WAGO-I/O-SYSTEM 750

Manual

750-633

Up/Down Counter Ex i

Version 1.3.0
HW-Version 03, SW-Version 01

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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.

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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 750-633 (Up/Down Counter Ex i).

The I/O module 750-633 shall only be installed and operated according to the instructions in this manual and in the manual for the used fieldbus coupler/controller.

NOTICE

Consider power layout of the WAGO-I/O-SYSTEM 750!
In addition to these operating instructions, you will also need the manual for the used fieldbus coupler/controller, which can be downloaded at www.wago.com. There, you can obtain important information including information on electrical isolation, system power and supply specifications.

1.2 Copyright

1.3 Symbols

⚠ DANGER

Personal Injury!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ DANGER

Personal Injury Caused by Electric Current!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Personal Injury!
Indicates a moderate-risk, potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Personal Injury!
Indicates a low-risk, potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Damage to Property!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

NOTICE

Damage to Property Caused by Electrostatic Discharge (ESD)!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

Note

Important Note!
Indicates a potential malfunction which, if not avoided, however, will not result in damage to property.

Information

Additional Information:
Refers to additional information which is not an integral part of this documentation (e.g., the Internet).

1.4 Number Notation

Table 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 WAGO-I/O-SYSTEM 750 in Compliance with Underlying Provisions

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

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

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

Appropriate housing (per 2014/34/EU) is required when operating the WAGO-I/O-SYSTEM 750 in hazardous environments. Please note that a prototype test

certificate must be obtained that confirms the correct installation of the system in a housing or switch cabinet.

2.1.4 Technical Condition of Specified Devices

The devices to be supplied ex works are equipped with hardware and software configurations, which meet the individual application requirements. WAGO Kontakttechnik GmbH & Co. KG will be exempted from any liability in case of changes in hardware or software as well as to non-compliant usage of devices.

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

2.2 Safety Advice (Precautions)

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

DANGER

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

DANGER

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

NOTICE

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

NOTICE

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

NOTICE

Clean only with permitted materials!
Clean soiled contacts using oil-free compressed air or with ethyl alcohol and leather cloths.

NOTICE

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

NOTICE

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

NOTICE

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

3 Device Description

The counter module 750-633 (Up/Down Counter Ex i) receives the binary signals from Namur sensors operating in hazardous environments of Zones 0 and 1.

The counter module supports 4 operation modes:

- Operation mode 1: Up-counter with enable input
- Operation mode 2: Up/down counter
- Operation mode 3: Frequency counter with enable input
- Operation mode 4: Peek time counter

The operation mode can be selected via the configuration and commissioning tool WAGO-I/O-*CHECK*.

⚠ WARNING

Installation only in zone 2 or in non-hazardous environments!
The installation of the WAGO-I/O-SYSTEM 750 fieldbus couplers/controllers and I/O modules is only to be done in zone 2 or in non-hazardous environments.

The counter is capable of counting binary pulses at the CLK input (clock). Counting is edge-triggered, i.e. if clock signal changes from I < 1.2 mA to I > 2.1 mA, the counter value will be incremented.

Using the operation modes “Counter with Enable Input” the U/D(GATE) input enables counting. If the input is set (I > 2.1 mA), counting is enabled, if the input is reset (I < 1.2 mA), counting is disabled.

Using operation mode “Up/Down Counter” the U/D(GATE) input determines the counting direction. If the input is set (I > 2.1 mA), the counter counts up, if the input is reset (I < 1.2 mA), the counter counts down. The counter can be set or reset with the control byte.

The digital output DO is activated directly via the control byte or depending on a pre-defined the counter value. The output is short-circuit-protected.

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

Three green status-LED indicate the status of the inputs U/D(GATE) and CLK and of the digital output DO.
Two red error-LED indicate a short circuit or a wire break at the inputs U/D(Gate) and CLK.
The meaning of the LEDs is described in the “Display Elements” section.

The Ex i I/O module receives the 24 V voltage supply for the field level from an upstream Ex i I/O module or from an Ex i power supply module via the power

contacts used as blade contacts. It then provides this potential to subsequent I/O modules via the power contacts used as spring contacts.

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

Any configuration of the I/O module is possible within an intrinsically safe segment when configuring the fieldbus node. An arrangement in groups within the group of potentials is not necessary.

The I/O module 750-633 can be used with all fieldbus couplers/controllers of the WAGO-I/O-SYSTEM 750 (except for the economy types 750-320, -323, -324 and -327).

3.1 View

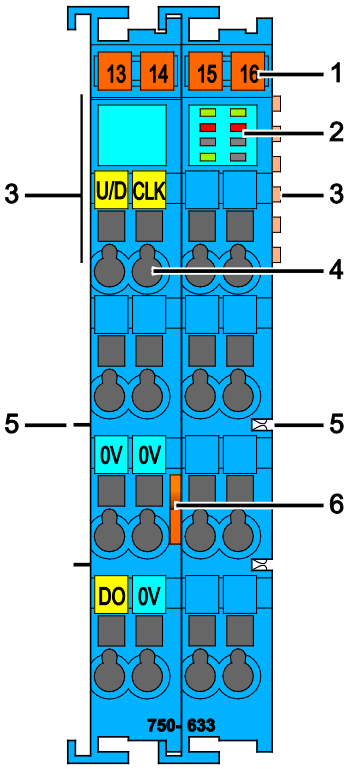

Figure 1: View

Table 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	Power jumper contacts	“Device Description” > “Connectors”
6	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.

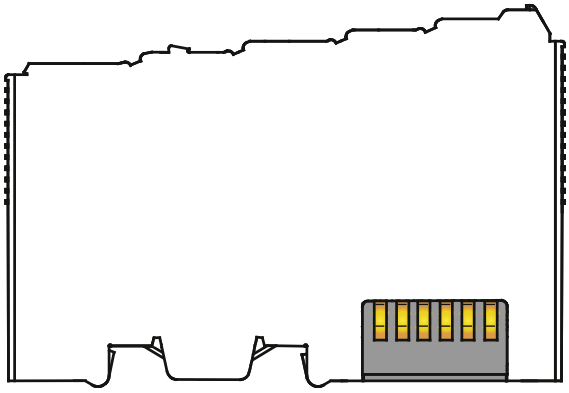

Figure 2: Data Contacts

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

⚠ 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.

The I/O module 750-633 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.

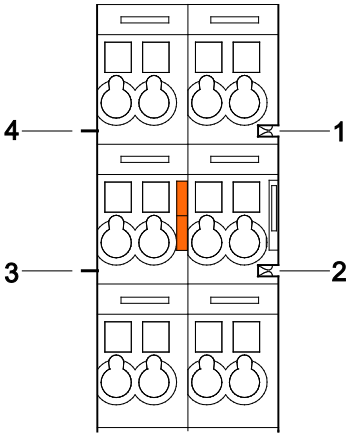

Figure 3: Power Jumper Contacts

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

Note

Do not exceed maximum current via power contacts!
The maximum current available from the 750-606 or 750-625/000-001 Ex-i Supply Module is 1 A.
When configuring the system, ensure that this current is not exceeded.
If exceeded, an additional potential feed module must be used.

3.2.3 CAGE CLAMP® Connectors

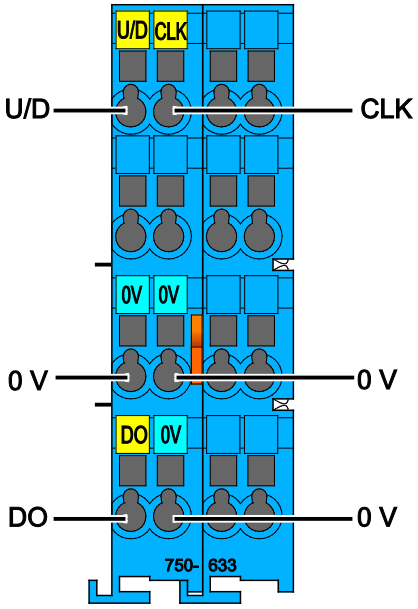

Figure 4: CAGE CLAMP® Connectors

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

Designation	Connector	Function
U/D	1	In mode 2: Direction input Up/Down
		In mode 1 and 3: Enable input Gate
		In mode 4: Gate input
0 V	3+7+8	Field supply 0 V
DO	4	Digital output 24 V
CLK	5	Clock input

Note

Use shielded signal lines!
Only use shielded signal lines for CLK and U/D (GATE) inputs. Only then can you ensure that the specified accuracy and interference immunity can be achieved even in the presence of interference acting on the signal cable.

