

WAGO → I/O → SYSTEM 750

**Fieldbus Independent
I/O Modules**

**Data Exchange Module
750-654, 750-654/000-001**



Manual

Version 1.0.3

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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: <http://www.wago.com>

Technical Support

Phone: +49 (0) 571/8 87 – 5 55
Fax: +49 (0) 571/8 87 – 85 55
E-Mail: support@wago.com

Every conceivable measure has been taken to ensure the correctness and completeness of this documentation. However, as errors can never be fully excluded, we would appreciate any information or ideas at any time.

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 trademark or patent protected.

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1.1 Scope

This manual describes the Special Module 750-654, 750-654/000-001 Data Exchange Module of the modular WAGO-I/O-SYSTEM 750.

Handling, assembly and start-up are described in the manual of the Fieldbus Coupler. Therefore this documentation is valid only in the connection with the appropriate manual.

2 I/O Modules

2.1 Special Modules

2.1.1 750-654, 750-654/000-001 [Data Exchange Module]

2.1.1.1 Variations

Item-No.	Designation	Description
750-654	Data Exchange Module	Baud rate: 62500 baud; Parity: none; data bits: 8, stop bits: 1
750-654/000-001	Data Exchange Module 125 kBaud	Baud rate: 125000 baud; Parity: none; data bits: 8, stop bits: 1

2.1.1.2 View

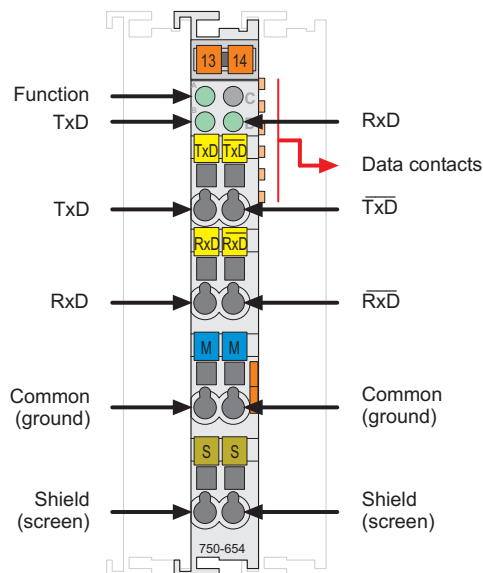


Fig. 2.1.1-1: View

g065400e

2.1.1.3 Description

The data exchange module allows the exchange of data between different fieldbus systems via multiplexing of a serial connection.

Two modules are a communication pair that is connected by means of two twisted wire pairs. Each module is part of a fieldbus node.

The wiring to the communication partner is made by the connections TxD, /TxD, RxD, /RxD and ground.

The screen connection is connected directly to the mounting rail.

The data exchange is done in full duplex operation, independent of the fieldbus system used. The data of the output process image of the fieldbus coupler/-controller is transmitted to the communication partner. This module then transmits the data to the input process image of its fieldbus coupler/-controller and vice versa.

Depending on the fieldbus coupler/-controller used, the data exchange module allows for the exchange of 4 (5) bytes, one status byte and one control byte between the fieldbus systems via multiplexing of a serial connection. The delay which is caused by the multiplexor is ca. 5 ms with the module 750-654 and 2.5 ms with the module 750-654/000-001.

Three green LEDs signal readiness for operation and troublefree internal bus communication as well as the condition of the signal transmission.

The interface guarantees high fail-safe characteristic by differential transmission and electrically isolated signals.

Any configuration of the specialty modules is possible when designing the fieldbus node. Grouping of module types is not necessary.



Attention

This module has no power contacts. For field supply to downstream I/O modules, a supply module will be needed.

The data exchange module 750-654 and its variations can be used with all couplers/controllers of the WAGO-I/O-SYSTEM 750 (except for the economy types 750-320, -323, -324 and -327).

This description is valid for hardware and software version XXXX3A05..... The version is specified in the manufacturing number, which is part of the lateral marking of the module.

2.1.1.4 Display Elements

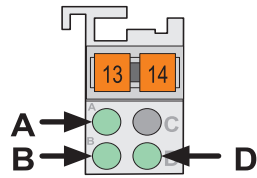


Fig. 2.1.1-2: Display Elements g065002x

LED	Channel	State	Function
A	Function	off	No operational readiness or the internal data bus communication is interrupted
		green	Operational readiness and trouble-free internal data bus communication
B	TxD	off	signal transfer TxD
		green	no signal transfer TxD
D	RxD	off	signal transfer RxD
		green	no signal transfer RxD

¹⁾ The pulses are so short that the off status cannot or only hardly be recognized with the eyes.

