:  $-20\text{ °C} \leq T_{amb} \leq +60\text{ °C}$



## 7.2.4 Special Conditions for Safe Use (IEC-Ex Certificate IECEx TUN 12.0039 X)

1. For use as Gc- or Dc-apparatus (in zone 2 or 22) the Field bus independent I/O Modules WAGO-I/O-SYSTEM 750-\*\*\* Ex i shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) IEC 60079-0, IEC 60079-11, IEC 60079-15, IEC 60079-31.  
For use as group I electrical apparatus M2 the apparatus shall be erected in an enclosure that ensures a sufficient protection according to IEC 60079-0 and IEC 60079-1 and the degree of protection IP64.  
The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExCB.
2. Measures have to be taken outside of the device that the rating voltage is not being exceeded of more than 40 % because of transient disturbances.
3. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes.  
The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded.
4. For the type the following shall be considered: The Interface circuits shall be limited to overvoltage category I/II (non mains/mains circuits) as defined in IEC 60664-1.

## 7.2.5 Special Conditions for Safe Use according to ANSI/ISA 12.12.01

- A. “This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.”
- B. “This equipment is to be fitted within tool-secured enclosures only.”
- C. “WARNING Explosion hazard - substitution of components may impair suitability for Class I, Div. 2.”
- D. “WARNING – Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous” has to be placed near each operator accessible connector and fuse holder.
- E. When a fuse is provided, the following information shall be provided: “A switch suitable for the location where the equipment is installed shall be provided to remove the power from the fuse.”
- F. For devices with EtherCAT/Ethernet connectors “Only for use in LAN, not for connection to telecommunication circuits.”
- G. “WARNING - Use Module 750-642 only with antenna module 758-910.”
- H. For Couplers/Controllers and Economy bus modules only: The instructions shall contain the following: “The configuration interface Service connector is for temporary connection only. Do not connect or disconnect unless the area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion.”
- I. Modules containing fuses only: “WARNING - Devices containing fuses must not be fitted into circuits subject to over loads, e.g. motor circuits.”
- J. Modules containing SD card reader sockets only: “WARNING - Do not connect or disconnect SD-Card while circuit is live unless the area is known to be free of ignitable concentrations of flammable gases or vapors.”
- K. The modules 750-439, 750-538, 750-633, 750-663/000-003 shall only be supplied with 750-606 or 750-625/000-001.
- L. Module 750-538 only “In Hazardous Locations, Non-Incendive only when installed per Control Drawing No. 750-538”.

---

### *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.

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# WE! INNOVATE!

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