3.3 Display Elements

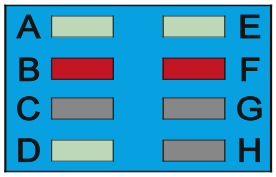

Figure 5: Display Elements

Table 6: Legend for Figure “Display Elements”

LED	Designation	State	Function
A	State U/D (GATE)	Off	No active signal at input U/D (GATE)
		Green	Active signal at input U/D (GATE)
B	Error U/D (GATE)	Off	No error at input U/D (GATE) or diagnostics not active
		Red	Error at input U/D (GATE) short circuit or wire break
D	State DO	Off	Output not active (0 V)
		Green	Output active (+24 V)
E	State CLK	Off	No active signal at input CLK
		Green	Active signal at input CLK
F	Error CLK	Off	No error at input CLK or diagnostics not active
		Red	Error at input CLK short circuit or wire break

3.4 Operating Elements

The I/O module 750-633 has no operating elements.

3.5 Schematic Diagram

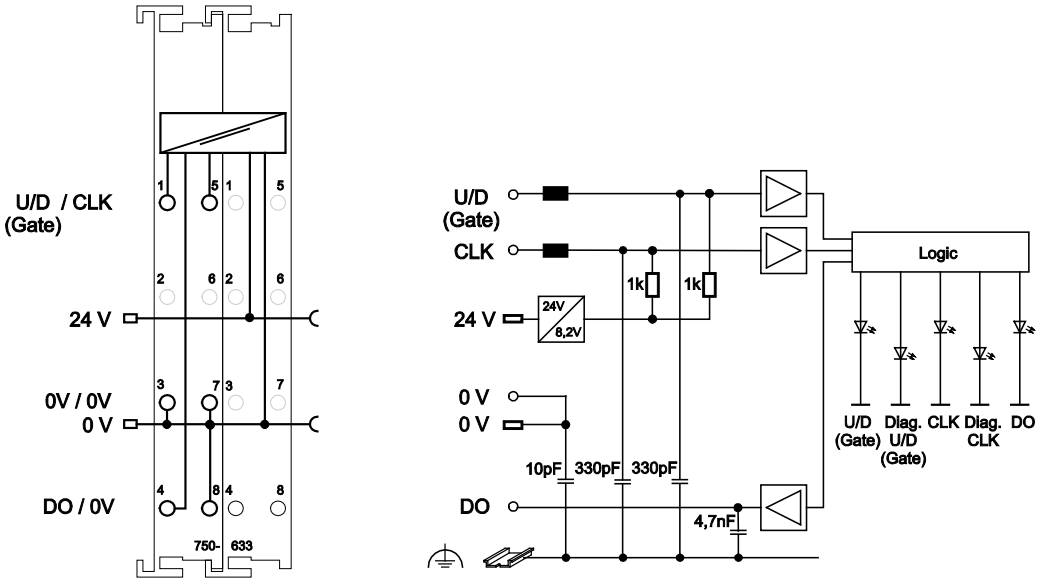

Figure 6: Schematic Diagram

3.6 Technical Data

3.6.1 Device Data

Table 7: Technical Data – Device

Wide	24 mm
Height (from upper edge of 35 DIN rail)	64 mm
Depth	100 mm
Weight	Approx. 85 g

3.6.2 Supply

Table 8: Technical Data – Supply

Voltage supply	Via system voltage terminal bus (5 V DC) and power jumper contacts (24 V DC, Supply via Ex i-supply module)
Current consumption typ. (internal) (5 V DC)	25 mA
Current input power contacts max. (24 V DC)	31 mA + sensor load + actuator load
Voltage via power jumper contacts	24 V DC (supply via Ex i-supply module)
Current via power contacts max.	1000 mA (supply via Ex i-supply module)
Power consumption $P_{max.}$	2.2 W (sensor load: 8,2 mA + actuator load: 45 mA)
Power loss P_V	1.7 W (sensor load: 8,2 mA + actuator load: 45 mA)
Isolation	300 VAC system/supply

3.6.3 Communication

Table 9: Technical Data – Communication

Internal bit width (terminal bus)	32 bits data, 8 bits control/status

3.6.4 Counter

Table 10: Technical Data – Counter

Number of counters	1
Operation modes	1: Counter with gate input 2: Up/down counter 3: Frequency counter with gate input 4: Peak time counter
Switching rate	20 Hz … 50 kHz
Counter depth	32 bits

3.6.5 Inputs

Table 11: Technical Data – Inputs

No. of inputs	2 • U/D(GATE) • CLK
Sensor supply U_V	DC 8.2 V
Signal current (0)	≤ 1.2 mA
Signal current (1)	≥ 2.1 mA
Switching hysteresis	0.2 mA
Input filter	10 µs
Input on-time	≥ 10 µs
Input off-time	≥ 10 µs
Input resistance	1 kΩ
Short-circuit current	8.2 mA (+5 % … -5 %)
Open-circuit voltage	DC 8.2 V

3.6.6 Outputs

Table 12: Technical Data – Outputs

No. of outputs	1 (DO)
Open-circuit voltage	DC 24 V
Internal resistance	285 Ω (+5 % … -5 %)

3.6.7 Explosion Protection Inputs

Table 13: Technical Data – Explosion Protection Inputs

Voltage supply via power jumper contacts (LK1, LK2)		U_i = 27.3 V P_{max} = 3 W	
Interface circuit (K-Bus)		U_n = 5 V U_m = 253 V	
Safety data electric circuit U/D, CLK Cage Clamp 1, 3; 5, 7		U_0 = 12 V I_0 = 13.5 mA P_0 = 40.5 mW Characteristic line: linear	
Reactance without consideration of the simultaneousness		L_0	C_0
	Ex ia IIC	100 mH	1.4 µF
	Ex ia IIB	100 mH	9 µF
	Ex ia IIA	100 mH	36 µF
	Ex ia I	100 mH	35 µF
Reactance with consideration of the simultaneousness		L_0	C_0
	Ex ia IIC	0.05 mH	1.4 µF
		1.0 mH	0.78 µF
		10.0 mH	0.49 µF
		50.0 mH	0.36 µF
		100.0 mH	0.3 µF
	Ex ia IIB	0.02 mH	6.6 µF
		1.0 mH	4.3 µF
		10.0 mH	2.5 µF
		50.0 mH	1.9 µF
		100.0 mH	1.7 µF
	Ex ia IIA	0.01 mH	27 µF
		0.05 mH	14 µF
		0.2 mH	9 µF
		1.0 mH	5.8 µF
		5.0 mH	4.1 µF
	Ex ia I	0.01 mH	34 µF
		0.05 mH	17 µF
		0.2 mH	11 µF
		1.0 mH	7.3 µF
		5.0 mH	5.2 µF

3.6.8 Explosion Protection Outputs

Table 14: Technical Data – Explosion Protection Outputs

Voltage supply via power jumper contacts (LK1, LK2)		U_i = 27.3 V P_{max} = 3 W	
Interface circuit (K-Bus)		U_n = 5 V U_m = 253 V	
Safety data electric circuit		U_0 = 27.3 V I_0 = 103 mA P_0 = 703 mW Characteristic line: linear	
Reactance without consideration of the simultaneousness		L_0	C_0
	Ex ia IIC	0.5 mH	88 nF
	Ex ia IIB	10 mH	683 nF
	Ex ia IIA	18 mH	2.2 µF
	Ex ia I	26 mH	3.6 µF
Reactance with consideration of the simultaneousness		L_0	C_0
	Ex ia IIC	0.2 mH	87 nF
		0.5 mH	68 nF
	Ex ia IIB	0.1 mH	0.68 µF
		0.2 mH	0.58 µF
		0.5 mH	0.44 µF
		1 mH	0.36 µF
		10 mH	0.26 µF
	Ex ia IIA	0.1 mH	0.98 µF
		0.2 mH	0.8 µF
		0.5 mH	0.61 µF
		1 mH	0.52 µF
		10 mH	0.45 µF
	Ex ia I	0.01 mH	2.6 µF
		0.05 mH	1.5 µF
		0.2 mH	1.0 µF
		1.0 mH	0.67 µF
		5.0 mH	0.62 µF

