WAGO-I/O-SYSTEM 750

Manual

750-306

DeviceNet^{TM} Fieldbus Coupler

125 Kbaud ... 500 Kbaud; digital and analog signals

Version 2.0.0

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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 “DeviceNet™ Fieldbus Coupler” (750-306).

The product “DeviceNetTM Fieldbus Coupler” (750-306) shall only be installed and operated according to the instructions in this manual and the system description for the WAGO-I/O-SYSTEM 750.

NOTICE

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

1.2 Copyright

1.3 Symbols

⚠ DANGER

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

NOTICE

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

Note

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

Information

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

1.4 Number Notation

Table 1: Number Notation

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

1.5 Font Conventions

Table 2: Font Conventions

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

2 Important Notes

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

2.1 Legal Bases

2.1.1 Subject to Changes

WAGO Kontakttechnik GmbH & Co. KG reserves the right to provide for any alterations or modifications 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.

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 System Description

The WAGO-I/O-SYSTEM 750 is a modular, fieldbus-independent input/output system (I/O system). The configuration described here consists of a fieldbus coupler/controller (1) and the modular I/O modules (2) for any signal shapes that form the fieldbus node together. The end module (3) completes the node and is required for correct operation of the fieldbus node.

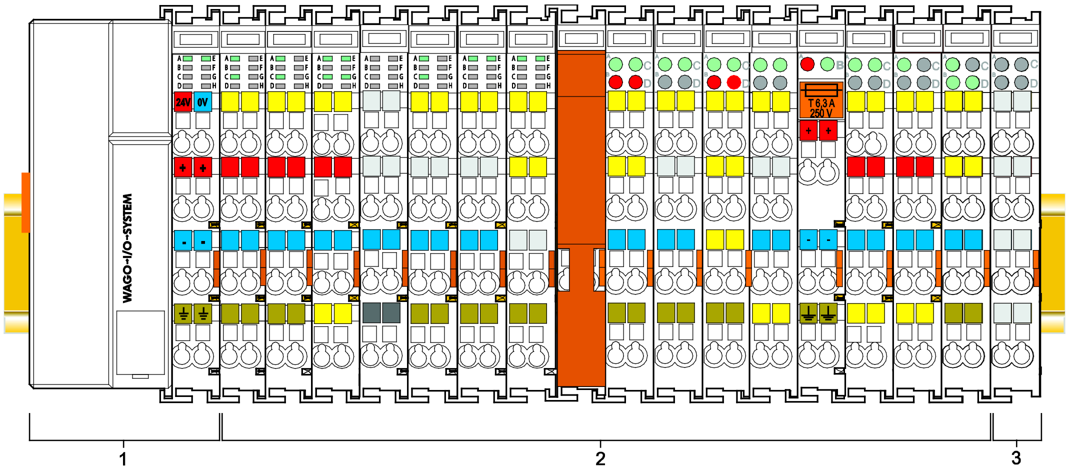


Figure 1: Fieldbus Node (Example)

Fieldbus couplers/controllers are available for different fieldbus systems.

The standard fieldbus couplers/controllers contain the fieldbus interface, electronics and a power supply terminal. The fieldbus interface forms the physical interface to the relevant fieldbus. The electronics process the data of the I/O modules and make it available for the fieldbus communication. The 24 V system supply and the 24 V field supply are fed in via the integrated power supply terminal.

The fieldbus coupler/controller exchanges process data with the respective control via the respective fieldbus. The programmable fieldbus controllers (PFC) allow implementation of additional PLC functions. WAGO-I/O-*PRO* is used to program the fieldbus controllers according to IEC 61131-3.

I/O modules for diverse digital and analog I/O signals as well as special functions can be connected to the fieldbus coupler/controller. The communication between the fieldbus coupler/controller and the I/O modules is carried out via an internal bus.

The components of the WAGO-I/O-SYSTEM 750 have clear termination points, light emitting diodes for status display, plug-in mini WSB tags and group marker cards for labeling.

The 1, 2 or 3 wire technology supplemented by a ground wire connection allows for direct sensor or actuator wiring.

3.1 Manufacturing Number

The serial number indicates the delivery status directly after production. This number is part of the labeling on the side of each component.

In addition, the serial number is printed on the cover cap of the configuration and programming interface of the fieldbus coupler/controller, so that it can also be read when installed.

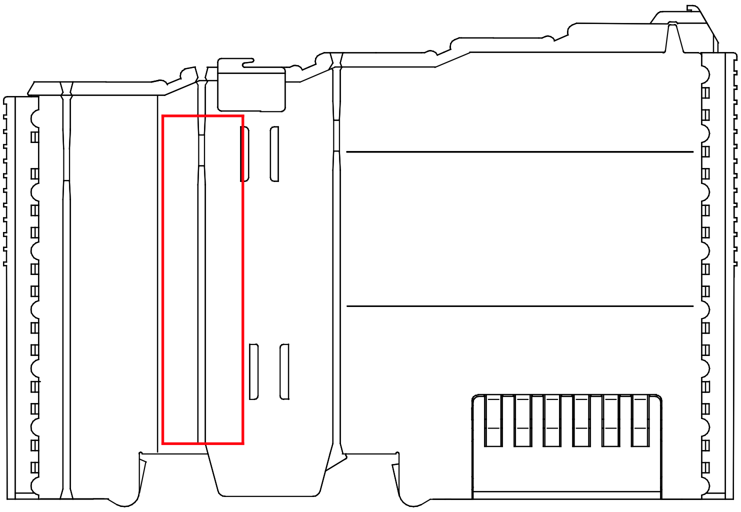


Figure 2: Marking Area for Serial Numbers

There are two serial numbers in two rows in the side marking. They are left of the release tab. The first 10 positions in the longer row of the serial numbers contain version and date identifications.

Example structure of the rows: 0114010101…

01	**14**	**01**	**01**	**01**	**(additional positions)**
WW	**YY**	**FW --**	**HW**	**FL**	**-**
Calendar week	Year	Firmware version	Hardware version	Firmware loader version	Internal information

The row order can vary depending on the production year, only the longer row is relevant. The back part of this and the shorter row contain internal administration information from the manufacturer.

3.2 Component Update

For the case of an update of one component, the lateral marking on each component contains a prepared matrix.

This matrix makes columns available for altogether three updates to the entry of the current update data, like production order number (NO; starting from calendar week 13/2004), date stamp (DS), software version (SW), hardware version (HW) and the firmware loader version (FWL, if available).

Current version data for		1. Update	2. Update	3. Update	
Production order no.	**NO**				← only starting from calendar week 13/2004
Date stamp	**DS**				
Software version	**SW**				
Hardware version	**HW**				
Firmware loader vers.	**FWL**				← only for fieldbus couplers/controllers

If the update of a component took place, the current version data are registered into the columns of the matrix.

Additionally with the update of a fieldbus coupler or controller also the cover of the configuration and programming interface of the fieldbus coupler or controller is imprinted with the current production order number.

The original manufacturing information on the device's housing remains unchanged.

3.3 Storage, Assembly and Transport

Whenever possible, the components are to be stored in their original packaging. Likewise, the original packaging provides optimal protection during transport.

When assembling or repacking the components, the contacts must not be soiled or damaged. The components must be stored and transported in appropriate containers/packaging. Thereby, the ESD information is to be regarded.

3.4 Assembly Guidelines/Standards

- DIN 60204 Electrical equipping of machines
- DIN EN 50178 Equipping of high-voltage systems with electronic components (replacement for VDE 0160)
- EN 60439 Low-voltage switchgear and controlgear assemblies

3.5 Power Supply

3.5.1 Isolation

Within the fieldbus node, there are three electrically isolated potentials:

- Electrically isolated fieldbus interface via transformer
- Electronics of the fieldbus couplers/controllers and the I/O modules (internal bus)
- All I/O modules have an electrical isolation between the electronics (internal bus, logic) and the field electronics. Some digital and analog input modules have each channel electrically isolated, please see catalog.

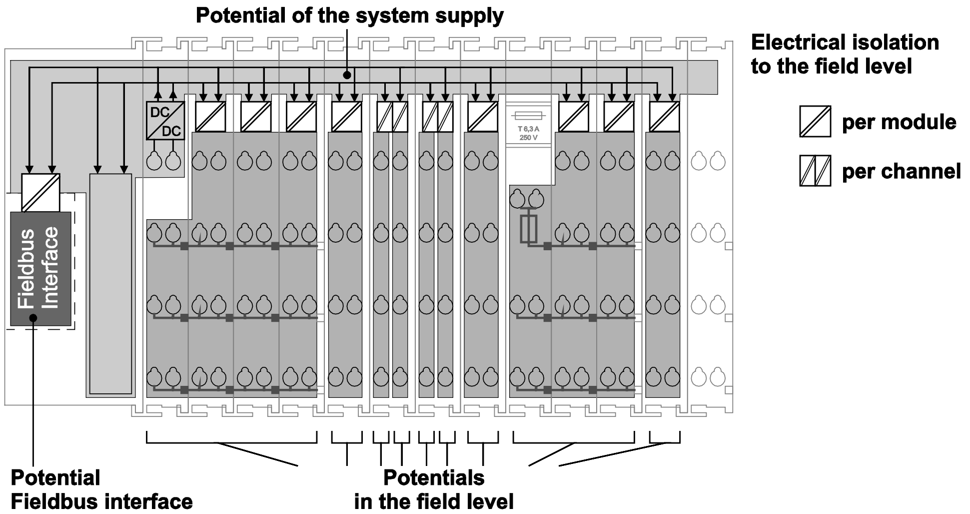


Figure 3: Isolation for Fieldbus Couplers/Controllers (Example)

3.5.2 System Supply

3.5.2.1 Connection

The WAGO-I/O-SYSTEM 750 requires a 24 V direct current system supply. The power supply is provided via the fieldbus coupler/controller and, if necessary, in addition via internal system supply modules 750-613. The power supply is reverse voltage protected.

NOTICE

Do not use an incorrect voltage/frequency!
The use of an incorrect supply voltage or frequency can cause severe damage to the components.

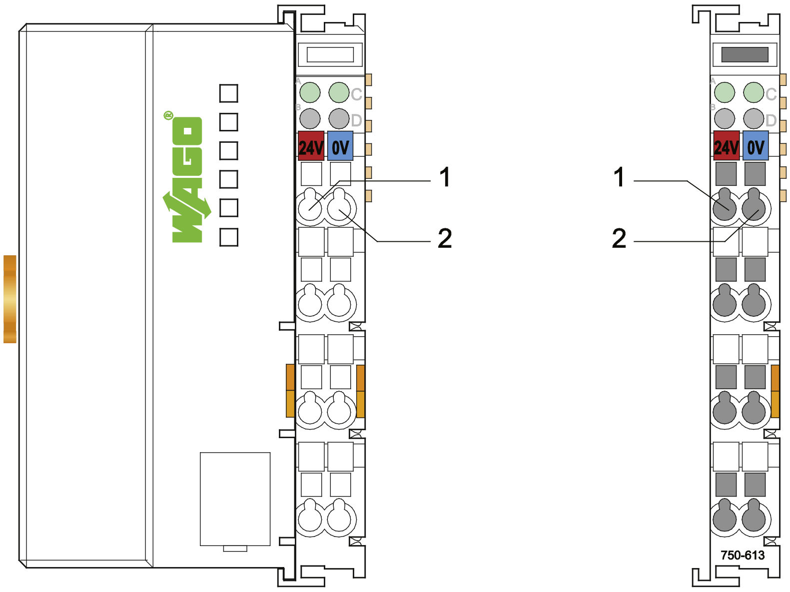


Figure 4: System Supply via Fieldbus Coupler/Controller (left) and via Internal System Supply Module (right)

Table 3: Legend for Figure "System Supply via Fieldbus Coupler/Controller (left) and via Internal System Supply Module (right)"

Position	Description
1	System supply DC 24 V (-25 % … +30 %)
2	System supply 0 V

The fed DC 24 V supplies all internal system components, e.g. fieldbus coupler/controller electronics, fieldbus interface and I/O modules via the internal bus (5 V system voltage). The 5 V system voltage is galvanically connected to the 24 V system supply.

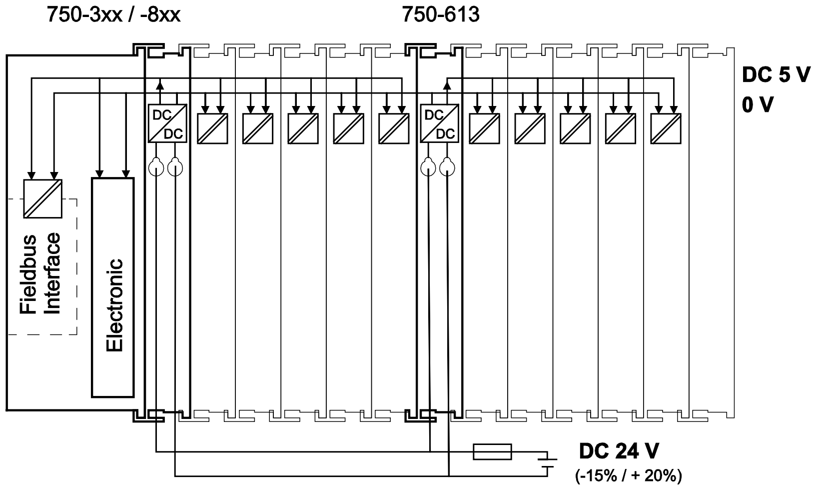


Figure 5: System Voltage for Standard Couplers/Controllers and Extended ECO Couplers

Note

Only reset the system simultaneously for all supply modules!
Reset the system by simultaneously switching the system supply at all supply modules (fieldbus coupler/controller and potential supply module with bus power supply) off and on again.

3.5.2.2 Dimensioning

Note

Recommendation
A stable power supply cannot always be assumed. Therefore, you should use regulated power supplies to ensure the quality of the supply voltage.

The supply capacity of the fieldbus coupler/controller or the internal system supply module can be taken from the technical data of the components.

Table 4: Alignment

Internal current consumption*)	Current consumption via system voltage (5 V for electronics of I/O modules and fieldbus coupler/controller).
Total current for I/O modules*)	Available current for the I/O modules. Provided by the bus power supply unit. See fieldbus coupler/controller and internal system supply module

*) See current catalog, manuals, Internet

Example:

Calculating the current consumption on the fieldbus coupler:

Internal current consumption of the coupler	350 mA at 5 V
Total current for I/O modules	1650 mA at 5 V
Sum $I_{(5\ V)\ total}$	**2000 mA at 5 V**

The internal current consumption is indicated in the technical data for each bus terminal. In order to determine the total requirement, add together the values of all I/O modules in the node.

Note

Please note the aggregate current for I/O modules. It may be necessary to supply potential!
When the sum of the internal current consumption for the I/O modules exceeds their aggregate current, you must use a supply module with bus power supply. Install it before the position where the permissible aggregate current would be exceeded.

Example:

Calculating the total current on a standard fieldbus coupler/controller:

A node configuration with 20 relay modules (750-517) and 30 digital input modules (750-405) should be attached to a fieldbus coupler/controller:

Internal current consumptions	20 × 90 mA = 1800 mA at 5 V
	+ 30 × 2 mA = 60 mA at 5 V
Sum of internal current consumptions	**1860 mA at 5 V**

However, the fieldbus coupler can only provide 1650 mA for the I/O modules. Consequently, an internal system supply module (750-613), e. g. in the middle of the node, should be added.

Note

Recommendation
Utilize the **smartDESIGNER** feature WAGO ProServe® software to configure fieldbus node assembly. You can test the configuration via the integrated plausibility check.

The maximum input current of the 24 V system supply is 500 mA. The exact electrical consumption ($I_{(V)}$) can be determined with the following formulas:

Fieldbus coupler or controller

$I_{(5\ V)\ total}$ = Sum of all the internal current consumption of the connected I/O modules + internal current consumption of the fieldbus coupler/controller

Internal system supply module

$I_{(5\ V)\ total}$ = Sum of all the internal current consumption of the connected I/O modules at internal system supply module

$$\text{Input current } I_{(24\ V)} = \frac{5\ V}{24\ V} \times \frac{I_{(5\ V)\ total}}{\eta}$$

$\eta = 0.87$
(87 % Efficiency of the power supply at nominal load 24 V)

Note

Activate all outputs when testing the current consumption!
If the electrical consumption of a power supply point for the 24 V system supply exceeds 500 mA, then the cause may be an improperly dimensioned node or a defect.
During the test, you must activate all outputs.

3.5.3 Field Supply

3.5.3.1 Connection

Sensors and actuators can be directly connected to the relevant channel of the I/O module in 1, 2, 3 or 4 conductor connection technology. The I/O module supplies power to the sensors and actuators. The input and output drivers of some I/O modules require the field side supply voltage.

The fieldbus coupler/controller provides field side power (DC 24 V). In this case it is a passive power supply without protection equipment.

Power supply modules with or without fuse holder and diagnostic capability are available for the power supply of other field potentials (DC 24 V, AC/DC 0 … 230 V, AC 120 V, AC 230 V). The power supply modules can also be used to set up various potential groups. The connections are connected in pairs to a power contact.

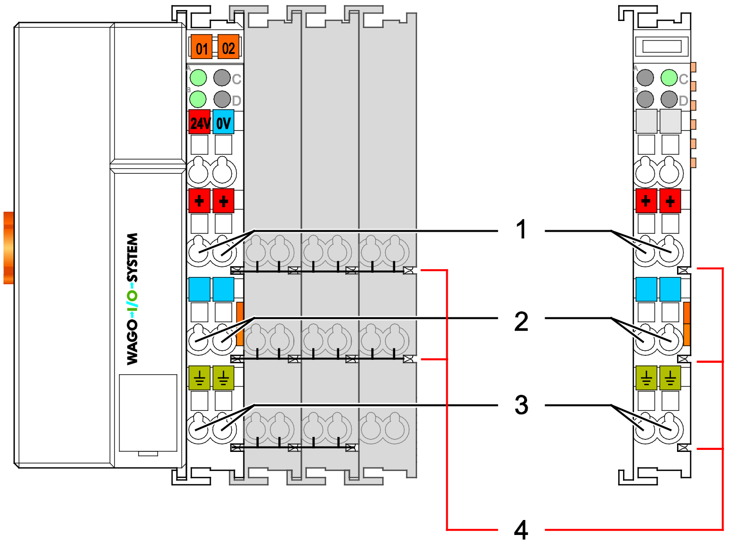


Figure 6: Field Supply for Standard Couplers/Controllers and Extended ECO Couplers

Table 5: Legend for Figure "Field Supply for Standard Couplers/Controllers and Extended ECO Couplers"

Field supply	
1	24 V (-15 % / +20 %)
2	0 V
3	Optional ground potential
Power jumper contacts	
4	Potential distribution to adjacent I/O modules

The field-side power supply is automatically derived from the power jumper contacts when snapping an I/O module.

The current load of the power contacts must not exceed 10 A on a continual basis.

By inserting an additional power supply module, the field supply via the power contacts is disrupted. From there a new power supply occurs which may also contain a new voltage potential.

Note

Re-establish the ground connection when the connection to the power jumper contacts is disrupted!
Some I/O modules have no or very few power contacts (depending on the I/O function). Due to this, the passing through of the relevant potential is disrupted. If you require a field supply via power jumper contacts for subsequent I/O modules, then you have to use a power supply module.
Note the data sheets of the I/O modules.

Note

Use a spacer module when setting up a node with different potentials!
In the case of a node setup with different potentials, e.g. the alteration from DC 24 V to AC 230 V, you should use a spacer module. The optical separation of the potentials acts as a warning to heed caution in the case of wiring and maintenance works. Thus, you can prevent the results of wiring errors.

3.5.3.2 Fusing

Internal fusing of the field supply is possible for various field voltages via an appropriate power supply module.

