TECHDOCS

Manual

WAGO-I/O-SYSTEM 750 XTR

750-1405/040-000

16DI 24VDC 3ms XTR

16-Channel Digital Input; 24 V DC; 3 ms; Extreme

Version 1.3.0

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

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

WAGO is a registered trademark of WAGO Verwaltungsgesellschaft mbH.

Table of Contents

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 750-1405/040-000 (16DI 24VDC 3ms XTR).

The I/O module 750-1405/040-000 shall only be installed and operated according to the instructions in this manual, in the system description for the WAGO-I/O-SYSTEM 750 XTR and in the manual for the used fieldbus coupler/controller.

NOTICE

Consider power layout of the WAGO-I/O-SYSTEM 750 XTR!
In addition to these operating instructions, you will also need the system description “Design Notes XTR – Guidelines and Recommendations for Increasing Operational Safety” and 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 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
italic	Names of paths and data files are marked in italic-type. e.g.: *C:\Program Files\WAGO Software*
Menu	Menu items are marked in bold letters. e.g.: **Save**
>	A greater-than sign between two names means the selection of a menu item from a menu. e.g.: **File** > **New**
Input	Designation of input or optional fields are marked in bold letters, e.g.: **Start of measurement range**
“Value”	Input or selective values are marked in inverted commas. e.g.: Enter the value “4 mA” under **Start of measurement range**.
[Button]	Pushbuttons in dialog boxes are marked with bold letters in square brackets. e.g.: **[Input]**
[Key]	Keys are marked with bold letters in square brackets. e.g.: **[F5]**

2 Important Notes

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

2.1 Legal Bases

2.1.1 Subject to Changes

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

2.1.2 Personnel Qualifications

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

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

2.1.3 Use of the 750 Series in Compliance with Underlying Provisions

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

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

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

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

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

2.1.4 Technical Condition of Specified Devices

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

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

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

2.1.4.1 Disposal

2.1.4.1.1 Electrical and Electronic Equipment

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

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

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

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

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

2.1.4.1.2 Packaging

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

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

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

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

2.2 Safety Advice (Precautions)

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

DANGER

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

DANGER

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

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

DANGER

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

DANGER

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

⚠ WARNING

Power from SELV/PELV power supply only!
All field signals and field supplies connected to this XTR I/O module (750-1405/040-000) must be powered from SELV/PELV power supply(s)!

⚠ CAUTION

Do not touch hot surfaces!
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

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

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

Use only direct current (DC) for insulation testing!
Both the system voltage and field voltage side are capacitively coupled to the DIN-rail. If an I/O module is mounted on the DIN-rail, application of an AC voltage between the DIN-rail and at least one of these two potentials can lead to the destruction of the module.
Use only direct current (DC) for insulation testing. To avoid destroying the I/O module, you must discharge it completely before applying the test voltage again.

3 Device Description

The digital input module 750-1405/040-000 (16DI 24VDC 3ms XTR) receives control signals from digital field (e.g. of sensors, transmitters, switches or proximity switches).

The I/O module has 16 input channels, providing a direct connection to 1-wire sensors.
The sensors are connected to the Push-in CAGE CLAMP® connectors DI 1 … DI 16.
The assignment of the connections is described in the “Connectors” section.

Note

Use field side connection modules!
Where required, use the appropriate field side connection modules for power supply to the sensors.

Each input channel has a RC noise rejection filter with a time constant of 3.0 ms.

The I/O module inputs provide high-side switching. If the 24 V potential for field power is switched to an input connection, the signal status for the corresponding input channel is set to “high”.

A green LED indicates the switched status of each channel.
The meaning of the LEDs is described in the “Display Elements” section.

The I/O module 750-1405/040-000 (16DI 24VDC 3ms XTR) receives the 24 V voltage supply for the field level from an upstream I/O module or from the fieldbus coupler/controller via blade-formed power jumper contacts. It then provides these potentials to subsequent I/O modules via spring-formed power jumper contacts.

⚠ WARNING

Power from SELV/PELV power supply only!
All field signals and field supplies connected to this XTR I/O module (750-1405/040-000) must be powered from SELV/PELV power supply(s)!

NOTICE

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

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

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

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

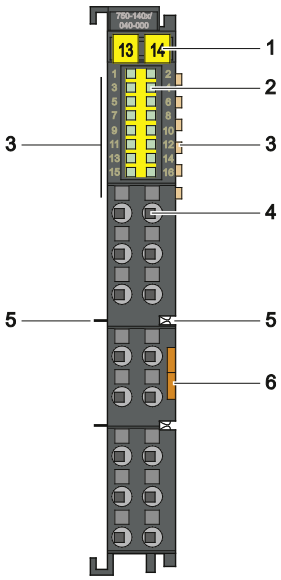

Figure 1: View

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	Push-in CAGE CLAMP® connectors	“Device Description” > “Connectors”
5	Power jumper contacts	“Device Description” > “Connectors”
6	Release tab	“Mounting” > “Inserting and Removing Devices”