3.6.9 Connection Type

Table 15: Technical Data – Field Wiring

Wire connection	CAGE CLAMP®
Cross section	0.08 mm² … 2.5 mm², AWG 28 … 14
Stripped lengths	8 mm … 9 mm / 0.33 in

Table 16: Technical Data – Power Jumper Contacts

Power jumper contacts	Blade/spring contact, self-cleaning

Table 17: Technical Data – Data Contacts

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

3.6.10 Climatic Environmental Conditions

Table 18: Technical Data – Climatic Environmental Conditions

Operating temperature range	0 °C … 55 °C
Storage temperature range	−25 °C … +85 °C
Relative humidity without condensation	Max. 95 %
Resistance to harmful substances	Acc. to IEC 60068-2-42 and IEC 60068-2-43
Maximum pollutant concentration at relative humidity < 75 %	$SO_2 \leq 25$ ppm $H_2S \leq 10$ ppm
Special conditions	Ensure that additional measures for components are taken, which are used in an environment involving: – dust, caustic vapors or gases – ionizing radiation

3.7 Approvals

Information

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

The following approvals have been granted to 750-633 I/O modules:

CE Conformity Marking

cULus UL E175199 for use in Ordinary Location

KC Korea Certification MSIP-REM-W43-CTM750

The following Ex approvals have been granted to 750-633 I/O modules:

TÜV 12 ATEX 106032 X

Ex
I M2 (M1) Ex d [ia Ma] I Mb
II 3 (1) G Ex ec [ia Ga] IIC T4 Gc
II 3 (1) D Ex tc [ia Da] IIIC T135°C Dc

IECEx TUN 12.0039 X

Ex d [ia Ma] I Mb
Ex ec [ia Ga] IIC T4 Gc
Ex tc [ia Da] IIIC T135°C Dc

TÜV 14.1911 X

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

cULus UL E480271 for Use in Zone Classified Hazardous Locations
Cl I Zn 2 AEx nA [ia Ga] IIC T4 Gc
Cl I Zn 2 AEx nA [ia IIIC] IIC T4 Gc
Ex nA [ia Ga] IIC T4 Gc X
Ex nA [ia IIIC] IIC T4 Gc X

cULus UL E198726 for Use in Hazardous Locations
Cl I, Div 2, Group A, B, C, D, T4

The following ship approvals have been granted to 750-633 I/O modules:

	Federal Maritime and Hydrographic Agency	
	GL (Germanischer Lloyd)	Cat. A, B, C, D (EMC 1)

3.8 Standards and Guidelines

750-633 I/O modules meet the following standards and guidelines:

EU Directive	2014/34/EU
Explosive atmosphere Devices – General requirements	EN 60079-0
Explosive atmosphere Equipment protection by increased safety "e"	IEC 60079-7
Explosive atmosphere Equipment protection by intrinsic safety “I”	EN 60079-11
Explosive atmosphere Equipment with equipment protection level (EPL) Ga	EN 60079-26
Explosive atmosphere Equipment dust ignition protection by enclosure “t”	EN 60079-31
Explosive atmospheres General requirements	IEC 60079-0
Explosive atmosphere Equipment protection by increased safety "e"	IEC 60079-7
Explosive atmospheres Equipment protection by intrinsic safety "i"	IEC 60079-11
Explosive atmospheres Equipment with equipment protection level (EPL) Ga	IEC 60079-26
Explosive atmospheres Equipment dust ignition protection by enclosure “t”	IEC 60079-31
Explosive atmospheres General requirements	UL 60079-0
Explosive atmospheres Equipment protection by intrinsic safety "i"	UL 60079-11
Explosive atmospheres Equipment protection by type of protection “n”	UL 60079-15
Explosive atmospheres Equipment - General requirements	CAN/CSA-C22.2 No. 60079-0

Explosive atmospheres Equipment Protection by Intrinsic Safety "i"	CAN/CSA-C22.2 No. 60079-11
Explosive atmospheres Equipment Protection by Intrinsic Safety "n"	CAN/CSA-C22.2 No. 60079-15
UL Standard for Safety – for Industrial Control Equipment	UL 508
American National Standard – for Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III. Division 1 and 2 Hazardous (Classified) Location	ANSI/ISA 12.12.01
EU EMC Directive	2014/30/EU
EMC CE-Immunity to interference	EN 61000-6-2 and to EN 61131-2
EMC CE-Emission of interference	EN 61000-6-3 + A1 and IEC 61131-2
EMC marine applications-Emission of interference	acc. to DNV GL
EMC marine applications-Immunity to interference	acc. to DNV GL

4 Process Image

Note

Mapping of process data in the process image of fieldbus systems
The representation of the process data of some I/O modules or their variants in the process image depends on the fieldbus coupler/controller used. Please take this information from the section “I/O Modules” included in the description concerning the process image of the corresponding coupler/controller.

The Up/Down Counter 750-633 provides 5 bytes of input and output process image to the fieldbus coupler/controller via 1 logical channel.

The meaning of the input and output data depends on the operating mode set.

4.1 Operating Mode 1 – Up Counter with Enable Input and Operating Mode 2 – Up/Down Counter with U/D Input

The counter setting value to be set is stored in binary format in the 4 output bytes ((D0 ... D3). In the 4 input bytes ((D0 ... D3), the value of the counter is stored in binary format. Control byte C0 is used to set and lock the counter and to set the outputs. Status byte S0 shows the counter status and the status of the inputs and outputs.

Table 19: Process Image, Operating Mode 1/2

Input		Output	
S0	Status byte	C0	Control byte
D0	Counter value byte 0 (LSB)	D0	Counter setting value byte 0 (LSB)
D1	Counter value byte 1	D1	Counter setting value byte 1
D2	Counter value byte 2	D2	Counter setting value byte 2
D3	Counter value byte 3 (MSB)	D3	Counter setting value byte 3 (MSB)

Table 20: Control Byte C0, Operating Mode 1/2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	CNT_SET	CNT_INH	0	SET_DO	0	SET_DO_ON_CNT_VAL

SET_DO_ON_CNT_VAL	Switch output DO depending on counter value
SET_DO	Set output DO
CNT_INH	Disable counter
CNT_SET	Set counter
0	This value is always 0 and may not be changed.

Table 21: Status Byte S0, Operating Mode 1/2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	NAMUR_ ERR	CNT_SET	CNT_INH	X	ST_DO	ST_U/D (GATE)	ST_CLK

ST_CLK	Status input CLK
ST_U/D(GATE)	Status input U/D(GATE)
ST_DO	Status output DO
CNT_INH	Feedback message counter locked
CNT_SET	Counter feedback message set
NAMUR_ERR	Namur error at input
X	This value is not defined and cannot be evaluated.

* In the error state (bit 6 is set), the status bits 0, 1, 2, 3, 4, 5 are always set to 0.

The following functions can be executed:

4.1.1 Set Counter

If bit 5 is set in the control byte, the counter is loaded with the 32-bit value from output bytes 0 to 3. As long as the bit is set, the counter is stopped and the load value stays the same. Bit 5 in the status byte indicates when the counter is successfully loaded.

4.1.2 Disable Counter

If bit 4 is set in the control byte, counts are locked. Bit 4 in the status byte shows when the counter is locked.

4.1.3 Set Output

Bit 2 of the control byte sets the digital output DO.

4.1.4 Example

The counter is first set to the decimal value 100 by "Set counter" (hexadecimal 0x64):

1. Enter the counter value in the output data.

Data Bytes				
Output Data	**D3**	**D2**	**D1**	**D0**
Value	0x00	0x00	0x00	0x64

2. Report the counter value as valid in the control byte with bit 5 (set counter), so that it is applied as the output value.