2.1.1.5 Schematic Diagram

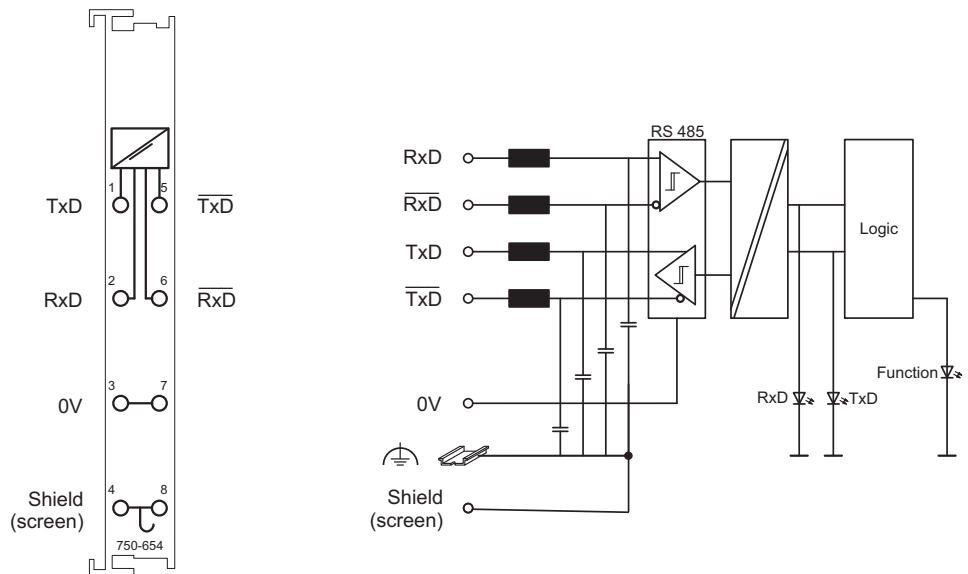














Fig. 2.1.1-3: Schematic Diagram

g065401e

2.1.1.6 Technical Data

Module Specific Data		
Transmission channel	1 TxD / 1 RxD, full duplex	
Baud rate	62500 baud (8 N 1) (750-654) 125000 baud (8 N 1) (750-654/000-001)	
Bit transfer	over 2 x twisted pair with differential signals	
Line impedance	120 Ω	
Transmission length _{max.}	100 m twisted pair	
Current consumption (internal)	65 mA	
Voltage supply	via system voltage DC /DC	
Isolation	500 V (System/Supply)	
Bit width	1 x 40 bits data 1 x 8 bits control/status	
Dimensions (mm) W x H x L	12 x 64* x 100 * from upper edge of 35 DIN rail	
Weight	ca. 55 g	
Standards and Regulations		
EMC CE-Emission of interference	acc. to EN 61000-6-4: 2007	
EMC CE-Emission of interference	acc. to EN 61000-6-2: 2005	
EMC marine applications-Immunity to interference	acc. to Germanischer Lloyd (2003)	
EMC marine applications-Emission of interference	acc. to Germanischer Lloyd (2003)	
ATEX guideline	Acc. to EN 60079-0:2006 and acc. to EN 60079-15:2005	
Approvals		
 cUL _{US}	cUL _{US} (UL508)	
	ABS (American Bureau of Shipping)	Only for 750-654
	BV (Bureau Veritas)	
	DNV (Det Norske Veritas)	Cl. B
	GL (Germanischer Lloyd) (applied for)	Cat. A, B, C, D
	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)	Only for 750-654

Approvals		
	DEKRA	II 3 G Ex nA II T4
	Conformity Marking	



More Information

Detailed references to the approvals are listed in the document "Overview Approvals WAGO-I/O-SYSTEM 750", which you can find on the CD ROM "AUTOMATION Tools and Docs" (Item-No.: 0888-0412) or in the internet under: <http://www.wago.com> → Documentation → WAGO-I/O-SYSTEM 750 → System Description

2.1.1.7 Functional description

The integrated watchdog function switches all outputs to zero if there is no valid information for more than 200 ms via the multiplex connection.

The 128 bytes input buffer provides for high rates of data transmission. When using slower speeds, you can collect the received data with lower priority without losing data.

