

WAGO-I/O-SYSTEM 750

Manual



750-514
2DO 125V AC 0.5A/ Relay 2CO/ Potential Free
2-Channel Relay Output Module 125 VAC, 30 VDC;
Isolated Outputs; 2 Changeover Contacts

Version 1.1.0

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

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

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1 Notes about this Documentation



Note

Always retain this documentation!

This documentation is part of the product. Therefore, retain the documentation during the entire service life of the product. Pass on the documentation to any subsequent user. In addition, ensure that any supplement to this documentation is included, if necessary.

1.1 Validity of this Documentation

This documentation is only applicable to the I/O module 750-514 (2DO 125V AC 0.5A/ Relay 2CO/ Potential Free).

The I/O module 750-514 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

This Manual, including all figures and illustrations, is copyright-protected. Any further use of this Manual by third parties that violate pertinent copyright provisions is prohibited. Reproduction, translation, electronic and phototechnical filing/archiving (e.g., photocopying) as well as any amendments require the written consent of WAGO Kontakttechnik GmbH & Co. KG, Minden, Germany. Non-observance will involve the right to assert damage claims.

1.3 Symbols



DANGER

Personal Injury!

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



DANGER

**Personal Injury Caused by Electric Current!**

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



WARNING

Personal Injury!

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



CAUTION

Personal Injury!

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

NOTICE

Damage to Property!

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



NOTICE

Damage to Property Caused by Electrostatic Discharge (ESD)!

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



Note

Important Note!

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



Information

Additional Information:

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

1.4 Number Notation

Table 1: Number Notation

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

1.5 Font Conventions

Table 2: Font Conventions

Font Type	Indicates
<i>italic</i>	Names of paths and data files are marked in italic-type. e.g.: <i>C:\Program Files\WAGO Software</i>
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 that serve to increase the efficiency of technical progress. WAGO Kontakttechnik GmbH & Co. KG owns all rights arising from the granting of patents or from the legal protection of utility patents. Third-party products are always mentioned without any reference to patent rights. Thus, the existence of such rights cannot be excluded.

2.1.2 Personnel Qualifications

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

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

2.1.3 Use of the WAGO-I/O-SYSTEM 750 in Compliance with Underlying Provisions

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

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

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

Appropriate housing (per 94/9/EG) 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.



DANGER

Only connect or disconnect lines when power is safely isolated!

The lines to the device can carry hazardous voltages and currents. Contact with the lines when live can result in severe injury or death. Therefore, read and observe the following safety rules before you perform work on the device:

1. Disconnect the respective system component from the power supply.
2. Secure the system component against unintentional restart.
3. Check if the voltage is positively isolated.

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 750-514 Digital Output Module transmits binary control signals from the automation device to the connected actuators (e.g., solenoid valves, contactors, transmitters, relays or other electrical loads).

The I/O module has 2 output channels, providing for direct connection of actuators to the CAGE CLAMP[®] connectors DO 1 or /DO 1 of channel 1 and an external N potential or DO 2 or /DO 2 of channel 2 and an external N potential.

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

An external potential of 125 VAC can be applied to relay contacts 11 and 21.

NOTICE

Inductive loads must be dampened!

For the protection of relay coils and contacts, inductive loads must be dampened with an effective protection circuit!

Examples of protection circuits can be seen in the section “Protective Circuits for Contacts of Relay Modules”.

NOTICE

Loss of properties due to high switching power!

To prevent the gold layer from being damaged, 30 VDC switching voltages and 50 mA currents must not be exceeded. Higher switching power with switching arc eventually evaporates the gold layer. This can cause the relay to lose its properties in regards to minimum switching current.

The I/O module incorporates two change-over relays connected potential free. This means on the field side only the connections of the relay contacts are present. Therefore, both relays can be operated with different voltages.

Because of the potential free contacts also a serial connection of the two relays is possible as well as a serial connection of several relays with block wise connection of several modules.

NOTICE

No use of different phases of a three-phase system on both channels!

The max. voltage between adjacent connections may not exceed 250 VAC. The use of different phases of a three-phase system on both channels of the relay output module 750-514 is not permitted!