Control Byte C0								
Output bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	X	1	X	X	X	X	X

3. Wait for feedback from the Up/Down Counter module in the status byte, bit 5 (counter set).

Status Byte S0								
Input bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	X	X	1	X	X	X	X	X

4. Clear bit 5 (set counter) in the control byte to complete the handshake.

Control Byte C0								
Output bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	X	0	X	X	X	X	X

5. The set counter value then appears in the input data with the following databases D0 to D3.

Data Bytes				
Input data	**D3**	**D2**	**D1**	**D0**
Value	0x00	0x00	0x00	0x64

Count up:

6. Wait for the first counting pulse and for others.

Data Bytes				
Input data	**D3**	**D2**	**D1**	**D0**
No counting pulse received	0x00	0x00	0x00	0x64
1st counting pulse received	0x00	0x00	0x00	0x65
2nd counting pulse received	0x00	0x00	0x00	0x66
More counting pulses	...	...	...	...
Maximum counter value reached	0xFF	0xFF	0xFF	0xFF
Another counting pulse results in a count overflow	0x00	0x00	0x00	0x00
Another counting pulse received	0x00	0x00	0x00	0x01

4.2 Operating Mode 3 – Frequency Counter

The Watchdog time to be set is stored in binary format in the 2 output bytes (D0, D1). The output bytes (D2, D3) are not used. In the 4 input bytes (D0 ... D3), the frequency value is stored in binary format. Control byte C0 is used to set the integration time, the Watchdog time and the measured value display, as well as to set the output. Status byte S0 shows the confirmation of the settings and the status of the inputs and outputs.

Table 22: Process Image, Operating Mode 3

Input		Output	
S0	Status byte	C0	Control byte
D0	Counter value byte 0 (LSB)	D0	Watchdog time byte 0 (LSB)
D1	Counter value byte 1	D1	Watchdog time byte 1 (MSB)
D2	Counter value byte 2	D2	Reserved
D3	Counter value byte 3 (MSB)	D3	Reserved

Table 23: Control Byte C0, Operating Mode 3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	T_{WD} REQ	0	SET_DO	RANGE_ SEL REQ1	RANGE_ SEL REQ0

RANGE_SEL REQ0	Selection of the integration time and display of the measured frequency values (see below).
RANGE_SEL REQ1	Selection of the integration time and display of the measured frequency values (see below).
SET_DO	Set output DO
T_{WD} REQ	Requirement to change the Watchdog time (T_{WD}) with valid data.
0	This value is always 0 and may not be changed.

Table 24: Status Byte S0, Operating Mode 3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	NAMUR_ ERR	ST_GATE	T_{WD} ACK	X	ST_DO	RANGE_ SEL ACK1	RANGE_ SEL ACK0

RANGE_SEL ACK0	Confirmation of the range selection, frequency values are valid (see below).
RANGE_SEL ACK1	Confirmation of the range selection, frequency values are valid (see below).
ST_DO	Status output DO
T_{WD} ACK	Confirmation of the change from T_{WD}.
ST_GATE	Status of the GATE input (0=enabled, 1=disabled)
NAMUR_ERR	Namur error at input
X	This value is not defined and cannot be evaluated.

* In the error state (bit 6 is set), the status bits 0, 1, 2, 3, 4, 5 are always set to 0.

The following functions can be executed:

4.2.1 Set Measuring Method, Frequency Range and Measured Value Display

The RANGE_SEL REQ bits in the control byte are used to set the measurement methods and display of the frequency value. The maximum frequency value also changes depending on the measuring method set. The following table shows the different operating modes.

Table 25: Measuring Method, Frequency Range and Measured Value Display Settings

Measuring Range	RANGE_ SEL REQ0	RANGE_ SEL REQ1	Measuring Method	Maximum Frequency Range	Measured Value Display
			Integration via		
1	0	0	4 periods	20 Hz … 16 kHz	Frequency in 1/1000 Hz
2	0	1	4 periods	160 Hz … 20 kHz	Frequency in 1/100 Hz
3	1	0	16 periods	4 kHz … 50 kHz	Frequency in 1/10 Hz
4	1	1	64 periods	16 kHz … 50 kHz	Frequency in Hz

Note

Note the delay time when changing the frequency range!
When setting a new frequency range, there is a delay time until valid data are read. After acknowledging the new frequency range settings via the RANGE_SEL ACK bits, this delay time must be taken into consideration.

The following formula can be used to calculate the maximum delay time:

T_{Dmax} = 2 x number of periods that are integrated / current frequency value

Note

No range requirement for enabled gate!
If the gate is enabled, the input data receives the last valid frequency value. No new range can be requested in this status.

Note

Display of invalid frequency ranges
If the maximum frequency range is exceeded, the module returns the invalid value 0xFFFFFFFF.

4.2.2 Set Watchdog Time

To detect static CLOCK signals, a Watchdog time has been implemented. The default value for the time is 10 s. The time is reinitialized at each power-on. The application can change the Watchdog time during operation via the control byte.

This process is started by writing the respective value to output bytes D1 and D0 before the T_{WD}_REQ bit is written to the control byte.
A successful parameter transfer is confirmed by the T_{WD}_ACK bit in the status byte.

Note

Display of Invalid Watchdog Times
The range of the Watchdog timer goes from 0 to 16383 ms (0x0000 to 0x3FFF) in steps of 1 ms per digit. Values that leave the permitted range of the Watchdog timer are identified with 0x3FFF.

4.2.3 Set Output

Bit 2 of the control byte sets the digital output DO.

4.2.4 Example

The measuring range is changed to range 2:

1. Set the new measuring range in the control byte with bits 0 and 1 (requirement of measuring range change).

Control Byte C0								
Output bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	X	X	X	X	X	0	1

2. Wait for feedback from the Up/Down Counter module in the status byte, bits 0 and 1 (confirmation of measuring range change).

Status Byte S0								
Input bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	X	X	X	X	X	X	0	1

3. After the delay time has elapsed, the current frequency value with the set resolution is written to the input data words D0 ... D3.

Data Bytes				
Input data	**D3**	**D2**	**D1**	**D0**
Value	0xXX	0xXX	0xXX	0xXX

4.3 Operating Mode 4 – Peak-Time Counter

In the 4 input bytes (D0 ... D3), the value of the counter is stored in binary format. Control byte C0 is used to start periodic counting and to set the outputs. Status byte S0 shows the counter status and the status of the inputs and outputs.

Table 26: Process Image, Operating Mode 4

Input		Output	
S0	Status byte	C0	Control byte
D0	Counter value byte 0 (LSB)	D0	Reserved
D1	Counter value byte 1	D1	Reserved
D2	Counter value byte 2	D2	Reserved
D3	Counter value byte 3 (MSB)	D3	Reserved

Table 27: Control Byte C0, Operating Mode 4

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	START_ CNT	0	0	SET_DO	0	0

SET_DO	Set output DO
START_CNT	Start of periodic counting pulse detection
0	This value is always 0 and may not be changed.

Table 28: Status Byte S0, Operating Mode 4

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	NAMUR_ ERR	START_ ACK	X	X	ST_DO	ST_U/D	TOGGLE

TOGGLE	Toggle bit for expiry of recording cycle
ST_U/D(GATE)	Status output U/D(GATE)
ST_DO	Status output DO
START_ACK	Confirmation of start for counting pulse detection
NAMUR_ERR	Namur error at input
X	This value is not defined and cannot be evaluated.

* In the error state (bit 6 is set), the status bits 0, 1, 2, 3, 4, 5 are always set to 0.

The counter processes the counting pulses on the CLK input over a specified period. This period is preset to 10 s. The counter value determined in this manner is saved in the process image until expiration of the next period. Counting begins at zero after each recoding cycle.

Activation of the count and synchronization with the additional control occurs by a handshake bit (bit 5) in the control and status byte.

A toggle bit (bit 0) in the status byte reports when the counting period elapses and there is new process data.

The following functions can be executed:

4.3.1 Set Output

Bit 2 of the control byte sets the digital output DO.

4.3.2 Example

1. The count direction is up (input U/D = 24 V). The counter value is 0. The timer is stopped. No pulses are detected on the CLK input.