3.2 Connectors

3.2.1 Data Contacts/Local Bus

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

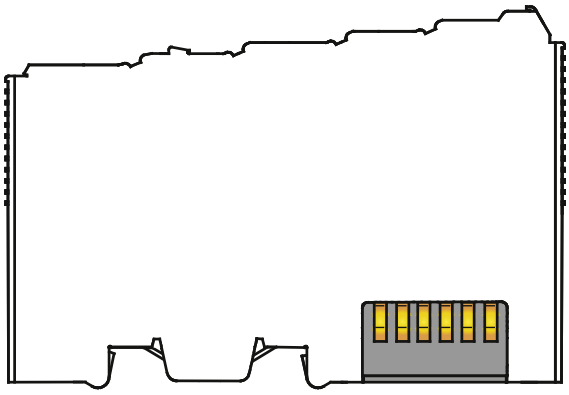

Figure 2: Data Contacts

NOTICE

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

NOTICE

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

3.2.2 Power Jumper Contacts/Field Supply

⚠ WARNING

Power from SELV/PELV power supply only!
All field signals and field supplies connected to this XTR I/O module (750-1405/040-000) must be powered from SELV/PELV power supply(s)!

⚠ CAUTION

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

The I/O module 750-1405/040-000 has 2 self-cleaning power jumper contacts that supply and transmit power for the field side. The contacts on the left side of the I/O module are designed as blade contacts and those on the right side as spring contacts.

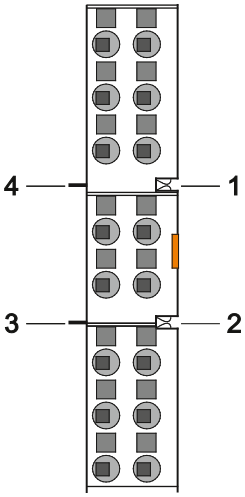

Figure 3: Power Jumper Contacts

Table 4: Legend for Figure “Power Jumper Contacts”

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

NOTICE

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

3.2.3 Push-in CAGE CLAMP® Connectors

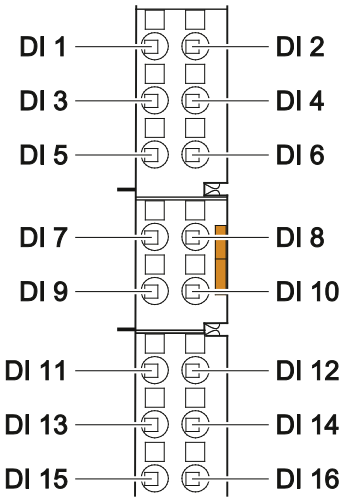

Figure 4: Push-in CAGE CLAMP® Connectors

Table 5: Legend for Figure “Push-in CAGE CLAMP® Connectors”

Channel	Designation	Connector	Function
1	DI 1	1	Input DI 1: Signal voltage
2	DI 2	2	Input DI 2: Signal voltage
			. . .
15	DI 15	15	Input DI 15: Signal voltage
16	DI 16	16	Input DI 16: Signal voltage

3.3 Display Elements

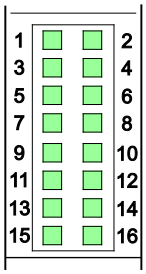

Figure 5: Display Elements

Table 6: Legend for Figure “Display Elements”

Channel	Designation	LED	State	Function
1	State DI 1	1	Off	Input DI 1: Signal voltage (0)
			Green	Input DI 1: Signal voltage (1)
2	State DI 2	2	Off	Input DI 2: Signal voltage (0)
			Green	Input DI 2: Signal voltage (1)
. . .				
15	State DI 15	15	Off	Input DI 15: Signal voltage (0)
			Green	Input DI 15: Signal voltage (1)
16	State DI 16	16	Off	Input DI 16: Signal voltage (0)
			Green	Input DI 16: Signal voltage (1)

3.4 Operating Elements

The I/O module 750-1405/040-000 has no operating elements.