The 16 byte output buffer provides for faster transmission of larger data strings.

The data exchange module is connected peer-to-peer. For the wiring of the serial multiplex connection the Rx/D and Tx/D cables are crossed. The following illustrations show the peer-to-peer connection and the internal structure of the data exchange module.

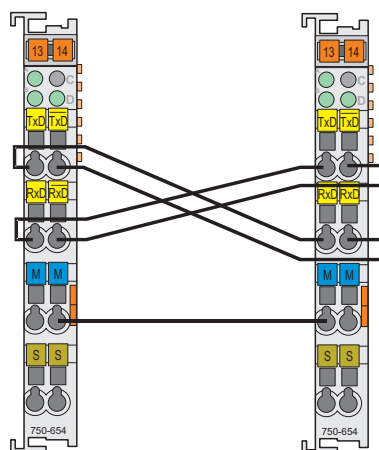


Fig. 2.1.1-4: Point-to-Point connection

g065402d

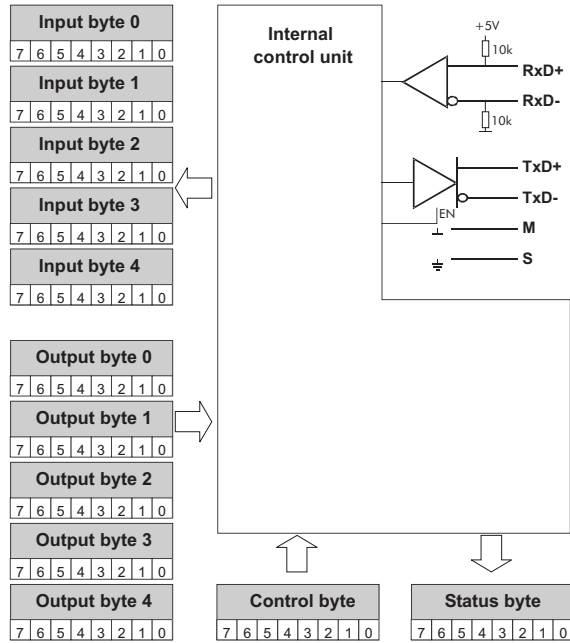


Fig. 2.1.1-5: Internal Structure

g065403e

2.1.1.8 Process Image

Using the module 750-654, a 6 byte input and output process image can be transferred to the fieldbus coupler / controller via one logical channel. The data sent and received are stored in up to 5 output and input bytes (D0 ... D4). One control byte (C) and one status byte (S) are used to control the data flow.



Attention

The representation of the process data of some I/O modules or their variations 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 corresponding coupler/controller.

Input data		Output data	
S	Status byte	C	Control byte
D0	Input byte 0	D0	Output byte 0
D1	Input byte 1	D1	Output byte 1
D2	Input byte 2	D2	Output byte 2
D3	Input byte 3	D3	Output byte 3
D4	Input byte 4	D4	Output byte 4

Control byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	X	X	X	X	X	X	X

- X not used
- 0 Constant value must always be 0

Status byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	X	X	RCVT1	RCVT2	CHK	OVR	PAR

- PAR Parity error or wrong data in a frame.
- OVR Buffer overflow
- CHK Checksum error.
- RCVT2 The receiver is in timeout.
- RCVT1 Constant value always should be 0. Module is in timeout. All output bits are set to 0 (watchdog). The receiver is in timeout. Checksum error. Buffer overflow Parity error or wrong data in a frame.
- X not used
- 0 Constant value must always be 0

2.1.1.9 Data Transfer

The status byte is used as diagnostic byte for the data communication and indicates the status of data communication with the partner module.

Control of the multiplex connection:

In the process image of the transmitting coupler/controller, one bit is set to "1" for the whole time. As long as this bit is "1" in the receiving coupler/controller, further input bits can be evaluated. If the bit is "0" the multiplex connection has been disrupted. The further bits are also 0 because of the watchdog.

Control of the multiplex connection with acknowledge:

If the transmitting coupler/controller gets an acknowledgement from the receiving coupler/controller, the received bit must be transferred by the application software as an output bit to the process image. The transmission is successful as long as the bit is "1".

Handshake:

If a serial data exchange should be made with the data exchange module, the handshake can be made via "Toggle Bits". Therefore an input bit and an output bit are reserved. As soon as this input bit is different from this output bit, a request from the opposite module is made. As soon as the request is executed the output bit is negative (toggled).