Table 6: Power Supply Modules

Order No.	Field Voltage
750-601	24 V DC, Supply/Fuse
750-609	230 V AC, Supply/Fuse
750-615	120 V AC, Supply/Fuse
750-617	24 V AC, Supply/Fuse
750-610	24 V DC, Supply/Fuse/Diagnosis
750-611	230 V AC, Supply/Fuse/Diagnosis
750-606	Supply Module 24 V DC, 1,0 A, Ex i
750-625/000-001	Supply Module 24 V DC, 1,0 A, Ex i (without diagnostics)

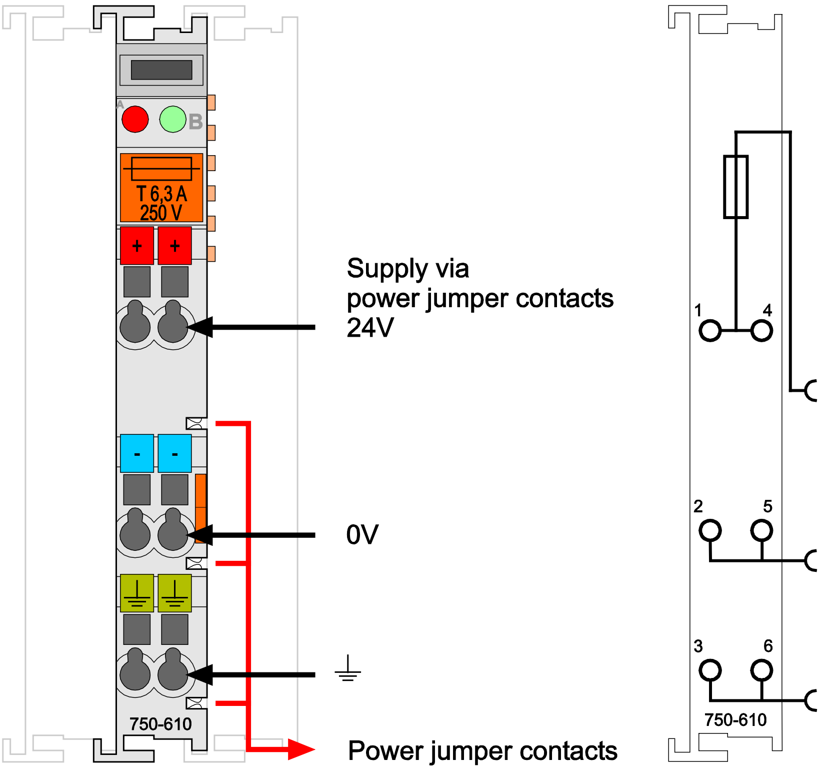


Figure 7: Supply Module with Fuse Carrier (Example 750-610)

NOTICE

Observe the maximum power dissipation and, if required, UL requirements!
In the case of power supply modules with fuse holders, you must only use fuses with a maximum dissipation of 1.6 W (IEC 127).
For UL approved systems only use UL approved fuses.

In order to insert or change a fuse, or to switch off the voltage in succeeding I/O modules, the fuse holder may be pulled out. In order to do this, use a screwdriver for example, to reach into one of the slits (one on both sides) and pull out the holder.

Figure 8: Removing the Fuse Carrier

Lifting the cover to the side opens the fuse carrier.

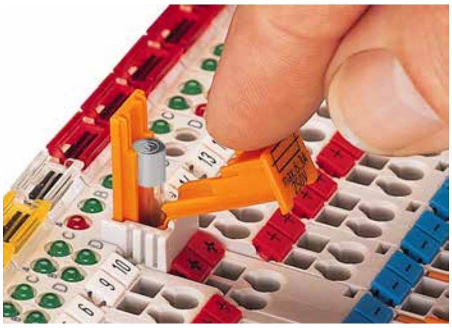


Figure 9: Opening the Fuse Carrier

Figure 10: Changing the Fuse

After changing the fuse, the fuse carrier is pushed back into its original position.

Alternatively, fusing can be done externally. The fuse modules of the WAGO series 281 and 282 are suitable for this purpose.

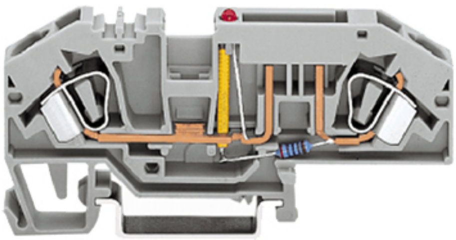


Figure 11: Fuse Modules for Automotive Fuses, Series 282

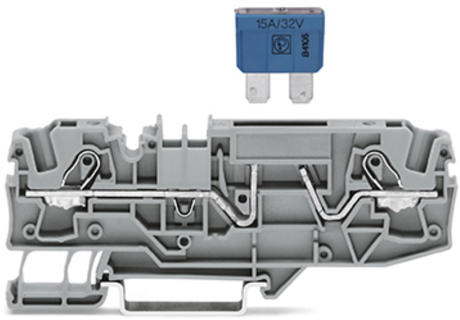


Figure 12: Fuse Modules for Automotive Fuses, Series 2006

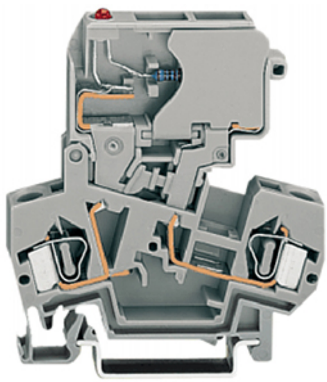


Figure 13: Fuse Modules with Pivotable Fuse Carrier, Series 281

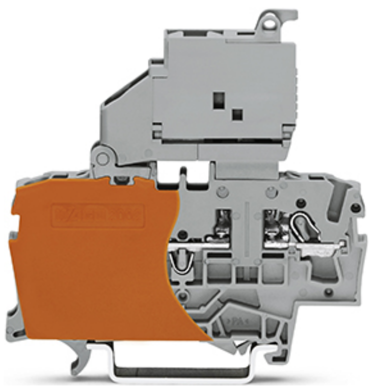


Figure 14: Fuse Modules with Pivotable Fuse Carrier, Series 2002

3.5.4 Supplementary Power Supply Regulations

The WAGO-I/O-SYSTEM 750 can also be used in shipbuilding or offshore and onshore areas of work (e. g. working platforms, loading plants). This is demonstrated by complying with the standards of influential classification companies such as Germanischer Lloyd and Lloyds Register.

Filter modules for 24 V supply are required for the certified operation of the system.

Table 7: Filter Modules for 24 V Supply

Order No.	Name	Description
750-626	Supply Filter	Filter module for system supply and field supply (24 V, 0 V), i. e. for fieldbus coupler/controller and bus power supply (750-613)
750-624	Supply Filter	Filter module for the 24 V field supply (750-602, 750-601, 750-610)

Therefore, the following power supply concept must be absolutely complied with.

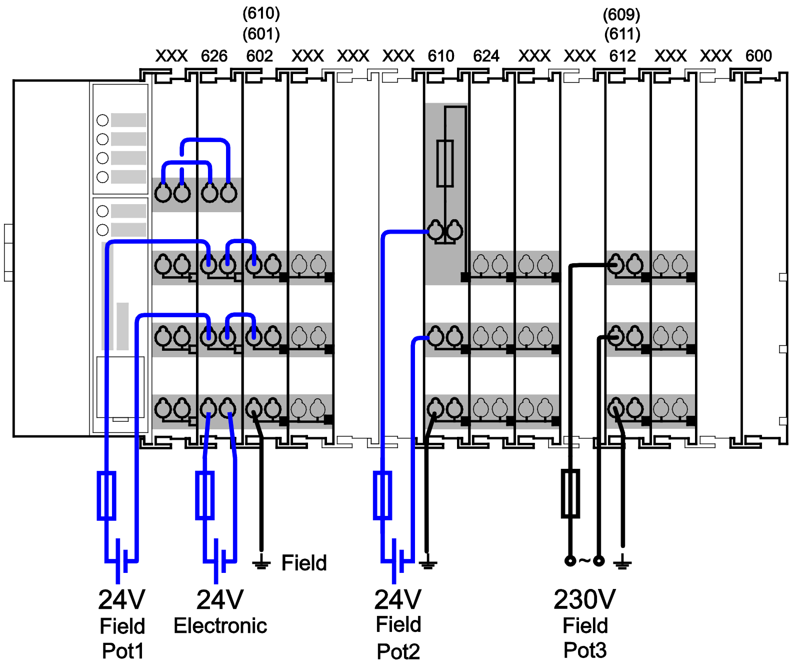


Figure 15: Power Supply Concept

Note

Use a supply module for equipotential bonding!
Use an additional 750-601/ 602/ 610 Supply Module behind the 750-626 Filter Module if you want to use the lower power jumper contact for equipotential bonding, e.g., between shielded connections and require an additional tap for this potential.

3.5.5 Supply Example

Note

The system supply and the field supply shall be separated!
You should separate the system supply and the field supply in order to ensure bus operation in the event of a short-circuit on the actuator side.

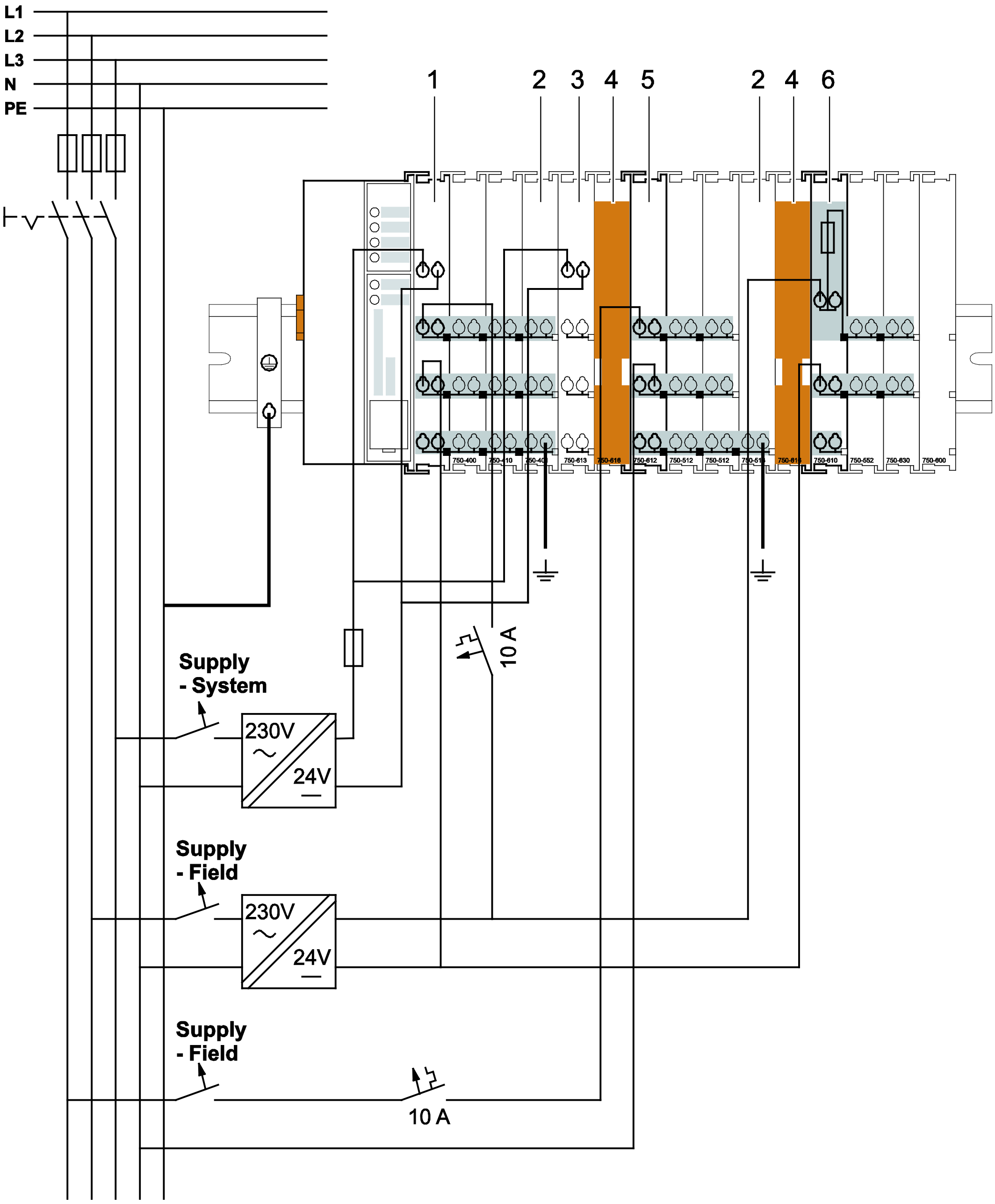


Figure 16: Supply Example for Standard Couplers/Controllers

Table 8: Legend for Figure “Supply Example for Fieldbus Coupler/Controller”

Pos.	Description
1	Power Supply on coupler via external Supply Module
2	Power Supply with optional ground
3	Internal System Supply Module
4	Separation module recommended
5	Supply Module passive
6	Supply Module with fuse carrier/diagnostics

3.5.6 Power Supply Unit

The WAGO-I/O-SYSTEM 750 requires a 24 VDC voltage (system supply).

Note

Recommendation
A stable power supply cannot always be assumed everywhere. Therefore, you should use regulated power supplies to ensure the quality of the supply voltage (see also table “WAGO power supply units”).

For brief voltage dips, a buffer (200 µF per 1 A load current) must be provided.

Note

Power failure time not acc. IEC 61131-2!
Note that the power failure time of 10 ms acc. IEC 61131-2 is not maintained in a maximum configuration.

The power demand must be determined individually depending on the entry point of the field supply. All loads through field devices and I/O modules must be taken into account. The field supply also impacts the I/O modules because the input and output drivers of some I/O modules require the voltage of the field supply.

Note

System and field supply must be isolated!
The system supply and field supply must be isolated to ensure bus operation in the event of short circuits on the actuator side.

Table 9: WAGO Power Supply Units (Selection)

WAGO Power Supply Unit	Description
787-612	Primary switched mode; DC 24 V; 2,5 A Input nominal voltage AC 230 V
787-622	Primary switched mode; DC 24 V; 5 A Input nominal voltage AC 230 V
787-632	Primary switched mode; DC 24 V; 10 A Input nominal voltage AC 230/115 V
 288-809 288-810 288-812 288-813	Rail-mounted modules with universal mounting carrier AC 115 V/DC 24 V; 0,5 A AC 230 V/DC 24 V; 0,5 A AC 230 V/DC 24 V; 2 A AC 115 V/DC 24 V; 2 A

3.6 Grounding

3.6.1 Grounding the DIN Rail

3.6.1.1 Framework Assembly

When setting up the framework, the carrier rail must be screwed together with the electrically conducting cabinet or housing frame. The framework or the housing must be grounded. The electrical connection is established via the screw. Thus, the carrier rail is grounded.

DANGER

Ensure sufficient grounding is provided!
You must take care to ensure the flawless electrical connection between the carrier rail and the frame or housing in order to guarantee sufficient grounding.

3.6.1.2 Insulated Assembly

Insulated assembly has been achieved when there is constructively no direct ohmic contact between the cabinet frame or machine parts and the carrier rail. Here, the earth ground must be set up via an electrical conductor in accordance with valid national safety regulations.

Note

Recommendation
The optimal setup is a metallic assembly plate with grounding connection which is electrically conductive linked to the carrier rail.

The separate grounding of the carrier rail can be easily set up with the aid of the WAGO ground wire terminals.

Table 10: WAGO Ground Wire Terminals

Order No.	Description
283-609	1-conductor ground (earth) terminal block make an automatic contact to the carrier rail; conductor cross section: 0.2 mm^2 … 16 mm^2 **Note**: Also order the end and intermediate plate (283-320).

3.6.2 Grounding Function

The grounding function increases the resistance against electro-magnetic interferences. Some components in the I/O system have a carrier rail contact that dissipates electro-magnetic interferences to the carrier rail.

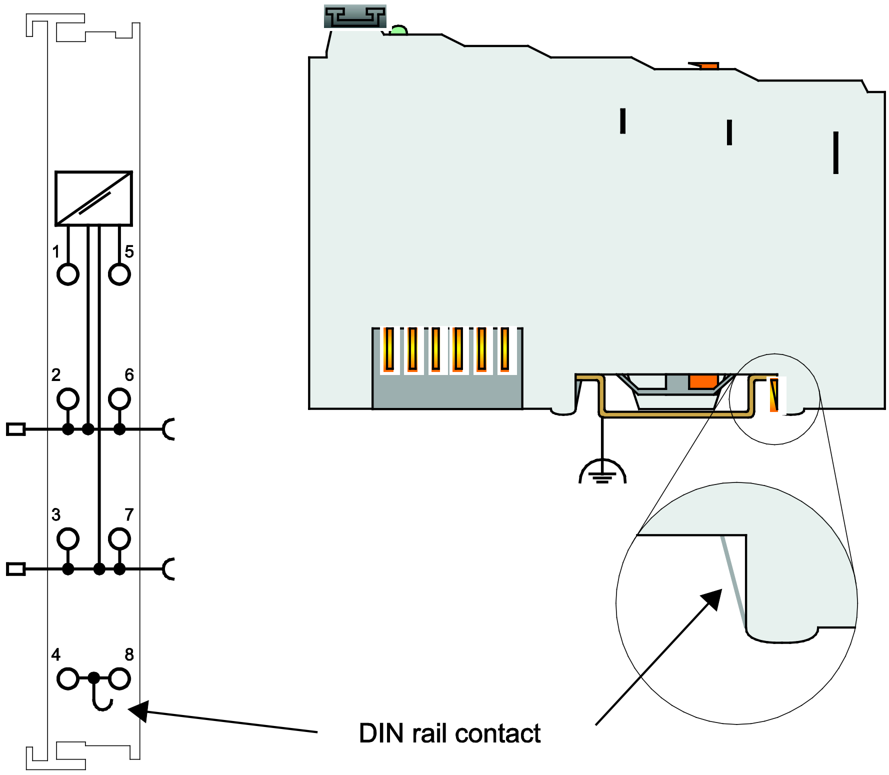


Figure 17: Carrier Rail Contact (Example)

DANGER

Ensure sufficient grounding is provided!
You must take care to ensure the direct electrical connection between the carrier rail contact and the carrier rail.
The carrier rail must be grounded.
For information on carrier rail properties, see section “Mounting” > … > “Carrier Rail Properties”.

The bottom CAGE CLAMP® connectors of the supply modules enable optional connection of a field-side functional ground. This potential is made available to the I/O module arranged on the right through the spring-loaded contact of the three power contacts. Some I/O modules are equipped with a knife-edge contact that taps this potential. This forms a potential group with regard to functional ground with the I/O module arranged on the left.

3.7 Shielding

3.7.1 General

Use of shielded cables reduces electromagnetic interference and thus increases signal quality. Measurement errors, data transmission errors and interference due to excessive voltage can be prevented.

Note

Connect the cable shield to the ground potential!
Integrated shielding is mandatory to meet the technical specifications in regards to measuring accuracy. Connect the cable shield and ground potential at the inlet to the cabinet or housing. This allows induced interference to dissipate and to be kept away from devices in the cabinet or housing.

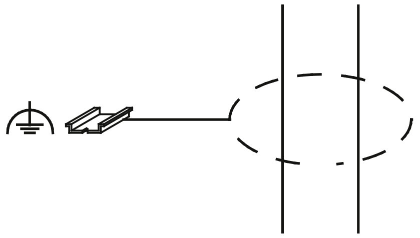


Figure 18: Cable Shield at Ground Potential

Note

Improve shielding performance by placing the shield over a large area!
Higher shielding performance is achieved via low-impedance connection between shield and ground. For this purpose, connect the shield over a large surface area, e.g., WAGO shield connecting system. This is especially recommended for large-scale systems where equalizing current or high impulse-type currents caused by atmospheric discharge may occur.

Note

Keep data and signal lines away from sources of interference!
Route data and signal lines separately from all high voltage cables and other sources of high electromagnetic emission (e.g., frequency converter or drives).

3.7.2 Bus Cables

The shielding of the bus line is described in the respective configuration guidelines and standards of the bus system.

3.7.3 Signal Lines

I/O modules for analog signals and some interface I/O modules are equipped with shield clamps.

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.

3.7.4 WAGO Shield Connecting System

The WAGO shield connecting system consists of shield clamping saddles, busbars and various mounting carriers. These components can be used to achieve many different configurations.

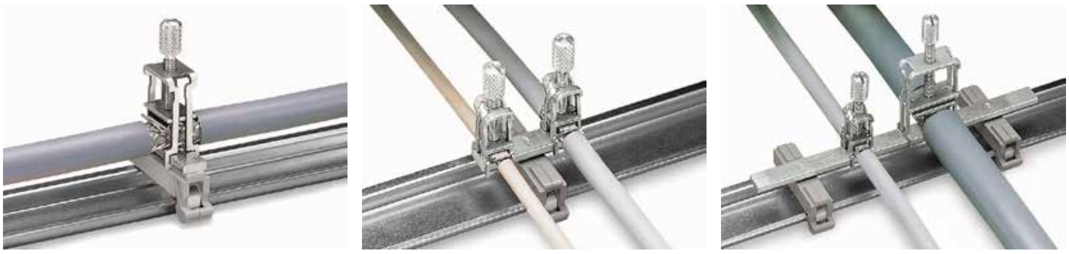


Figure 19: Examples of the WAGO Shield Connecting System

Figure 20: Application of the WAGO Shield Connecting System

4 Device Description

The DeviceNet^{TM} Fieldbus Coupler 750-306 links the WAGO-I/O-SYSTEM 750 as a slave to the DeviceNet^{TM} fieldbus system.

