TECHDOCS

Manual

WAGO I/O System 750

750-637(/xxx-xxx)

Incremental Encoder Interfaces

Version 1.6.1

WAGO Kontakttechnik GmbH & Co. KG

Hansastraße 27
D-32423 Minden

Phone: +49 (0) 571/8 87 – 0
Fax: +49 (0) 571/8 87 – 1 69

E-Mail: info@wago.com

Web: www.wago.com

Technical Support

Phone: +49 (0) 571/8 87 – 4 45 55
Fax: +49 (0) 571/8 87 – 84 45 55

E-Mail: support@wago.com

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.

E-Mail: documentation@wago.com

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 750-637 (Incremental Encoder Interfaces) and the variants listed in the table below.

Tabelle 1: Varianten

Bestellnummer/Variante	Bezeichnung
750-637	Incremental Encoder Interfaces
750-637/000-001	Incremental Encoder Interfaces 24 V/32 Bit differential
750-637/000-002	Incremental Encoder Interfaces 24 V/32 Bit single ended
750-637/000-003	Incremental Encoder Interfaces RS-422/32Bit/Single Interpreter
750-637/000-004	Incremental Encoder Interfaces 24 V/32 Bit single ended/cam outputs

Note

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

The I/O module 750-637 shall only be installed and operated according to the instructions in this manual and in the manual for the used fieldbus coupler or controller.

NOTICE

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

1.2 Copyright

1.3 Symbols

⚠ DANGER

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

NOTICE

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

Note

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

Information

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

1.4 Number Notation

Table 2: Number Notation

Number Code	Example	Note
Decimal	100	Normal notation
Hexadecimal	0x64	C notation
Binary	'100' '0110.0100'	In quotation marks, nibble separated with dots (.)

1.5 Font Conventions

Table 3: Font Conventions

Font Type	Indicates
italic	Names of paths and data files are marked in italic-type. e.g.: *C:\Program Files\WAGO Software*
Menu	Menu items are marked in bold letters. e.g.: **Save**
>	A greater-than sign between two names means the selection of a menu item from a menu. e.g.: **File** > **New**
Input	Designation of input or optional fields are marked in bold letters, e.g.: **Start of measurement range**
“Value”	Input or selective values are marked in inverted commas. e.g.: Enter the value “4 mA” under **Start of measurement range**.
[Button]	Pushbuttons in dialog boxes are marked with bold letters in square brackets. e.g.: **[Input]**
[Key]	Keys are marked with bold letters in square brackets. e.g.: **[F5]**

2 Important Notes

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

2.1 Legal Bases

2.1.1 Subject to Changes

WAGO Kontakttechnik GmbH & Co. KG reserves the right to provide for any alterations or modifications. 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 fulfill the requirements of protection type IP20 and are designed for use in dry interior spaces. There is protection against finger injury and solid impurities up to 12.5 mm diameter is assured; protection against water damage is not ensured.
The devices represent open-type devices. They may only be installed in enclosures (tool-secured enclosures or operating rooms) which fulfil the listed requirements specified in the safety instructions in chapter “Safety Advice (Precautions)”. Use without additional protective measures in environments within which dust, corrosive fumes, gases or ionized radiation can occur is considered improper use.

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 device.

Appropriate housing (per 2014/34/EU) is required when operating the WAGO I/O System 750 in hazardous environments. Please observe the installation regulations! 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.

⚠ CAUTION

Inadequate wire cross sections can cause temperature increases!
To avoid increasing thermal risks, only use conductor cross-sections sufficient for the required maximum load current. The conductor cross-sections specified in the technical data refer exclusively to the mechanical connection capacity of the clamping points.

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

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

3 Device Description

This module is an interface for different versions of incremental encoders with various connections (RS-422, differential, single-ended).

The data width for the encoder module is 32 bits. Either the current counter value, the latch value, the set value or the current rate can be shown in the process data.

The table below provides an overview of the different versions and their connections:

Table 4: Inputs/Outputs – Versions 750-637 and 750-637/000-003

Inputs/Outputs	
A, /A, B, /B	Quadrature inputs, 24 V, RS-422
C, /C	Initial point input, 24 V, RS-422
Latch, Gate, Ref	Input, 24 V
N1, N2	Output, 24 V

Table 5: Inputs/Outputs – Versions 750-637/000-001

Inputs/Outputs	
A, /A, B, /B	Quadrature inputs, 24 V, differential
C, /C	Initial point input, 24 V, differential
Latch, Gate, Ref	Input, 24 V
N1, N2	Output, 24 V

Table 6: Inputs/Outputs – Versions 750-637/000-002 and 750-637/000-004

Inputs/Outputs	
A, B	Quadrature inputs, 24 V, single-ended
C	Initial point input, 24 V, single-ended
Latch, Gate, Ref	Input, 24 V
N1, N2	Output, 24 V

A counter with quadrature decoder as well as a latch for the zero impulse can be read or enabled by the control. The control can set the counter. Depending on the operating mode, the counter value is added to the latch register on a positive edge at the “C” or “Latch” input.

The rate (increments/ms) is automatically acquired and can also be transmitted to the control as an alternative to the latch value.

A counter lock-out is possible using the “Gate” input. Input “Ref” can be used to activate the initial point “C” function.

The cam outputs N1 and N2 indicate whether the counter value is within a defined range of values. The range can be adjusted for each cam via the control unit.

Starting with the software version XXXX03XX, the cam outputs can be disabled by the control unit and the states of the cam outputs can be queried.

The signal status for inputs A, B and C, Latch and Gate and the operating status of the I/O module are each indicated by a dedicated green status LED.

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

Power supply for 24 V encoders is provided via the 24 V field supply connections. The encoder ground must be connected with the 0 V module.

Power supply for 5 V encoders can be tapped directly at connections V_e and V_0 of the standard module 750-637.

Note

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

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

The I/O module 750-637 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

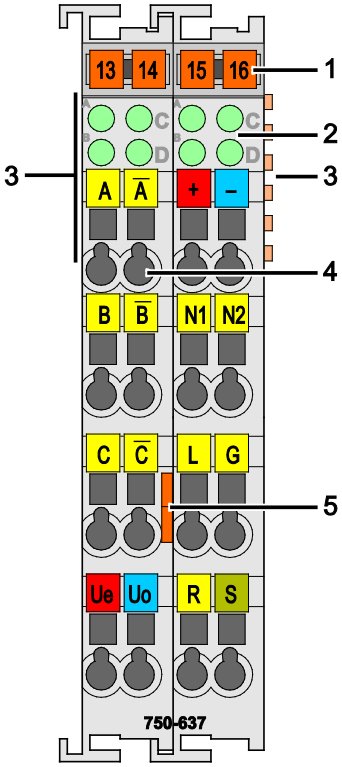

Figure 1: View

Table 7: Legend for Figure “View”

Pos.	Description	Details See Section
1	Marking possibility with Mini-WSB	---
2	Status LEDs	“Device Description” > “Display Elements”
3	Data contacts	“Device Description” > “Connectors”
4	CAGE CLAMP® connectors	“Device Description” > “Connectors”
5	Release tab	“Mounting” > ”Inserting and Removing Devices”

3.2 Connectors

3.2.1 Data Contacts/Local Bus

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

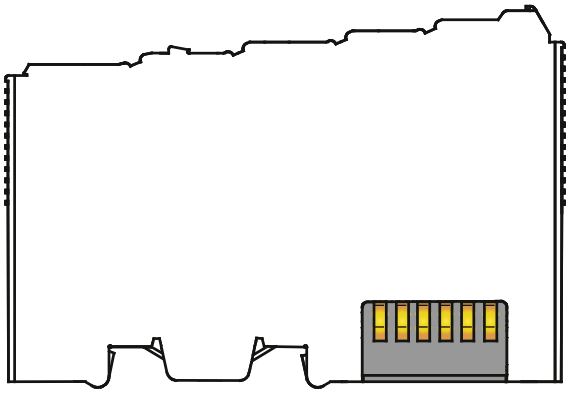

Figure 2: Data Contacts

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

The I/O module 750-637 has no power jumper contacts.