Control Byte C0								
Output bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	0	0	0	X	0	0
Status Byte S0								
Input bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	0	0	0	X	1	0

2. Cyclic recording is requested. The counter value is 0. The timer is stopped. No pulses are detected on the CLK input.

Control Bbyte C0								
Output bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	1	0	0	X	0	0
Status Byte S0								
Input bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	0	0	0	X	1	0

3. Cyclic recording has started. The counter value is 0. The timer runs with at the preset cycle time. Pulses on the CLK input are counted.

Control Byte C0								
Output bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	1	0	0	X	0	0
Status Byte S0								
Input bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	1	0	0	X	1	0

4. Cyclic recording is running. The counter value has been reset and the timer restarted. The process data provides the number of pulses registered in the previous cycle.

Control Byte C0								
Output bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	1	0	0	X	0	0
Status Byte S0								
Input bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	1	0	0	X	1	1

5. Cyclic recording is running. The counter value has been reset and the timer restarted. The process data provides the number of pulses registered in the previous cycle.

Control Byte C0								
Output bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	1	0	0	X	0	0
Status Byte S0								
Input bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	1	0	0	X	1	0

6. Cyclic recording is running. The request was made to stop cyclic recording. The process data provides the counter value of the previous cycle.

Control Byte C0								
Output bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	0	0	0	X	0	0
Status Byte S0								
Input bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	1	0	0	X	1	X

7. Cyclic recording has stopped. The counter value has been reset. The process data provides the value 0.

Control Byte C0								
Output bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	0	0	0	X	0	0
Status Byte S0								
Input bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Value	0	0	0	0	0	X	1	0

5 Mounting

5.1 Mounting Sequence

Fieldbus couplers/controllers and I/O modules of the WAGO-I/O-SYSTEM 750 are snapped directly on a carrier rail in accordance with the European standard EN 50022 (DIN 35).

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

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

⚠ CAUTION

Risk of injury due to sharp-edged blade contacts!
The blade contacts are sharp-edged. Handle the I/O module carefully to prevent injury.

NOTICE

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

Note

Don't forget the bus end module!
Always plug a bus end module (750-600) onto the end of the fieldbus node! You must always use a bus end module at all fieldbus nodes with WAGO-I/O-SYSTEM 750 fieldbus couplers/controllers to guarantee proper data transfer.

5.2 Inserting and Removing Devices

NOTICE

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

5.2.1 Inserting the I/O Module

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

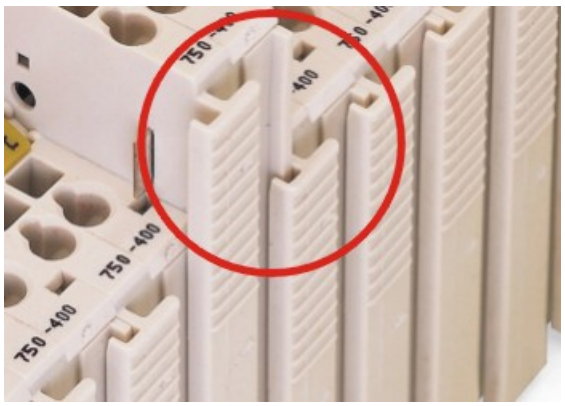

Figure 7: Insert I/O Module (Example)

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

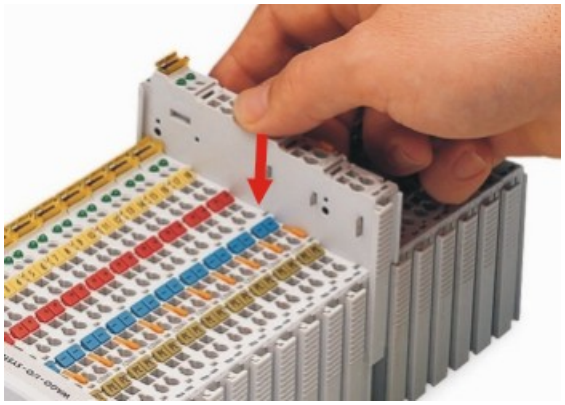

Figure 8: Snap the I/O Module into Place (Example)

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.

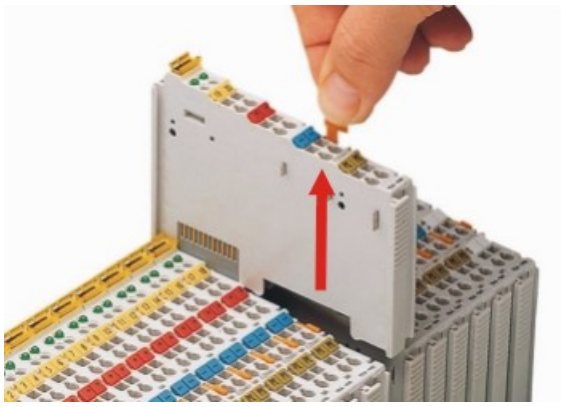

Figure 9: Removing the I/O Module (Example)

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 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.

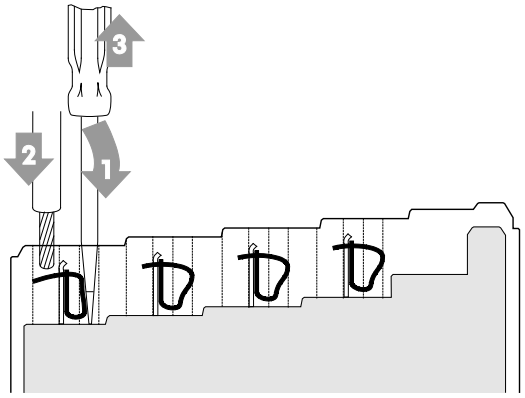

Figure 10: Connecting a Conductor to a CAGE CLAMP®

6.2 Power Supply Concept

⚠ WARNING

Ex i I/O modules shall only be supplied via Ex i 24VDC power supply module!
Ex i I/O modules shall only be operated with an Ex i 24VDC power supply module.

⚠ WARNING

Keep the air and creep distances between intrinsically safe segments!
The maximum current available from the 750-606 or 750-625/000-001 Ex-i Supply Module is 1 A.
If the use of further DC 24 V Ex i Supply modules is necessary for reasons of extent of utilization, four Separation Modules (750-616) must be used to guarantee the distance between the intrinsically safe segments.

Note

Do not exceed maximum current via power contacts!
The maximum current available from the 750-606 or 750-625/000-001 Ex-i Supply Module is 1 A.
When configuring the system, ensure that this current is not exceeded.
If exceeded, an additional potential feed module must be used.

Information

Further information about explosion prevention!
Further information about explosion prevention can be found in section “Use in Hazardous Environments”!

The Ex i I/O module receives the 24 V voltage supply for the field level from an upstream Ex i I/O module or from an Ex i power supply module via the power contacts used as blade contacts. It then provides this potential to subsequent I/O modules via the power contacts used as spring contacts.