Depending on the relay status the voltage of the middle contact 11 resp. 21 is switched to the lower contact 12 resp. 22 or to the upper contact 14 resp. 24. In the OFF state the contacts 11 resp. 21 are switched to the lower contacts 12 resp. 22.

The internal system voltage is used to trigger the relays.

The switching status of the two relays is indicated via green status LEDs. The meaning of the LEDs is described in the “Display Elements” section.

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

The I/O module receives the earth potential for the field level from an upstream I/O 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.

Note



Use the supply module!

The I/O module is equipped with an integrated power contact for relaying the ground potential.

When required, use a power supply module for the field-side supply of the following I/O modules.

The I/O module 750-514 can be used with all fieldbus couplers/controllers of the WAGO-I/O-SYSTEM 750.

3.1 View

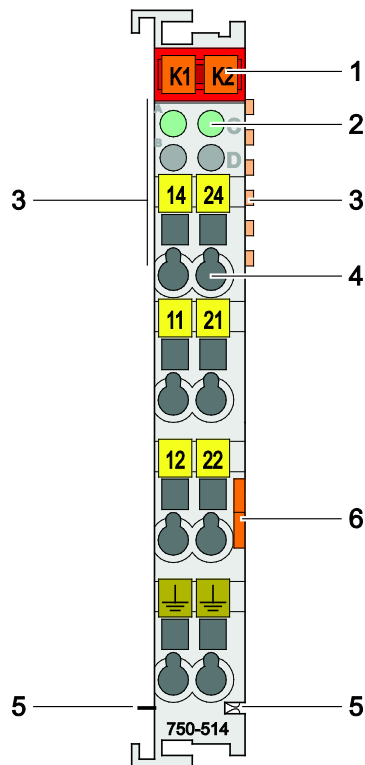


Figure 1: View

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.

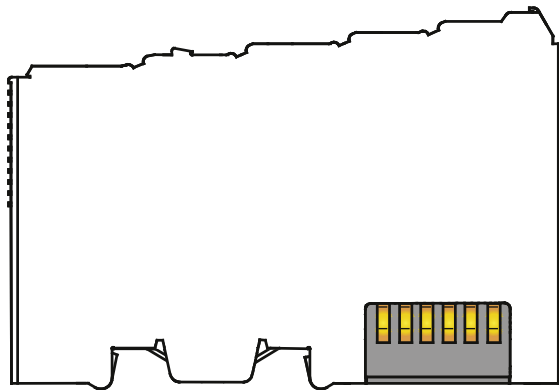


Figure 2: Data Contacts

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



Note

Use the supply module!

The I/O module is equipped with an integrated power contact for relaying the ground potential.

When required, use a power supply module for the field-side supply of the following I/O modules.

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 750-514 has 1 self-cleaning power jumper contact that supply and transmit power for the field side. The contact on the left side of the I/O module is designed as male contact and the contact on the right side as spring contact.

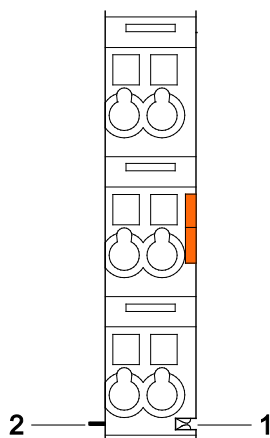


Figure 3: Power Jumper Contacts

Table 4: Legend for Figure “Power Jumper Contacts”

Contact	Type	Function
1	Spring contact	Potential transmission (Earth) for field supply
2	Blade contact	Potential feed-in (Earth) for field supply

3.2.3 CAGE CLAMP® Connectors

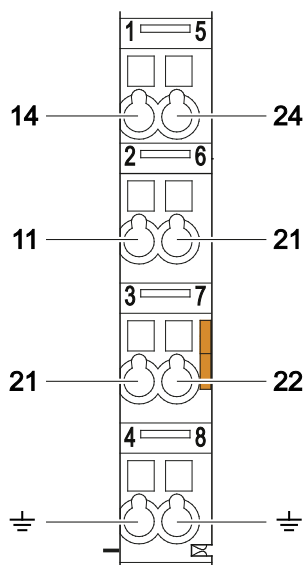


Figure 4: CAGE CLAMP® Connectors

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

Channel	Designation	Connector	Function
1	14	1	Output DO 1: Normally open contact
	11	2	Load line
	12	3	Output /DO 1: Normally closed contact
	Ground	4	Field supply ground
2	24	5	Output DO 2: Normally open contact
	21	6	Load line
	22	7	Output /DO 2: Normally closed contact
	Ground	8	Field supply ground