This fieldbus coupler can be used for applications in mechanical and systems engineering, as well as in the processing industry.

The fieldbus connection is made via 231 series 5-pin plug connector of the *WAGO MULTI CONNECTION SYSTEM (MCS)*.

The DIP switch can be used to specify baud rate and station address of the fieldbus coupler.

In the Fieldbus Coupler, all input signals from the sensors are combined. After connecting the Fieldbus Coupler, the Fieldbus Coupler determines which I/O modules are on the node and creates a local process image from these. Analog and specialty module data is sent via words and/or bytes; digital data is grouped bit-by-bit.

The local process image is divided into two data zones containing the data received and the data to be sent.

The process data is sent via the DeviceNet^{TM} fieldbus to a control system for further processing. The process output data is sent via the DeviceNet^{TM} fieldbus.

The data of the analog modules is mapped first into the process image. The modules are mapped in the order of their physical position after the Coupler.

The bits of the digital modules are combined into bytes and then mapped after the analog ones in the process image. If the number of digital I/Os is greater than 8 bits, the Fieldbus Coupler automatically begins a new byte.

The fieldbus coupler supports the DeviceNet^{TM} “Bit Strobe” function where the function is limited to the extent that only the status byte is supplied.

4.1 View

The view below shows the three parts of the device:

- The left side shows the fieldbus connection and a DIP switch to set both the node ID and baud rate.
- LEDs for operation status, bus communication, error messages and diagnostics, as well as the service interface are in the middle area.
- The right side shows the power supply unit for the system supply and for the field supply of the attached I/O modules via power jumper contacts.
  LEDs show the status of the operating voltage for the system and field supply (jumper contacts).

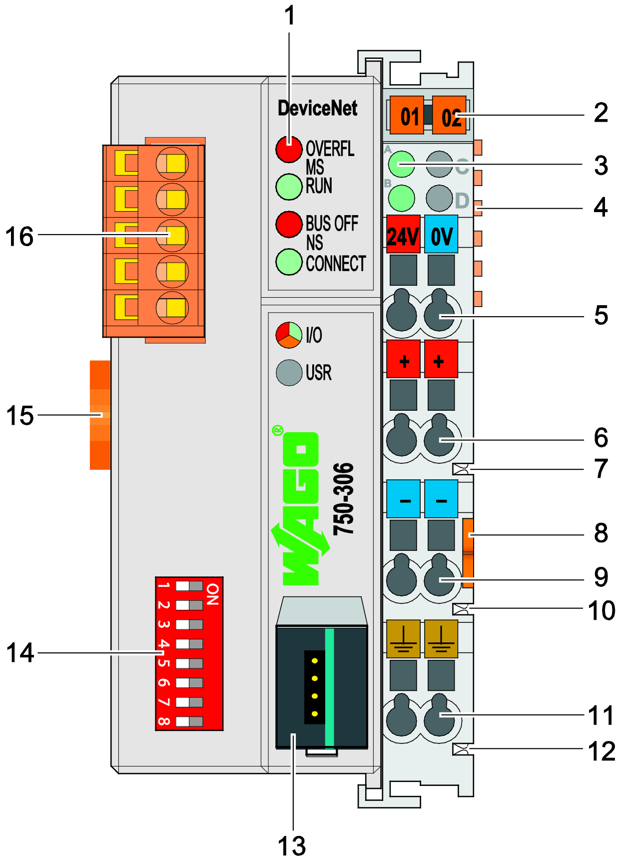


Figure 21: View DeviceNet™ Fieldbus Coupler

Table 11: Legend for Figure “View DeviceNet™ Fieldbus Coupler”

Pos.	Desig-nation	Meaning	Details see Section
1	OVERFL, RUN, BUS OFF, CONNECT	Status LEDs Fieldbus	“Device Description” > “Display Elements”
2	---	Group marking carrier (retractable) with additional marking possibility on two miniature WSB markers	---
3	A, B or C	Status LED’s System/Field Supply	“Device Description” > “Display Elements”
4	---	Data Contacts	“Connect Devices” > “Data Contacts/Internal Bus”
5	24 V, 0 V	CAGE CLAMP® Connections System Supply	“Connect Devices” > “Connecting a conductor to the CAGE CLAMP®”
6	+	CAGE CLAMP® Connections Field Supply 24 VDC	“Connect Devices” > “Connecting a conductor to the CAGE CLAMP®”
7	---	Power Jumper Contact 24 VDC	“Connect Devices” > “Power Contacts/ Field Supply”
8	---	Unlocking Lug	“Mounting” > “Inserting and Removing Devices”
9	-	CAGE CLAMP® Connections Field Supply 0 V	“Connect Devices” > “Connecting a conductor to the CAGE CLAMP®”
10	---	Power Jumper Contact 0 V	“Connect Devices” > “Power Contacts/ Field Supply”
11	(Ground)	CAGE CLAMP® Connections Field Supply (Ground)	“Connect Devices” > “Connecting a conductor to the CAGE CLAMP®”
12	---	Power Jumper Contact (Ground)	“Connect Devices” > “Power Contacts/ Field Supply”
13	---	Service Interface (open flap)	“Device Description” > “Operating Elements”
16	---	DIP Switch	“Device Description” > “Operating Elements”
15	---	Locking Disc	“Mounting” > “Inserting and Removing Devices”
16	---	Fieldbus Data contacts connection, 231 Series (MCS)	“Device Description“ > “Connectors“

4.2 Connectors

4.2.1 Device Supply

The device is powered via terminal blocks with CAGE CLAMP® connections.

The device supply generates the necessary voltage to power the electronics of the device and the internal electronics of the connected I/O modules.

The fieldbus interface is galvanically separated to the electrical potential of the device.

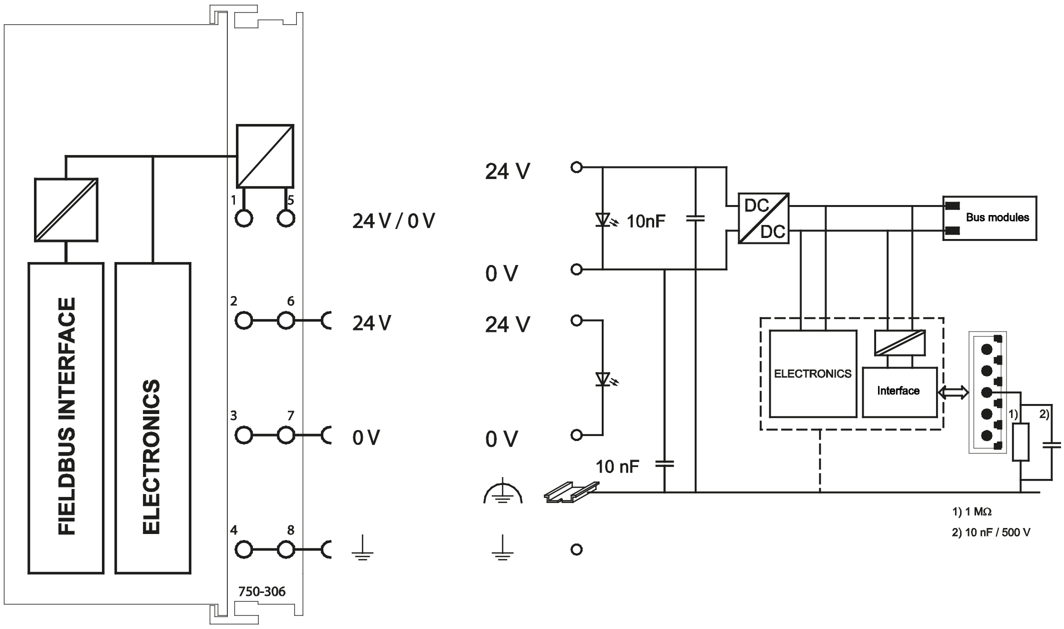


Figure 22: Device Supply

4.2.2 Fieldbus Connection

The fieldbus connection for DeviceNet™ is made via Series 231 5-pin plug connector from the *MULTI CONNECTION SYSTEM (MCS)*. A connector (OpenStyle) is the counterpart. The 231-305/010-000/050-000 connector is included.

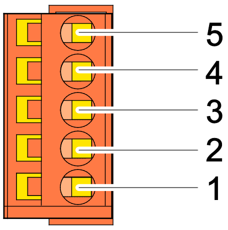


Figure 23: Fieldbus Connections, Series 231 *(MCS)*

Table 12: Pin Assignment for the Fieldbus Connection, Series 231 *(MCS)*

PIN	**Signal**	**Code***	**Description**
5	V+	red	11 V … 25 V
4	CAN_H	white	CAN Signal $_{High}$
3	Drain shield		Shield termination
2	CAN_L	blue	CAN Signal $_{Low}$
1	V-	black	0 V

* according to DeviceNet™ specification, identical to the conductors of the DeviceNet™ cable

To connect small conductor cross-sections, an insulation stop of series 231-670 (white), 231-671 (light gray) or 231-672 (dark gray) should be used due to their flexibility. The insulating stop prevents the conductor from deforming when pushed against the conductor stop. As a result, the conductor insulation may be clamped, causing intermittent contact or no contact at all. The marking of the connector, as well as housing parts, test plugs with cable and male connectors for cable extensions are available.

The connection point is lowered for mounting into an 80 mm-high switchgear cabinet after connector attachment.

DC/DC converters and optocouplers in the fieldbus interface electrically isolate the fieldbus system and the electronics.

4.3 Display Elements

The operating condition of the fieldbus coupler or the node is displayed with the help of illuminated indicators in the form of light-emitting diodes (LEDs).
The LED information is routed to the top of the case by light guides. In some cases, the LEDs are multi-colored (red, green or orange).

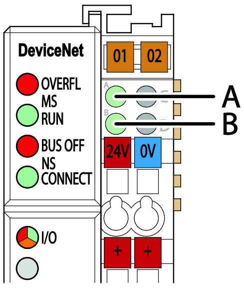


Figure 24: Display Elements

For the diagnostics of the different domains fieldbus, node and supply voltage, the LEDs can be divided into three groups:

Table 13: Display Elements Fieldbus Status

LED	Color	Meaning
OVERFL	red	Indicates an error or defect on the fieldbus coupler
RUN	green	Indicates that the fieldbus coupler is operational
BUS OFF	red	Indicates an error or malfunction in the network
CONNECT	green	Indicates that the fieldbus coupler is ready for network communication

Table 14: Display Elements Node Status

LED	Color	Meaning
I/O	red/green/ orange	Indicates the operation of the node and signals via a blink code faults encountered.

Table 15: Display Elements Supply Voltage

LED	Color	Meaning
A	green	indicates the status of the operating voltage – system
B	green	indicates the status of the operating voltage – power jumper contacts

Information

More information about the LED Signaling
Read the detailed description for the evaluation of the displayed LED state in the section “Diagnostics” > … > “LED Signaling”.

4.4 Operating Elements

4.4.1 Service Interface

The service interface is located behind the flap.

It is used for the communication with the WAGO-I/O-*CHECK* and for downloading the firmware updates.

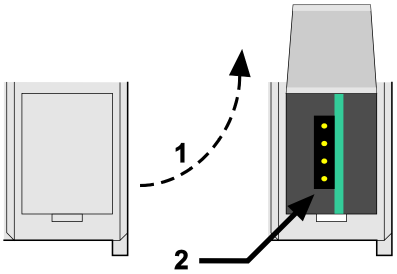


Figure 25: Service Interface (Closed and Opened Flap)

Table 16: Legend for Figure “Service Interface (Closed and Opened Flap)”

Number	Description
1	Open closed
2	View Service Interface

NOTICE

Device must be de-energized!
To prevent damage to the device, unplug and plug in the communication cable only when the device is de-energized!

The connection to the 4-pin header under the cover flap can be realized via the communication cables with the item numbers750-920 and 750-923 or via the WAGO radio adapter with the item number 750-921.

4.4.2 DIP Switch

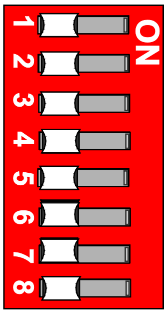


Figure 26: DIP Switch

The DIP switch is used to set the baud rate of the fieldbus coupler and to set the DeviceNet™ station address (relating to DeviceNet™, also called “MAC ID”).

Settings are made by moving the slide switches to “ON” or “OFF”.

The position of the individual slide switches is only evaluated when turning on the fieldbus coupler, i.e., changes are applied when the power supply for the fieldbus coupler is turned OFF then ON again.

4.4.2.1 Baud Rate Setting

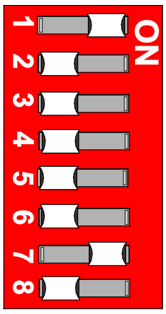
The baud rate is set using slide switches 7 and 8 of the DIP switch. 3 different baud rates are supported.

Table 17: Setting the Baud Rate via DIP Switch

Baud rate	Slide switch 7	Slide switch 8
125 kBaud (default)	OFF	OFF
250 kBaud	ON	OFF
500 kBaud	OFF	ON
not permitted	ON	ON

Example:

Setting the baud rate to 250 kBaud



- ON
- OFF

Figure 27: Example with Baud rate Sent to 250 kBaud

4.4.2.2 Station address

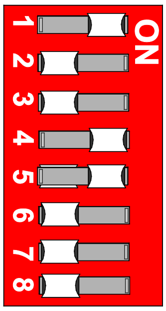
The station address is set using slide switches 1 to 6.

The binary significance of the individual slide switches increases in the direction of the slide switch numbers. Slide switch 1 is used to set the lowest bit with a significance of 2^0 and slide switch 6 to set the highest bit with a significance of 2^5. If slide switch 1 is set to “ON”, “MAC ID” 1 is set, if slide switch 1 and 4 are set to “ON”, “MAC ID” 9 is set ((2^0 + 2^3).

Station addresses in the range of 0 (all slide switches set to “OFF”) to 63 (all slide switches set to “ON”) can be set for the DeviceNet™ fieldbus nodes. The station address is set to 1 when delivered.

Example:

Setting the station address to 25.



- ON $2^0 = 1$
- OFF
- OFF
- ON $2^3 = 8$
- ON $2^4 = 16$
- OFF

Figure 28: Example with Station Address Set to 25

4.5 Technical Data

4.5.1 Device Data

Table 18: Technical Data, Device Data

Width	51 mm
Height (from upper-edge of DIN-35 rail)	65 mm
Depth	100 mm
Weight	approx. 195 g
Degree of protection	IP20

4.5.2 System Data

Table 19: Technical Data, System Data

Number of I/O modules	64 with scanner
Number of I/O points	approx. 6000 (master/slave dependent)
Transmission medium	Shielded Cu cable Remote bus cable: 2 x 0.82 mm^2 + 2 x 1.7 mm^2 Drop cable: 2 x 0.2 mm^2 + 2 x 0.32 mm^2
Bus segment length $_{max}$	100 m ... 500 m (depending on baud rate/cable)
Network length $_{max}$	acc. specification IEEE 802.3, stub line length for all baud rates 6 m
Baud rate	125 kBaud, 250 kBaud, 500 kBaud
Buscoupler connection	5-pin male connector, Series 231 (*MCS*)
Protocols	DeviceNet™
Number of I/O modules	64
Input process image $_{max}$	512 bytes
Output process image $_{max}$	512 bytes
Configuration	via PC or PLC

4.5.3 DeviceNet™ Fieldbus

Table 20: Technical Data, DeviceNet™ fieldbus

DeviceNet™ characteristics	“Polled I/O Message Connection”, “Strobed I/O Message Connection”, “Change of State”/“Cyclic Message Connection”, “Group 2 only Slave”

4.5.4 Supply

Table 21: Technical Data, Power Supply

Voltage via power jumper contacts	24 VDC (-15% ... +20%)
Current via power jumper contacts $_{max.}$	10 ADC
Power supply efficiency $_{typ.}$ at nominal load	87%
Internal current consumption	350 mA at 5 V
Current consumption via - Power supply - CAN interface	 < 500 mA at 24 V < 120 mA at 11 V
Total current for I/O modules	1650 mA at 5 V
Electrical isolation	500 V system/supply

4.5.5 Accessories

Table 22: Technical Data, Accessories

Pluggable connectors	Plug connectors 231-305/010-000/050-000 for *MCS* male connector (included)
Marking	Miniature WSB Quick marking system
EDS Files	Download via http://www.wago.com

4.5.6 Connection Type

Table 23: 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 24: Technical Data – Power Jumper Contacts

Power jumper contacts	Spring contact, self-cleaning
Voltage drop at I $_{max.}$	< 1 V/64 modules

Table 25: Technical Data – Data Contacts

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

4.5.7 Climatic Environmental Conditions

Table 26: Technical Data – Climatic Environmental Conditions

Operating temperature range	0 °C … 55 °C
Operating temperature range for components with extended temperature range (750-xxx/025-xxx)	−20 °C … +60 °C
Storage temperature range	−25 °C … +85 °C
Storage temperature range for components with extended temperature range (750-xxx/025-xxx)	−40 °C … +85 °C
Relative humidity	Max. 5 % … 95 % without condensation
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

4.5.8 Mechanical Strength acc. to IEC 61131-2

Table 27: Technical Data – Mechanical Strength acc. to IEC 61131-2

Test specification	Frequency range	Limit value
IEC 60068-2-6 vibration	5 Hz ≤ f < 9 Hz	1.75 mm amplitude (permanent) 3.5 mm amplitude (short term)
	9 Hz ≤ f < 150 Hz	0.5 g (permanent) 1 g (short term)
	Note on vibration test: a) Frequency change: max. 1 octave/minute b) Vibration direction: 3 axes	
IEC 60068-2-27 shock		15 g
	Note on shock test: a) A Type of shock: half sine b) Shock duration: 11 ms c) Shock direction: 3x in positive and 3x in negative direction for each of the three mutually perpendicular axes of the test specimen	
IEC 60068-2-32 free fall	1 m (module in original packing)	

4.6 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 750-306 fieldbus coupler/controller:

CE	Conformity Marking	
cULus	cULus	UL508
ODVA	"Open DeviceNet Vendors Association" certified	

The following Ex approvals have been granted to 750-306 fieldbus coupler/controller:

Ex	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	
cULus	cULus Class I, Div2 ABCD T4	ANSI/ISA 12.12.01
KC	Korea Certification	MSIP-REM-W43-FBC750
Brasilian-Ex	TUEV 12.1297 X Ex nA IIC T4 Gc	

The following ship approvals have been granted to 750-306 fieldbus coupler/controller:

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)	

4.7 Standards and Guidelines

750-306 meets the following requirements on emission and immunity of interference:

EMC CE-Immunity to interference	acc. to EN 61000-6-2
EMC CE-Emission of interference	acc. to EN 61000-6-3
EMC marine applications-Immunity to interference	acc. to Germanischer Lloyd
EMC marine applications-Emission of interference	acc. to Germanischer Lloyd

5 Mounting

5.1 Installation Position

Along with horizontal and vertical installation, all other installation positions are allowed.

Note

Use an end stop in the case of vertical mounting!
In the case of vertical assembly, an end stop has to be mounted as an additional safeguard against slipping.

WAGO order no. 249-116	End stop for DIN 35 rail, 6 mm wide
WAGO order no. 249-117	End stop for DIN 35 rail, 10 mm wide

5.2 Overall Configuration

The maximum total length of a fieldbus node without fieldbus coupler/controller is 780 mm including end module. The width of the end module is 12 mm. When assembled, the I/O modules have a maximum length of 768 mm.

Examples:

- 64 I/O modules with a 12 mm width can be connected to a fieldbus coupler/controller.
- 32 I/O modules with a 24 mm width can be connected to a fieldbus coupler/controller.

Exception:

The number of connected I/O modules also depends on the type of fieldbus coupler/controller is used. For example, the maximum number of stackable I/O modules on one PROFIBUS DP/V1 fieldbus coupler/controller is 63 with no passive I/O modules and end module.

NOTICE

Observe maximum total length of a fieldbus node!
The maximum total length of a fieldbus node without fieldbus coupler/controller and without using a 750-628 I/O Module (coupler module for internal data bus extension) may not exceed 780 mm.
Also note the limitations of individual fieldbus couplers/controllers.

Note

Increase the total length using a coupler module for internal data bus extension!

You can increase the total length of a fieldbus node by using a 750-628 I/O Module (coupler module for internal data bus extension). For such a configuration, attach a 750-627 I/O Module (end module for internal data bus extension) after the last I/O module of a module assembly. Use an RJ-45 patch cable to connect the I/O module to the coupler module for internal data bus extension of another module block.

This allows you to segment a fieldbus node into a maximum of 11 blocks with maximum of 10 I/O modules for internal data bus extension.

The maximum cable length between two blocks is five meters.

More information is available in the manuals for the 750-627 and 750-628 I/O Modules.