3.2.3 CAGE CLAMP® Connectors

3.2.3.1 Versions 750-637 and 750-637/000-003

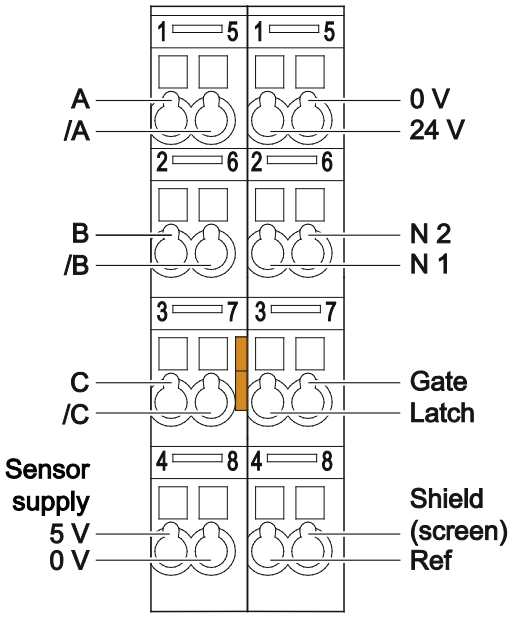

Figure 3: CAGE CLAMP® Connectors – Versions 750-637 and 750-637/000-003

Table 8: Legend for Figure “CAGE CLAMP® Connectors – Versions 750-637 and 750-637/000-003“

Designation	Connector	Function
A	1, left	Connection of sensor
B	2, left	
C	3, left	
/A	5, left	
/B	6, left	
/C	7, left	
5 V	4, left	Sensor supply
0 V	8, left	
24 V	1, right	Supply voltage input
0 V	5, right	
N1	2, right	Cam outputs
N2	6, right	
Latch	3, right	Latch input
Gate	7, right	Gate input
Ref	4, right	Ref input
Shield (screen)	8, right	Shield connection (carrier rail)

3.2.3.2 Version 750-637/000-001

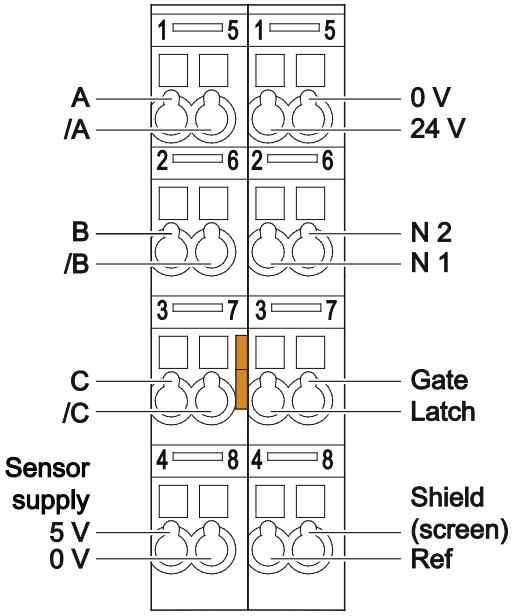

Figure 4: CAGE CLAMP® Connectors – Version 750-637/000-001

Table 9: Legend for “CAGE CLAMP® Connectors – Version 750-637/000-001” Figure

Designation	Connection	Function
A	1, left	Sensor connection
B	2, left	
C	3, left	
/A	5, left	
/B	6, left	
/C	7, left	
-	4, left	Not assigned
-	8, left	
24 V	1, right	Power supply input
0 V	5, right	
N1	2, right	Cam outputs
N2	6, right	
Latch	3, right	Latch input
Gate	7, right	Gate input
Ref	4, right	Ref input
Shield	8, right	Shield connection (DIN rail)

3.2.3.3 Versions 750-637/000-002 and 750-637/000-004

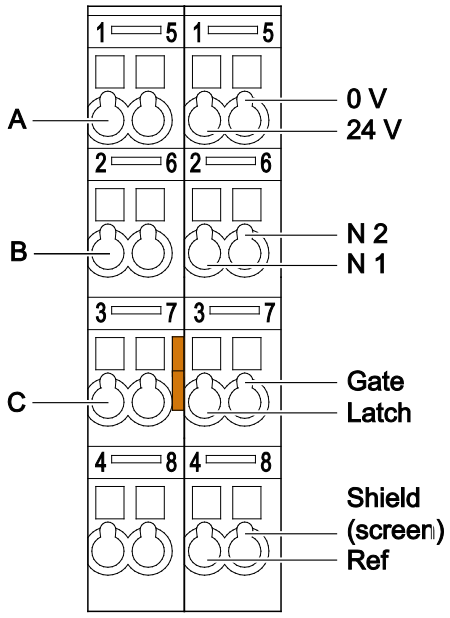

Figure 5: CAGE CLAMP® Connectors – Versions 750-637/000-002 and 750-637/000-004

Table 10: Legend for “CAGE CLAMP® Connectors – Versions 750-637/000-002 and 750-637/000-004” Figure

Designation	Connection	Function
A	1, left	Sensor connection
B	2, left	
C	3, left	
-	4, left	Not assigned
-	5, left	
-	6, left	
-	7, left	
-	8, left	
24 V	1, right	Power supply input
0 V	5, right	
N1	2, right	Cam outputs
N2	6, right	
Latch	3, right	Latch input
Gate	7, right	Gate input
Ref	4, right	Ref input
Shield	8, right	Shield connection (DIN rail)

3.3 Display Elements

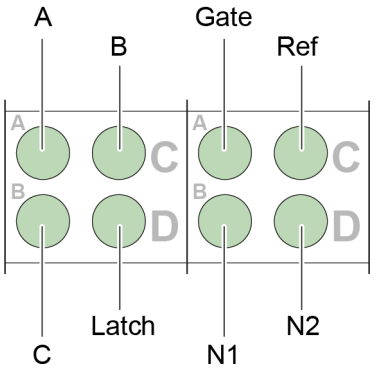

Figure 6: Display Elements

Table 11: Key for the “Display Elements” Figure, Versions 750-637 and 750-637/000-003

Designation	LED	State	Function
A	A, left	Off	U(A) − (U(/A) < −0.2 V
		Green	U(A) − (U(/A) < 0.2 V or both inputs open
B	C, left	Off	U(A) − (U(/A) < −0.2 V
		Green	U(A) − (U(/A) < 0.2 V or both inputs open
C	B, left	Off	U(B) − (U(/B) < −0.2 V
		Green	U(B) − (U(/B) < 0.2 V or both inputs open
Latch	D, left	Off	Input = 0 V or open
		Green	Input = 24 V
Gate	A, right	Off	Input = 0 V or open
		Green	Input = 24 V
Ref	C, right	Off	Input = 0 V or open
		Green	Input = 24 V
N1	B, right	Off	Output = 0 V
		Green	Output = 24 V
N2	D, right	Off	Output = 0 V
		Green	Output = 24 V

Table 12: Legend for the “Display Elements” Figure, Version 750-637/000-001

Designation	LED	State	Function
A	A, left	Off	−30 V < (U(A) – U(/A)) < −15 V
		Green	30 V < (U(A) – U(/A)) < 15 V or both inputs open
B	C, left	Off	−30 V < (U(C) – U(/C)) < −15 V
		Green	30 V < (U(C) – U(/C)) < 15 V or both inputs open
C	B, left	Off	−30 V < (U(B) – U(/B)) < −15 V
		Green	30 V < (U(B) – U(/B)) < 15 V or both inputs open
Latch	D, left	Off	Input = 0 V or open
		Green	Input = 24 V
Gate	A, right	Off	Input = 0 V or open
		Green	Input = 24 V
Ref	C, right	Off	Input = 0 V or open
		Green	Input = 24 V
N1	B, right	Off	Output = 0 V
		Green	Output = 24 V
N2	D, right	Off	Output = 0 V
		Green	Output = 24 V

Table 13: Legend for the “Display Elements” Figure, Versions 750-637/000-002 and 750-637/000-004

Designation	LED	State	Function
A	A, left	Off	0 V < (U(A) < 5 V or input open
		Green	30 V > (U(B) > 15 V
B	C, left	Off	0 V < (U(C) < 5 V or input open
		Green	30 V > (U(A) > 15 V
C	B, left	Off	0 V < (U(B) < 5 V or input open
		Green	30 V > (U(C) > 15 V
Latch	D, left	Off	Input = 0 V or open
		Green	Input = 24 V
Gate	A, right	Off	Input = 0 V or open
		Green	Input = 24 V
Ref	C, right	Off	Input = 0 V or open
		Green	Input = 24 V
N1	B, right	Off	Output = 0 V
		Green	Output = 24 V
N2	D, right	Off	Output = 0 V
		Green	Output = 24 V

3.4 Operating Elements

The I/O module 750-637 has no operating elements.