3.3 Display Elements

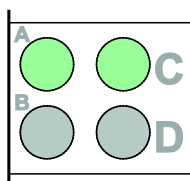


Figure 5: Display Elements

Table 6: Legend for Figure “Display Elements”

Channel	Designation	LED	State	Function
1	State relays 1	A	Off	Make contact DO 1 opened Break contact /DO 1 closed
			Green	Make contact DO 1 closed Break contact /DO 1 opened
2	State relays 2	C	Off	Make contact DO 2 opened Break contact /DO 2 closed
			Green	Make contact DO 2 closed Break contact /DO 2 opened

3.4 Schematic Diagram

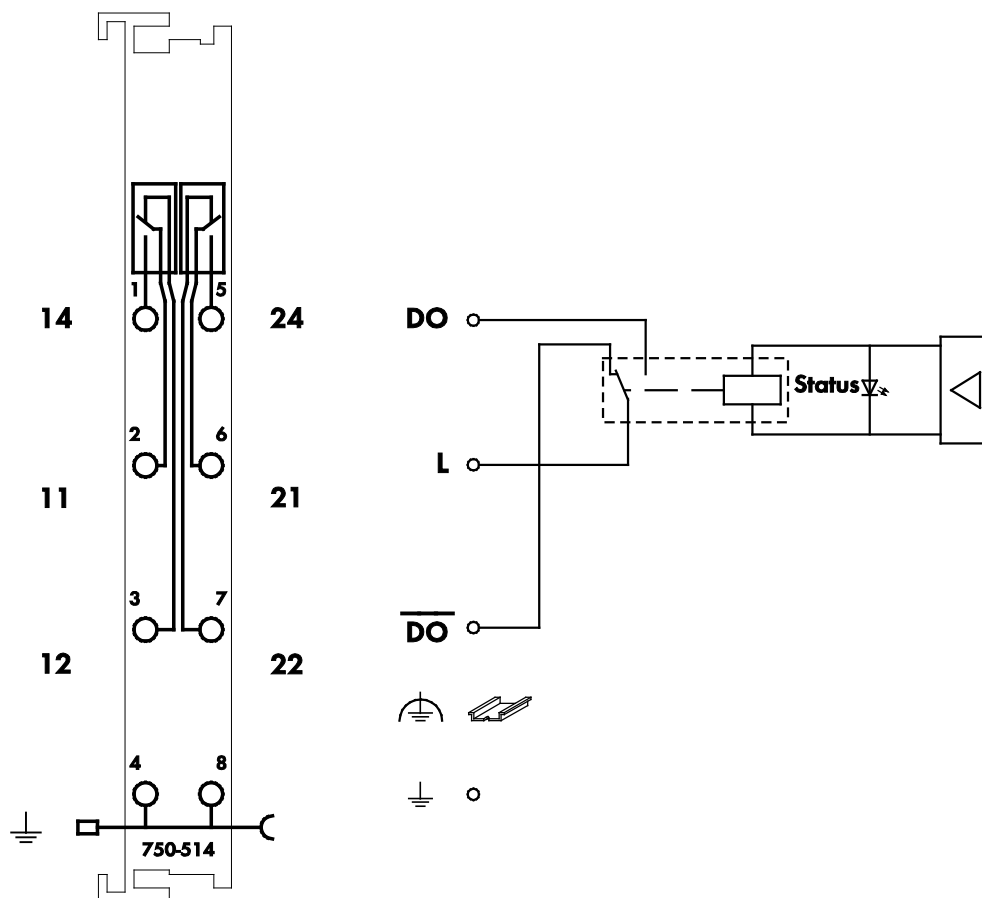


Figure 6: Schematic Diagram

3.5 Technical Data

3.5.1 Device

Table 7: Technical Data – Device

Width	12 mm
Height (from upper edge of 35 DIN rail)	64 mm
Depth	100 mm
Weight	Approx. 48.5 g

3.5.2 Power Supply

Table 8: Technical Data – Power Supply

Current consumption (internal)	70 mA
Switching voltage _{max}	125 VAC / 30 VDC
Switching power	62.5 VA / 30 W
Switching current _{min.}	0.01 mA / 10 mV DC
Switching current _{max.}	0.5 A AC / 1 A DC
Isolation	1.5 kV eff. (field/system)
Rated surge voltage	2.5 kV
Overvoltage category	III

NOTICE

Loss of properties due to high switching power!