5.3 Mounting onto Carrier Rail

5.3.1 Carrier Rail Properties

All system components can be snapped directly onto a carrier rail in accordance with the European standard EN 50022 (DIN 35).

NOTICE

Do not use any third-party carrier rails without approval by WAGO!
WAGO Kontakttechnik GmbH & Co. KG supplies standardized carrier rails that are optimal for use with the I/O system. If other carrier rails are used, then a technical inspection and approval of the rail by WAGO Kontakttechnik GmbH & Co. KG should take place.

Carrier rails have different mechanical and electrical properties. For the optimal system setup on a carrier rail, certain guidelines must be observed:

- The material must be non-corrosive.
- Most components have a contact to the carrier rail to ground electro-magnetic disturbances. In order to avoid corrosion, this tin-plated carrier rail contact must not form a galvanic cell with the material of the carrier rail which generates a differential voltage above 0.5 V (saline solution of 0.3 % at 20°C).
- The carrier rail must optimally support the EMC measures integrated into the system and the shielding of the I/O module connections.
- A sufficiently stable carrier rail should be selected and, if necessary, several mounting points (every 20 cm) should be used in order to prevent bending and twisting (torsion).
- The geometry of the carrier rail must not be altered in order to secure the safe hold of the components. In particular, when shortening or mounting the carrier rail, it must not be crushed or bent.
- The base of the I/O components extends into the profile of the carrier rail. For carrier rails with a height of 7.5 mm, mounting points are to be riveted under the node in the carrier rail (slotted head captive screws or blind rivets).
- The medal springs on the bottom of the housing must have low-impedance contact with the DIN rail (wide contact surface is possible).

5.3.2 WAGO DIN Rail

WAGO carrier rails meet the electrical and mechanical requirements shown in the table below.

Table 28: WAGO DIN Rail

Order number	Description
210-113 /-112	35 x 7.5; 1 mm; steel yellow chromated; slotted/unslotted
210-114 /-197	35 x 15; 1.5 mm; steel yellow chromated; slotted/unslotted
210-118	35 x 15; 2.3 mm; steel yellow chromated; unslotted
210-198	35 x 15; 2.3 mm; copper; unslotted
210-196	35 x 7.5; 1 mm; aluminum; unslotted

5.4 Spacing

The spacing between adjacent components, cable conduits, casing and frame sides must be maintained for the complete fieldbus node.

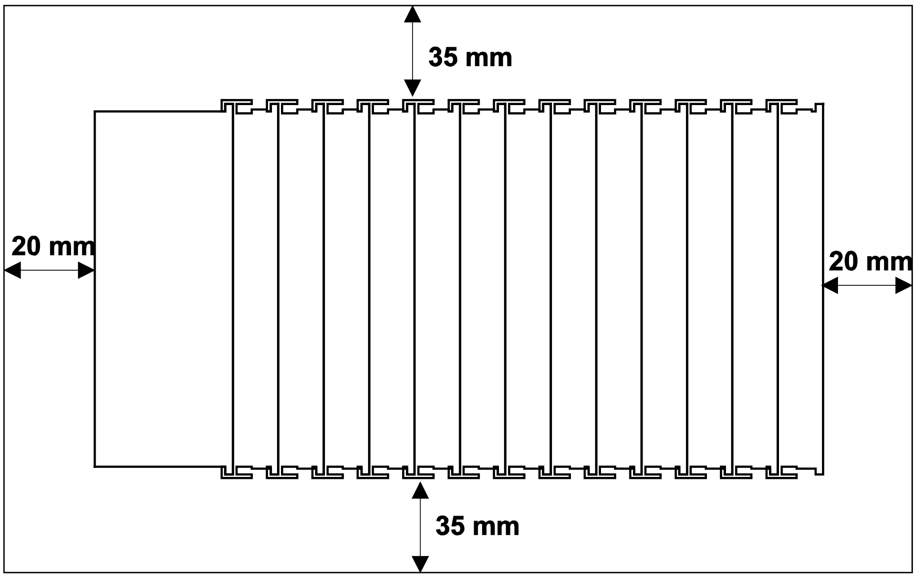


Figure 29: Spacing

The spacing creates room for heat transfer, installation or wiring. The spacing to cable conduits also prevents conducted electromagnetic interferences from influencing the operation.

5.5 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.

5.6 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.

5.6.1 Inserting the Fieldbus Coupler/Controller

1. When replacing the fieldbus coupler/controller for an already available fieldbus coupler/controller, position the new fieldbus coupler/controller so that the tongue and groove joints to the subsequent I/O module are engaged.

2. Snap the fieldbus coupler/controller onto the carrier rail.

3. Use a screwdriver blade to turn the locking disc until the nose of the locking disc engages behind the carrier rail (see the following figure). This prevents the fieldbus coupler/controller from canting on the carrier rail.

With the fieldbus coupler/controller snapped in place, the electrical connections for the data contacts and power contacts (if any) to the possible subsequent I/O module are established.

Figure 30: Release Tab Standard Fieldbus Coupler/Controller (Example)

5.6.2 Removing the Fieldbus Coupler/Controller

1. Use a screwdriver blade to turn the locking disc until the nose of the locking disc no longer engages behind the carrier rail.

2. Remove the fieldbus coupler/controller from the assembly by pulling the release tab.

Electrical connections for data or power contacts to adjacent I/O modules are disconnected when removing the fieldbus coupler/controller.

5.6.3 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.

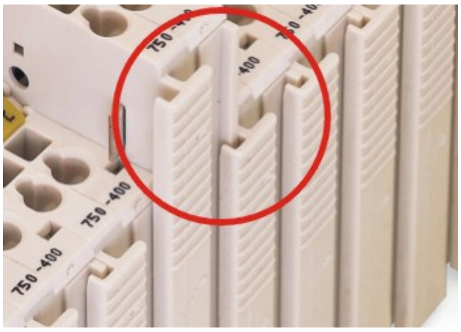


Figure 31: Insert I/O Module (Example)

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

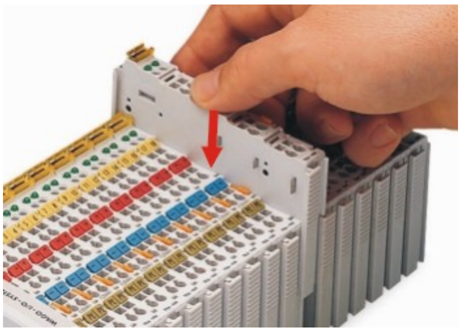


Figure 32: Snap the I/O Module into Place (Example)

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.

5.6.4 Removing the I/O Module

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

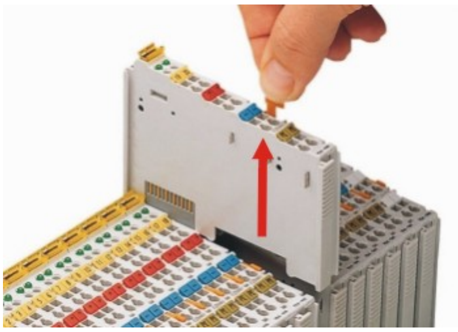


Figure 33: Removing the I/O Module (Example)

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

6 Connect Devices

6.1 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.

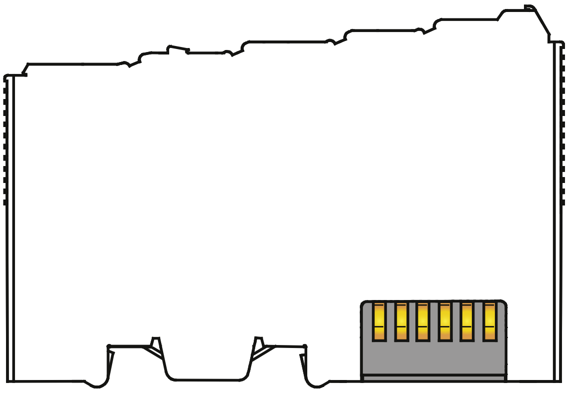


Figure 34: Data Contacts

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.

6.2 Power Contacts/Field Supply

⚠ CAUTION

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

Self-cleaning power jumper contacts used to supply the field side are located on the right side of most of the fieldbus couplers/controllers and on some of the I/O modules. These contacts come as touch-proof spring contacts. As fitting counterparts the I/O modules have male contacts on the left side.

Power jumper contacts

Blade	0	0	3	2
Spring	0	3	3	2

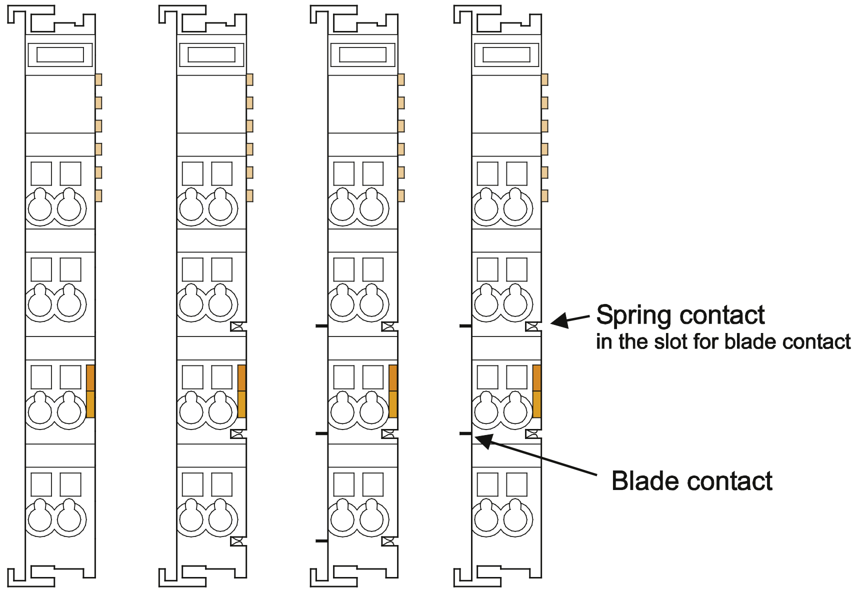


Figure 35: Example for the Arrangement of Power Contacts

Note

Field bus node configuration and test via smartDESIGNER
With the WAGO ProServe® Software smartDESIGNER, you can configure the structure of a fieldbus node. You can test the configuration via the integrated accuracy check.

6.3 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.

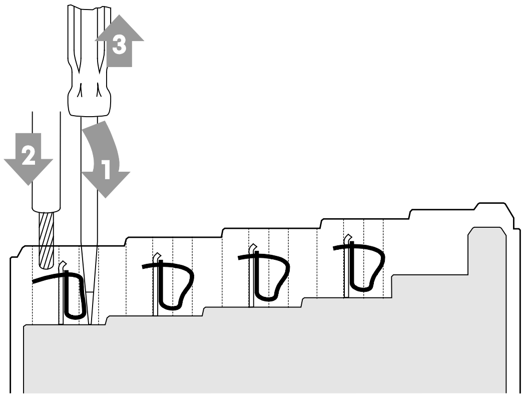


Figure 36: Connecting a Conductor to a CAGE CLAMP®

7 Function Description

7.1 Operating System

After master configuration and electrical installation of the fieldbus station, the system is operative.

The coupler begins running up after switching on the power supply or after a reset.

Upon initialization, the fieldbus coupler determines the I/O modules and configuration. The 'I/O' LED flashes red. After a trouble-free start-up, the coupler enters “Fieldbus start” mode and the 'I/O' LED lights up green.
In the event of a failure, the 'I/O' LED will blink continuously. Detailed error messages are indicated by blinking codes; an error is indicated cyclically by up to 3 blinking sequences.

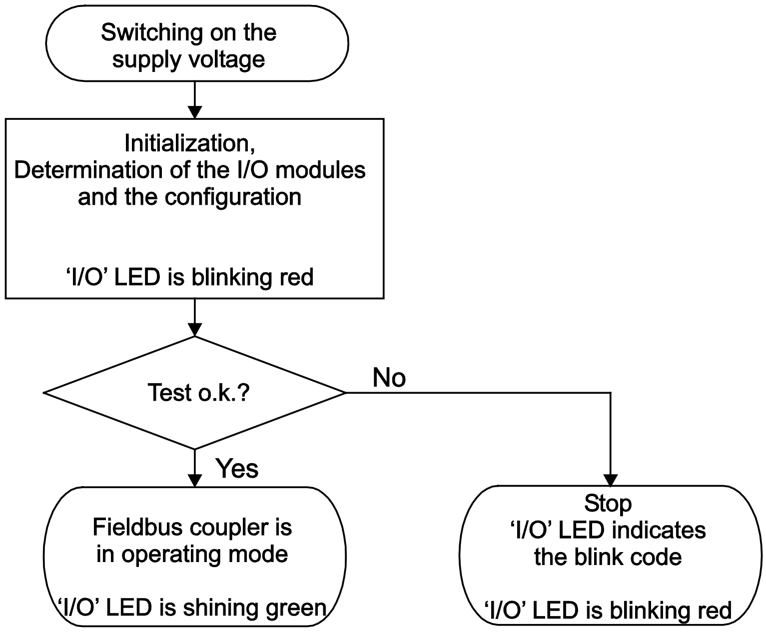


Figure 37: Operating System

Information

More information about the LED Signaling
Read the detailed description for the evaluation of the displayed LED state in the section “Diagnostics” > … > “LED Signaling”.

7.2 Process Data Architecture

7.2.1 Basic Setup

After switching on the fieldbus coupler, it identifies all I/O modules of the node that send or expect to receive data (data/bit width > 0). Any number of analog input/output modules and digital input/output modules can be arranged within a node.

Information

Additional Information
For the number of input and output bits or bytes of the individual I/O modules, refer to the corresponding description of the I/O modules.

The coupler creates an internal local process image on the basis of the data width, the type of I/O module and the position of the module in the node. This process image is separated into input and output data range.

The data of the digital input/output modules is bit-oriented, i.e., data is exchanged bit by bit. The analog I/O bus modules represent all byte-oriented bus modules, which send data byte by byte.

This group includes: counter modules, angle and distance measurement modules and communication modules.

For both, the local input and output process image, the I/O module data is stored in the corresponding process image depending on the order in which the modules are connected to the coupler.

First, all the byte-oriented (analog) IO modules are filed in the process image, then the bit-oriented (digital) IO modules. The bits of the digital modules are grouped into bytes. If the amount of digital information exceeds 8 bits, the coupler automatically starts with a new byte.

Note

Hardware changes can result in changes of the process image!
If the hardware configuration is changed by adding, changing or removing of I/O modules with a data width > 0 bit, this result in a new process image structure. The process data addresses would then change. If adding I/O modules, the process data of all previous I/O modules has to be taken into account.

7.3 Data Exchange

Objects are used for exchange of process data for the DeviceNet™ fieldbus coupler.

For access from the network to the individual objects, connections between the required subscribes must first be established and connection objects set up or activated.

For a quick and easy connection, the DeviceNet™ 750-306 fieldbus coupler uses the “Predefined Master/Slave Connection Set” in which 4 connections are already predefined. Access to the fieldbus coupler is then possible by simply activating (allocating) the connections.

The “Predefined Master/Slave Connection Set” is limited to only master/slave relationships. Slaves only addressed via its assigned client like the DeviceNet™ 750-306 fieldbus coupler are called “Group 2 Only Servers”. They can only be addressed via the “Group 2 Only Unconnected Explicit Message Port” and only receive messages defined in message group 2.

The “Assembly Object” specifies the structure of the objects for data transmission. With the “Assembly Object”, I/O data can be combined into blocks, for example, and sent via a single message connection. Creating blocks requires less traffic on the network.

There is a distinction between input and output assemblies. An input assembly reads in data from the application via network or produces data on the network.

An output assembly writes data to the application or pulls data from the network. In the fieldbus coupler, various assembly instances are pre-programmed (static assembly).

Information

Additional Information
The assembly instances for static assembly are described in the section “Fieldbus Communication” > … > “Process Data and Diagnostic Status” > “Assembly Instances.”

7.3.1 Communication Interfaces

Basically, the fieldbus coupler has two interfaces for exchanging data:

- Interface to the fieldbus (fieldbus master)
- Interface to the I/O modules.

Data is exchanged between the fieldbus master and the I/O modules.
Access from the fieldbus side to the data is fieldbus specific.

7.3.2 Memory Space

The fieldbus coupler's process image contains the physical data for the bus modules.
These have a value of 0 ... 255.

1 The input module data can be read from the fieldbus side.

2 Likewise, data can be written to the output modules from the fieldbus side.

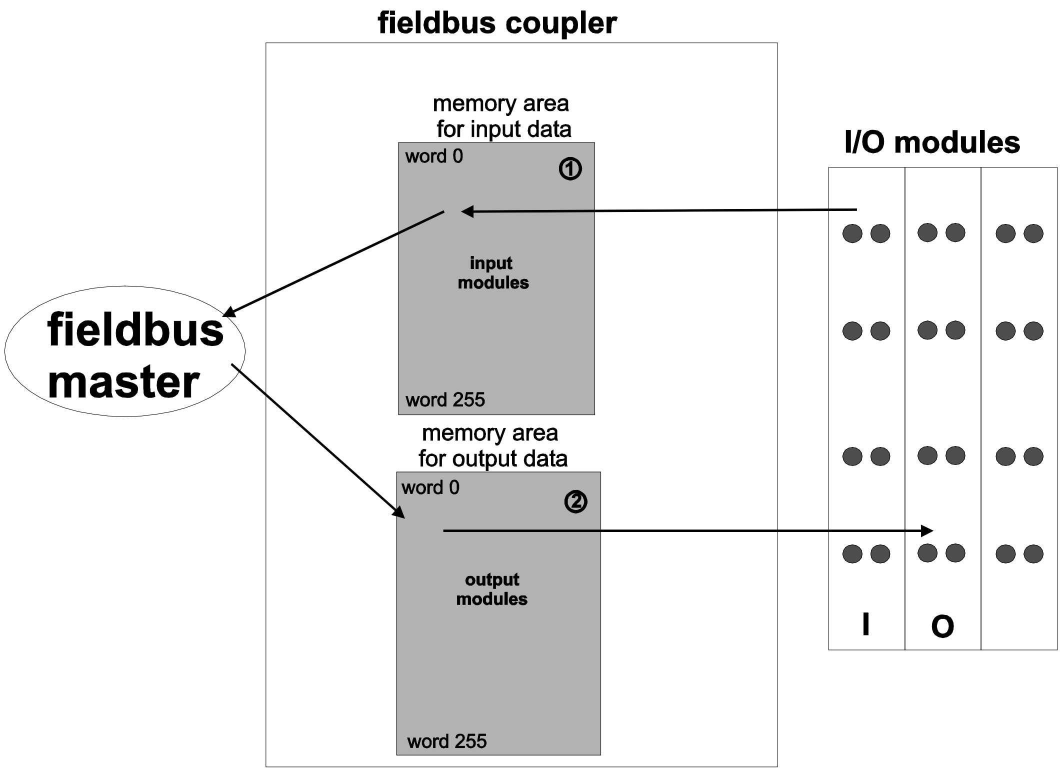


Figure 38: Memory Areas and Data Exchange

7.3.3 Addressing

7.3.3.1 Fieldbus-Specific Addressing

After turning on the power supply, the assembly object combines data from the process image. As soon as a connection is established, a DeviceNet™ master (scanner) can address the data with “class”, “instance” and “Attribute” and then access it or read and/or write via I/O connections.

Data mapping depends on the assembly instance selected or on application-specific determination with the dynamic assembly.

Information

Additional Information
The assembly instances for static assembly are described in the section “Fieldbus Communication” > … > “Assembly Instances.”

Information

Additional Information
For the number of input and output bits or bytes of the individual I/O modules, please refer to their corresponding descriptions.