3.5 Schematic Diagram

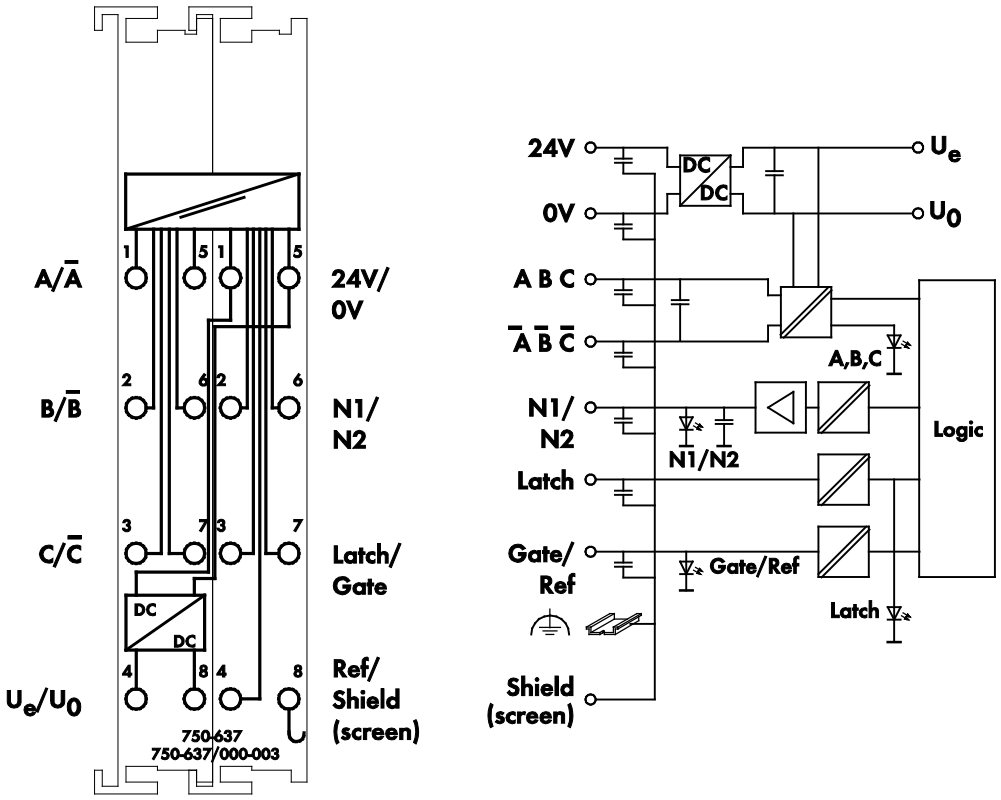

Figure 7: Schematic Diagram – Versions 750-637 and 750-637/000-003

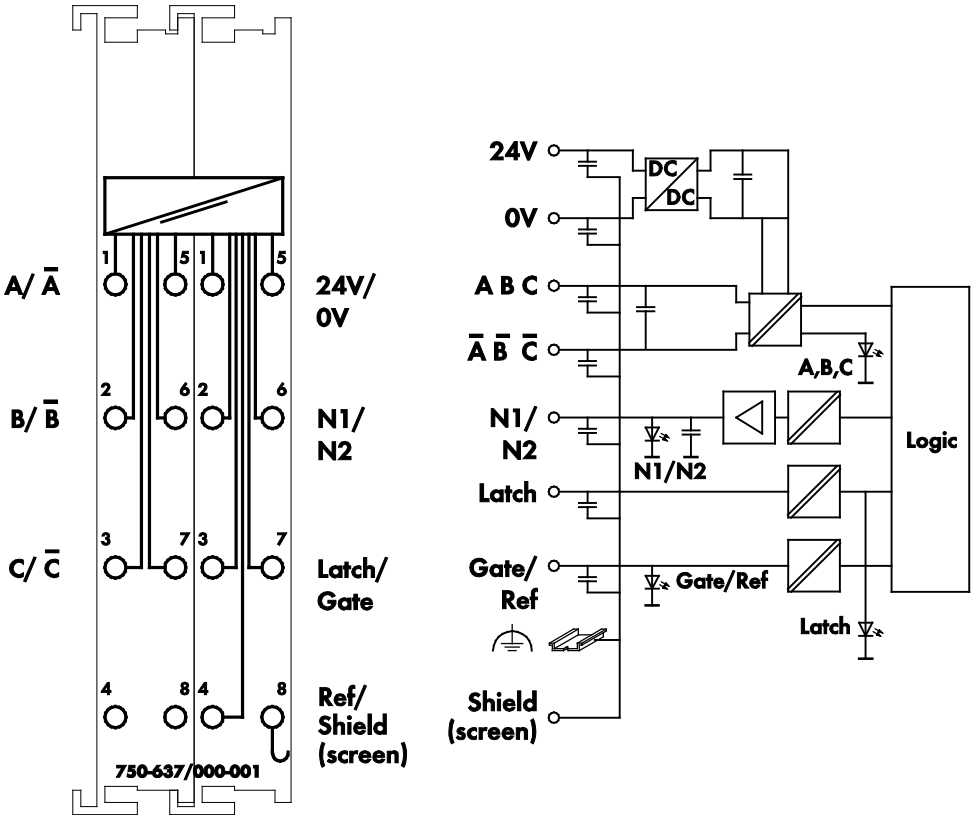

Figure 8: Schematic Diagram – Version 750-637/000-001

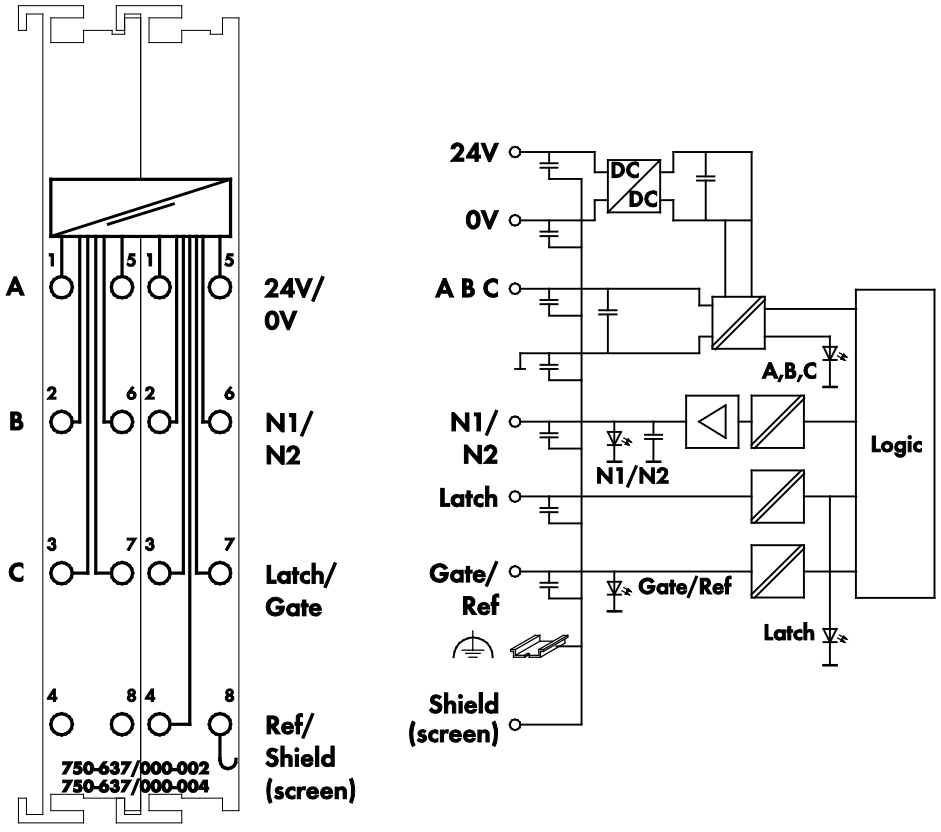

Figure 9: Schematic Diagram – Versions 750-637/000-002 and 750-637/000-004

3.6 Technical Data

3.6.1 Device Data

Table 14: Technical Data — Device

Width	24 mm
Depth (from upper-edge of DIN rail)	64 mm
Height	100 mm
Weight	Approx. 105 g
Degree of protection	IP 20

3.6.2 Power Supply

Table 15: Technical Data — Power Supply

Power supply	Via CAGE CLAMP® connectors
	24 VDC (−15% … +20%)
Current consumption max. (24 VDC)	12 mA (without encoder or load)
Current consumption (internal)	110 mA
Encoder output current$_{max.}$	300 mA
Encoder operating voltage	24 VDC
at 750-637	5 VDC
for 750-637/000-003	
Undervoltage diagnostic for version 750-637/000-004	(0) 28.8 VDC > Supply voltage > 20.4 VDC
	(1) 0 VDC < Supply voltage < 5 VDC