3.5 Schematic Diagram

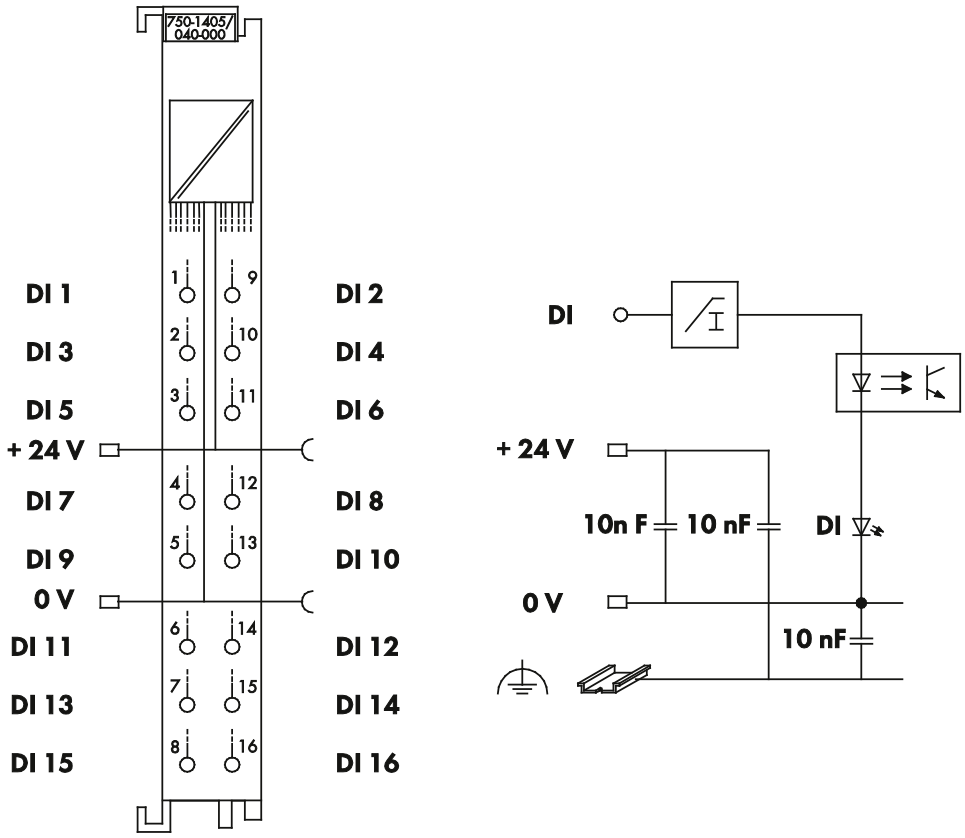

Figure 6: Schematic Diagram

3.6 Technical Data

3.6.1 Device Data

Table 7: Technical Data – Device

Width	12 mm
Height (from upper edge of DIN-rail)	62 mm
Depth	100 mm
Weight	60 g
Degree of protection	IP20

3.6.2 Power Supply

Table 8: Technical Data – Power Supply

Current consumption, system voltage $_{max.}$	Approx. 25 mA
Current consumption, power jumper contact $_{typ.}$ (24 VDC)	---
Voltage supply via power jumper contacts	24 VDC (power supply via SELV/PELV power supply unit)
under laboratory conditions	18 V … 31,2 V (17,4 V … 31,2 V)*)
for ambient operating temperature −40 °C … +55 °C	18 V … 28,8 V (17,4 V … 28,8 V)*)
for ambient operating temperature +55 °C … +70 °C	18 V … 26,4 V (17,4 V … 26,4 V)*)
Current$_{max.}$ via power jumper contacts	10 A
Rated surge voltage	1 kV

*) Including residual ripple of 15 %

3.6.3 Communication

Table 9: Technical Data – Communication

Data width	16 bits

3.6.4 Inputs

Table 10: Technical Data – Inputs

No. of inputs	16
Input type	Type 1 (IEC 61131-2) hide-side switching
Input signal “0”	−3 V … +5 VDC
Input signal “1”	+15 V … +30 VDC
Input current $_{typ.}$	+0.6 mA (at 5 VDC)
	+2.1 mA … +2.4 mA (at 24 VDC)
Input filter	3.0 ms

3.6.5 Connection Type

Table 11: Technical Data – Field Wiring

Wire connection	Push-in CAGE CLAMP®
Cross section	0.25 mm² … 1.5 mm² / AWG 24 … 16
Stripped lengths	8 mm … 9 mm / 0.33 in

Table 12: Technical Data – Power Jumper Contacts

Power jumper contacts	Blade/spring contact, self-cleaning, hard gold plated

Table 13: Technical Data – Data Contacts

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

3.6.6 Mechanical Conditions

Table 14: Technical Data – Mechanical Conditions

Vibration resistance	Max. 5g *

* Follow the installation instructions

3.6.7 Climatic Environmental Conditions

Table 15: Technical Data – Climatic Environmental Conditions

Surrounding air temperature, operation	−40 °C … +70 °C
Surrounding air temperature, storage	−40 °C … +85 °C
Relative humidity *)	95 %
Elevation above sea level without temperature derating with temperature derating max.	 0 m … 2000 m 2000 m … 5000 m: 0.5 K per 100 m 5000 m
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

*) Short-term condensation acc. class 3K7 / IEC EN 60721-3-3 permitted, applying 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 → DOWNLOADS → Documentation → System Description.