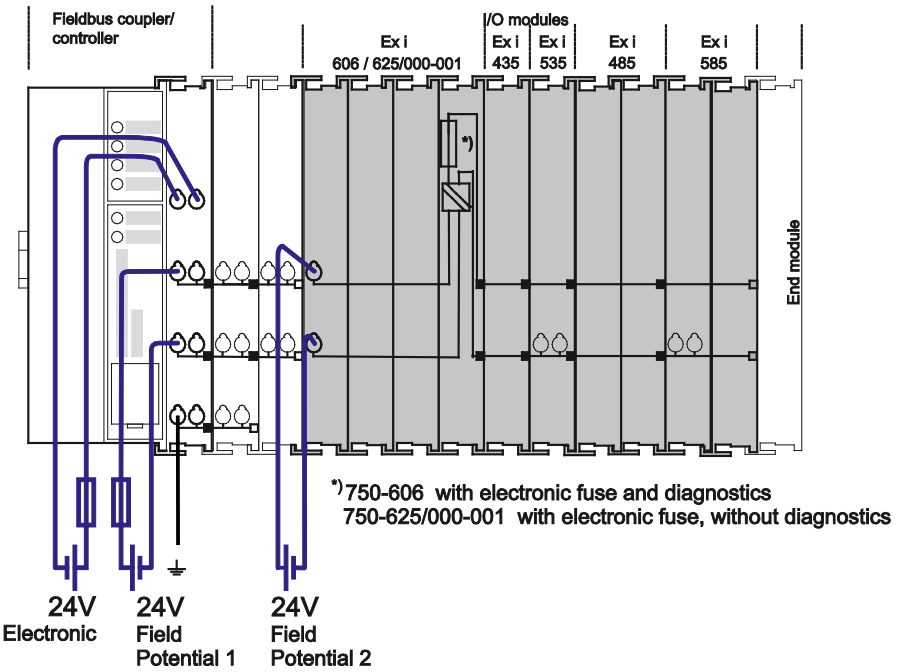

Figure 11: Supply Principle Ex i

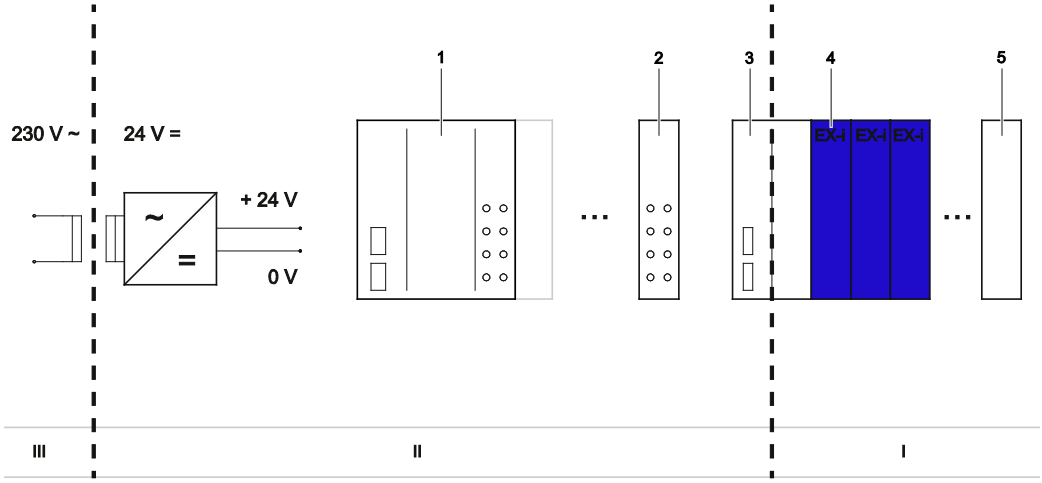

Figure 12: Overvoltage Categories

Table 29: Legend for Figure “Overvoltage Categories”

Pos.	Explanation
1	Fieldbus coupler/controller
2	Filter module
3	Ex i supply module
4	Ex i I/O modules
5	End module

Both overvoltage categories and rated surge voltage acc. to EN 60664-1:2007 are listed in the appendix.

6.2.1 Power Supply Concept in Marine Applications

⚠ WARNING

The appropriate filter module is required when using Ex i I/O modules in marine applications!

Power supply to the Ex i supply module shall be provided via the appropriate filter module when using Ex i I/O modules in marine applications! Modules approved to category EMC1 (marine applications): 750-626 or 750-626/020-000. Modules approved to category EMC2 (marine applications): 750-626, 750-626/020-000, 750-624 or 750-624/020-000.

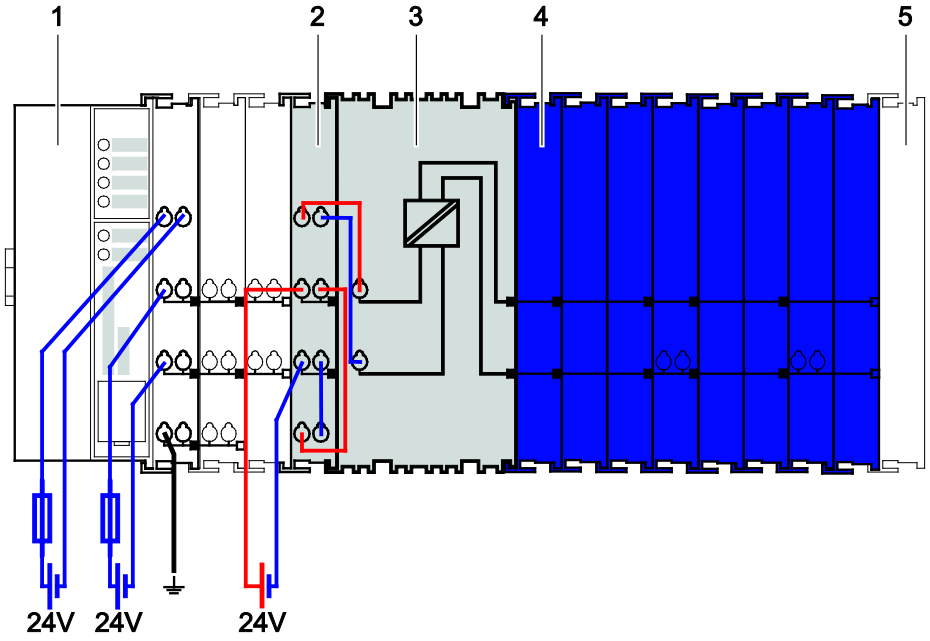

Figure 13: Power Supply Concept, Category EMC1 (Marine Applications)

Table 30: Legend for Figure “Power Supply Concept, Category EMC1 (Marine Applications)”

Pos.	Explanation
1	Fieldbus coupler/controller
2	Filter module (750-626, 750-626/020-000)
3	Ex i supply module (750-606, 750-625/000-001)
4	Ex i I/O modules
5	End module

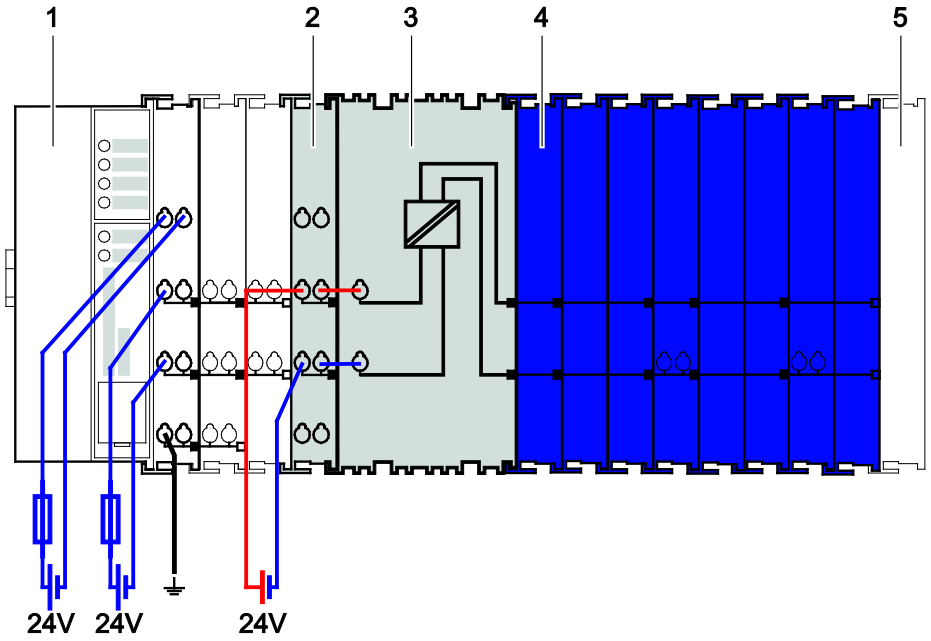

Figure 14: Power Supply Concept, Category EMC2 (Marine Applications)

Table 31: Legend for Figure “Power Supply Concept, Category EMC2 (Marine Applications)”

Pos.	Explanation
1	Fieldbus coupler/controller
2	Filter module (750-626, 750-626/020-000, 750-624, 750-624/020-000)
3	Ex i supply module (750-606, 750-625/000-001)
4	Ex i I/O modules
5	End module

6.3 Connection Example

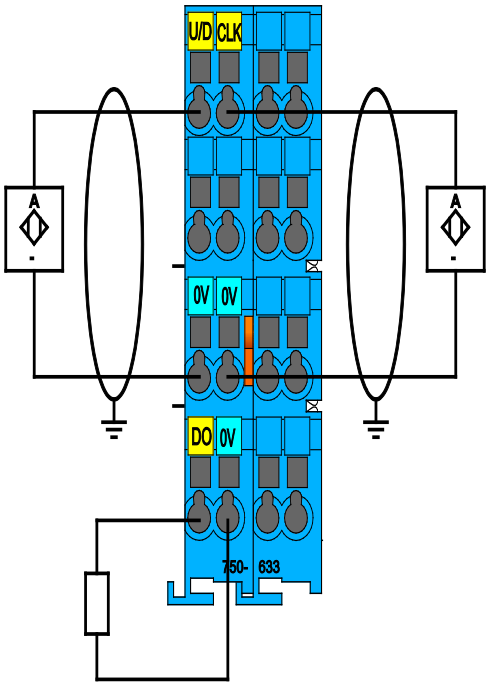

Figure 15: Connection Example for U/D (GATE), CLK and DO

Note

Use shielded signal lines!
Only use shielded signal lines for CLK and U/D (GATE) inputs. Only then can you ensure that the specified accuracy and interference immunity can be achieved even in the presence of interference acting on the signal cable.