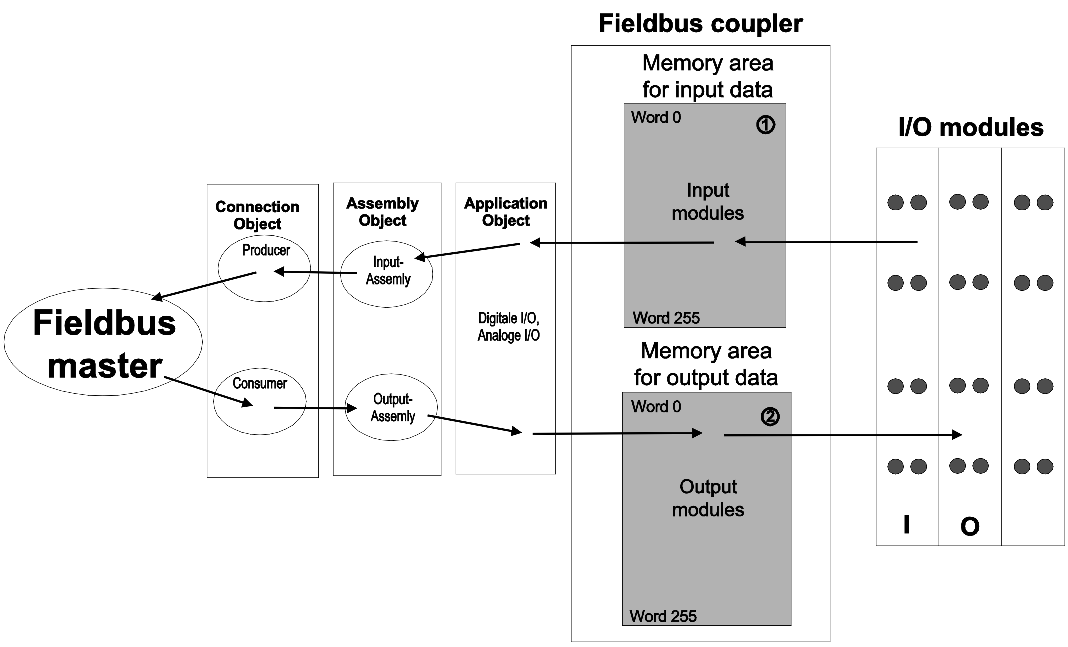


Figure 39: Fieldbus-Specific Data Exchange

Information

Take into account the process data of previous I/O modules in case of an expansion!
If a node is changed or expanded, this may result in a new process image structure. In this case, the process data addresses also change. In case of an expansion, the process data of all previous I/O modules has to be taken into account.

Example of a static assembly:

On delivery of the fieldbus coupler, the default setting for the static assembly is:

- Output1 (I/O Assembly Instance 1)
- Input1 (I/O Assembly Instance 4)

Example setup of the fieldbus node:

1. DeviceNet™ fieldbus coupler (750-306)
2. 4-channel digital input module (e.g., 750-402)
3. 4-channel digital output module (e.g., 750-504)
4. 2-channel analog output module with 2 bytes per channel (e.g., 750-552)
5. 2-channel analog input module with 2 bytes per channel (e.g., 750-456)
6. End module (750-600)

Input process image:

Standard process data, input image (Assembly Class, Instance 4)

Table 29: Input Process Image

	Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Byte 0	Low byte channel 1							
Byte 1	High byte channel 1							
Byte 2	Low byte channel 2							
Byte 3	High byte channel 2							
Byte 4	unused				DI04[1)]	DI03[1)]	DI02[1)]	DI01[1)]
Byte 5	DS08[2)]	DS07[2)]	DS06[2)]	DS05[2)]	DS04[2)]	DS03[2)]	DS02[2)]	DS01[2)]

[1)] DI = Digital input

[2)] DS = Diagnostic status (The last byte in the input process image is the diagnostic status byte, DS01 … DS08, see also object 0x64/Instance 1/Attr. 5.)
DS01 =1: Internal bus error (0x01)
DS02 =1: Coupler configuration error (0x02)
DS04 =1: Module diagnostics (0x08)
DS08 =1: Fieldbus error (0x80)

Output process image:

Standard process data, output image (Assembly Class, Instance 1)

Table 30: Output Process Image

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Low byte channel 1							
Byte 1	High byte channel 1							
Byte 2	Low byte channel 2							
Byte 3	High byte channel 2							
Byte 4	unused				DO04[1)]	DO03[1)]	DO02[1)]	DO01[1)]

[1)] DO = Digital output

8 Commissioning

This section shows a step-by-step procedure for starting up exemplarily a WAGO fieldbus node.

Note

Exemplary Example!
This description is exemplary and is limited here to the execution of a local start-up of one individual DeviceNet™ fieldbus node with a non-interlaced computer running Windows.

For start-up, three steps are necessary. The description of these work steps can be found in the corresponding following sections.

- **Connecting Client-PC and Fieldbus Node**
- **Setting the "MAC ID" and baud rate**
- **Configuring static assemblies**

8.1 Connecting Client PC and Fieldbus Nodes

1. Mount the fieldbus node to the carrier rail.
   Observe the installation instructions described in “Mounting” section.

2. Use a fieldbus cable to connect the DeviceNet™ fieldbus node to the DeviceNet™ fieldbus card in your PC.

   24V power is supplied to the fieldbus via connections V+, V- of the 5-pin fieldbus connector (Series 231 *(MCS)*) from an external fieldbus power supply unit.

3. Turn the operating voltage on.

4. Turn on your PC.

The fieldbus coupler is initialized. The coupler determines the I/O module configuration and creates a process image.
During start-up, the I/O LED (red) flashes.
If the I/O LED lights up green after a brief period, the fieldbus coupler is operational.

If an error occurs during start-up indicated by the I/O LED flashing red, evaluate the error code and argument and resolve the error.

Information

More information about LED signaling
The exact description for evaluating the LED signal displayed is available in the section “Diagnostics” > … > “LED Signaling”.

8.2 Setting the DeviceNet™ Station Address and Baud Rate

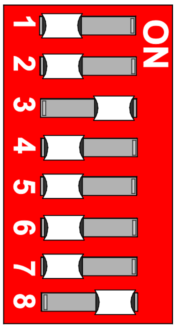
1. Switch off the power for the fieldbus coupler.

2. Set the required DeviceNet™ station address (“MAC ID”) using slide switches 1 … 6 of the DIP switch.

3. Set the required baud rate using slide switches 7 and 8.

Example:

Setting the station address “MAC ID” 4 (DIP 3 = ON) and baud rate 500 kBaud (DIP 7 = OFF, DIP 8 = ON).



OFF		
OFF		
ON (2² = 4)	Station address	
OFF		
OFF		
OFF		
OFF	Baud rate	
ON		

Figure 40: Example of DIP Switch Settings

4. Then switch on the supply voltage of the fieldbus coupler.

8.3 Configuring Static Assemblies

Configuring static assemblies is described in a separate document.

Information

Please note Application Note A100103!
Configuring static assemblies is described in Application Note **A100103**.
The application note is available for download at the WAGO website http://www.wago.com.

Information

Additional Information
ESD files for the fieldbus coupler are available in the Download area on the website http://www.wago.com.

9 Diagnostics

9.1 LED Signaling

For on-site diagnostics, the fieldbus coupler has several LEDs that indicate the operational status of the fieldbus coupler or the entire node (see following figure).

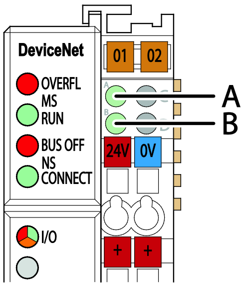


Figure 41: Display Elements

The diagnostics displays and their significance are explained in detail in the following section.

The LEDs are assigned in groups to the various diagnostics areas:

Table 31: LED Assignment for Diagnostics

Diagnostics area	LEDs
Fieldbus status	• MS -OVERFL -RUN • NS -BUS OFF -CONNECT
Node status	• I/O
Status Supply Voltage	• A (system supply) • B (field supply)

9.1.1 Evaluating the Fieldbus Status

Communication via the fieldbus is by the top LED group. The two “MS” (“Module Status”) and “NS” (“Network Status”) LEDs are used for the status of the system and fieldbus connections.

Table 32: Diagnostics – Module Status (MS)

Module Status (MS)			
OVERFL (red)	**RUN (green)**	**Device status by DeviceNet™**	**Explanation**
off	off	“no power”	The device has no power.
off	on	“device operational”	The device is working properly.
off	flashes	“device in standby”	The device must still be configured or is partially configured.
flashes	off	“minor fault”	There is a minor error. A diagnosis is available.
on	off	“unrecoverable fault”	The device is defective and requires service or must be replaced.
flashes	flashes	“device self testing”	The device is performing a self-test.

Table 33: Diagnostics – Network Status (NS)

Network Status (NS)			
BUS OFF (red)	**CONNECT (green)**	**Device status by DeviceNet™**	**Explanation**
off	off	No power or not online	The device is has no power (fieldbus power supply), the DeviceNet™ cable is not attached and the “Duplicate MAC ID detection” has not been completed.
off	flashes	Online but not connected	The device is working properly on the fieldbus. However, but yet integrated by a scanner.
off	on	Online and connected	The device is working properly on the fieldbus. There is at least one connection to another device.
flashes	off	Error (time out)	There is a minor error (e.g., EPR at a Poll connection not equal to 0, slave is no longer polled cyclically).
on	off	Critical connection error	The device has detected an error “Duplicated MAC ID Check”). No functions can be executed on the network.

9.1.2 Evaluating Node Status – I/O LED (Blink Code Table)

The communication status between fieldbus coupler/controller and the I/O modules is indicated by the I/O LED.

Table 34: Node Status Diagnostics – Solution in Event of Error

LED Status	Meaning	Solution
I/O		
green	The fieldbus node is operating correctly.	Normal operation.
red	a.) **During fieldbus coupler boot-up:** Internal data bus is initialized, Boot-up is indicated by fast flashing for 1 … 2 seconds.	-
red	b.) **After fieldbus coupler boot-up:** Blink codes indicate internal data bus errors by up to 3 flashing sequences. These sequences are separated by short breaks.	Evaluate (error code and error argument) error message

Device boot-up occurs after turning on the power supply. The I/O LED flashes orange.

Then the bus is initialized. This is indicated by flashing red at 10 Hz for 1 … 2 seconds.

After a trouble-free initialization, the I/O LED is green.

In the event of an error, the I/O LED continues to blink red. Blink codes indicate detailed error messages. An error is indicated cyclically by up to 3 flashing sequences.

After elimination of the error, restart the node by turning the power supply of the device off and on again.

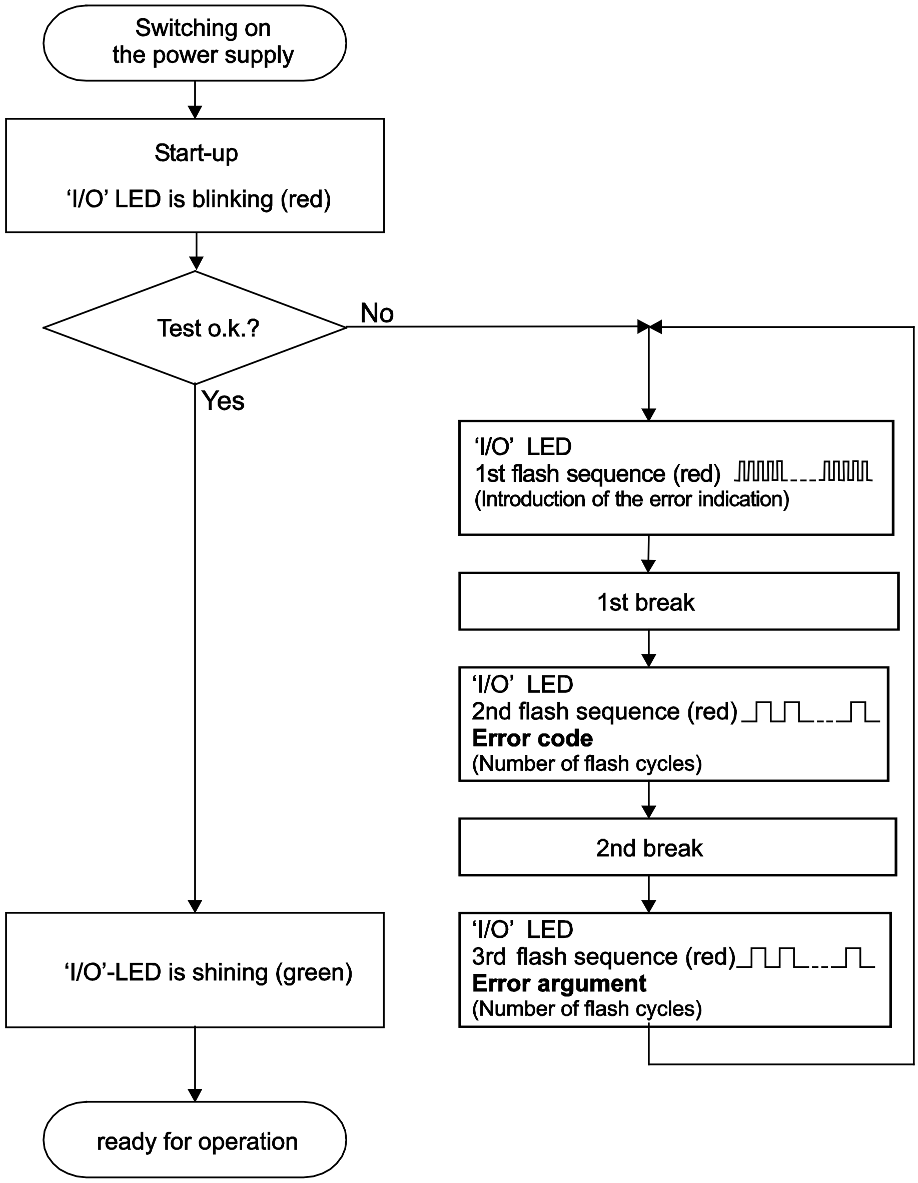


Figure 42: Node Status – I/O LED Signaling

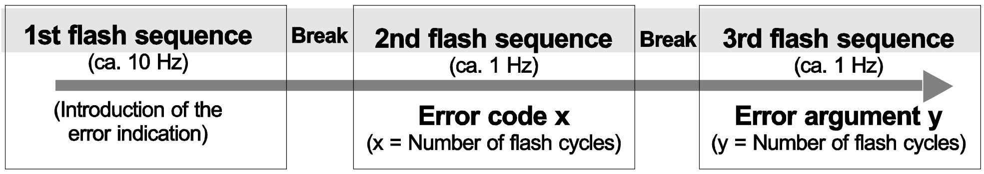


Figure 43: Error Message Coding

Example of a module error:

- The I/O LED starts the error display with the first flashing sequence (approx. 10 Hz).
- After the first break, the second flashing sequence starts (approx. 1 Hz): The I/O LED blinks four times.
  Error code 4 indicates "data error internal data bus".

- After the second break, the third flashing sequence starts (approx. 1 Hz): The I/O LED blinks twelve times.
  Error argument 12 means that the internal data bus is interrupted behind the twelfth I/O module.

The thirteenth I/O module is either defective or has been pulled out of the assembly.

Table 35: Blink code- table for the I/O LED signaling, error code 1

Error code 1: "Hardware and configuration error"		
Error Argument	**Error Description**	**Solution**
-	Invalid check sum in the parameter area of the fieldbus coupler.	1. Turn off the power supply for the node. 2. Replace the fieldbus coupler. 3. Turn the power supply on again.
1	Overflow of the internal buffer memory for the attached I/O modules.	1. Turn off the power for the node. 2. Reduce the number of I/O modules. 3. Turn the power supply on again. 4. If the error persists, replace the fieldbus coupler.
2	I/O module(s) with unknown data type	1. Determine the faulty I/O module by first turning off the power supply. 2. Plug the end module into the middle of the node. 3. Turn the power supply on again. 4. - LED continues to flash? - Turn off the power supply and plug the end module into the middle of the first half of the node (toward the fieldbus coupler). - LED not flashing? - Turn off the power and plug the end module into the middle of the second half of the node (away from the fieldbus coupler). 5. Turn the power supply on again. 6. Repeat the procedure described in step 4 while halving the step size until the faulty I/O module is detected. 7. Replace the faulty I/O module. 8. Inquire about a firmware update for the fieldbus coupler.
3	Unknown module type of the Flash program memory	1. Turn off the power supply for the node. 2. Replace the fieldbus coupler. 3. Turn the power supply on again.
4	Fault when writing in the Flash program memory.	1. Turn off the power supply for the node. 2. Replace the fieldbus coupler. 3. Turn the power supply on again.
5	Fault when deleting the Flash memory.	1. Turn off the power supply for the node. 2. Replace the fieldbus coupler. 3. Turn the power supply on again.

Table 35: Blink code- table for the I/O LED signaling, error code 1

Error code 1: "Hardware and configuration error"		
Error Argument	**Error Description**	**Solution**
6	The I/O module configuration after AUTORESET differs from the configuration determined the last time the fieldbus coupler was powered up.	1. Restart the fieldbus coupler by turning the power supply off and on.
7	Fault when writing in the serial EEPROM.	1. Turn off the power supply for the node. 2. Replace the fieldbus coupler. 3. Turn the power supply on again.
8	Invalid hardware-firmware combination.	1. Turn off the power supply for the node. 2. Replace the fieldbus coupler. 3. Turn the power supply on again.
9	Invalid check sum in the serial EEPROM.	1. Turn off the power supply for the node. 2. Replace the fieldbus coupler. 3. Turn the power supply on again.
10	Serial EEPROM initialization error	1. Turn off the power supply for the node. 2. Replace the fieldbus coupler. 3. Turn the power supply on again.
11	Fault when reading in the serial EEPROM.	1. Turn off the power supply for the node. 2. Replace the fieldbus coupler. 3. Turn the power supply on again.
12	Timeout during access on the serial EEPROM	1. Turn off the power supply for the node. 2. Replace the fieldbus coupler. 3. Turn the power supply on again.
14	Maximum number of gateway or mailbox modules exceeded	1. Turn off the power for the node. 2. Reduce the number of corresponding modules to a valid number. 3. Turn the power supply on again.

Table 36: Blink Code Table for the I/O LED Signaling, Error Code 2

Error code 2: – not used –		
Error Argument	**Error Description**	**Solution**
1	Not used	-

Table 37: Blink Code Table for the I/O LED Signaling, Error Code 3

Error code 3: "Protocol error, internal bus"		
Error Argument	**Error Description**	**Solution**
-	Internal data bus communication is faulty, defective module cannot be identified.	- Are passive power supply modules (750-613) located in the node? - 1. Check that these modules are supplied correctly with power. 2. Determine this by the state of the associated status LEDs. - Are all modules connected correctly or are there any 750-613 Modules in the node? - 1. Determine the faulty I/O module by turning off the power supply. 2. Plug the end module into the middle of the node. 3. Turn the power supply on again. 4. - LED continues to flash? - Turn off the power supply and plug the end module into the middle of the first half of the node (toward the fieldbus coupler). - LED not flashing? - Turn off the power and plug the end module into the middle of the second half of the node (away from the fieldbus coupler). 5. Turn the power supply on again. 6. Repeat the procedure described in step 4 while halving the step size until the faulty I/O module is detected. 7. Replace the faulty I/O module. 8. If there is only one I/O module on the fieldbus coupler and the LED is flashing, either the I/O module or fieldbus coupler is defective. 9. Replace the defective component.

Table 38: Blink Code Table for the I/O LED Signaling, Error Code 4

Error code 4: "Physical error, internal bus"		
Error Argument	**Error Description**	**Solution**
-	Internal bus data transmission error or interruption of the internal data bus at the fieldbus coupler	1. Turn off the power supply to the node. 2. Plug in an end module behind the fieldbus coupler. 3. Turn the power supply on. 4. Observe the error argument signaled. - Is no error argument indicated by the I/O LED? - 5. Replace the fieldbus coupler. - Is an error argument indicated by the I/O LED? - 5. Identify the faulty I/O module by turning off the power supply. 6. Plug the end module into the middle of the node. 7. Turn the power supply on again. - LED continues to flash? – 8. Turn off the power and plug the end module into the middle of the first half of the node (toward the fieldbus coupler). - LED not flashing? - 9. Turn off the power and plug the end module into the middle of the second half of the node (away from the fieldbus coupler). 10. Turn the power supply on again. 11. Repeat the procedure described in step 6 while halving the step size until the faulty I/O module is detected. 12. Replace the faulty I/O module. 13. If there is only one I/O module on the fieldbus coupler and the LED is flashing, either the I/O module or fieldbus coupler is defective. 14. Replace the defective component.
n*	Interruption of the internal data bus behind the nth bus module with process data	1. Turn off the power supply of the node. 2. Replace the (n+1)th I/O module containing process data. 3. Turn the power supply on.

* The number of light pulses (n) indicates the position of the I/O module.
I/O modules without data are not counted (e.g., supply modules without diagnostics)

Table 39: Blink Code Table for the I/O LED Signaling, Error Code 5

Error code 5: "Initialization error, internal bus"		
Error Argument	**Error Description**	**Solution**
n*	Error in register communication during internal bus initialization	1. Turn off the power supply to the node. 2. Replace the nth I/O module containing process data. 3. Turn the power supply on.