3 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.

3.1 Marking Configuration Examples

3.1.1 Marking for Europe according to CENELEC and IEC

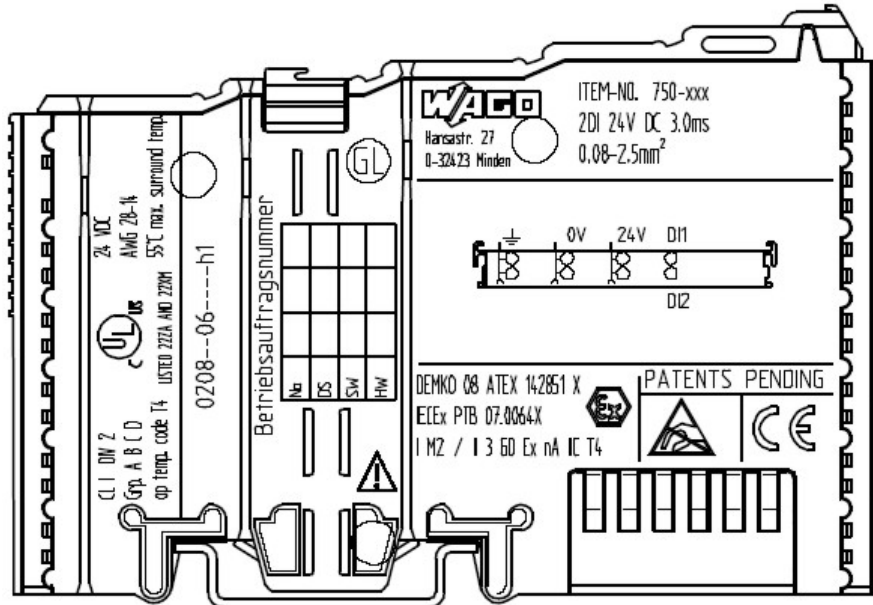


Figure 1: Side marking example for ATEX and IEC Ex approved I/O modules according to CENELEC and IEC

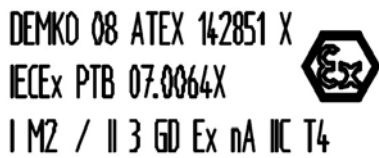


Figure 2: Printing Text detail – Marking example for ATEX and IEC Ex approved I/O modules according to CENELEC and IEC

Table 1: Description of marking example for ATEX and IEC Ex approved I/O modules according to CENELEC and IEC

Printing on Text	Description
DEMKO 08 ATEX 142851 X IECEX PTB 07.0064X	Approval body and/or number of the examination certificate
I M2 / II 3 GD	Explosion protection group and Unit category
Ex nA	Type of ignition and extended identification
IIC	Explosion protection group
T4	Temperature class

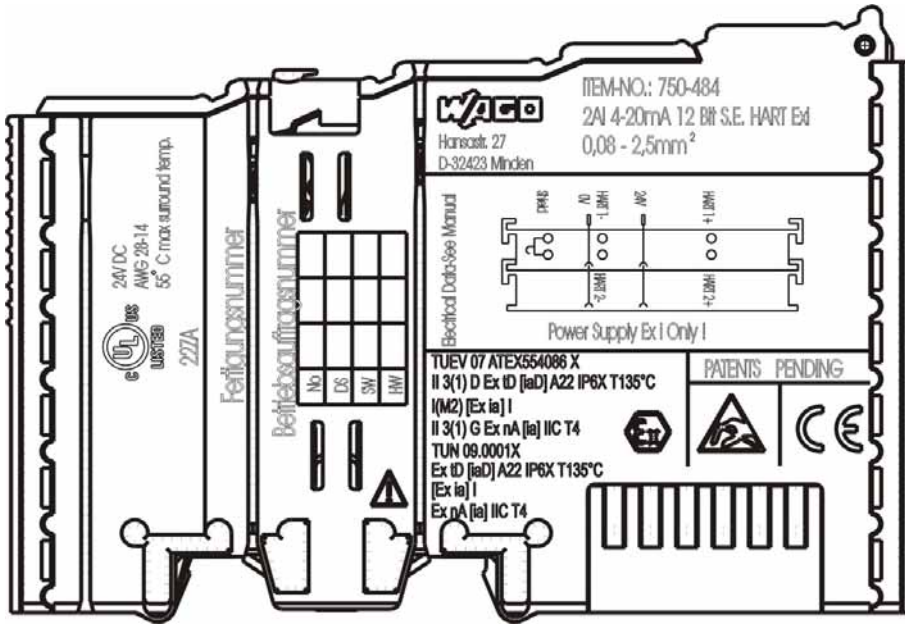


Figure 3: Side marking example for Ex i and IEC Ex i approved I/O modules according to CENELEC and IEC