7 Parameterizing

7.1 Parameterization with WAGO-I/O-*CHECK*

7.1.1 Up/Down Counter Ex i 750-633 (Parameter Dialog Box)

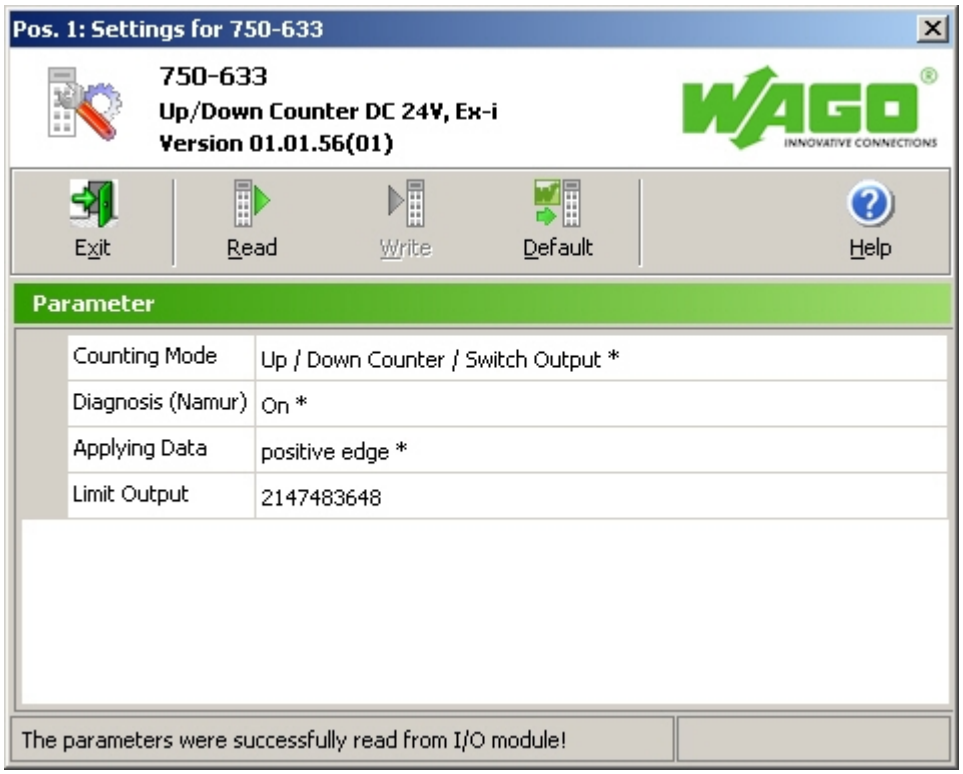

Figure 16: Up/Down Counter Ex i 750-633 (Parameter Dialog Box)

The parameter dialog box is divided into the following areas:

- Titlebar with position and item number of the selected I/O module,
- information area including item number, name as well as version number and version date of the module,
- toolbar,
- parameter area and
- statusbar.

7.1.1.1 Up/Down Counter Ex i 750-633 Toolbar

The toolbar in the parameter dialog box contains the following buttons:

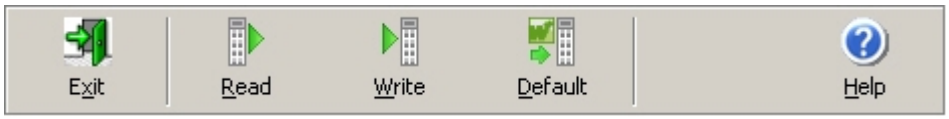

Figure 17: Up/Down Counter Ex i 750-633 Toolbar

Table 32: Up/Down Counter Ex i 750-633 Toolbar

Symbol	Designation	Description
	Exit	Closes the active window. If you have changed settings, you are requested for the final assumption of the values into the device.
	Read	Reads out the current settings from the attached device.
	Write	Transfers the indicated settings into the attached device.
	Default	Resets the selected I/O module to the WAGO default values.
	Help	Shows the help **WAGO-I/O-*CHECK***.

7.1.1.2 Up/Down Counter Ex i 750-633 Parameter

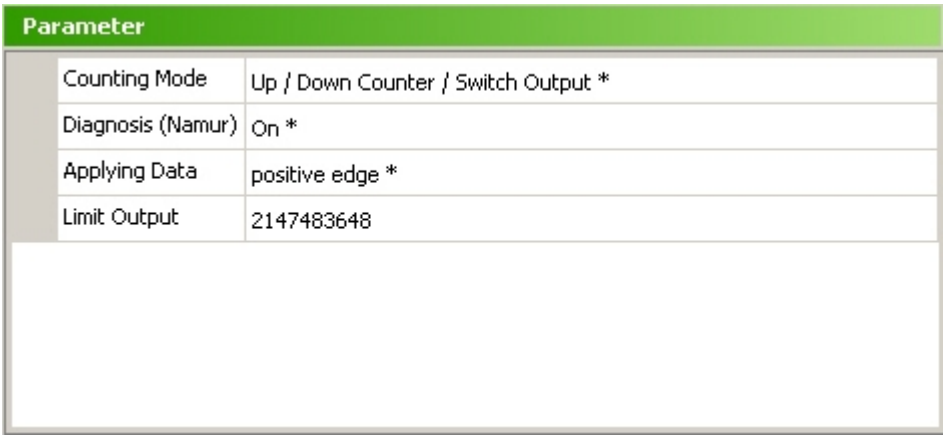

Figure 18: Up/Down Counter Ex i 750-633 Parameter

Following select boxes are shown in the dialog box:

Table 33: Up/Down Counter Ex i 750-633 Parameter

Select box	Available settings	
Counting Mode	Up counter with enable input	With a positive edge on the CLK input, the counter counts up (ascending) if the U/D(GATE) input is connected with a high signal level. With a low signal level on the U/D(GATE) input, counting is disabled.
	Up/down counter*	With a positive edge on the CLK input, the counter counts up (ascending) if the U/D(GATE) input is connected with a high signal level and down (descending) if the U/D(GATE) input is connected with a low signal level.
	Frequency counter	The counter measures the cycle duration of the signal on the CLK input if the U/D(GATE) input is connected with a low signal. With a high signal level on the U/D(GATE) input, measurement is disabled.
	Peak-time counter	The counter records counting pulses on the CLK input over a defined period of 10 seconds.
Diagnosis (Namur)	Off	Diagnostics according to Namur is off.
	On*	Diagnostics according to Namur is on.
Applying Data	Positive edge*	Values are accepted with a positive edge.
	Negative edge	Values are accepted with a negative edge.
Limit Output	In this field, enter the value at which the output is switched on when exceeded.	
	* Default setting	

8 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.