To prevent the gold layer from being damaged, 30 VDC switching voltages and 50 mA currents must not be exceeded. Higher switching power with switching arc eventually evaporates the gold layer. This can cause the relay to lose its properties in regards to minimum switching current.

3.5.3 Communication

Table 9: Technical Data – Communication

Data width, internal (internal bus)	2 bits out
-------------------------------------	------------

3.5.4 Outputs

Table 10: Technical Data – Outputs

No. of outputs	2 changeover contacts
Switching frequency _{max.}	20/min.
Response time _{max.}	4 ms
Drop-out time _{max.}	4 ms
Contact material	Silver alloy, gold-plated
Switching operation, mechanical life _{min.}	1×10^8
Switching operation, electrical life _{min.}	1×10^5 (0.5 A/125 VAC); 2×10^5 (1 A/30 VDC)

3.5.5 Connection Type

Table 11: 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 12: Technical Data – Power Jumper Contacts

Power jumper contacts	Blade/spring contact, self-cleaning
Voltage drop at $I_{max.}$	< 1 V/64 modules

Table 13: Technical Data – Data Contacts

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

3.5.6 Climatic Environmental Conditions

Table 14: 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 ≤ 25 ppm H ₂ S ≤ 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

3.5.7 Load Limiting Value Graph of the Relay

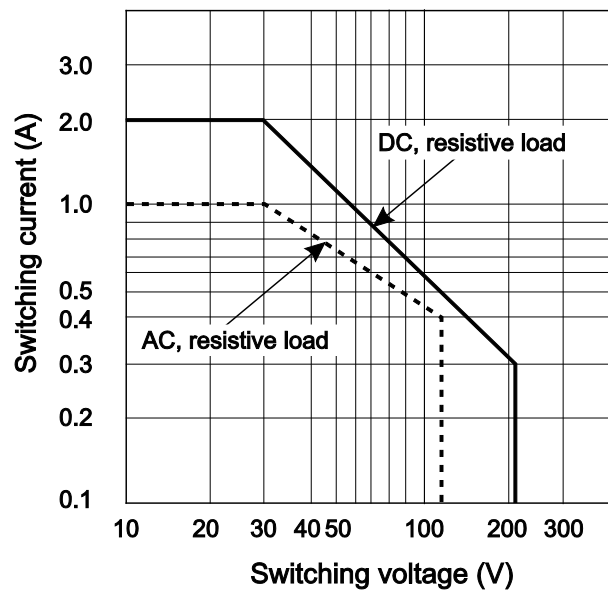


Figure 7: Load Limiting Value Graph of the Relay

3.6 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 750-514 I/O modules:



Conformity Marking



cUL_{US}

UL508



Korea Certification

MSIP-REM-W43-DOM750

The following ship approvals have been granted to 750-514 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)

3.7 Standards and Guidelines

All variations of 750-514 I/O modules meet the following requirements on emission and immunity of interference:

EMC CE-Emission of interference	acc. to EN 61000-6-4
EMC CE-Immunity to interference	acc. to EN 61000-6-2
EMC marine applications-Emission of interference	acc. to Germanischer Lloyd
EMC marine applications-Immunity to interference	acc. to Germanischer Lloyd

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 “Fieldbus Specific Design of the Process Data” included in the description concerning the process image of the corresponding fieldbus coupler/controller.

Table 15: Output Bits

		Bit 1	Bit 0
		DO 2	DO 1
DO 1	Signal state DO 1 – digital output channel 1		
DO 2	Signal state DO 2 – digital output channel 2		

5 Mounting

5.1 Mounting Sequence

Fieldbus couplers/controllers and I/O modules of the WAGO-I/O-SYSTEM 750/753 are snapped directly on a carrier rail in accordance with the European standard EN 50022 (DIN 35).