* The number of light pulses (n) indicates the position of the I/O module.
I/O modules without data are not counted (e.g., supply modules without diagnostics)

Table 40: Blink Ccode Table for the I/O LED Signaling, Error Code 6 … 8

Error code 6 … 8: -not used-		
Error Argument	**Error Description**	**Solution**
-	Not used	

Table 41: Blink Code Table for the I/O LED Signaling, Error Code 9

Error code 9: "CPU Trap error"		
Error Argument	**Error Description**	**Solution**
1	Illegal Opcode	Fault in the program sequence. 1. Please contact the I/O Support.
2	Stack overflow	
3	Stack underflow	
4	NMI	

Table 42: Blink code table for I/O LED signaling, error code 10

Error code 10: -not used-		
Error argument	**Error description**	**Remedy**
-	not used	-

Table 43: Blink Code Table for the I/O LED Signaling, Error Code 11

Error code 11: "Error in I/O modules with gateway/mailbox functionality"		
Error Argument	**Error Description**	**Remedy**
1	Too many I/O modules with gateway functionality are plugged in	1. Reduce the number of gateway modules.
	Note **Note process image size limit!** Please note the process image size limit when configuring a node with analog input/output modules and I/O modules that have mailbox functionality. Depending on the overall configuration of all I/O modules of a node, the maximum number of object directory entries may be exceeded in some cases.	
2	Maximum mailbox size exceeded	1. Reduce the size of the mailbox.
3	Maximum PA size exceeded due to connected I/O modules with mailbox functionality	1. Reduce the data width of I/O modules with mailbox functionality.

9.1.3 Evaluating Power Supply Status

The power supply unit of the device has two green LEDs that indicate the status of the power supplies.
LED "A" indicates the 24 V supply of the coupler.
LED "B" or "C" reports the power available on the power jumper contacts for field side power.

Table 44: Power Supply Status Diagnostics – Solution in Event of Error

LED Status	Meaning	Solution
A		
Green	Operating voltage for the system is available.	-
Off	No power is available for the system	Check the power supply for the system (24 V and 0 V).
B or C		
Green	The operating voltage for power jumper contacts is available.	-
Off	No operating voltage is available for the power jumper contacts.	Check the power supply for the power jumper contacts (24 V and 0 V).

10 Fieldbus Communication

10.1 DeviceNet™

DeviceNet™ is a network concept on the device level based on the serial bus system “Controller Area Network” (CAN). It is particularly characterized by easy addition and removal of devices during operation. The range of devices spans from simple light barriers to complex engine control units. DeviceNet™ is primarily used in industrial automation and robot controllers.

The physical data link layer is defined in the CAN specification. The telegram structure is described, but nothing is said about the application layer. DeviceNet™ is implemented here. It describes the significance of the transmitted data defined in the application layer. The “Open DeviceNet™ Vendor Association” (ODVA) is the user organization for DeviceNet™. In a specification, the ODVA devices DeviceNet™ as a uniform application layer and specifies technical and functional characteristics for device linking.

Up to 64 fieldbus nodes can be operated in one DeviceNet™ network. Network reach depends on the selected baud rate (125 kBaud, 250 kBaud or 500 kBaud). Contrary to other fieldbus systems, in CAN the modules connected to the bus are not addressed, but the messages are identified.

The devices are allowed to send messages whenever the bus is available. Each bus node decides by itself when it wants to send data or prompts other bus nodes to send data. Thus, communication without the bus master module is possible. Bus conflicts are solved by assigning messages a specific priority. This priority is defined by the CAN identifier, “Connection ID” at DeviceNet™. The smaller the identifier is, the higher the priority.

A general difference between high-priority process messages (I/O messages) and low-priority management messages (explicit messages) is done before. Messages with a data length of more than 8 bytes can be fragmented.

Communication with DeviceNet™ is always connection based. All data and functions of a device are described by means of an object model. Therefore, for a message exchange directly after switching on a device, the connections to the desired subscriber have to be established first and communication objects be created or allocated. Message distribution is according to the broadcast system, data exchange according to the producer consumer model.

A transmitting DeviceNet™ node produces data that is either consumed via a point-to-point connection (1 to 1) by one receiving node, or via a multicast connection (1 to n) by several receiving nodes.

Information

Additional Information
The "Open DeviceNet™ Vendor Association" (ODVA) makes more information available on the Internet at: http://www.odva.org.

Information

Additional Information
"CAN in Automation" (CiA) makes documentation about CAN networks available on the Internet at: http://www.can-cia.de.

10.1.1 Network Structure

10.1.1.1 Transfer Media

A bus medium forms the basis for the physical implementation of a network with DeviceNet™.

According to the cable specification, a double 2-conductor twisted pair cable (twisted pair, shielded cable) is recommended ad the medium. It consists of two shielded twisted-pair cables with a wire in the middle of the cable. Additional shielding runs on the outside. The blue and white twisted-pair cable is used for signal transmission, the black and red one for the power supply.

The DeviceNet™- bus is configured from a remote bus cable as the trunk line and several drop lines.

The DeviceNet™ specification distinguishes between 2 cable types:

- **Thick Cable**
  For the trunk line with maximum 8 A or for networks extending over more than 100 m.
  The trunk line topology is linear, i.e., remote bus cables are not further branched. At each end of the remote bus cable, terminating resisters are required.

- **Thin Cable**
  For drop lines with maximum 3 A or for networks extending less than 100 m.
  One or more nodes can be connected to the drop lines, i.e., branching is permitted here. The length of the individual drop lines is measured from the branching point of the node and can be up to 6 m The entire length of the drop line depends on the baud rate.

NOTICE

Note information about connection data lines!
Route data lines separately from all high-current cables.

Information

Additional Information
The detailed specification regarding cable types is available on the Internet at: http://www.odva.org.

In the following table, the permitted cable length is represented based on the baud rate. A distinction is made between the maximum lengths for transmission with thick and thin cable.

Table 45: Maximum bus lengths dependent on preset baud rate

Baud rate	Bus length			Drop Cable Length	
	Thick + Thin Cable	Thick Cable only	Thinn Cable only	maximum	cumulated
500 Kbit/s	$L_{Thick} + L_{Thin} \leq 100$ m (328 ft)	100 m (328 ft)	100 m (328 ft)	6 m (19.6 ft)	39 m (127.9 ft)
250 Kbit/s	$L_{Thick} + 2.5 \bullet L_{Thin} \leq 250$ m (820.2 ft)	250 m (820.2 ft)	100 m (328 ft)	6 m (19.6 ft)	78 m (255.9 ft)
125 Kbit/s	$L_{Thick} + 5 \bullet L_{Thin} \leq 500$ m (1640.4 ft)	500 m (1640.4 ft)	100 m (328 ft)	6 m (19.6 ft)	156 m (511.8 ft)

Specifying maximum cable lengths ensures that communication is possible between two nodes located at maximum distance to each other (worst case).

10.1.1.2 Cabling

The connection of a WAGO fieldbus node to the DeviceNet™ bus cable is made by the included 5-pole plug, Series 231 *(MCS)*.

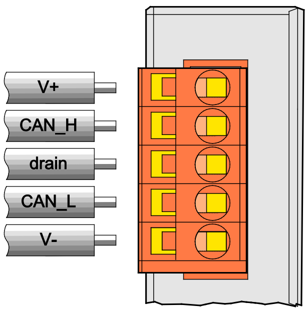


Figure 44: Plug Assignment for the Fieldbus Connection, Series 231 *(MCS)*

For wiring with shielded cable, the connector is assigned the connections V+, V- for the power supply and CAN_High, CAN_Low for data transmission

The 24 V field bus supply is fed by an external fieldbus network power supply.

CAN_High and CAN_Low are two physically different bus signal levels. The cable's shielding is connected to the “drain” connection. This is terminated to PE in devices with 1 MΩ (DIN rail contact). A low-impedance connection of the shielding to PE is possible only from the outside (e.g., by a supply module). The aim is a central PE contact for the entire DeviceNet™ bus cable shield.

Note

Use the WAGO Shield Connecting System for optimal shielding!
For the optimal connection between fieldbus cable shielding and functional ground, WAGO offers a cable shielding system (Series 790).

Each DeviceNet™ node forms the UDiff differential voltage from the CAN_High and CAN_Low as follows: UDiff = UCAN_High - UCAN_Low.

The differential signal transmission offers the benefit of insensitivity to common mode interferences and ground offsets between the nodes.

Note

Use the proper terminating resistor for both ends of the bus cable!
The bus cable must have a terminating resistor of 121 Ω / ±1% / ¼ W at both ends between CAN-High and CAN-Low to prevent reflections and transmission problems.
This is also required for very short cable lengths.

Because the CAN bus can be designed as a 2-wire bus, bus fault management detects a break or short circuit in a line by asymmetric operation.

Information

Additional Information
The “CAN in Automation” (CiA) organization makes specification documents for a CAN network available on the Internet at: http://www.can-cia.de.

10.1.1.3 Topology

To build a simple DeviceNet™ network, you need a scanner (PC with DeviceNet™ fieldbus PCB card), a connection cable and a 24 VDC power supply unit in addition to a DeviceNet™ fieldbus node.

The DeviceNet™ network is set up as a line structure (trunk line) with terminating resistors (121 Ohm).

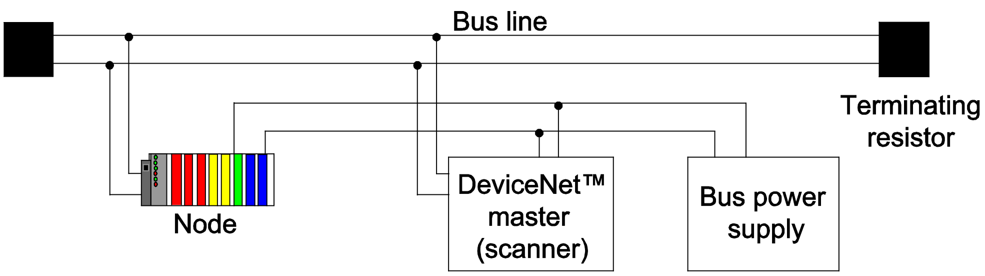


Figure 45: DeviceNet™ Network – Line Structure (Trunk Line) with Terminating Resistors

In systems with more than two stations, all nodes are wired in parallel. The nodes are connected to the fieldbus cable (trunk line) by drop lines. This requires the bus cable to be looped through without disruption. The maximum length of a line branch should not exceed 6 m.

An example of this topology is shown in the following figure:

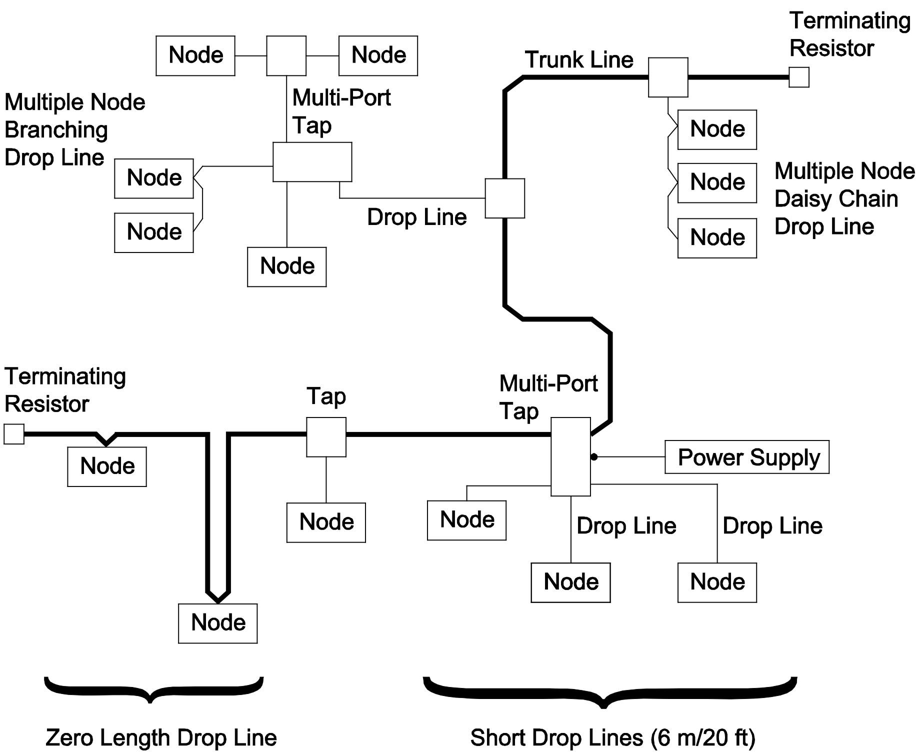


Figure 46: DeviceNet™ Network with Cable Branches

To connect the nodes, a branching unit ("Multi-Port DeviceNet™ Tap") has been developed by WAGO Kontakttechnik GmbH & Co. KG. The unit allows remote bus cables and drop lines to be connected using CAGE CLAMP® technology. A secure and fast, as well as vibration- and corrosion-resistant connection is thereby achieved.

The DeviceNet™ taps are available in 2 versions.

Table 46: DeviceNet™ Tap Versions

Items	Description
810-900/000-001	Closed design with connection options for 6 lines. The enclosure provides protection in harsh environments.
810-901/000-001	Open design for connecting 2 drop lines and 2 remote bus cables.

All devices in the network communicate at the same baud rate. The bus structure makes it possible to couple and decouple stations or to start up the system step by step in a non-reactive manner.

Later upgrades have no effect on stations that are already in operation. If a device malfunctions or is added to the network, it is automatically detected.

10.1.1.4 Network Grounding

The devices can either be powered by the DeviceNet™ bus or have their own power supply. However, the network can only be grounded at one location. The network is preferably grounded in the network center (surge arrestor V- and "drain" shielding for round media) to optimize capacity and to minimize interference.

Not permitted are ground loops via devices that are not disconnected from the power supply. The device must either be insulated or, if that is not possible, the power must be disconnected from the device.

10.1.1.5 Interface Modules

In a network, all WAGO DeviceNet™- fieldbus nodes are delivered to operate as slaves in a network. Master operation is performed by a central control system, such as PLC, NC or RC.

The fieldbus devices are linked via interface modules.

As an interface module, WAGO offers the PC interface cards for DeviceNet™, ISA DeviceNet™ Master 7 kByte (order No. 758-340), PC104 DeviceNet™ Master 7 kByte D-Sub, straight, angled (order No. 758-341) and PCI DeviceNet™ Master 7 kByte (order No. 758-342) from the WAGO-I/O-SYSTEM 758.

Other interface modules for programmable logic controllers are also available from other manufacturers.

10.1.2 Network Communication

10.1.2.1 Objects, Classes, Instances and Attributes

Protocol processing of DeviceNet™ is object oriented. Each node in the network is depicted as a collection of objects. Some related terms are defined below:

- **Object**
  An object is an abstract representation of individual, related components within a device. It is determined by its data or attributes, its outwardly applied functions or services and by its defined behavior.

- **Class**
  A class contains related components (objects) of a product organized in instances, e.g., Identity Class, DeviceNet Class.

- **Instance**
  An instance is composed of various variables (attributes). Different instances of a class have the same services, the same behavior and the same variables (attributes).
  However, they can have different variable values, e.g., different "Connection Instances": "Explicit Message", "Poll I/O" or "Bit-Strobe Connection Instance".

- **Attributes**
  The attributes represent data provided by a device via DeviceNet™. They contain the current values of e.g., a configuration or input, such as "Vendor ID", "Device Type" or "Product Name".

- **Service**
  Services can be applied to classes and attributes and perform defined actions, e.g., reading attributes or resetting a class.

- **Behavior**
  The behavior defines how a device responds to external events, e.g., changed process data or as a consequence of internal events, e.g., elapsed timers.

10.1.3 Characteristics of DeviceNet^{TM} Devices

DeviceNet^{TM}- devices are defined by “Vendor ID” and “Device Type”:

- **Vendor ID** 0x28 (40)
- **Device Type** 0x0C (12), Communication Adapter

10.1.3.1 Communication Model

10.1.3.1.1 Message Groups

DeviceNet^{TM} messages are divided into different groups to obtain various priorities:

- Message group 1 is used for the exchange of I/O data via I/O messages
- Message group 2 is provided for master/slave applications
- Message group 3 is used to exchange configuration data via explicit communication links
- Message group 4 is reserved for future applications (e.g., “Offline Connection Set”)

The so-called connection ID, which determines message priority, is established by the various message groups and the DeviceNet^{TM} station address “MAC ID” that is set on the device.

10.1.3.1.2 Message Types

A distinction is made between two message types for DeviceNet^{TM}:

- I/O messages
- Explicit messages

10.1.3.1.2.1 I/O Messages

The messages, primarily input/output data, are sent by a node and can be received and processed by one or more nodes. No protocol data are specified in the data field.

10.1.3.1.2.2 Explicit Messages

Explicit messages are directly transmitted from one node to the other. They consist of a requirement and a reply. As such, services can be directly requested or performed by a different subscriber. The data field contains, among other things, the target address and the service identification. The format of explicit messages is fixed. Explicit messages are used to configure devices or to create a dynamic structure of communication links.

10.1.3.2 Data Exchange

Process data are exchanged between scanner and DeviceNet™ device by means of the following three mechanisms:

- **Polled I/O Connection**
  Slaves are polled cyclically by the master.

- **Change of Cyclic/State**
  Message are transmitted either cyclically by the master or the slave or in the event of a state change.

- **Bit-Strobe**
  All slaves are polled by the master by means of a command.

10.1.4 Process Data and Diagnostic Status

The data are transmitted between master and slave in the form of objects, distinguishing between input and output objects. The structure of the objects is determined by assembly objects, which is used to group attributes of different application objects. Input/output data from different objects can be combined into data blocks and transmitted via a communication link.

10.1.4.1 Process Image

The process image is distinguished between input and output process image.

The assembly object provides a statically configured process image in instances 1 through 9.

By setting the “Produced Connection Path” and the “Consumed Connection Path” for individual I/O connections (poll, bit strobe, change of state or change of value), the required process image can be selected.

The structure of the individual instances of the assembly object is described below.

10.1.4.1.1 Assembly Instances

Permanently pre-programmed (static) assemblies in the device permit easy and rapid transmission of input and output images from the fieldbus coupler/controller to the master. For this purpose, various assembly instances are provided in the fieldbus coupler/controller:

- **Output 1 (“I/O Assembly Instance 1”)**
  The entire output data image is transmitted from the master to the fieldbus coupler via the corresponding I/O message connection. The data length corresponds to the quantity of output data in bytes. The analog output data come before the digital output data.

- **Output 2 (“I/O Assembly Instance 2”)**
  The digital output data image is transmitted from the master to the coupler via the corresponding I/O message connection. The data length corresponds to the quantity of digital output data and is rounded up to full bytes.

- **Output 3 (“I/O Assembly Instance 3”)**
  The analog output data image is transmitted from the master to the coupler via the corresponding I/O message connection. The data length corresponds to the quantity of analog output data in bytes.

- **Input 1 (“I/O Assembly Instance 4”)**
  The entire input data image and one status byte are transmitted to the master via the corresponding I/O message connection. The data length corresponds to the quantity of input data in bytes and one status byte.

- **Input 2 (“I/O Assembly Instance 5”)**
  The digital input data image and one status byte are transmitted to the master via the corresponding I/O message connection. The data length corresponds to the quantity of digital input data and is rounded up to full bytes. In addition, a status byte is attached.

- **Input 3 (“I/O Assembly Instance 6”)**
  The analog input data image and one status byte are transmitted to the master via the corresponding I/O message connection. The data length corresponds to the quantity of analog input data in bytes and one status byte.

- **Input 1 (“I/O Assembly Instance 7”)**
  The entire input data image is transmitted to the master via the corresponding I/O message connection. The data length corresponds to the quantity of input data in bytes.

- **Input 2 (“I/O Assembly Instance 8”)**
  The digital input data image is transmitted to the master via the corresponding I/O message connection. The data length corresponds to the quantity of digital input data and is rounded up to full bytes.

- **Input 3 (“I/O Assembly Instance 9”)**
  The analog input data image is transmitted to the master via the corresponding I/O message connection. The data length corresponds to the quantity of analog input data in bytes.

10.1.5 Configuration and Parameterization Using the Object Model

10.1.5.1 EDS Files

Features of DeviceNet™ devices are documented by the manufacturers in the form of EDS files ("Electronic Data Sheet") and made available to the user.

Structure, content and coding of the EDS files are standardized, allowing configuration via configuration devices from various manufacturers.

EDS file for fieldbus coupler 750-306	**750-306_1.LED***

* "_1" indicates that this EDS file is valid for fieldbus couplers with firmware major version 1.

The ESD file is read by the configuration software. Corresponding settings are transmitted.

Information

Additional Information
Refer to the software user manuals for the important entries and handling steps for settings in the configuration.

Information

Additional Information
The "Open DeviceNet Vendor Association" (ODVA) provides information about the EDS files for all listed manufacturers. http://www.odva.org.
EDS and symbol files to configure the I/O modules are available under order number 750-912 on the Internet at: http://www.wago.com.

10.1.5.2 Object Model

For network communication, DeviceNet™ utilizes an object model in which all functions and data of a device are described.