8.1 Marking Configuration Examples

8.1.1 Marking for Europe According to ATEX and IECEx

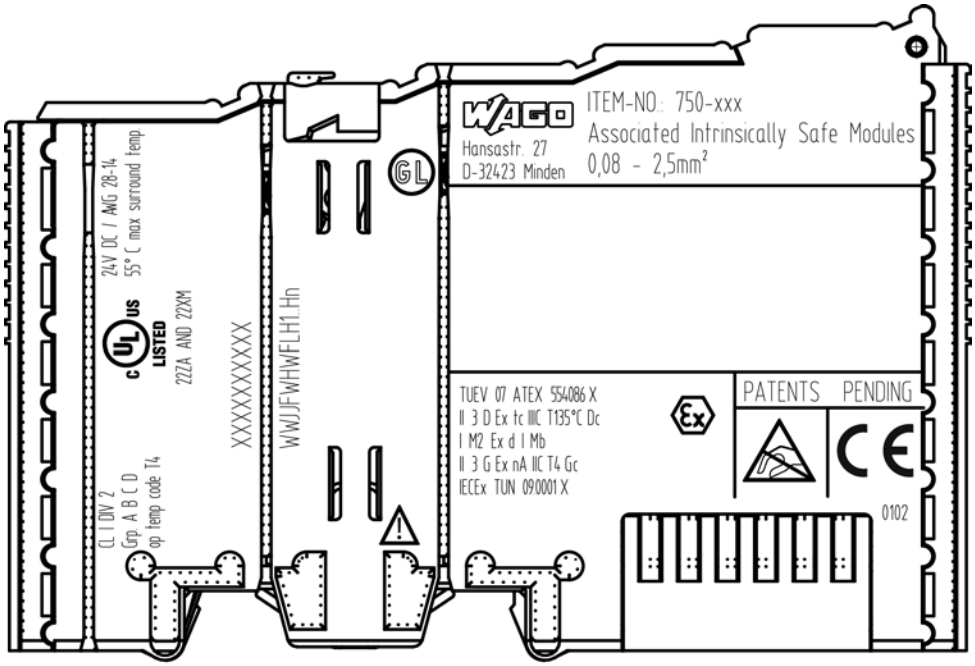

Figure 19: Marking Example According to ATEX and IECEx

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 20: Text Detail – Marking Example According to ATEX and IECEx

Table 34: 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)

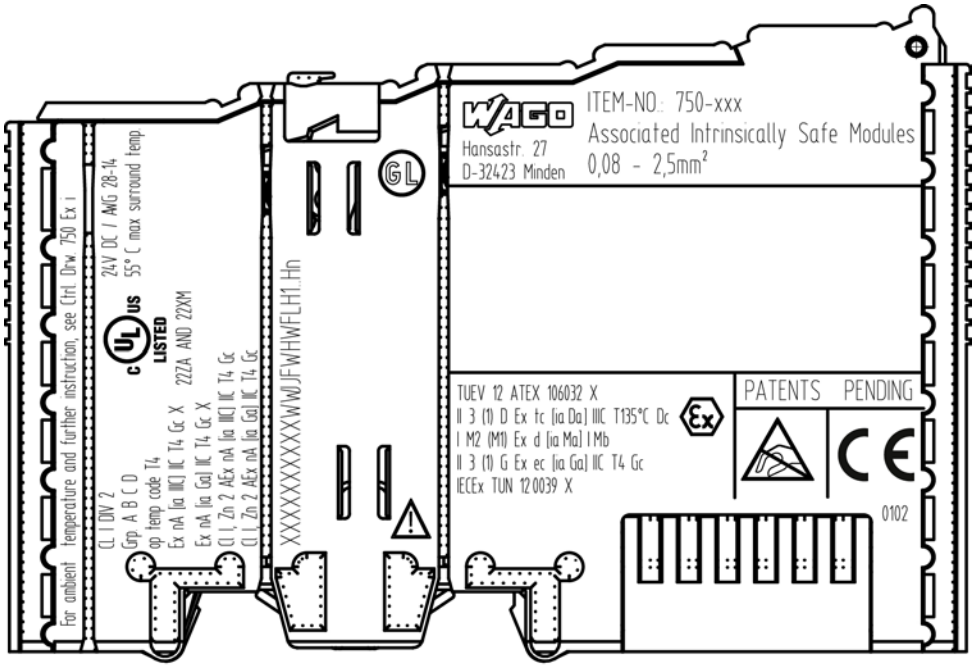

Figure 21: Marking Example for Approved Ex i I/O Module According to ATEX and IECEx

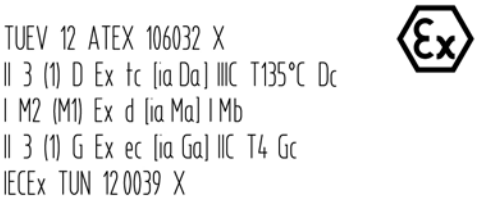

Figure 22: Text Detail – Marking Example for Approved Ex i I/O Module According to ATEX and IECEx

Table 35: 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)

8.1.2 Marking for America (NEC) and Canada (CEC)

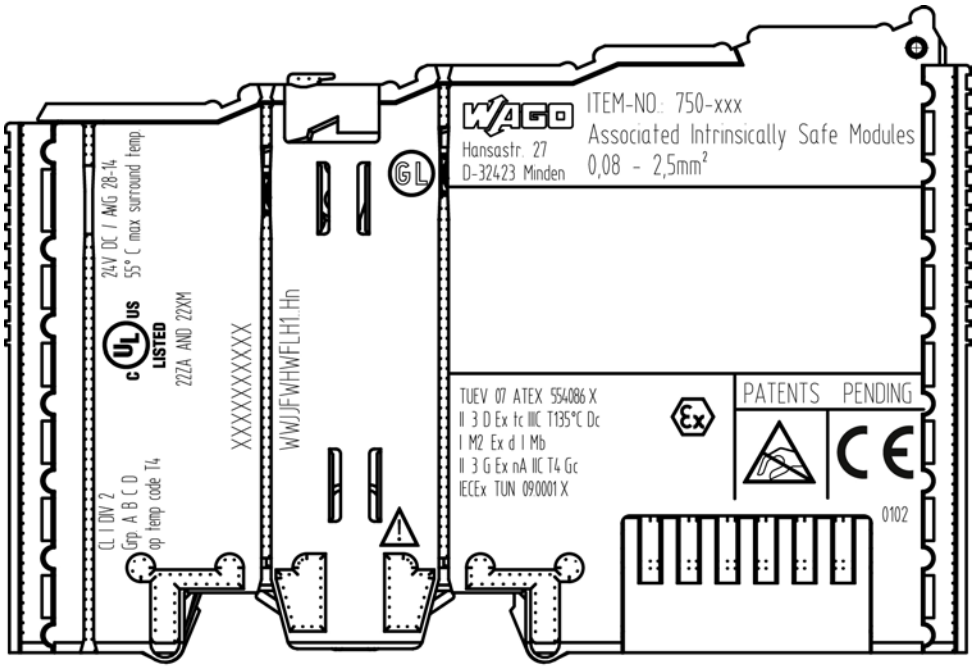

Figure 23: Marking Example According to NEC

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

Figure 24: Text Detail – Marking Example According to NEC 500

Table 36: 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

Figure 25: Text Detail – Marking Example for Approved Ex i I/O Module According to NEC 505

Table 37: 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)

Figure 26: Text Detail – Marking Example for Approved Ex i I/O Module According to NEC 506

Table 38: 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)

Figure 27: Text Detail – Marking Example for Approved Ex i I/O Modules According to CEC 18 attachment J

Table 39: 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

8.2 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.

8.2.1 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.

8.2.2 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.

9 Appendix

9.1 Rated Surge Voltage

Table 40: Rated Surge Voltage[*)]

Nominal voltage of the power supply system (mains) acc. to IEC 60038 3		Line-to-neutral voltage, derived from the nominal AC or DC voltage up to and including	Rated surge voltage			
Three-phase	Single-phase		Overvoltage category			
			I	II	III	IV
		50 V	330 V	500 V	800 V	1500 V
		100 V	500 V	800 V	1500 V	2500 V
	120 V … 240 V	150 V	800 V	1500 V	2500 V	4000 V
230 V / 400 V 277 V / 480 V		300 V	1500 V	2500 V	4000 V	6000 V
400 V / 690 V		600 V	2500 V	4000 V	6000 V	8000 V
1000 V		1000 V	4000 V	6000 V	8000 V	12000 V

[*)] Source: EN 60664-1:2007, Appendix F.1

List of Figures

List of Tables

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