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

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

CAUTION

Risk of injury due to sharp-edged blade contacts!

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

NOTICE

Insert I/O modules only from the proper direction!

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

Note



Don't forget the bus end module!

Always plug a bus end module 750-600 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 8: Insert I/O Module (Example)

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

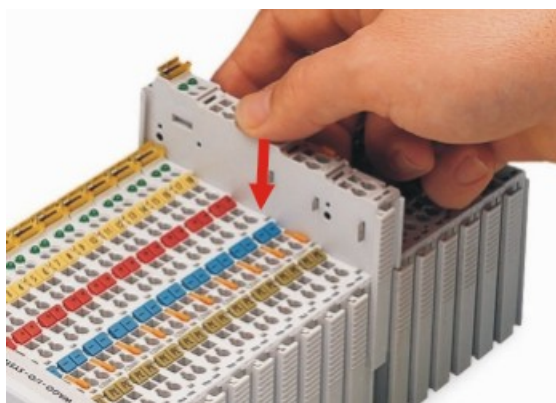


Figure 9: Snap the I/O Module into Place (Example)

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.

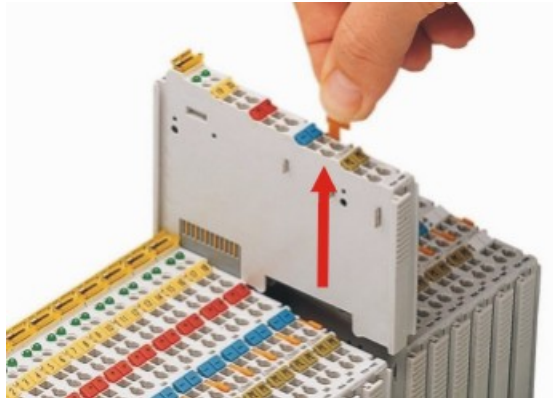


Figure 10: Removing the I/O Module (Example)

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

6 Connect Devices



DANGER

Only connect or disconnect lines when power is safely isolated!

The lines to the device can carry hazardous voltages and currents. Contact with the lines when live can result in severe injury or death. Therefore, read and observe the following safety rules before you perform work on the device:

1. Disconnect the respective system component from the power supply.
2. Secure the system component against unintentional restart.
3. Check if the voltage is positively isolated.

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.

Exception:

If it is unavoidable to jointly connect 2 conductors, then you must use a ferrule to join the wires together. The following ferrules can be used:

Length:	8 mm
Nominal cross section _{max.} :	1 mm ² for 2 conductors with 0.5 mm ² each
WAGO product:	216-103 or products with comparable properties

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.

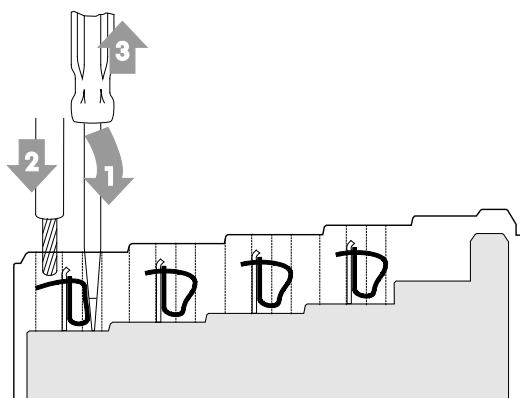


Figure 11: Connecting a Conductor to a CAGE CLAMP®

6.2 Connection Examples

6.2.1 1-Wire Connection, Protection Class I Actuators

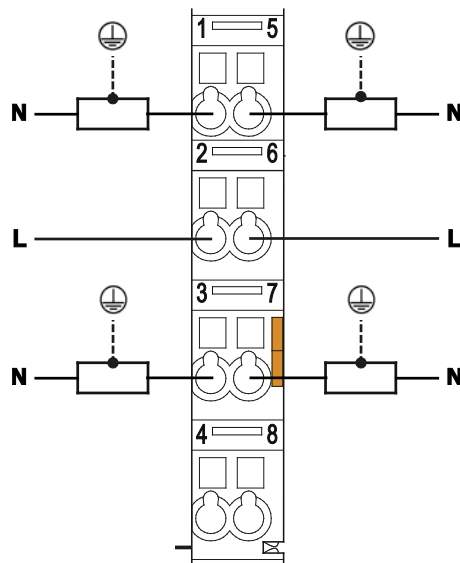


Figure 12: Connection Example, 1-Wire Connection for Protection Class I Actuators (Ground Conductor)