General Management Objects
("System Support Objects")

- "Identity Object"
- "Message Router Object"

Communication Objects for Data Exchange
("Communication Objects")

- "DeviceNet Object"
- "Connection Object"

Application Objects, to determine device function and/or configuration ("Application Objects")

- "Application Object(s)"
- "Assembly Object"
- "Parameter Object"

Communication can be connection based exclusively. For access from the network to the individual objects, connections between the required subscribes must first be established and connection objects set up or activated.

The data types used in the object model are described below.

Table 47: Object Model Data Types

Data types	
USINT	Unsigned Short Integer (8 bit)
UINT	Unsigned Integer (16 bit)
USINT	Unsigned Short Integer (8 bit)
UDINT	Unsigned Double Integer (32 bit)
BOOL	Boolean, True (1) or False (0)
STRUCT	Structure of ...
ARRAY	Array of ...

Ranges of input classes may overlap, ranges of output ranges classes also.

Example:
class 160 / instance 1 and 2 (USINT) = Class 166 / instance 1 (UINT) or
class 166 / instance 1 and 2 (UINT) = Class 170 / instance 1 (UDINT).

The DeviceNet™ fieldbus coupler (750-306) is referred to as "Device" in the tables below.

10.1.5.2.1 Object Classes

Defined object classes:

Table 48: Object Classes

Object	Class	Instance	Description
Identity	0x01	1	"Device type", "Vendor ID", serial number, etc.
Message Router	0x02	1	Routes explicit messages
DeviceNet	0x03	1	Maintains the physical link to the DeviceNet™ network. Allocates/deallocates "Master/Slave Connection Set"
Assembly	0x04	9	Allows data transmission of different objects over a single connection, by combining attributes of different objects
Connection class	0x05	3	Allows forwarding of explicit messages
Acknowledge handler	0x2B	1	Coordinates receipt of message confirmations. Communicates with the "Application Object". Defines "Acknowledge reception", "Acknowledge timeouts" and "Production retry limit"
Coupler configuration object	0x64	1	Device configuration
Discrete input point	0x65	0 ... 255	Digital input channel objects
Discrete output point	0x66	0 ... 255	Digital output channel objects
Analog input point	0x67	0 ... 255	Analog input channel objects
Analog output point	0x68	0 ... 255	Analog output channel objects
Module configuration	0x80	1…65	Description of connected I/O modules

10.1.5.2.1.1 Identity Class (0x01)

Instance 0

Table 49: Instance 0

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	required	get	Revision	UINT	0x01	Revision number of the class definition for the "Identity Object"

Instance 1

Table 50: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	required	get	Vendor	UINT	40 (0x28)	Vendor identification
2	required	get	Device Type	UINT	12 (0x0C)	Displays the device type
3	required	get	Product Code	UINT	e.g., 306 (0x132), for the 750-306	Displays a specific device from a specific manufacturer
4	required	get	Revision Major/ Minor	Struct: USINT/ USINT	e.g., “020b” (FW02.11(11))	Revision of the DeviceNet™ device, which represents the “Identity Object”
5	required	get	Status	WORD	-	Device status
6	required	get	Serial_ number	UDINT	-	Serial number
7	required	get	Product name	SHORT_ STRING (num,char char...)	e.g., “WAGO 750-306 V 3.0)” for the 750-306	Identification
10	required	get/set	Heartbeat Interval	USINT	0	Interval between 2 heartbeat messages in seconds

Services

Table 51: Service

Service Code	Service Name	Description
0x0E	Get_Attribute_Single	Returns the content of a specific attribute
0x05	Reset	Invokes the reset service for the device

10.1.5.2.1.2 Message Router (0x02)

No attributes, no services

10.1.5.2.1.3 DeviceNet Object (0x03)

Instance 0

Table 52: Instance 0

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	required	get	Revision	UINT	0x02	Revision number of the class definition for the “Identity Object”

Instance 1

Table 53: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	Optional	get/set	MAC ID	USINT	0 … 63	Node address
2	Optional	get	Baud rate	USINT	0 … 2	Baud rate
3	Optional	get/set	BOI	BOOL	0/1	Bus-off Interrupt
4	Optional	get/set	Bus-Off Counter	USINT	0 … 255	Number of times CAN switches to Buss-off status
5	Optional	get	Allocation Information Allocation Choice Byte Master's ID	Struct of: BYTE, USINT	0 … 63, 255	s. MAC ID of Master (from Allocate)

Services

Table 54: Service

Service Code	Service Name	Description
0x0E	Get_Attribute_Single	Returns the content of a specific attribute
0x10	Set_Attribute_Single	Modifies the content of a specific attribute
0x4B	Allocate_Master/Slave_Connection	Requests use of the predefined Master/Slave connection
0x4C	Release_Group_2_Identifier_Set	Deletes connections via “Predefined Connection Set”

10.1.5.2.1.4 Assembly Object (0x04)

Instance 0

Table 55: Instance 0

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	required	get	Revision	UINT	0x02	Revision number of the class definition for the “Assembly Object”

Description of Instances

Table 56: Description of Instances

Instance ID	Description
1	Reference to process image: Analog/digital output data
2	Reference to process image: Digital output data
3	Reference to process image: Analog output data
4	Reference to process image: Analog/digital input data plus status
5	Reference to process image: Digital input data plus status
6	Reference to process image: Analog input data plus status
7	Reference to process image: Analog/digital input data
8	Reference to process image: Digital input data
9	Reference to process image: Analog input data
10	Reference to the process image that contains the PFC output variables.
11	Reference to the process image that contains the PFC input variables.
12	Reference to process image: Analog/digital input data plus error code
13	Reference to process image: Analog/digital input data plus error code and error argument
14	Reference to process image: Analog/digital input data plus error code and error argument, status

Instance 1

Table 57: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get/set	Process image	Array of byte	Process image, collection of all output data of the I/O modules

Instance 2

Table 58: Instance 2

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get/set	Process image	Array of byte	Process image, collection of all digital output data of the I/O modules

Instance 3

Table 59: Instance 3

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get/set	Process image	Array of byte	Process image, collection of all analog output data of the I/O modules

Instance 4

Table 60: Instance 4

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get	Process image	Array of byte	Process image, collection of all I/O module input data plus status

Instance 5

Table 61: Instance 5

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get	Process image	Array of byte	Process image, collection of all digital input data of the I/O modules plus status

Instance 6

Table 62: Instance 6

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get	Process image	Array of byte	Process image, collection of all analog input data of the I/O modules plus status

Instance 7

Table 63: Instance 7

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get	Process image	Array of byte	Process image, collection of all I/O module input data

Instance 8

Table 64: Instance 8

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get	Process image	Array of byte	Process image, collection of all digital input data of the I/O modules

Instance 9

Table 65: Instance 9

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get	Process image	Array of byte	Process image, collection of all Analog I/O module input data

Instance 12

Table 66: Instance 12

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get	Process image + Error code	Array of byte	Process image, collection of all Input data from I/O modules plus error code (Class 100, Instance 1, Attribute 45)

Instance 13

Table 67: Instance 13

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get	Process image + Error code + Error Argumen t	Array of byte	Process image, collection of all Input data from I/O modules plus "Error Code" (Class 100, Instance 1, Attribute 45) plus error code (Class 100, Instance 1, Attribute 46)

Instance 14

Table 68: Instance 14

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
3	Depending on the type of I/O module	get	Process image + Error Code + Error Argument + Status +Terminal diagnostics +Diagnostic value	Array of byte	Process image, collection of all input data from I/O modules plus error code (Class 100, Instance 1, Attribute 45) plus error argument (Class 100, Instance 1, Attribute 46) plus status (Class 100, Instance 1, Attribute 5) plus terminal diagnostics (Class 100, Instance 1, Attribute 6) plus diagnostic value) (Class 100, Instance 1, Attribute 47), the diagnostic value is only valid when indicated in the status that there is a diagnostic message

Services

Table 69: Service

Service Code	Service Name	Description
0x0E	Get_Attribute_Single	Returns the content of a specific attribute
0x10	Set_Attribute_Single	Changes content of a specific attribute

Instance Services

Table 70: Instance Service

Service Code	Service Name	Description
0x0Eh	Get_Attribute_Single	Used to read an object attribute value
0x10h	Set_Attribute_Single	Modifies an attribute value
0x09h	Delete	Deletes an assembly object

10.1.5.2.1.5 Connection Object (0x05)

Instance 0

Table 71: Instance 0

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	required	get	Revision	UINT	0x01	Revision number of the class definition for the “Connection Object”

Description of Instances

Table 72: Description of Instances

Instance ID	Description
1	Describes the “explicit messaging connection”
2	Describes the “poll I/O connection”
3	Describes the “bit-strobe I/O connection”
4	Describes the “change of state” or “cycle I/O connection”

Instance 1 (Explicit Messaging)

Table 73: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
1	Available	get	state	USINT	Status of the object
2	required	get	instance_ type	USINT	Displays “I/O” or “messaging connection”
3	required	get	transport-Class_trigger	USINT	Defines the connection behavior
4	required	get	produced_ connection_ id	UINT	In the CAN identifier field when transmitting
5	required	get	consumed_ connection_ id	UINT	CAN identifier field value that denotes the “message” that should be transmitted
6	required	get	initial_ comm_ characteristics	USINT	Defines the “message groups” across which “productions” and “consumptions” associated with this connection occur
7	required	get	produced_ connection_ size	UINT	Maximum number of bytes that can be transmitted via the connection
8	required	get	consumed_ connection_ size	UINT	Maximum number of bytes that can be received via this connection
9	required	get/set	expected_ packet_rate	UINT	Defines the “timing” of the connection
10, 11	N/A	get	N/A	N/A	not used

Table 73: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
12	required	get	watchdog_ timeout_ action	USINT	Defines how to handle “inactivity” / “watchdog timeouts”
13	required	get	produced_ connection_ path_length	UINT	Number of bytes in “produced_connection_path” attribute
14	required	get/set	produced_ connection_ path	Array of USINT	Specifies “application objects”, whose data are generated in this “connection object”
15	required	get	consumed_ connection_ path_ length	UINT	Number of bytes in the attribute “consumed_connection_path”
16	required	get	consumed_ connection_ path	Array of USINT	Specifies “application objects”, whose data are received by this “connection object”
17	required	get	production_ inhibi t_time	USINT	Defines the minimum time between data transmission

Instance 2 (Poll I/O Connection)

Table 74: Instance 2

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
1	Available	get	state	USINT	Status of the object
2	required	get	instance_ type	USINT	Displays “I/O” or “messaging connection”
3	required	get	transport Class_trigger	USINT	Defines the connection behavior
4	required	get	produced_ connection_ id	UINT	In the CAN identifier field when transmitting
5	required	get	consumed_ connection_ id	UINT	CAN identifier field value that denotes the message that should be transmitted
6	required	get	initial_ comm_ characteristics	USINT	Defines the “message groups” across which “productions” and “consumptions” associated with this connection occur
7	required	get	produced_ connection_ size	UINT	Maximum number of bytes that can be transmitted via the connection
8	required	get	consumed_ connection_ size	UINT	Maximum number of bytes that can be received via this connection
9	required	get/set	expected_ packet_rate	UINT	Defines the timing of the connection
10, 11	N/A	get	N/A	N/A	not used

Table 74: Instance 2

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
12	required	get	watchdog_ timeout_action	USINT	Defines how to handle inactivity / watchdog timeouts
13	required	get	produced_ connection_ path_length	UINT	Number of bytes in "produced_connection_path" attribute
14	required	get/set	produced_ connection_ path	Array of USINT	Specifies application objects, whose data are generated in this connection object
15	required	get	consumed_ connection_ path_length	UINT	Number of bytes in "consumed_connection_path" attribute
16	required	get/set	consumed_ connection_ path	Array of USINT	Specifies application objects, whose data are received by this "connection object"
17	required	get	production_ inhibit_time	USINT	Defines the minimum time between data transmission

Instance 3 (Bit-Strobe I/O Connection)

Table 75: Instance 3

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
1	Available	get	state	USINT	Object state
2	required	get	instance_ type	USINT	Displays "I/O" or "messaging connection"
3	required	get	transportC lass_trigger	USINT	Defines the connection behavior
4	required	get	produced_ connection_id	UINT	In the CAN identifier field when transmitting
5	required	get	consumed_ connection_id	UINT	CAN identifier field value that denotes the "message" that should be transmitted
6	required	get	initial_comm_ characteristics	USINT	Defines the message groups across which "productions" and "consumptions" associated with this connection occur
7	required	get	produced_ connection_ size	UINT	Maximum number of bytes that can be transmitted via the connection
8	required	get	consumed_ connection_ size	UINT	Maximum number of bytes that can be received via the connection
9	required	get/set	expected_ packet_rate	UINT	Defines the "timing" of the connection
10, 11	N/A	get	N/A	N/A	not used
12	required	get	watchdog_ timeout_action	USINT	Defines how to handle "inactivity" / "watchdog timeouts"
13	required	get	produced_ connection_ path_length	UINT	Number of bytes in "produced_connection_path" attribute

Table 75: Instance 3

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
14	required	get	produced_ connection_ path	Array of USINT	Specifies application objects, whose data are generated in this connection object
15	required	get	consumed_ connection_ path_length	UINT	Number of bytes in "consumed_connection_path" attribute
16	required	get	consumed_ connection_ path	Array of USINT	Specifies application objects, whose data are received by this "connection object"
17	required	get	production_ inhibit_time	USINT	Defines the minimum time between data transmission

Instance 4 (Change of State und Cyclic I/O Connection)

Table 76: Instance 4

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
1	Available	get	state	USINT	Object state
2	required	get	instance_ type	USINT	Displays "I/O" or "messaging connection"
3	required	get	transportC lass_ trigger	USINT	Defines the connection behavior
4	required	get	produced_ connection_ id	UINT	In the CAN identifier field when transmitting
5	required	get	consumed_ co nnection_ id	UINT	CAN identifier field value that denotes the message that should be transmitted
6	required	get	initial_ comm _characteri stics	USINT	Defines the "message groups" across which "productions" and "consumptions" associated with this connection occur
7	required	get	produced_ con nection_ size	UINT	Maximum number of bytes that can be transmitted via the connection
8	required	get	consumed_ connection_ size	UINT	Maximum number of bytes that can be received via the connection
9	required	get/set	expected_ packet_rate	UINT	Defines the "timing" of the connection
10, 11	N/A	get	N/A	N/A	not used
12	required	get	watchdog_ timeout_action	USINT	Defines how to handle "inactivity" / "watchdog timeouts"
13	required	get	produced_ connection_ path_length	UINT	Number of bytes in "produced_connection_path" attribute

Table 76: Instance 4

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
14	required	get/set	produced_ connection_ path	Array of USINT	Specifies application objects, whose data are generated in this "connection object"
15	required	get	consumed_ connection_ path_length	UINT	Number of bytes in "consumed_connection_path" attribute
16	required	get	consumed_ connection_ path	Array of USINT	Specifies application objects, whose data are received by this "connection object"
17	required	get/set	production_ inhibit_time	USINT	Defines the minimum time between data transmission

Services

Table 77: Service

Service Code	Service Name	Description
0x0E	Get_Attribute_Single	Returns the content of a specific attribute
0x10	Set_Attribute_Single	Modifies the content of a specific attribute
0x05	Reset	Invokes the reset service for the device

The instances are unavailable when the connection is in "non-existent" mode.

I/O Connection Object State

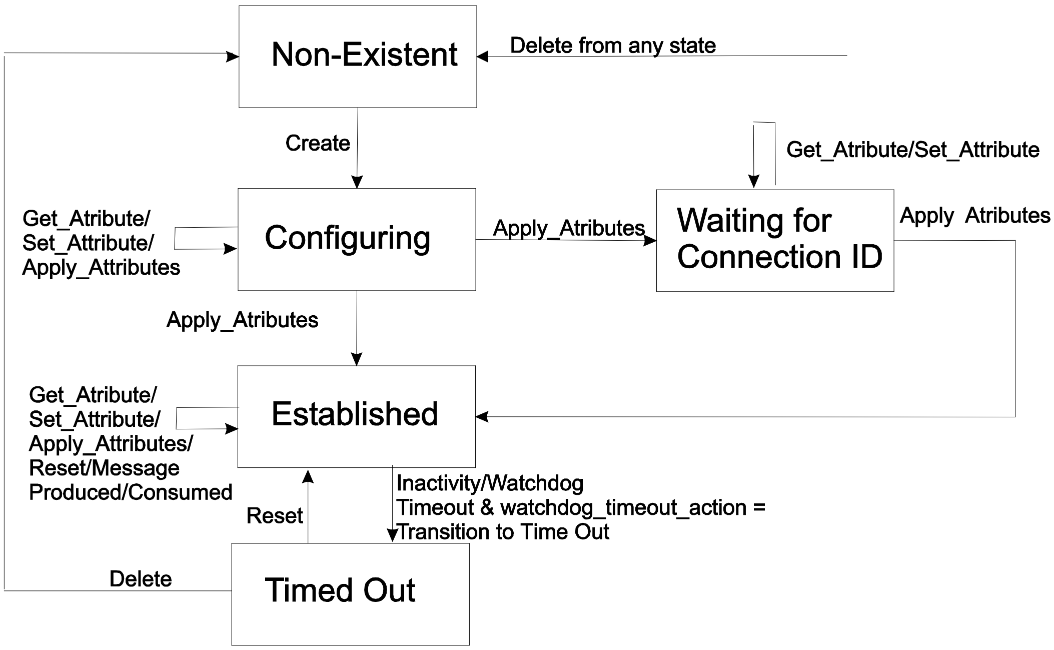


Figure 47: I/O Connection Object State

10.1.5.2.1.6 Acknowledge Handler Object (0x2B)

Instance 0

Table 78: Instance 3

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	required	get	Revision	UINT	0x01	Revision number of the class definition for the “Acknowledge Handler Object”
2	required	get	Max instance	UINT	0x01	Maximum number of instances of an object generated at the time in this class level of the device

Instance 1

Table 79: Instance 4

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
1	required	get/set	Acknowledge timer	UINT	Time to wait for a confirmation 1 … 65.535 s (0 invalid), default 16 ms
2	required	get/set	Retry limit	USINT	Number of "Ack Timeouts" elapsed before the application is notified about a “RetryLimit_Reached”, event default = 1, range 0 … 255, default 16 ms
3	required	get	COS Producing Connection Instance	UINT	0x04, connection instance that contains the path of the I/O application object that is informed by the “Ack Handlers”

Services

Table 80: Service

Service Code	Service Name	Description
0x0E	Get_Attribute_Single	Returns the content of a specific attribute
0x10	Set_Attribute_Single	Modifies the content of a specific attribute

10.1.5.2.1.7 Coupler Configuration Object (0x64)

Instance 0

Table 81: Instance 0

Attributes ID	Utilization in Device*	Access Rights	Name	Data Type	Value	Description
1	required	get	Revision	UINT	0x01	Revision number of the class definition for the “Identity Object”

Table 81: Instance 0

Attributes ID	Utilization in Device*	Access Rights	Name	Data Type	Value	Description
2	required	get	Max instance	UINT	0x01	Maximum number of instances of an object generated at the time in this class level of the device

Instance 1

Table 82: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
1	specific	get/set	Bk_ModuleNo	USINT	Module number: 0 – Coupler/controller 1 – First I/O module 2 – Second I/O module
2	specific	get/set	Bk_TableNo	USINT	Table number: 0 … 256; not all available
3	specific	get/set	Bk_RegisterNo	USINT	Register number: 0 … 255 for the coupler/controller (0 … 63 for I/O modules)
4	specific	get/set	Bk_Data	UINT	Register data, status
5	specific	get	ProcessState	USINT	Coupler/controller status: 0x01: Internal bus error, 0x02: Coupler/controller configuration error 0x08: Module diagnostic 0x80: Fieldbus error
6	specific	get	DNS_i_Trmnl dia (*)	UINT	Diagnostic, 0x8000, to decode a message, high byte (bit 14 … 8): channel number, low byte (bit 7 … 0) module number
	(*) Object 100 (0x64) Instance 1 Attribute 6 The “DNS_i_Trmndia” attribute is set depending on the state of the node, i.e., it will execute a diagnostic evaluation. However, this word only supplies valid data if bit 3 (counted up from 0) in “ProcessState” (Class 100, Instance 1, Attribute 5) is set. This bit indicates that a new diagnostic message is available (see “ProcessState” description). The diagnostic evaluation is done by bit 15 in the “DNS_i_Trmndia” attribute. There is a diagnostic error if bit 15 is set. The error is rectified if bit 15 is not set. As long as at least one diagnostic error is present, the MS LED is flashing red. If there are several diagnostic notifications at the same time, the next diagnostic notification is output with every read out of this attribute. If DNS_i_Trmndia = 0, there are currently no new diagnostic notifications. The MS LED only changes back to green after the last diagnostic message has been read (if the diagnostic reason has been resolved).				
7	specific	get	CnfLen. AnalogOut	UINT	Number of input/output bits for the analog output data words
8	specific	get	CnfLen. AnalogInp	UINT	Number of input/output bits for the analog input data words
9	specific	get	CnfLen. DigitalOut	UINT	Number of input/output bits for the digital output bits
10	specific	get	CnfLen. DigitalInp	UINT	Number of input/output bits for the digital input bits

Table 82: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
11	specific	get/set	BK_FAULT_ REACTION	USINT	Enumeration for error handling 0: Stops local input/output cycles (default) 1: Sets all outputs to 0 2: Does nothing
12	specific	get/set	BK_SEL_ STORED_POL L_P_PATH	UINT	Power-up value for send path. “Polled I/O” enumeration for the assembly path, class and instance for the object path. (Notice: e.g., do not choose analog inputs if only digital input modules on the node) 4: Analog/digital input data plus status 5: Digital input data plus status 6: Analog input data plus status 7: Analog/digital input data 8: Digital input data 9: Analog input data 12: Analog/digital input data plus BK_LED_ERR_CODE (C 100, I 1, A45) 13: Analog/digital input data plus BK_LED_ERR_CODE (C 100, I 1, A45) plus BK_LED_ERR_ARG (C 100, I 1, A46) 14: Analog/digital input data plus BK_LED_ERR_CODE (C 100, I 1, A45) plus BK_LED_ERR_ARG (C 100, I 1, A46) plus Status (C 100, I 1 A 5) plus DNS_i_Trmnldia (C 100, I 1, A6) plus BK_DIAG_VALUE (C 100, I 1, A47)
13	specific	get/set	BK_SEL_STO RED_POLL_C _PATH	UINT	Power-up value for the receive path. “Polled I/O” enumeration for the assembly path, class and instance for the I/O module objects. Notice: Only write values to this attribute that are also available, e.g., do not use analog inputs if only digital input/output modules are linked.