TUEV 07 ATEX554086 X
II 3(1) D Ex tD [iaD] A22 IP6X T135°C
I(M2) [Ex ia] I
II 3(1) G Ex nA [ia] IIC T4
TUN 09.0001X
Ex tD [iaD] A22 IP6X T135°C
[Ex ia] I
Ex nA [ia] IIC T4



Figure 4: Text detail – Marking example for Ex i and IEC Ex i approved I/O modules according to CENELEC and IEC

Table 2: Description of marking example for Ex i and IEC Ex i approved I/O modules according to CENELEC and IEC

Inscription text	Description
TÜV 07 ATEX 554086 X TUN 09.0001X	Approving authority or certificate numbers
Dust	
II	Device group: All except mining
3(1)D	Device category: Zone 22 device (Zone 20 subunit)
Ex	Explosion protection mark
tD	Protection by enclosure
[iaD]	Approved in accordance with "Dust intrinsic safety" standard
A22	Surface temperature determined according to Procedure A, use in Zone 22
IP6X	Dust-tight (totally protected against dust)
T 135°C	Max. surface temp. of the enclosure (no dust bin)
Mining	
I	Device group: Mining
(M2)	Device category: High degree of safety
[Ex ia]	Explosion protection: Mark with category of type of protection intrinsic safety: Even safe when two errors occur
I	Device group: Mining
Gases	
II	Device group: All except mining
3(1)G	Device category: Zone 2 device (Zone 0 subunit)
Ex	Explosion protection mark
nA	Type of protection: Non-sparking operating equipment
[ia]	Category of type of protection intrinsic safety: Even safe when two errors occur
IIC	Explosion Group
T4	Temperature class: Max. surface temperature 135°C

3.1.2 Marking for America according to NEC 500

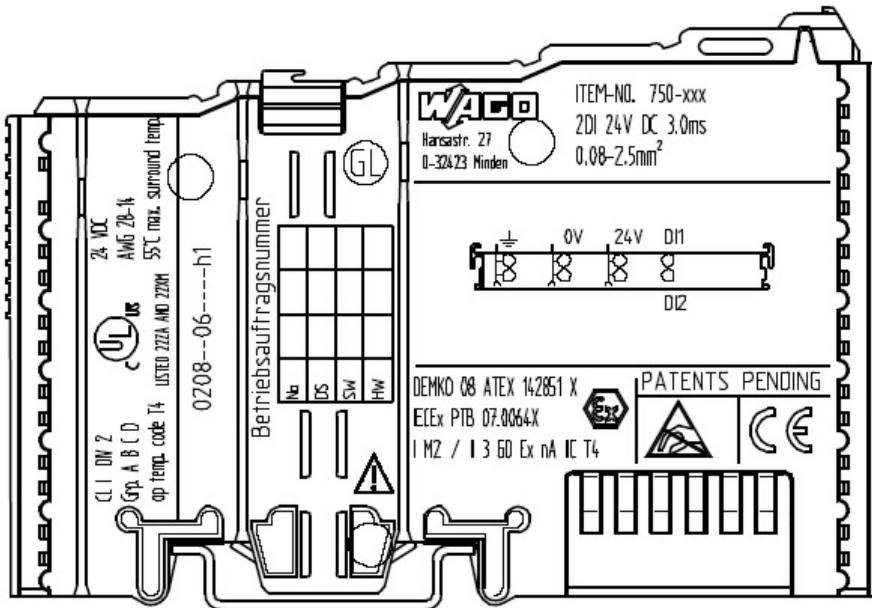


Figure 5: Side marking example for I/O modules according to NEC 500



Figure 6: Text detail – Marking example for I/O modules according to NEC 500

Table 3: Description of marking example for I/O modules according to NEC 500

Printing on Text	Description
CL 1	Explosion protection group (condition of use category)
DIV 2	Area of application (zone)
Grp. ABCD	Explosion group (gas group)
Optemp code T4	Temperature class