3.6.3 Communication

Table 16: Technical Data — Communication

Data width, internal (local bus)	1 × 32-bit data 2 × 8-bit control/status

3.6.4 Inputs/Outputs

Table 17: Technical Data — Inputs/Outputs

Encoder connection	
750-637	A, /A, B, /B, C, /C (/A, /B, /C are inverted))
750-637/000-001	
750-637/000-003	
750-637/000-002	A, B, C, 0 V
750-637/000-004	
Encoder supply	24 VDC via field supply
Speed	16 bits (increments per 1 ms)
Quadrature decoder	See table “Technical Data — Quadrature Decoder”
Counter	32 bits, binary
Capture mode	32 bits
Preload mode	32 bits
Zero impulse latch	32 bits
Commands	Reading, setting, activating
Limit frequency	250 kHz
LATCH input time constant	364 µs
GATE time constant	32 µs
REF time constant	32 µs

3.6.5 Digital Outputs (N1, N2)

Table 18: Technical Data — Digital Outputs (N1, N2)

Output voltage	24 VDC
Output current$_{max.}$	0.5 A, short-circuit protected
Output resistance$_{typ.}$	160 MΩ

3.6.6 Digital Inputs (Latch, Gate, Ref)

Table 19: Technical Data — Digital Inputs (Latch, Gate, Ref), Versions 750-637, 750-637/000-003, 750-637/000-001

Input voltage	(0) −3 VDC… +5 VDC
	(1) +15 VDC… +30 VDC
Input current$_{typ.}$	Latch: 5 mA
	Gate: 7 mA
	Ref: 7 mA

3.6.7 Quadrature Inputs (A, /A, B, /B, C, /C)

Table 20: Technical Data — Quadrature Inputs (A, /A, B, /B, C, /C), Versions 750-637 and 750-637/000-003

Input voltage A, /A	(0) U(A) − U(/A) < −0.2 VDC
	(1) U(A) − U(/A) > 0.2 VDC
Input voltage B, /B	(0) U(B) − U(/B) < −0.2 VDC
	(1) U(B) − U(/B) > 0.2 VDC
Input voltage C, /C	(0) U(C) − U(/C) < −0.2 VDC
	(1) U(C) − U(/C) > 0.2 VDC

Table 21: Technical Data — Quadrature Inputs (A, B, C), Versions 750-637/000-002 and 750-637/000-004

Input voltage A	(0) 0 VDC < U(A) < 5 VDC
	(1) 30 VDC > U(A) > 15 VDC
Input voltage B	(0) 0 VDC < U(B) < 5 VDC
	(1) 30 VDC > U(B) > 15 VDC
Input voltage C	(0) 0 VDC < U(C) < 5 VDC
	(1) 30 VDC > U(C) > 15 VDC

Table 22: Technical Data — Quadrature Inputs (A, /A, B, /B, C, /C), Version 750-637/000-001

Input voltage A, /A	(0) −30 VDC < U(A) – U(/A) < −15 VDC
	(1) +30 VDC > U(A) – U(/A) > +15 VDC
Input voltage B, /B	(0) −30 VDC < U(B) – U(/B) < −15 VDC
	(1) +30 VDC > U(B) – U(/B) > +15 VDC
Input voltage C, /C	(0) −30 VDC < U(C) – U(/C) < −15 VDC
	(1) +30 VDC > U(C) – U(/C) > +15 VDC

3.6.8 Quadrature Decoder

Table 23: Technical Data — Quadrature Decoder

Function	
750-637	Incremental Encoder Interfaces
750-637/000-001	
750-637/000-003	
750-637/000-002	
750-637/000-004	
Input	
750-637	RS-422
750-637/000-003	
750-637/000-001	Differential
750-637/000-002	Single-ended
750-637/000-004	
Encoder voltage	
750-637	5 VDC
750-637/000-003	
750-637/000-001	24 VDC
750-637/000-002	
750-637/000-004	
Evaluation	
750-637	4×
750-637/000-001	
750-637/000-002	
750-637/000-004	
750-637/000-003	1×
Data width	
750-637	32 bits
750-637/000-001	
750-637/000-002	
750-637/000-004	
750-637/000-003	

3.6.9 Climatic Environmental Conditions

Table 24: Technical Data – Climatic Environmental Conditions

Surrounding air temperature, operation	0 °C … 55 °C
Surrounding air temperature, storage	−25 °C … +85 °C
Operating altitude	0 … 2000 m; (> 2000 m upon request)
Relative humidity	Max. 5 % … 95 % without condensation
Pollution degree	2
Protection type	IP20
Resistance to harmful substances	Acc. to IEC 60068-2-42 and IEC 60068-2-43
Maximum pollutant concentration at relative humidity < 75 %	$SO_2 \leq 25$ 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

The following approvals have been granted to the basic version and all variants of 750-637 I/O modules:

Information

More information about approvals.
Detailed references to the approvals are listed in the document "**Overview on WAGO I/O System 750 approvals**", which you can find via the internet under: www.wago.com → DOWNLOADS → Documentation → System Description.

	Conformity Marking	
	UL508	
	Korea Certification	MSIP-REM-W43-DAM750

3.7.1 Ex Approvals

The following Ex approvals have been granted to the basic version and all variants of 750-637 I/O modules:

	TÜV 07 ATEX 554086 X I M2 Ex d I Mb II 3 G Ex nA IIC T4 Gc II 3 D Ex tc IIIC T135°C Dc	
	IECEx TUN 09.0001 X Ex d I Mb Ex nA IIC T4 Gc Ex tc IIIC T135°C Dc	
	$_{C}UL_{US}$ Class I, Div2 ABCD T4	ANSI/ISA 12.12.01

The following Ex approvals have been granted to the basic version of 750-637 I/O modules:

Brasilian-Ex	TUEV 12.1297 X Ex ec IIC T4 Gc	

The following ship approvals have been granted to the basic version of 750-637 I/O modules:

	ABS (American Bureau of Shipping)	
	Federal Maritime and Hydrographic Agency	
	BV (Bureau Veritas)	
	DNV (Det Norske Veritas)	Class B
	GL (Germanischer Lloyd)	Cat. A, B, C, D (EMC 1)
	KR (Korean Register of Shipping)	
	LR (Lloyd’s Register)	Env. 1, 2, 3, 4
	NKK (Nippon Kaiji Kyokai)	
	PRS (Polski Rejestr Statków)	
	RINA (Registro Italiano Navale)	

3.8 Standards and Guidelines

All variations of 750-637 I/O modules meet the following requirements on emission and immunity of interference:

EMC CE-Immunity to interference	EN 61000-6-2
EMC CE-Emission of interference	EN 61000-6-4

The I/O modules 750-637 meet the following requirements on emission and immunity of interference:

EMC marine applications-Immunity to interference	acc. to DNV GL
EMC marine applications-Emission of interference	acc. to DNV GL

4 Process Image

Note

Mapping of process data in the process image of fieldbus systems
The representation of the I/O modules' process data in the process image depends on the fieldbus coupler/controller used. Please take this information as well as the particular design of the respective control/status bytes from the section "Fieldbus Specific Design of the Process Data" included in the description concerning the process image of the fieldbus coupler/controller used.

The I/O module provides the fieldbus coupler/controller with a 6-byte input and output process image via 2 logical channels.

The set values to be set are stored in 4 output bytes (D0 … D3). The read-in process data is stored in the 4 input bytes (D0 … D3). Two control bytes (C0, C1) and two status bytes (S0, S1) control the data flow and are used to select the set and actual values.

Table 25: Process Image

Process Image			
Input		**Output**	
S0	Status byte S0	C0	Control byte C0
D0	Process data byte 0 (LSB)	D0	Set value byte 0 (LSB)
D1	Process data byte 1	D1	Set value byte 1
S1	Status byte S1	C1	Control byte C1
D2	Process data byte 2	D2	Set value byte 2
D3	Process data byte 3 (MSB)	D3	Set value byte 3 (MSB)

Various process data is displayed as a function of bit 0 and bit 1 in control byte C1 (see Table "MapPZD, All Versions, Except 750-637/000-004"):

- Counter value
- Latch value
- Rate
- Set value

The setting is mirrored in bit 0 and bit 1 of status byte S1.

Table 26: MapPZD, All Versions, Except 750-637/000-004

MapPZD (Control Byte C1/ Status Byte S1, Bit 0 and Bit 1)		
Bit 1	**Bit 0**	**Coding of Process Data**
0	0	Count value
0	1	Latch value
1	0	Rate in increments per milliseconds
1	1	Set value

With Version 750-637/000-004, the following process data is displayed as a function of bit 0 in control byte C1 (see Table “MapPZD, Verstion 750-637/000-004”):

- Counter value
- Latch value

The setting is mirrored in bit 0 of status byte S1.