The following approvals have been granted to 750-1405/040-000 I/O modules:


Conformity Marking


UL508


Korea Certification MSIP-REM-W43-DIM750

The following Ex approvals have been granted to 750-1405/040-000 I/O modules:


$_{C}UL_{US}$ ANSI/ISA 12.12.01
Class I, Div2 ABCD T4


TÜV 17 ATEX 193969 X
II 3 G Ex ec IIC T4 Gc

IECEx TUN 16.0046X
Ex ec IIC T4 Gc

The following ship approvals have been granted to 750-1405/040-000 I/O modules:


ABS (American Bureau of Shipping)

Temperature:	D (cold test with −40 °C/16 h)
Humidity:	B
Vibration:	B (vibration test with acceleration amplitude 5.0g)
EMC:	B
Enclosure:	A


LR (Lloyd’s Register) Env. 1, 2, 3, 4


PRS (Polski Rejestr Statków)

3.8 Standards and Guidelines

750-1405/040-000 I/O modules meet the following standards and guidelines:

Table 16: Standards and Rated Conditions for Explosion Protection Applications

ATEX acc. Directive 2014/34/EU	
General Requirements	
EN 60079-0:2012 + A11:2013	Group II electrical equipment
Equipment requirements in the types of protection	
EN 60079-7:2015	Electrical equipment in “e” type of protection with “ec” level of protection
EN 60079-15:2010	Electrical equipment in the “n” type of protection with “nC” level of protection
IECEx Certificates of Conformity	
General Requirements	
IEC 60079-0 ed. 6	Group II electrical equipment
Equipment requirements in the types of protection	
EC 60079-7 ed. 5	Electrical equipment in “e” type of protection with “ec” level of protection
IEC 60079-15 ed.4	Electrical equipment in the “n” type of protection with “nC” level of protection

Table 17: Climatic and Mechanical Environmental Conditions and Shipbuilding

Standard	Test Value
Transport	
EN 60870-2-2	Ct2(2k4) (except precipitation/water/moisture)
Mechanical Environmental Conditions	
EN 61850-3	Achieved
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
Environmental Requirements	
EN 61850-3	Achieved
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)
EN 50155	TX (−40 … +70 °C)
Shipbuilding (Mechanical/Climatic Environmental Conditions and EMC)	
Shipbuilding*)	Temperature: D (cold test with −40 °C/16 h) Humidity: B Vibration: B (vibration test with acceleration amplitude 5.0g) EMC: B Enclosure: A

*) The list of ship certifications issued is available in the section “Approvals”.

The I/O module 750-1405/040-000 meets the following EMC standards as these standards relate to the I/O module:

Table 18: EMC – Immunity to Interference

Standard	Test Value
Electrostatic Discharge	
• EN 61000-4-2 • EN 60255-26 • IEEE C37.90.3	8 kV (contact discharge) 8 kV (air discharge)
High-frequency Electromagnetic Fields	
• EN 61000-4-3 • EN 60255-26 • IEEE C37.90.2	20 V/m (80 MHz … 1 GHz) 10 V/m (1 GHz … 3 GHz)
Fast Electrical Transient Disturbances / Burst	
• EN 61000-4-4 • EN 60255-26 • IEEE C37.90.1	4 kV
Surge Voltage / Surge	
• EN 61000-4-5 • EN 60255-26	1 kV (conductor/conductor) 2 kV (conductor/ground)
Conducted Disturbances, Induced by High-frequency Fields	
• EN 61000-4-6 • EN 60255-26	10 V (150 kHz … 80 MHz)
Magnetic Fields With Electrical Frequencies	
• EN 61000-4-8 • EN 60255-26	300 A/m continuous / 1000 A/m for 1 s
Pulse-shaped Magnetic Fields	
• EN 61000-4-9	300 A/m
Damped Oscillatory Magnetic Fields	
• EN 61000-4-10	100 A/m
Voltage Dips, Short-term Interruptions and Voltage Fluctuations	
• EN 61000-4-11 • EN 60255-26	Standard not applicable
Damped Sinusoidal Oscillations	
• EN 61000-4-12	1 kV (conductor/conductor) 2 kV (conductor/ground)
Harmonics and Interharmonics	
• EN 61000-4-13	Standard not applicable
Conducted Asymmetric Disturbances	
• EN 61000-4-16 **)	30 V continuous 300 V for 1 s

Table 18: EMC – Immunity to Interference

Standard	Test Value
Line Frequency Disturbances	
• EN 60255-26[**)]	Class A (150 V conductor/conductor / 300 V conductor/ground)
Alternating Components of the Voltage to DC Line Connections	
• EN 61000-4-17 • EN 60255-26	15 %
Damped Oscillatory Waves	
• EN 61000-4-18 • EN 60255-26 • IEEE C37.90.1	1.25 kV conductor/conductor 2.5 kV conductor/ground
Voltage Dips, Short-term Interruptions and Voltage Fluctuations to DC Supply Inputs	
• EN 61000-4-29 • EN 60255-26	Standard not applicable
Harmonics	
• Shipbuilding[*)]	Max. 2 W DC: 3 V_{eff}, AC: 10 % to 15th harmonic 10 % … 1 % for 15th to 100th harmonic 1 % for 100th to 200th harmonic

[*)] The list of ship certifications issued is available in the section “Approvals”.

[**)] To ensure proper function of inputs in the event of line frequency disturbances in accordance with EN 61000-4-16 or EN 60255-22-7 with respect to the power supply, shielded cables must be used at a cable length of 10 m or more.