3.2 Installation Regulations

In the **Federal Republic of Germany**, various national regulations for the installation in explosive areas must be taken into consideration. The basis for this forms the working reliability regulation, which is the national conversion of the European guideline 99/92/E6. They are complemented by the installation regulation EN 60079-14. The following are excerpts from additional VDE regulations:

Table 4: VDE Installation Regulations in Germany

DIN VDE 0100	Installation in power plants with rated voltages up to 1000 V
DIN VDE 0101	Installation in power plants with rated voltages above 1 kV
DIN VDE 0800	Installation and operation in telecommunication plants including information processing equipment
DIN VDE 0185	lightning protection systems

The **USA** and **Canada** have their own regulations. The following are excerpts from these regulations:

Table 5: Installation Regulations in USA and Canada

NFPA 70	National Electrical Code Art. 500 Hazardous Locations
ANSI/ISA-RP 12.6-1987	Recommended Practice
C22.1	Canadian Electrical Code

NOTICE

Notice the following points

When using the **WAGO-I/O SYSTEM 750** (electrical operation) with Ex approval, the following points are mandatory:

3.2.1 Special Conditions for Safe Operation of the ATEX and IEC Ex (acc. DEMKO 08 ATEX 142851X and IECEx PTB 07.0064)

The fieldbus-independent I/O modules of the WAGO-I/O-SYSTEM 750-.../...-... must be installed in an environment with degree of pollution 2 or better. In the final application, the I/O modules must be mounted in an enclosure with IP 54 degree of protection at a minimum with the following exceptions:

- I/O modules 750-440, 750-609 and 750-611 must be installed in an IP 64 minimum enclosure.
- I/O module 750-540 must be installed in an IP 64 minimum enclosure for 230 V AC applications.
- I/O module 750-440 may be used up to max. 120 V AC.

When used in the presence of combustible dust, all devices and the enclosure shall be fully tested and assessed in compliance with the requirements of IEC 61241-0:2004 and IEC 61241-1:2004.

When used in mining applications the equipment shall be installed in a suitable enclosure according to EN 60079-0:2006 and EN 60079-1:2007.

I/O modules fieldbus plugs or fuses may only be installed, added, removed or replaced when the system and field supply is switched off or the area exhibits no explosive atmosphere.

DIP switches, coding switches and potentiometers that are connected to the I/O module may only be operated if an explosive atmosphere can be ruled out.

I/O module 750-642 may only be used in conjunction with antenna 758-910 with a max. cable length of 2.5 m.

To exceed the rated voltage no more than 40%, the supply connections must have transient protection.

The permissible ambient temperature range is 0 °C to +55 °C.

3.2.2 Special conditions for safe use (ATEX Certificate TÜV 07 ATEX 554086 X)

1. For use as Gc- or Dc-apparatus (in zone 2 or 22) the field bus independent I/O modules WAGO-I/O-SYSTEM 750-*** shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) EN 60079-0, EN 60079-11, EN 60079-15, EN 61241-0 and EN 61241-1. For use as group I, electrical apparatus M2, the apparatus shall be erected in an enclosure that ensures a sufficient protection according to EN 60079-0 and EN 60079-1 and the degree of protection IP64. The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExNB.
2. If the interface circuits are operated without the field bus coupler station type 750-3../...-... (DEMKO 08 ATEX 142851 X), measures must be taken outside of the device so that the rating voltage is not being exceeded of more than 40% because of transient disturbances.
3. DIP-switches, binary-switches and potentiometers, connected to the module may only be actuated when explosive atmosphere can be excluded.
4. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes. The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded.
5. For the types 750-606, 750-625/000-001, 750-487/003-000, 750-484 the following shall be considered: The interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in IEC 60664-1.
6. For the type 750-601 the following shall be considered: Do not remove or replace the fuse when the apparatus is energized.
7. The ambient temperature range is: $0^{\circ}\text{C} \leq T_a \leq +55^{\circ}\text{C}$ (for extended details please note certificate).

8. The following warnings shall be placed nearby the unit:

 **WARNING**

Do not remove or replace fuse when energized!

If the module is energized do not remove or replace the fuse.

 **WARNING**

Do not separate when energized!

Do not separate the module when energized!

 **WARNING**

Separate only in a non-hazardous area!

Separate the module only in a non-hazardous area!