Table 27: MapPZD, Version 750-637/000-004

MapPZD (Control Byte C1/ Status Byte S1, Bit 0)	
Bit 0	**Coding of Process Data**
0	Count value
1	Latch value

4.1 Control/Status Byte

Table 28: Status Byte S0, All Versions, Except 750-637/000-004

Status Byte S0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	X	AckSet LoadExt	OVER-FLOW	UNDER-FLOW	CNT-SET_ ACK	LAT_ EXT_ VAL	LATC_ VAL

LATC_VAL	**Ack Bit for EN-LATC (C0.0)**	
	Latch Mode:	This bit is set on a positive edge at input C Reset is carried out when EN_LATC is reset
	Preload Mode:	This bit is set on a positive edge at input C Reset is carried out when EN_LATC is reset
LAT_EXT_VAL	**Ack Bit for EN-LAT_EXT (C0.1)**	
	Latch Mode:	This bit is set on a positive edge at the Latch input Reset is carried out when EN_LAT_EXT is reset
	Preload Mode:	This bit is set on a positive edge at the Latch input Reset is carried out when EN_LAT_EXT is reset
CNT-SET_ACK	**Ack Bit for CNT_SET (C0.2)**	
	–	Reset is carried out when CNT_SET=0.
UNDERFLOW	**UNDERFLOW**	
	1:	On counter underflow from 0x00000000 to 0xffffffff
	0:	When counter value < 0xAAAAAAAA
		With a positive edge for ResetUnderflow (C0.3)
		When OVERFLOW=1
OVERFLOW	**OVERFLOW**	
	1:	On counter overflow from 0xffffffff to 0x00000000
	0:	When counter value < 0x55555555
		With a positive edge for ResetOverflow (C0.4)
		When UNDERFLOW=1
AckSet LoadExt	**Ack Bit for SetLoadExt**	
	–	Reset is carried out when SetLoadExt=0 (C0.5)
X	**Reserved**	
0	**Reserved**	

Table 29: Status Byte S0, Version 750-637/000-004

Status Byte S0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	PF	AckSet LoadExt	OUF	Enable_ Cam_ Ack	CNT-SET_ ACK	LAT_ EXT_ VAL	LATC_ VAL

LATC_VAL	**Ack Bit for EN-LATC (C0.0)**	
	Latch Mode:	This bit is set on a positive edge at input C Reset is carried out when EN_LATC is reset
	Preload Mode:	This bit is set on a positive edge at input C Reset is carried out when EN_LATC is reset
LAT_EXT_VAL	**Ack Bit for EN-LAT_EXT (C0.1)**	
	Latch Mode:	This bit is set on a positive edge at the Latch input Reset is carried out when EN_LAT_EXT is reset
	Preload Mode:	This bit is set on a positive edge at the Latch input Reset is carried out when EN_LAT_EXT is reset
CNT-SET_ACK	**Ack Bit for CNT_SET (C0.2)**	
	–	Reset is carried out when CNT_SET=0.
Enable_Cam_Ack	**Ack Bit for Enable_Cam (C1.6)**	
	–	The command has been executed by the I/O module when the ack bit and the request bit are identical. The cam outputs have the desired state.
OUF	**Combined Overflow/Underflow Status Bit**	
	Underflow function (“counter-clockwise” rotation)	
	1:	On counter underflow from 0x00000000 to 0xffffffff
	0:	When counter value is then < 0xAAAAAAAA
		On acknowledgement, i.e., positive edge RESET_OUF (C0.4)
		With an overflow event without previous acknowledgement
	Overflow function (“clockwise” direction of rotation)	
	1:	On counter overflow from 0xffffffff to 0x00000000
	0:	When counter value is then < 0x55555555
		On acknowledgement, i.e., positive edge RESET_OUF (C0.4)
		For underflow event without previous acknowledgement
AckSet LoadExt	**Ack Bit for SetLoadExt**	
	–	Reset is carried out when SetLoadExt=0 (C0.5)
PF	**Powerfail — A Loss of Field Power Supply is Reported**	
	1:	Field voltage is < 5 V
	0:	Field voltage is > 20.4 V
	After a power failure, all cam windows are set to 0. The counter reading is set to 0.	
0	**Reserved**	

Table 30: Status Byte S1, All Versions, Except 750-637/000-004

Status Byte S1							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	0	N2	N1	StaN2	StaN1	MapPZD	MapPZD

MapPZD	**Coding of Process Data**	
MapPZD	**Coding of Process Data**	
StaN1	**Status Cam Output 1**	
	0:	Cam output 1 is not set
	1:	Cam output 1 is set
StaN2	**Status Cam Output 2**	
	0:	Cam output 2 is not set
	1:	Cam output 2 is set
N1	**Cam Window 1**	
	Bit is set when:	Lower comparison value N1_LO ≤ counter value ≤ upper comparison value N1_HI
N2	**Cam Window 2**	
	Bit is set when:	Lower comparison value N2_LO ≤ counter value ≤ upper comparison value N2_HI
0	**Reserved**	
0	**Reserved**	

Table 31: Status Byte S1, Version 750-637/000-004

Status Byte S1							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	0	N2_F1	N1_F1	N2_F2	N1_F2	Set Cam_ Ack	MapPZD

MapPZD	**Coding of Process Data**	
Set Cam_Ack	**Collective and Ack Bit for All Cam Set Requests**	
	Bit is set when:	One or more request bists 2,3,4 or 5 are set by the control byte.
N1_F2	**Cam 1, Window 2**	
	Bit is set when:	Lower comparison value N1F2_LO < counter value < upper comparison value N1F2_HI and cams enabled (C1.6) and field voltage present (S0.6=0)
N2_F2	**Cam 2, Window 2**	
	Bit is set when:	Lower comparison value N2F2_LO < counter value < upper comparison value N2F2_HI and cams enabled (C1.6) and field voltage present (S0.6=0)
N1_F1	**Cam 1, Window 1**	
	Bit is set when:	Lower comparison value N1F1_LO < counter value < upper comparison value N1F1_HI and cams enabled (C1.6) and field voltage present (S0.6=0)
N2_F1	**Cam 2, Window 1**	
	Bit is set when:	Lower comparison value N2F1_LO < counter value < upper comparison value N2F1_HI and cams enabled (C1.6) and field voltage present (S0.6=0)
0	**Reserved**	
0	**Reserved**	

Table 32: Control Byte C0, All Versions, Except 750-637/000-004

Control Byte C0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	OpMode	SetLoad Ext	RESET OVER-FLOW	RESET UNDER-FLOW	CNT_SET	EN_LAT_ EXT	EN_LATC

EN_LATC	**The initial point of the encoder is enabled**	
	Capture Mode:	On a positive edge at input C, the counter value is transferred to the Latch register.
	Preload Mode:	On a positive edge at input C, the counter value is transferred to the Latch register. The set value is loaded to the counter.
	Confirmation is canceled on a negative edge at EN_LATC. EL_LATC is dominant over EN_LAT_EXT.	
EN_LAT_EXT	**The external Latch input is enabled**	
	Capture Mode:	On a positive edge at the LATCH input, the counter value is transferred to the Latch register.
	Preload Mode:	On a positive edge at the LATCH input, the counter value is transferred to the Latch register. The set value is loaded to the counter.
	Confirmation is canceled on a negative edge at EN_LAT_EXT.	
CNT_SET	**On a positive edge, the counter is initialized to the set value**	
RESET UNDERFLOW	**The UNDERFLOW status bit (S0.3) is reset on a positive edge.**	
RESET OVERFLOW	**The OVERFLOW status bit (S0.4) is reset on a positive edge.**	
SetLoad Ext	**On a positive edge, the set value to which the counter is to be set for an external event is transferred to the process data.**	
OpMode	**OpMode**	
	0:	Capture Mode: The counter is latched by a trigger signal
	1:	Preload Mode: The counter is latched by a trigger signal. The set value is then loaded to the counter.
0	**Reserved**	

Table 33: Control Byte C0, Version 750-637/000-004

Control Byte C0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	OpMode	SetLoad Ext	RESET OUF	INV_DIR	CNT_SET	EN_LAT_ EXT	EN_LATC