Table 19: EMC – Emission of Interference

Standard	Test Value *)
Enclosure Emission of Interference	
• EN 61000-6-3 • EN 55022 Class B	30 dB(µV/m), QP, 30 MHz … 230 MHz 37 dB(µV/m), QP, 230 MHz … 1 GHz 70 dB(µV/m), Peak, 1 GHz … 3 GHz 50 dB(µV/m), AV, 1 GHz … 3 GHz 74 dB(µV/m), Peak, 3 GHz … 6 GHz 54 dB(µV/m), AV, 3 GHz … 6 GHz
• EN 61000-6-4 • EN 60255-26 • EN 55011 Class A • EN 55022 Class A	40 dB(µV/m), QP, 30 MHz … 230 MHz 47 dB(µV/m), QP, 230 MHz … 1 GHz 76 dB(µV/m), Peak, 1 GHz … 3 GHz 56 dB(µV/m), AV, 1 GHz … 3 GHz 80 dB(µV/m), Peak, 3 GHz … 6 GHz 60 dB(µV/m), AV, 3 GHz … 6 GHz
• Shipbuilding**) (Class B)	80 dB(µV/m) …50 dB(µV/m), QP, 150 kHz … 300 kHz 50 dB(µV/m) … 34 dB(µV/m), QP, 0.3 MHz … 30 MHz 54 dB(µV/m), QP, 30 MHz … 2 GHz 24 dB(µV/m), QP, 156 MHz … 165 MHz
• Shipbuilding**) (Class A)	80 dB(µV/m) … 50 dB(µV/m), QP, 150 kHz … 30 MHz 60 dB(µV/m) … 54 dB(µV/m), QP, 30 MHz … 100 MHz 54 dB(µV/m), QP, 100 MHz … 2 GHz 24 dB(µV/m), QP, 156 MHz … 165 MHz
Conducted Emission of Interference – Line Connection AC Voltage	
• EN 61000-6-3 • EN 55022 Class B	Standard not applicable
• EN 61000-6-4 • EN 55011 Class A • EN 50121-3-2	Standard not applicable
Conducted Emission of Interference – Line Connection	
• Shipbuilding**) (Class B)	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**) (Class A)	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

Table 19: EMC – Emission of Interference

Standard	Test Value *)
Conducted Emission of Interference – Line Connection DC Voltage	
• EN 61000-6-3 • EN 60255-26 • EN 55022 Class A	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

*) QP = Quasi Peak Detector; AV = Average Detector

**) If necessary, please find different data in the section “Approval” (regarding approval for EMC A or EMC B).

Table 20: Standards and Rated Conditions for Rail Applications (EN 50155)

	Class / Standard Compliance
4.1 Rated Operating Conditions	
4.1.1 Altitude above sea level	AX (EN 50125-1)
4.1.2 Ambient operating temperature	TX
4.1.3 Shock and vibration	1A and 1B (EN 61373)
4.1.4 Relative humidity	95 % (coated PCBs)
5.1 Power Supply	
5.1.1.1 Master voltage fluctuations	
Minimum voltage	0.725 × U_n
Maximum voltage	1.3 × U_n
5.1.1.2 Power interruptions	S1
5.4 Surge, ESD, Burst Tests	EN 50121-3-2
5.5 EMC (Emission of Interference, Immunity to Interference)	EN 50121-3-2 EN 50121-4 EN 50121-5
9.11 Materials (Fire Protection)	EN 45545-2 Hazard level HL3

WAGO is a company certified in accordance with the IRIS quality standard.

4 Process Image

Table 21: Input Bits 0 … 7

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
DI 8	DI 7	DI 6	DI 5	DI 4	DI 3	DI 2	DI 1

DI 1	Signal state DI 1 – digital input channel 1
DI 2	Signal state DI 2 – digital input channel 2
DI 3	Signal state DI 3 – digital input channel 3
DI 4	Signal state DI 4 – digital input channel 4
DI 5	Signal state DI 5 – digital input channel 5
DI 6	Signal state DI 6 – digital input channel 6
DI 7	Signal state DI 7 – digital input channel 7
DI 8	Signal state DI 8 – digital input channel 8

Table 22: Input Bits 8 … 15

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
DI 16	DI 15	DI 14	DI 13	DI 12	DI 11	DI 10	DI 9

DI 9	Signal state DI 9 – digital input channel 9
DI 10	Signal state DI 10 – digital input channel 10
DI 11	Signal state DI 11 – digital input channel 11
DI 12	Signal state DI 12 – digital input channel 12
DI 13	Signal state DI 13 – digital input channel 13
DI 14	Signal state DI 14 – digital input channel 14
DI 15	Signal state DI 15 – digital input channel 15
DI 16	Signal state DI 16 – digital input channel 16

5 Mounting

5.1 Mounting Sequence

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

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

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

⚠ CAUTION

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

NOTICE

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

Note

Don't forget the bus end module!
Always plug a bus end module 750-600/040-000 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

Do not touch hot surfaces!
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.

⚠ DANGER

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

NOTICE

Temperature range applies to normal operation!
XTR I/O modules may be operated below −20 °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.