3.2.3 Special conditions for safe use (IEC-Ex Certificate TUN 09.0001 X)

1. For use as Dc- or Gc-apparatus (in zone 2 or 22) the fieldbus independent I/O modules WAGO-I/O-SYSTEM 750-*** shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) IEC 60079-0, IEC 60079-11, IEC 60079-15, IEC 61241-0 and IEC 61241-1. For use as group I, electrical apparatus M2, the apparatus shall be erected in an enclosure that ensures a sufficient protection according to IEC 60079-0 and IEC 60079-1 and the degree of protection IP64. The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExCB.
2. Measures have to be taken outside of the device that the rating voltage is not being exceeded of more than 40% because of transient disturbances.
3. DIP-switches, binary-switches and potentiometers, connected to the module may only be actuated when explosive atmosphere can be excluded.
4. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes. The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded.
5. For the types 750-606, 750-625/000-001, 750-487/003-000, 750-484 the following shall be considered: The interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in IEC 60664-1.
6. For the type 750-601 the following shall be considered: Do not remove or replace the fuse when the apparatus is energized.
7. The ambient temperature range is: $0^{\circ}\text{C} \leq T_a \leq +55^{\circ}\text{C}$ (for extended details please note certificate).

8. The following warnings shall be placed nearby the unit:

 **WARNING**

Do not remove or replace fuse when energized!

If the module is energized do not remove or replace the fuse.

 **WARNING**

Do not separate when energized!

Do not separate the module when energized!

 **WARNING**

Separate only in a non-hazardous area!

Separate the module only in a non-hazardous area!

3.2.4 Special conditions for safe use (ATEX Certificate DEKRA 11ATEX0203 X)

1. The components shall be installed in a suitable enclosure providing a degree of protection of at least IP54 according to EN 60529, taking into account the environmental conditions under which the equipment will be used.
2. When the temperature under rated conditions exceeds 70 °C at the cable or conduit entry point, or 80 °C at the branching point of the conductors, the temperature specification of the selected cable shall be in compliance with the actual measured temperature values.
3. Provisions shall be made to prevent the rated voltages from being exceeded by transient disturbances of more than 40 %.
4. Components may only be removed or inserted when the system supply and the field supply are switched off, or when the location is known to be non-hazardous.
5. Fieldbus connectors may only be disconnected or connected when the system supply is switched off, or when the location is known to be non-hazardous.
6. The fuses, present in de the system modules 750-6xx may only be replaced when the supply is switched off, or when the location is known to be non-hazardous.
7. Address selectors and ID switches may only be adjusted when the system supply is switched off, or when the location is known to be non-hazardous.
8. The ambient temperature range is: $0^{\circ}\text{C} \leq T_a \leq +55^{\circ}\text{C}$.

3.2.5 ANSI/ISA 12.12.01

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.

This equipment is to be fitted within tool-secured enclosures only.

 **WARNING**

Explosion hazard!

Explosion hazard - substitution of components may impair suitability for Class I, Div. 2.

 **WARNING**

Disconnect device when power is off and only in a non-hazardous area!

Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous near each operator accessible connector and fuse holder." When a fuse is provided, the following information shall be provided: "A switch suitable for the location where the equipment is installed shall be provided to remove the power from the fuse."

For devices with Ethernet connectors:

"Only for use in LAN, not for connection to telecommunication circuits".

 **WARNING**

Use only with antenna module 758-910!

Use Module 750-642 only with antenna module 758-910.

For Couplers/Controllers and Economy bus modules only: "The configuration Interface Service connector is for temporary connection only. Do not connect or disconnect unless the area is known to be nonhazardous. Connection or disconnection in an explosive atmosphere could result in an explosion.

 **WARNING**

Devices containing fuses must not be fitted into circuits subject to over loads!

Devices containing fuses must not be fitted into circuits subject to over loads, e.g. motor circuits!

 **WARNING**

Do not connect or disconnect SD-Card unless the area known to be free of ignitable concentrations of flammable gases or vapors!

Do not connect or disconnect SD-Card while circuit is live unless the area is known to be free of ignitable concentrations of flammable gases or vapors.

 **Information**

Additional Information

Proof of certification is available on request. Also take note of the information given on the module technical information sheet. The Instruction Manual, containing these special conditions for safe use, must be readily available to the user.



WAGO Kontakttechnik GmbH & Co. KG
Postfach 2880 • D-32385 Minden
Hansastraße 27 • D-32423 Minden
Phone: 05 71/8 87 – 0
Fax: 05 71/8 87 – 1 69
E-Mail: info@wago.com

Internet: <http://www.wago.com>