EN_LATC	**The initial point of the encoder is enabled**	
	Capture Mode:	On a positive edge at input C, the counter value is transferred to the Latch register.
	Preload Mode:	On a positive edge at input C, the counter value is transferred to the Latch register. The set value is loaded to the counter.
		Confirmation is canceled on a negative edge at EN_LATC. EL_LATC is dominant over EN_LAT_EXT.
EN_LAT_EXT	**The external Latch input is enabled**	
	Capture Mode:	On a positive edge at the LATCH input, the counter value is transferred to the Latch register.
	Preload Mode:	On a positive edge at the LATCH input, the counter value is transferred to the Latch register. The set value is loaded to the counter.
		Confirmation is canceled on a negative edge at EN_LAT_EXT.
CNT_SET	**On a positive edge, the counter is initialized to the set value**	
INV_DIR	**INV_DIR**	
	Bit = 0:	The counting direction is positive, i.e., from left to right.
	Bit = 1:	The counting direction is negative, i.e., from right to left.
	NOTICE:	The request is not acknowledged in the status byte (S0.4).
RESET OUF	**The OUF status bit (S0.4) is reset on a positive edge.**	
SetLoad Ext	**On a positive edge, the set value to which the counter is to be set for an external event is transferred to the process data.**	
OpMode	**OpMode**	
	0:	Capture Mode: The counter is latched by a trigger signal
	1:	Preload Mode: The counter is latched by a trigger signal. The set value is then loaded to the counter.
0	**Reserved**	

Table 34: Control byte C1, All Versions, Except 750-637/000-004

Control Byte C1							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Enable Ref	Set Cam2	Set Cam1	Dis Cam2	Dis Cam1	MapPZD	MapPZD

MapPZD	**Coding of Process Data**	
MapPZD	**Coding of Process Data**	
DisCam1	**Inhibit Cam Output 1**	
	0:	Cam output 1 enabled.
	1:	Cam output 1 inhibited.
DisCam2	**Inhibit Cam Output 2**	
	0:	Cam output 2 enabled.
	1:	Cam output 2 inhibited.
SetCam1	**Apply Cam Output 1**	
	Positive edge:	Set value applied as lower comparison value N1_LO for cam output 1 (N1).
	Negative edge	Set value applied as the upper comparison value N1_HI for cam output 1 (N1).
SetCam2	**Apply Cam Output 2**	
	Positive edge:	Set value applied as lower comparison value N2_LO for cam output 2 (N2).
	Negative edge	Set value applied as the upper comparison value N2_HI for cam output 2 (N2).
EnableRef	**Enable REF Input**	
		The control system sets the EnableRef bit
		The control system must enable EN_LATC (C0.0) or EN_LAT_EXT (C0.1) with a positive edge
		A positive edge is generated at input REF
		After this, the next positive edge at input C or LATCH will result in a capture or preload event
0	**Reserved**	

Table 35: Control byte C1, Version 750-637/000-004

Control Byte C1							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Enable_ Cam	Set Cam2_ F1	Set Cam1_ F1	Set Cam2_ F2	Set Cam1_ F2	INV_ GATE	MapPZD

MapPZD	**Coding of Process Data**	
	0:	Counter value
	1:	Latch value
INV_GATE	**Coding of Process Data**	
	0:	The counting process is disabled when 24 V is applied to the GATE input.
	1:	The counting process is disabled when 0 V is applied to the GATE input or when the input is open.
	NOTICE:	The request is not acknowledged in the status byte!
SetNocke1_F2	**Apply Cam Output 1, Window 2**	
	Positive edge:	Set value applied as lower comparison value N1F2_LO for cam output 1 (N1) window F2
	Negative edge:	Set value applied as the upper comparison value N1F2_HI for cam output 1 (N1) window F2
SetNocke2_F2	**Apply Cam Output 2, Window 2**	
	Positive edge:	Set value applied as lower comparison value N2F2_LO for cam output 2 (N2) window F2
	Negative edge:	Set value applied as the upper comparison value N2F2_HI for cam output 2 (N2) window F2
SetCam1_F1	**Apply Cam Output 1, Window 1**	
	Positive edge:	Set value applied as lower comparison value N1F1_LO for cam output 1 (N1) window F1
	Negative edge	Set value applied as the upper comparison value N1F1_HI for cam output 1 (N1) window F1
SetCam2_F1	**Apply Cam Output 2, Window 1**	
	Positive edge:	Set value applied as lower comparison value N2F1_LO for cam output 2 (N2) window F1
	Negative edge	Set value applied as the upper comparison value N2F1_HI for cam output 2 (N2) window F1
Enable_Cams	**Output Voltage**	
	0:	All cam outputs are inhibited, i.e., the output voltage is 0 V
	1:	Alle cam outputs are enabled, i.e., the output voltage is 24 V
	The request is acknowledged in the status bit Enable_Cams (S0.3).	
0	**Reserved**	

5 Function Description

As a rule, incremental encoders supply two output signals from the encoder tracks, offset by 90°. These signals are designated A and B. The difference between the input signals is evaluated in the incremental encoder I/O module.

In addition to the two track signals, incremental encoders normally also have an index track. This track contains only one impulse per rotation of the encoder. From this impulse and the counter value, the absolute position of the encoder can be determined within a revolution. As the index impulse is equal to the length of a line of the track signals, the latch process should always be carried out with the same direction of rotation.

Table 36: Function Description – Inputs

Input	Description	I/O Module	Function
A, /A, B, /B	Quadrature inputs, RS-422	750-637	Track signal A or B of the incremental encoder
		750-637/000-003	
	Quadrature inputs, 24 V, differential	750-637/000-001	
A,B	Quadrature inputs, 24 V, single-ended	750-637/000-004	
		750-637/000-002	
C, /C	Initial point input, RS-422	750-637	Track signal for the index channel of the incremental encoder. Based on the operating mode, the content of the counter is placed in the Latch register, or the set value also loaded to the counter on a positive edge at this input.
		750-637/000-003	
	Initial point input, 24 V, differential	750-637/000-001	
C	Initial point input, single-ended	750-637/000-002	
		750-637/000-004	
LATCH	LATCH input, 24 V	750-637	Based on the operating mode, the content of the counter is placed in the Latch register, or the set value also loaded to the counter on a positive edge at this input.
		750-637/000-001	
		750-637/000-002	
		750-637/000-003	
		750-637/000-004	

Table 36: Function Description – Inputs

Input	Description	I/O Module	Function
GATE	GATE input, 24 V	750-637	The counting process is disabled when 24 V is applied to the GATE input.
		750-637/000-001	
		750-637/000-002	
		750-637/000-003	
		750-637/000-004	The counting process is disabled when 24 V is applied to the GATE input. The counter is enabled when 0 V is present at the GATE input, or when the input is open. This allocation can be inverted by a control bit.
REF	REF input, 24 V	750-637	During a reference run the index impulse is only evaluated when an additional sensor signal (REF) is present.
		750-637/000-001	
		750-637/000-002	
		750-637/000-003	
	REF input	750-637/000-004	The counter is set to 0 on a positive edge for REF
Shield	Shielding	750-637	Connection for shielding of the encoder line. The shield (screen) is directly connected to the DIN rail.
		750-637/000-001	
		750-637/000-002	
		750-637/000-003	
		750-637/000-004	
+24 V	Supply voltage	750-637	24 V supply voltage for the I/O module
		750-637/000-001	
		750-637/000-002	
		750-637/000-003	
		750-637/000-004	
0 V	Ground	750-637	Ground for the 24 V power supply and encoder signals, connected internally with terminal V_0
		750-637/000-003	
		750-637/000-001	Ground for 24 V supply voltage
		750-637/000-002	Ground for 24 V power supply and encoder signals
		750-637/000-004	
V_e (+5 V)	Supply voltage	750-637	5 V supply voltage for encoder
V_0 (0 V)	Ground	750-637	Ground for encoder signals and power supply connected internally with 0 V terminal

Table 37: Function Description — Outputs, All Versions, Except 750-637/000-004

Output	Function	
N1, N2	Cam output, 24 V, 0.5 A	
	0:	Counter value outside the set window.
	1:	Counter value within the set window.

Table 38: Function Description — Outputs, Version 750-637/000-004 Only

Output	Function	
N1, N2	Cam output, 24 V, 0.5 A	
	0:	Counter value outside the set window.
	1:	Counter value within the set window.
	Cams can be enabled and disabled globally. This guarantees that no unexpected switching states occur during ongoing operation due to changes of the windows.	
	All cam outputs are reset (output votlage 0 V) on loss of field voltage. When voltage is restored, all cams remain reset, regardless of the previous switching state (output voltage 0 V). The loss of voltage is reported to the control unit via a status bit. The cam windows must then be set anew.	

6 Mounting

⚠ 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.

⚠ 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

Do not contaminate contacts!
Contamination may negatively impact the functionality of data and power jumper contacts. Do not touch the contacts. Avoid contaminating the 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.

NOTICE

Follow the installation instructions!
Only install this device in dry, indoor rooms.
Do not install the device on or in the vicinity of easily flammable materials!

6.1 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.

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 (e.g. 750-600) onto the end of the fieldbus node! You must always use a bus end module at all fieldbus nodes with WAGO I/O System 750 fieldbus couplers or controllers to guarantee proper data transfer.