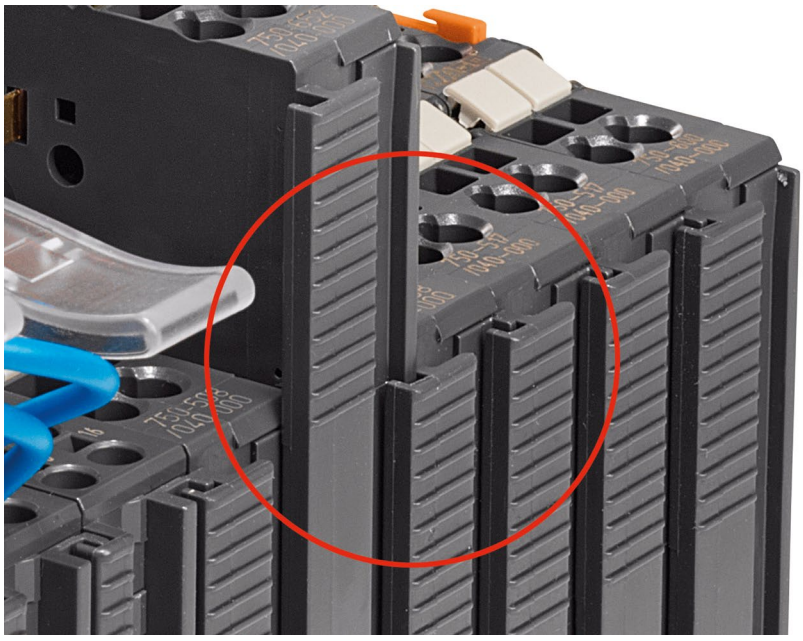

Figure 7: Insert I/O Module (Example)

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

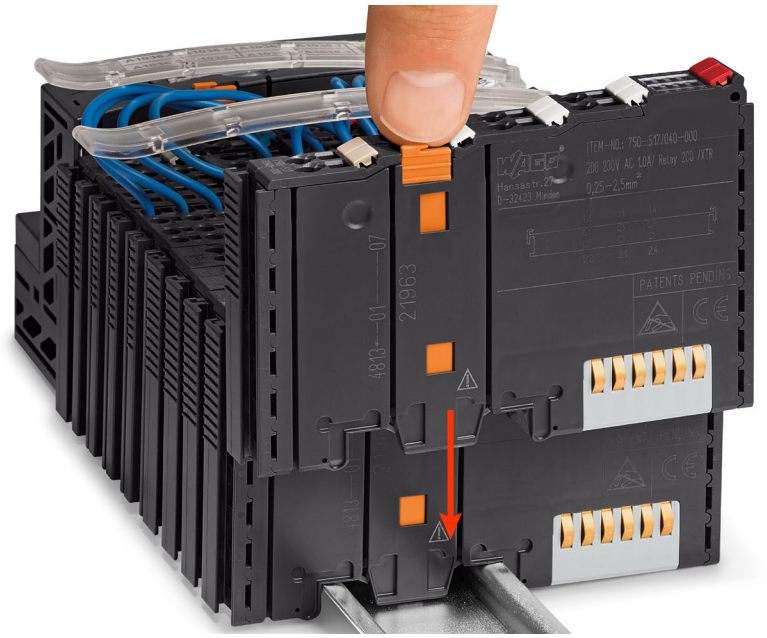

Figure 8: Snap the I/O Module into Place (Example)

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.

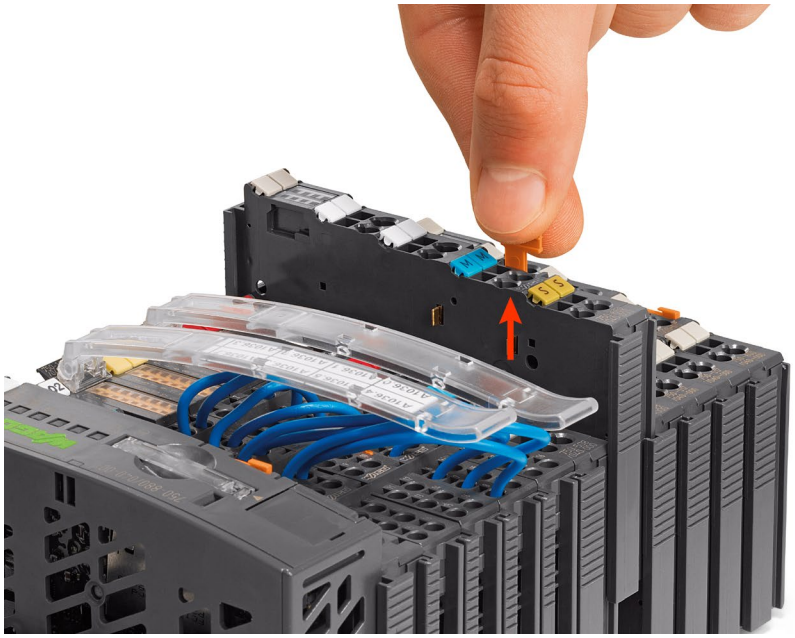

Figure 9: Removing the I/O Module (Example)

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

6 Connect Devices

6.1 Connecting a Conductor to the Push-in CAGE CLAMP®

The Push-in CAGE CLAMP® connection is appropriate for solid, stranded and finely stranded conductors.