6.2.2 1-Wire Connection, Protection Class II and III Actuators

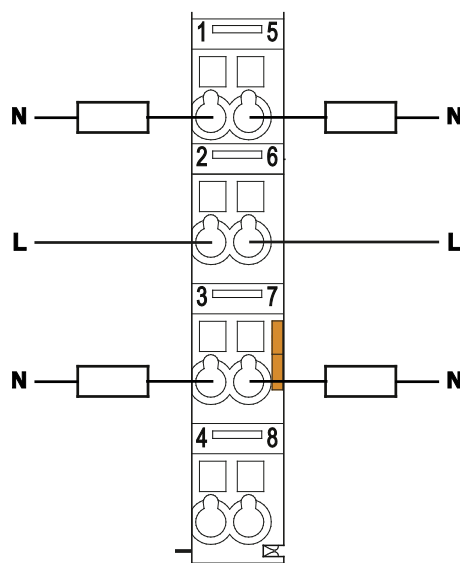


Figure 13: Connection Example 1-Wire Connection for Protection Class II (Double Insulated) and Class III (Safety Extra-Low Voltage) Actuators

6.3 Protective Circuits for Contacts of Relay Modules

Switching off inductive loads such as contactors and solenoid valves can generate transients with voltage peaks of up to several thousand volts. Very often, these transients exceed the permissible limits specified in the EMC standards. They must therefore be limited by using external protective circuits.

Furthermore, they cause an arc, which may destroy the switching contact, and has a significant impact on the lifetime and safety of the relay. The following protective circuits, which are directly connected to the source of the interference in parallel with the consumer, have proved successful in practice:

Table 16: Protective Circuits for Contacts of Relay Modules

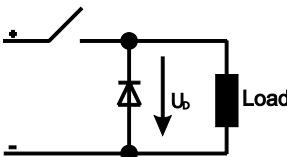
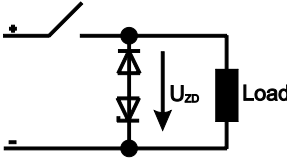
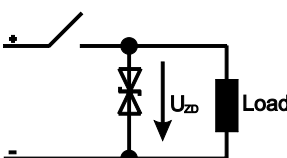
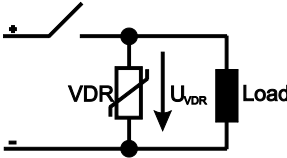
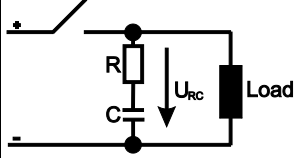
Protective Circuits	Additional Off-Delay	Defined Induction Voltage Limitation	Bipolar Effective Attenuation	Advantages and Disadvantages
 Figure 14: Diode	long	yes (U_D)	no	Advantages: - easy implementation - cost-effective and reliable - uncritical dimensioning - low induction voltages Disadvantages: - attenuation only via load resistor - long off-delay
 Figure 15: Zener Diode and Diode	medium to short	yes (U_{ZD})	no	Advantages: - uncritical dimensioning Disadvantages: - attenuation only above U_{ZD}
 Figure 16: Suppressor Diode	medium to short	yes (U_{ZD})	yes	Advantages: - cost-effective - uncritical dimensioning - limitation of positive and negative peaks - suitable for AC voltage Disadvantages: - attenuation only above U_{ZD}
 Figure 17: Varistor	medium to short	yes (U_{VDR})	yes	Advantages: - high power absorption - uncritical dimensioning - suitable for AC voltage Disadvantages: - attenuation only above U_{VDR}

Table 16: Protective Circuits for Contacts of Relay Modules

Protective Circuits	Additional Off-Delay	Defined Induction Voltage Limitation	Bipolar Effective Attenuation	Advantages and Disadvantages
 Figure 18: R/C Combination	medium to short	no	yes	Advantages: • HF attenuation via power storage • suitable for AC voltage • level-independent attenuation Disadvantages: • exact dimensioning required • high inrush current

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