6.2 Inserting and Removing Devices

6.2.1 Inserting the I/O Module

1. Position the I/O module in such a way that the groove and spring are connected to the preceding and following components.

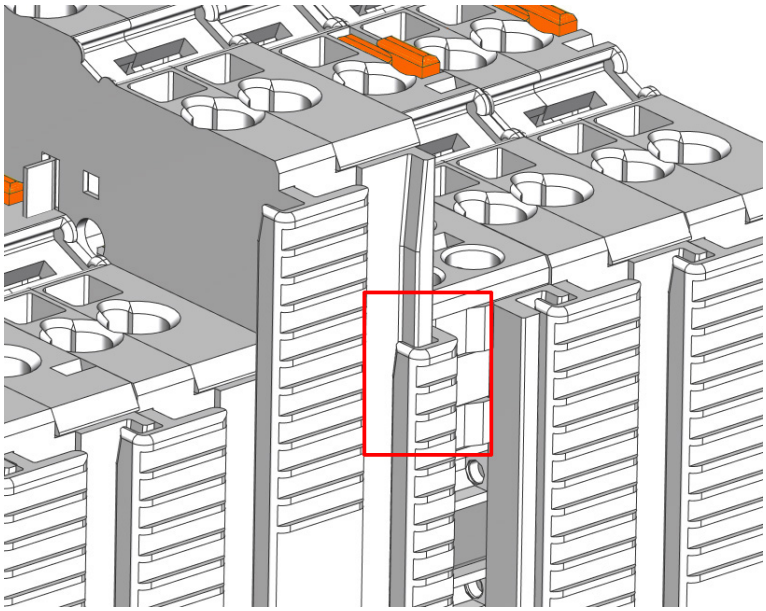

Figure 10: Inserting I/O Module (Example)

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

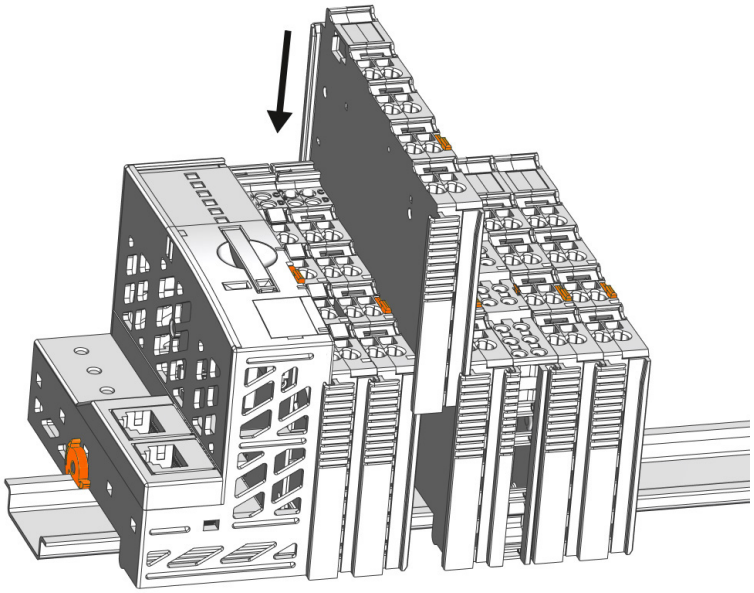

Figure 11: Snap the I/O Module into Place (Example)

3. Check that the I/O module is seated securely on the carrier rail and in the assembly. The I/O module must not be inserted crooked or askew.

Once the I/O module has snapped into place, the electrical connections for the data contacts and power contacts (if any) to the head station or to the preceding and, if applicable, following I/O module are established.

6.2.2 Removing the I/O Module

1. Remove the I/O module from the assembly by pulling the release tab.

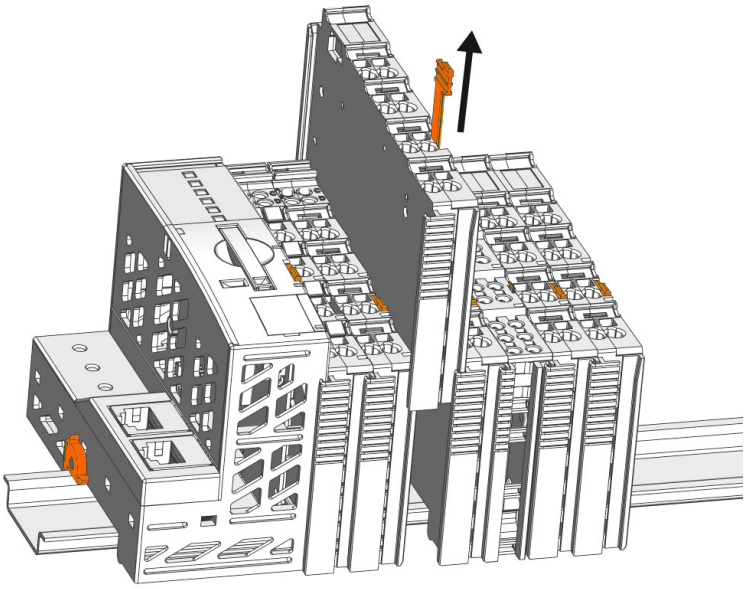

Figure 12: Removing the I/O Module (Example)

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

7 Connect Devices

Note

Use shielded signal lines!
Only use shielded signal lines for analog signals and I/O modules which are equipped with shield clamps. Only then can you ensure that the accuracy and interference immunity specified for the respective I/O module can be achieved even in the presence of interference acting on the signal cable.

7.1 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.

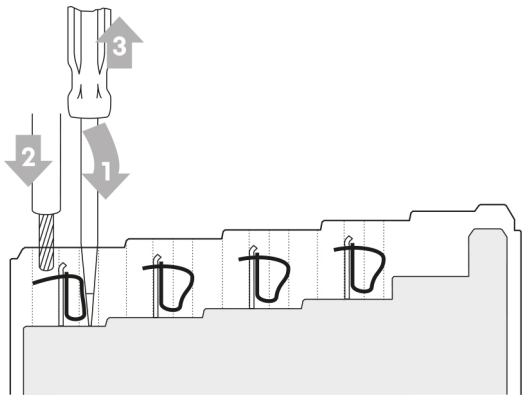

Figure 13: Connecting a Conductor to a CAGE CLAMP®

8 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.