Note

Only connect one conductor to each Push-in CAGE CLAMP® connection!
Only one conductor may be connected to each Push-in CAGE CLAMP® connection.
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.

Terminate both solid and stranded or ferruled conductors by simply pushing them in - no tool required. For all other types of conductors, Push-in CAGE CLAMP® must be opened for connection with an operating tool with a 2.5 mm blade (order no. 210-719).

1. To open the Push-in CAGE CLAMP® insert the actuating tool into the opening above the connection.
2. Insert the conductor into the corresponding connection opening.
3. To close the Push-in CAGE CLAMP® simply remove the tool - the conductor is then clamped firmly in place.

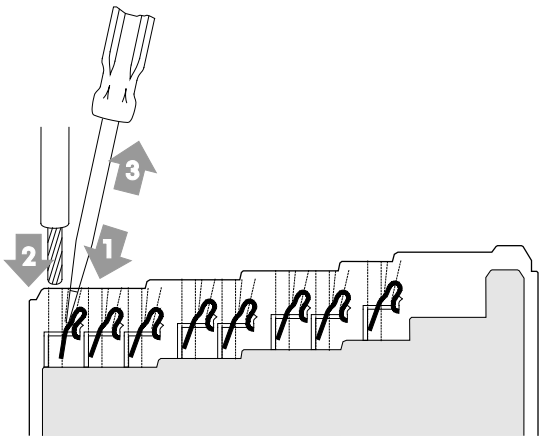

Figure 10: Connecting a Conductor to a Push-in CAGE CLAMP®

7 Use in Hazardous Environments

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

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

7.1 Marking Configuration Examples

7.1.1 Marking for Europe According to ATEX and IECEx

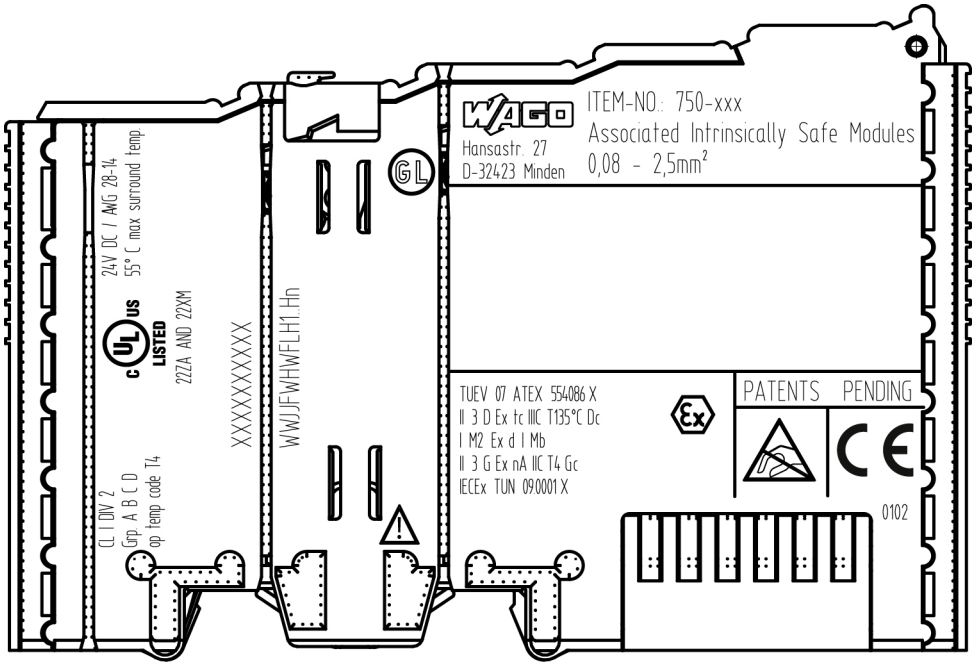

Figure 11: Marking Example According to ATEX and IECEx

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

Figure 12: Text Detail – Marking Example According to ATEX and IECEx

Table 23: Description of Marking Example According to ATEX and IECEx

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

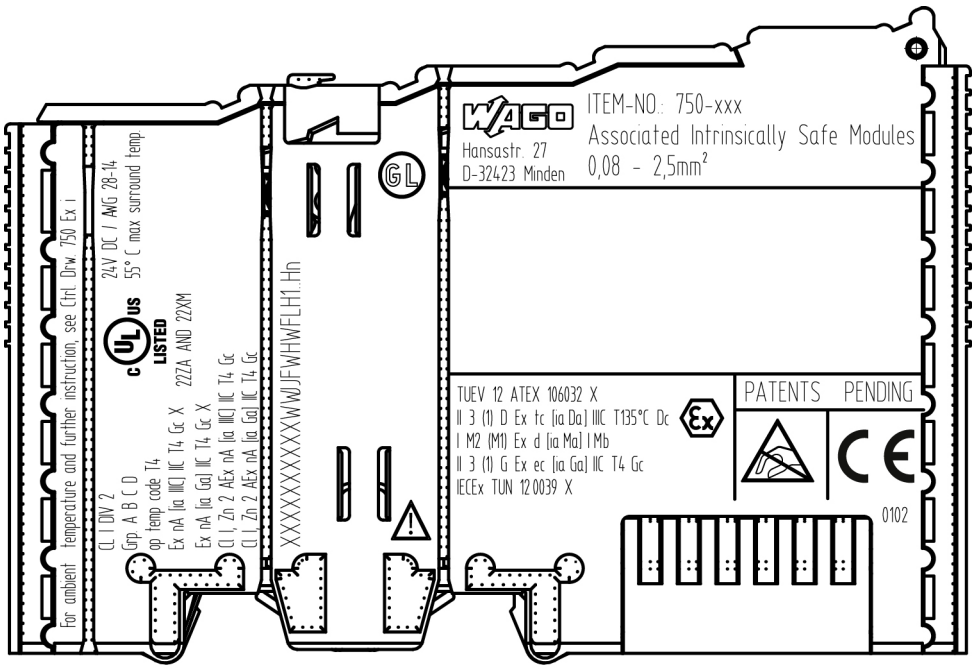

Figure 13: Marking Example for Approved Ex i I/O Module According to ATEX and IECEx

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

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

Table 24: Description of Marking Example for Approved Ex i I/O Module According to ATEX and IECEx

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

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

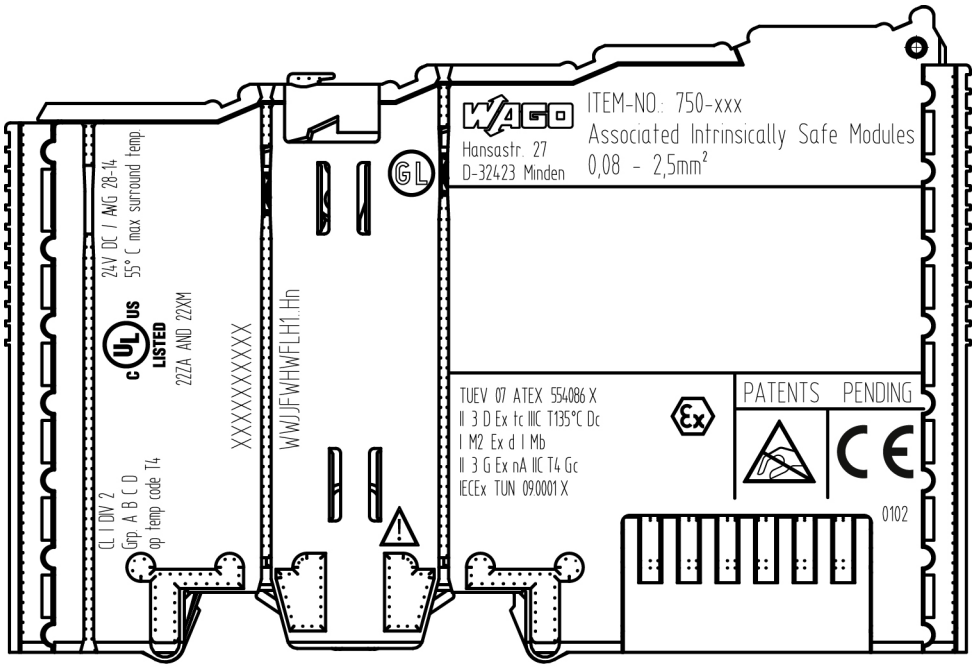

Figure 15: Marking Example According to NEC

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

Figure 16: Text Detail – Marking Example According to NEC 500

Table 25: Description of Marking Example According to NEC 500

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

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

Figure 17: Text Detail – Marking Example for Approved Ex i I/O Module According to NEC 505

Table 26: Description of Marking Example for Approved Ex i I/O Module According to NEC 505

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

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

Figure 18: Text Detail – Marking Example for Approved Ex i I/O Module According to NEC 506

Table 27: Description of Marking Example for Approved Ex i I/O Modules According to NEC 506

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

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

Figure 19: Text Detail – Marking Example for Approved Ex i I/O Modules According to CEC 18 attachment J

Table 28: Description of Marking Example for Approved Ex i I/O Modules According to CEC 18 attachment J

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

7.2 Installation Regulations

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

7.2.1 Special Notes Regarding Explosion Protection

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

WARNING – DO NOT REMOVE OR REPLACE FUSED WHILE ENERGIZED!

WARNING – DO NOT DISCONNECT WHILE ENERGIZED!

WARNING – ONLY DISCONNECT IN A NON-HAZARDOUS AREA!

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

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

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

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

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

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

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

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

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

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

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.

List of Figures

List of Tables

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