8.1 Marking Configuration Examples

8.1.1 Marking for Europe According to ATEX and IECEx

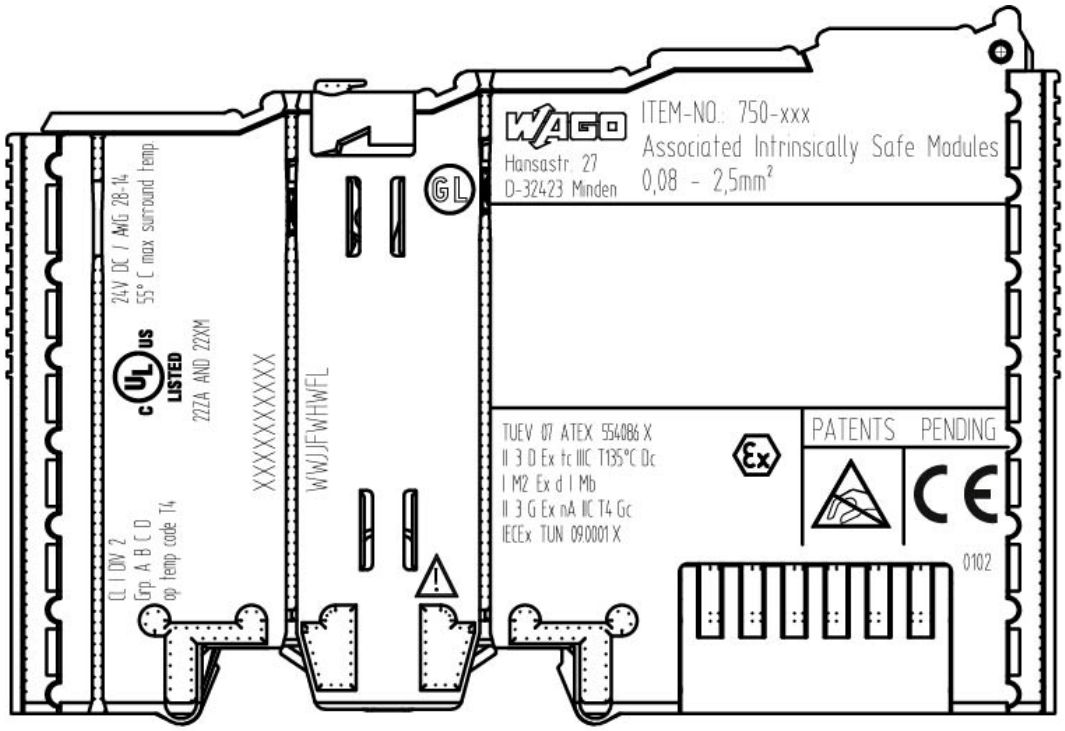

Figure 14: Marking Example per ATEX and IECEx

Figure 15: Text Detail – Marking Example per ATEX and IECEx

Table 39: Description of the Marking Example per ATEX and IECEx

Marking Text	Description
TUEV 07 ATEX 554086 X IECEx TUN 09.0001 X	Approving authority or certificate numbers
Dust	
II	Device group: All except mining
3 D	Device category 3 (Zone 22)
Ex	Explosion protection mark
tc	Protection type: Protection by enclosure
IIIC	Dust group: Explosive dust atmosphere
T135°C	Maximum surface temperature of the enclosure (no dust bin)
Dc	Level of equipment protection (EPL)
Mining	
I	Device group: Mining
M2	Device category: High degree of safety
Ex	Explosion protection mark
d	Protection type: Pressure-tight encapsulation
I	Electrical devices in potentially explosive mines
Mb	Level of equipment protection (EPL)
Gases	
II	Device group: All except mining
3 G	Device category 3 (Zone 2)
Ex	Explosion protection mark
nA	Protection type: Non-sparking equipment
IIC	Gas group: Explosive gas atmosphere
T4	Temperature class: Max. surface temperature 135 °C
Gc	Level of equipment protection (EPL)

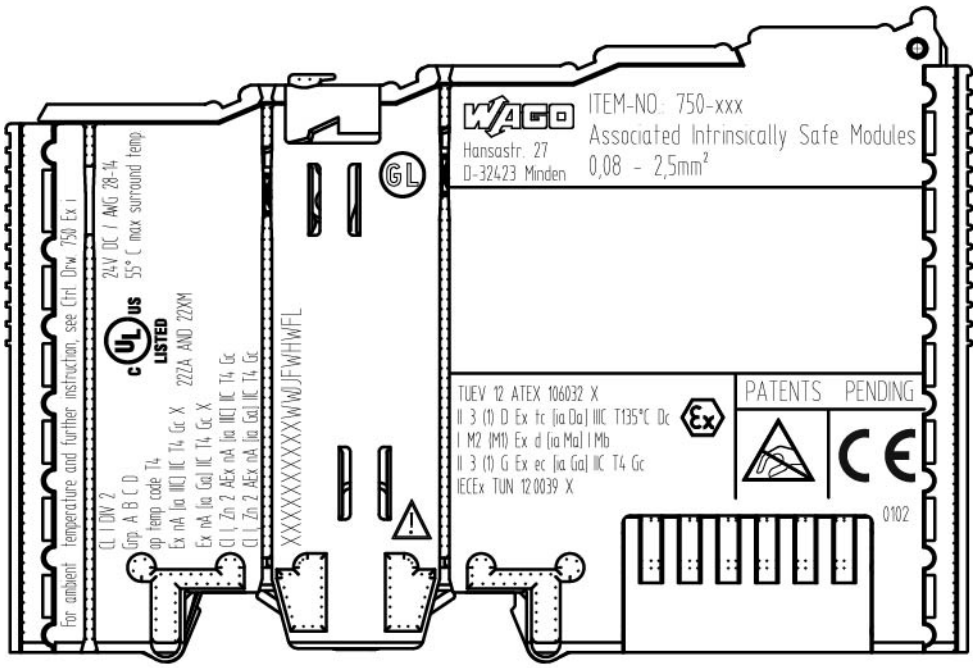

Figure 16: Marking Example of an Approved I/O Module Ex i per ATEX and IECEx

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 17: Text Detail – Marking Example of an Approved I/O Module Ex i per ATEX and IECEx

Table 40: Description of the Marking Example of an Approved I/O Module Ex i per ATEX and IECEx

Marking Text	Description
TUEV 12 ATEX 106032 X IECEx TUN 12 0039 X	Approving authority or certificate numbers
Dust	
II	Device group: All except mining
3 (1) D	Device category 3 (Zone 22) that contain safety devices for Category 1 (Zone 20) devices
Ex	Explosion protection mark
tc	Protection type: Protection by enclosure
[ia Da]	Protection type and equipment protection level (EPL): Associated equipment with intrinsically safe circuits for Zone 20
IIIC	Dust group: Explosive dust atmosphere
T135°C	Max. surface temperature of the enclosure (no dust bin)
Dc	Level of equipment protection (EPL)
Mining	
I	Device group: Mining
M2 (M1)	Device category: High level of safety with circuits that offer a very high level of safety
Ex	Explosion protection mark
d	Protection type: Pressure-tight encapsulation
[ia Ma]	Protection type and equipment protection level (EPL): Associated equipment with intrinsically safe circuits
I	Electrical devices in potentially explosive mines
Mb	Level of equipment protection (EPL)
Gases	
II	Device group: All except mining
3 (1) G	Device category 3 (Zone 2) that contain safety devices for Category 1 (Zone 0) devices
Ex	Explosion protection mark
ec	Protection type: Increased safety
[ia Ga]	Protection type and equipment protection level (EPL): Associated equipment with intrinsically safe circuits for Zone 0
IIC	Gas group: Explosive gas atmosphere
T4	Temperature class: Max. surface temperature 135 °C
Gc	Level of equipment protection (EPL)

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

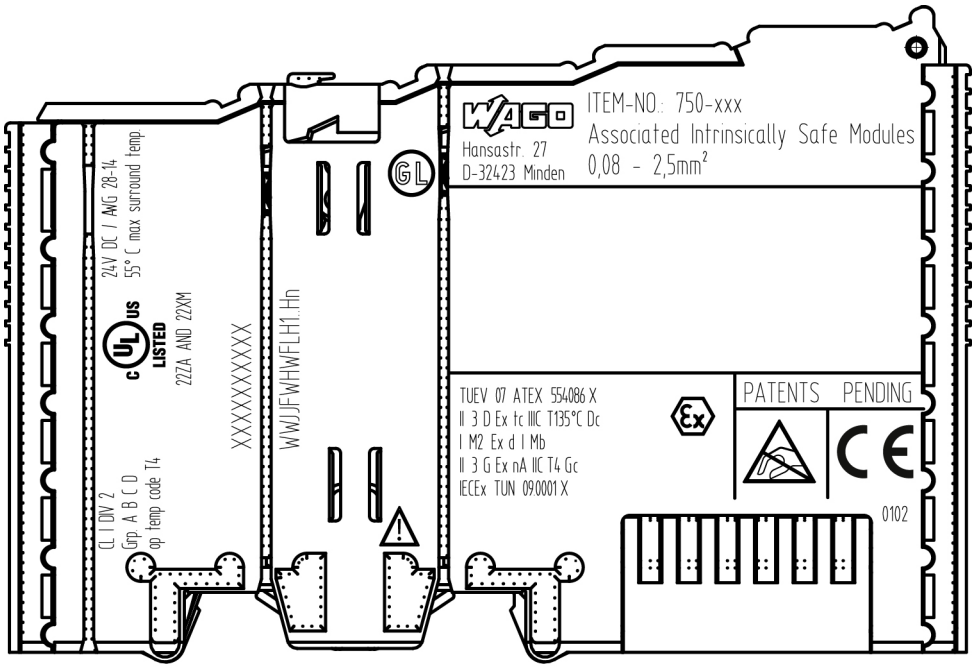

Figure 18: Marking Example According to NEC

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

Figure 19: Text Detail – Marking Example According to NEC 500

Table 41: 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 20: Text Detail – Marking Example for Approved I/O Module Ex i According to NEC 505

Table 42: Description of Marking Example for Approved I/O Module Ex i According to NEC 505

Marking	Description
Cl 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 21: Text Detail – Marking Example for Approved I/O Module Ex i According to NEC 506

Table 43: Description of Marking Example for Approved I/O Module Ex i According to NEC 506

Marking	Description
Cl 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 22: Text Detail – Marking Example for Approved I/O Module Ex i According to CEC 18 attachment J

Table 44: Description of Marking Example for Approved I/O Module Ex i 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 including 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 UL Hazardous Location

For UL Hazardous Location 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

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WAGO Kontakttechnik GmbH & Co. KG
Postfach 2880 • D - 32385 Minden
Hansastraße 27 • D - 32423 Minden
Phone: +49 571 887 – 0
Fax: +49 571 887 – 844169
E-Mail: info@wago.com
Internet: www.wago.com