Table 82: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
14	specific	get/set	BK_SEL_STORED_COSCYC_C_PATH	UINT	Power-up value for change of state and cyclic connection. Enumeration for the assembly path, class and instance of the I/O module objects. Notice: Only write values to this attribute that are also available, e.g., do not use analog inputs if only digital input/output modules are linked.
15	specific	get/set	BK_EM_expected_packet_rate	UINT	Defines the default time for the explicit messaging connection
16	specific	get/set	BK_EM_watchdog_timeout_action	USINT	Defines how inactivity/watchdog explicit messaging connection timeouts are handled
17	specific	get/set	BK_PIO_expected_packet_rate	UINT	Defines the default time for the poll I/O connection
18	specific	get/set	BK_PIO_watchdog_timeout_action	USINT	Defines how inactivity/watchdog poll connection timeouts are handled
19	specific	get/set	BK_BS_expected_packet_rate	UINT	Defines the default time for the bit-strobe I/O connection
20	specific	get/set	BK_BS_watchdog_timeout_action	USINT	Defines how inactivity/watchdog bit-strobe I/O connection timeouts are handled
21	specific	get/set	BK_COS_expected_packet_rate	UINT	Defines the default time for the change of state and cyclic I/O connection
22	specific	get/set	BK_COS_watchdog_timeout_action	USINT	Defines how inactivity/watchdog change of state and cyclic I/O connection timeouts are handled
23	specific	get/set	BK_BOI	USINT	Defines the default value for BIO (Obj. 0x03 Inst.1, Att.3.) It handles the CAN-Bus-Off situation 0: After detection of a bus-off alarm, keep the CAN chip in the Bus-Off (Reset) status status. 1: If possible, full reset of the CAN chip and after detection of a bus-off alarm, continue with communication.
24	specific	get/set	BK_DO_FAULT_REACTION_ON_RELEASE_PIO	USINT	Defines the behavior after allocation of the polled I/O connection 0: No activity (default) 1: Error behavior processing for fieldbus coupler/controller

Table 82: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
25	specific	get/set	BK_DO_FAULT_REACTION_ON_RELEASE_COS	USINT	Defines the behavior after allocation of the change of state and cyclic I/O connection 0: No activity (default) 1: Error behavior processing for fieldbus coupler/controller
26	specific	get/set	BK_DO_FAULT_REACTION_ON_RELEASE_ST	USINT	Defines the behavior after allocation of the strobed connection 0: No activity (default) 1: Error behavior processing for fieldbus coupler/controller
40	specific	get/set	BK_static_analog_digital_input_mapping	UINT	Defines how the values for the analog and digital input bits are determined. 0000: All bits are digital. 0016: One word is analog, the remaining bits are digital. 0032: Two words are analog, the remaining bits are digital. ... 0xFFFF: All bits are handled as “Module Type” (default).
41	specific	get/set	BK_static_analog_digital_input_mapping	UINT	Defines how the values for the analog and digital outputs bits are determined. 0000: All bits are digital. 0016: One word is analog, the remaining bits are digital. 0032: Two words are analog, the remaining bits are digital. ... 0xFFFF: All bits are handled as “Module Type” (default). (If the number of analog bits exceeds the size of the process image, all bits are mapped to analog bits.)
42	specific	get/set	BK_specific_coupler_behavior	UINT	Defines the fieldbus coupler/controller functionality. 0xFFFF: All possible functions are enabled. (Resetting a bit to 0 disables the related function.) It is only possible to reduce the functionality. Resetting to “1” is ignored.

Table 82: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
43	specific	get/set	BK_revision_setting	UINT	Defines the major and minor revision attributes of the fieldbus coupler/controller. 0xFFFF: The major and minor revision attributes are set by the firmware by default. 0xXX00: The minor revision is set to 0. 0x03XX: The major revision is set to 3. All other values are also valid.
45	specific	get	BK_LED_ERR_CODE	UINT	Contains the error code displayed using I/O LED blink code.
46	specific	get	BK_LED_ERR_ARG	UINT	Contains the error argument displayed using I/O LED blink code.
47	specific	get	BK_DIAG_VALUE	UINT	Contains diagnostic information supplied from the I/O module. This attribute must be read before attribute 6 of this class. This only contains valid data when attribute 6 contains valid data.
51	specific	get/set	BK_FBC_CFG	UINT	Contains configuration settings Bit 0: =1 turns off displaying current diagnostic messages via MS LED. The diagnostic messages, however, are still transmitted via the fieldbus. Any change to this setting is only applied after a power-on cycle. Bit 1..15: reserved

Services

Table 83: Service

Service Code	Service Name	Description
0x0E	Get_Attribute_Single	Returns the content of a specific attribute
0x10	Set_Attribute_Single	Modifies the content of a specific attribute

10.1.5.2.1.8 Discrete Input Point Object (0x65)

Instance 0

Table 84: Instance 0

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	required	get	Revision	UINT	0x01	Revision number of the class definition for the “Identity Object”
2	optional	get	Max instance	UINT	0x256	Maximum number of instances of an object generated at the time in this class level of the device

Description of Instances

Table 85: Description of Instances

Instance ID	Description
1	Reference to the first digital input point
2	Reference to the next digital input point
…	
255	Reference to the last possible digital input point

Instance 1 … 255

Table 86: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	Depending on the type of I/O module	get	DIPOBJ_ VALUE	BIT	0: off 1: on	Digital input bit

Services

Table 87: Service

Service Code	Service Name	Description
0x0E	Get_Attribute_Single	Returns the content of a specific attribute

10.1.5.2.1.9 Discrete Output Point Object (0x66)

Instance 0

Table 88: Instance 0

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	required	get	Revision	UINT	0x01	Revision number of the class definition for the “Identity Object”
2	optional	get	Max instance	UINT	0x255	Maximum number of instances of an object generated at the time in this class level of the device

Description of Instances

Table 89: Description of Instances

Instance ID	Description
1	Reference to the first digital output point
2	Reference to the next digital output point
…	
255	Reference to the last possible digital output point

Instance 1 … 255

Table 90: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	Depending on the type of I/O module	get	DIPOBJ_ VALUE	BIT	0: off 1: on	Digital output bit

Services

Table 91: Service

Service Code	Service Name	Description
0x0E	Get_Attribute_Single	Returns the content of a specific attribute
0x10	Set_Attribute_Single	Modifies the content of a specific attribute

10.1.5.2.1.10 Analog Input Point Object (0x67)

Instance 0

Table 92: Instance 0

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	required	get	Revision	UINT	1	Revision number of the class definition for the "Identity Object"
2	optional	get	Max instance	UINT	255	Maximum number of instances of an object generated at the time in this class level of the device

Description of Instances

Table 93: Description of Instances

Instance ID	Description
1	Reference to the first analog input point
2	Reference to the next analog input point
…	
255	Reference to the last possible analog input point

Instance 1 … 255

Table 94: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	Depending on the type of I/O module	get	AIPOBJ_ VALUE	Array of Byte	Current Input values	Input data
2	Dep. on type of module	get	AIPOBJ_ VALUE	USINT	No. Bytes	Input data lengths

Services

Table 95: Service

Service Code	Service Name	Description
0x0E	Get_Attribute_Single	Returns the content of a specific attribute
0x10	Set_Attribute_Single	Modifies the content of a specific attribute

10.1.5.2.1.11 Analog Output Point Object (0x68)

Instance 0

Table 96: Instance 0

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	required	get	Revision	UINT	1	Revision number of the class definition for the “Identity Object”
2	optional	get	Max instance	UINT	256	Maximum number of instances of an object generated at the time in this class level of the device

Description of Instances

Table 97: Description of Instances

Instance ID	Description
1	Reference to the first analog output point
2	Reference to the next analog output point
…	
255	Reference to the last possible analog output point

Instance 1 … 255

Table 98: Instance 1

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Value	Description
1	Depending on the type of I/O module	get	AOPOBJ_ VALUE	Array of Byte	Current Output values	Output data
2	Depending on the type of I/O module	get	AOPOBJ_ VALUE	USINT	No. Bytes	Output data lengths

Services

Table 99: Service

Service Code	Service Name	Description
0x0E	Get_Attribute_Single	Returns the content of a specific attribute
0x10	Set_Attribute_Single	Modifies the content of a specific attribute

10.1.5.2.1.12 Module Configuration Object (0x80)

Instance 0

Table 100: Instance 0

Attributes ID	Access Rights	Name	Data Type	Value	Description
1	get	Revision	UINT	1	Revision number of the class definition for the “Identity Object”
2	get	Max instance	UINT	-	Maximum number of instances of an object generated at the time in this class level of the device

Description of Instances

Table 101: Description of Instances

Instance ID	Description
1	Reference to the first I/O module
…	
65	Reference to the last possible I/O module

Instance 1 … 65

Attributes ID	Utilization in Device	Access Rights	Name	Data Type	Description
1	Depending on the type of I/O module	get	AOPOBJ_ VALUE	Array of Byte	Description of the connected I/O module (Instance 1 = Fieldbus coupler/controller) Bit 0: I/O module has inputs Bit 1: I/O module has outputs Bit 8…14: Internal data width (bit) Bit 15: 0/1 Analog input/output modules / digital input/output modules For analog input/output modules, bits 0…14 designate the I/O module type, e.g., 467 for I/O module 750-467

11 I/O Modules

11.1 Overview

For modular applications with the WAGO-I/O-SYSTEM 750/753, different types of I/O modules are available

- Digital Input Modules
- Digital Output Modules
- Analog Input Modules
- Analog Output Modules
- Specialty Modules
- System Modules

For detailed information on the I/O modules and the module variations, refer to the manuals for the I/O modules.

You will find these manuals on the WAGO web pages under www.wago.com.

Information

More Information about the WAGO-I/O-SYSTEM
Current information on the modular WAGO-I/O-SYSTEM is available in the Internet under: www.wago.com.

11.2 Process Data Architecture for DeviceNet^{TM}

For some I/O modules (and their variants), the architecture of the process data depends on the fieldbus.

With the DeviceNet^{TM} fieldbus coupler, the process image uses a byte structure (no word alignment). The internal mapping method for data greater than one byte conforms to Intel formats.

The fieldbus-specific representation of compatible I/O modules in the process image of the DeviceNet^{TM} fieldbus coupler is described based on examples.

Note

Take into account the process data of all connected I/O modules!
Depending on the specific position of an I/O module in the fieldbus node, the process data of all previous byte- or bit-oriented modules must be taken into account to determine its location in the process data map.

11.2.1 Digital Input Modules

The digital input modules provide a process value of one bit per channel, which indicates the status of the respective channel. These bits are mapped in the input process image.

Each input channel occupies one instance in the "Discrete Input Point Object" (Class 0x65). I/O modules with data bits assigned by channel also occupy more instances of this class accordingly.

Example: 2-channel digital input modules with diagnostics (4 instances)

Table 102: 2-Channel Digital Input Modules with Diagnostics (4 Instances)

Input Process Image							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
				Diagnostic bit S 2 Channel 2	Diagnostic bit S 1 Channel 1	Data bit DI 2 Channel 2	Data bit DI 1 Channel 1

These input modules occupy 4 instances in the "Discrete Input Point Object" (0x65) class.

Some digital input modules provide additional data, e.g., acknowledgements mapped in the output process image. The output data of these I/O modules occupies a corresponding number of instances in class (0x66).

Example: 8-channel digital input modules with diagnostics (8 instances)

Table 103: 8-Channel Digital Input Modules (8 Instances)

Input Process Image							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Data bit DI 8 Channel 8	Data bit DI 7 Channel 7	Data bit DI 6 Channel 6	Data bit DI 5 Channel 5	Data bit DI 4 Channel 4	Data bit DI 3 Channel 4	Data bit DI 2 Channel 2	Data bit DI 1 Channel 1

These input modules occupy 4 instances in the “Discrete Input Point Object” (0x65) class.

11.2.2 Digital Output Modules

The digital output modules provide one bit as the process value per channel that indicates the status of the respective channel. These bits are mapped in the output process image.

Each output channel occupies one instance in the "Discrete Output Point Object" (Class 0x66). I/O modules with data bits assigned by channel also occupy more instances of this class accordingly.

Some digital output modules provide additional data, e.g., status bits mapped in the input process image. The input data of these I/O modules occupies a corresponding number of instances in class (0x65).

For 4-channel or 8-channel digital output modules with diagnostics, the diagnostic bits are occupied accordingly in the input process image.

Example: 8-channel digital output modules with diagnostics (8 instances)

Table 104: 8-Channel Digital Output Modules with Diagnostics (8 Instances)

Input Process Image							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Diagnostic bit S 7 Channel 8	Diagnostic bit S 6 Channel 7	Diagnostic bit S 5 Channel 6	Diagnostic bit S 4 Channel 5	Diagnostic bit S 3 Channel 4	Diagnostic bit S 2 Channel 4	Diagnostic bit S 1 Channel 2	Diagnostic bit S 0 Channel 1

Diagnostic bit S = '0' no error
Diagnostic bit S = '1' wire break, short circuit or overload

These input modules occupy 8 instances in the “Discrete Input Point Object” (0x65) class.

Table 105: 8-Channel Digital Output Modules with Diagnostics (8 Instances)

Output process image							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
controls DO 8 Channel 8	controls DO 7 Channel 7	controls DO 6 Channel 6	controls DO 5 Channel 5	controls DO 4 Channel 4	controls DO 3 Channel 4	controls DO 2 Channel 2	controls DO 1 Channel 1

These input modules occupy 8 instances in the “Discrete Input Point Object” (0x65) class.Analog Input Modules

The analog input modules provide 16-bit measured data and 8 control/status bits per channel. DeviceNet™ does not use the 8 control/status bits, however, i.e., it does not access or evaluate them.
Therefore, only the 16-bit measured values per channel are in Intel format and mapped by byte in the input process image for the fieldbus for the DeviceNet™ fieldbus coupler.

If digital input modules are in the node, the analog input data is mapped first into the input process image, followed by the digital input data.

Each input channel occupies one instance in the “Analog Input Point Object” (Class 0x67).

Example: 8-channel analog input modules (8 instances)

Table 106: 8-Channel Analog Input Modules (8 Instances)

Input Process Image		
Instance	**Byte designation**	**Remark**
n	D0	Measured value channel 1
	D1	
n+1	D2	Measured value channel 2
	D3	
n+2	D4	Measured value channel 3
	D5	
n+3	D6	Measured value channel 4
	D7	
n+4	D8	Measured value channel 5
	D9	
n+5	D10	Measured value channel 6
	D11	
n+6	D12	Measured value channel 7
	D13	
n+7	D14	Measured value channel 8
	D15	

These input modules represent 8 x 2 bytes and occupy 8 instances in class (0x67).

Particularly interesting are I/O modules that send multiple measured values per channel, e.g., the 1-channel analog input module 750-491 that provides two measured values per channel.

11.2.3 Analog Output Modules

The analog output modules provide 16-bit output values and 8 control/status bits per channel. DeviceNet^{TM} does not use the 8 control/status bits, however, i.e., it does not access or evaluate them.

Therefore, only the 16-bit output values for each channel are in Intel format and are mapped by byte in the output process image for the fieldbus with the DeviceNet^{TM} fieldbus coupler.

If digital output modules are in the node, the analog output data is mapped first into the output process image, followed by the digital output data.

Each output channel occupies one instance in the "Analog Output Point Object" (Class 0x68).

Example: 2-channel output modules

Table 107: 2-channel analog output modules

Output process image		
Instance	**Byte designation**	**Remark**
n	D0	Output value channel 1
	D1	
n+1	D2	Output value channel 2
	D3	

These output modules represent 2 x 2 bytes and occupy 2 instances in class (0x68).

11.2.4 Specialty Modules

In addition to the data bytes, the control/status byte is also displayed for select I/O modules. This byte is used for the bi-directional data exchange of the I/O module with the higher-level control system.

The control byte (Control “C”) is transmitted from the coupler to the I/O module. The status byte (Status “S”) is transmitted from the I/O module to the coupler. As a result, it is possible to set the counter with the control byte or indicate a range overflow/underflow with the status byte.

Information

Additional Information
The special configuration of the respective control/status byte can be found in the corresponding description of the I/O module. A manual with the detailed description of each I/O module can be found on the Internet at: http://www.wago.com.

The specialty modules represent analog I/O modules. Therefore, their process input values also occupy one instance per channel in the “Analog Input Point Object” (Class 0x67) and their process output values one instance per channel in the “Analog Output Point Object” (Class 0x68).

Up/down counters
750-404, (and all versions except /000-005),
753-404, (and versions /000-003)

In the input and output process image, counter modules occupy 5 bytes of user data: 4 data bytes and 1 additional control/status byte. The I/O module provides 32-bit counter values. 6 bytes are occupied in the process image.

Table 108: Input Process Image Counter Modules

Input Process Image		
Instance	**Byte designation**	**Remark**
n	S	Status byte
	-	not used
	D0	Counter value
	D1	
	D2	
	D3	

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x67).

Table 109: Output Process Image Counter Modules

Output process image		
Instance	**Byte designation**	**Remark**
n	C	Control byte
	-	not used
	D0	Counter setting value
	D1	
	D2	
	D3	

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x68).

Up/down counters
750-404/000-005

In the input and output process image, counter modules occupy 5 bytes of user data: 4 data bytes and 1 additional control/status byte. The I/O module provides 16-bit counter values for every counter. 6 bytes are occupied in the process image.

Table 110: Input Process Image, Counter Modules

Input Process Image		
Instance	**Byte designation**	**Remark**
n	S	Status byte
	-	not used
	D0	Counter value of counter 1
	D1	
	D2	Counter value of counter 2
	D3	

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x67).

Table 111: Output Process Image, Counter Modules

Output process image		
Instance	**Byte designation**	**Remark**
n	C	Control byte
	-	not used
	D0	Counter setting value counter 1
	D1	
	D2	Counter setting value counter 2
	D3	

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x68).

2-channel pulse width output module, 24 VDC
750-511 (and all versions)

In the input and output process image, pulse width output modules occupy 6 bytes of user data: 4 data bytes and two additional control/status bytes. 6 bytes are occupied in the process image.

Table 112: Input/Output Process Image, Pulse Width Output Modules

Input and Output Process Image		
Instance	**Byte designation**	**Remark**
n	C0/S0	Control/status byte of channel 1
	D0	Data value of channel 1
	D1	
n+1	C1/S1	Control/status byte of channel 2
	D2	Counter setting value of channel 2
	D3	

These specialty modules represent 2 x 3 bytes and occupy 2 instances in class (0x67) and 2 instances in class (0x68).

2-channel up/down counters
750-638, 753-638

In the input and output process image, counter modules occupy 6 bytes of user data: 4 data bytes and two additional control/status bytes. The I/O module provides 16-bit counter values for every counter. 6 bytes are occupied in the process image.

Table 113: Input Process Image Counter Modules

Input Process Image		
Instance	**Byte designation**	**Remark**
n	S0	Status byte of counter 1
	D0	Counter value of counter 1
	D1	
n+1	S1	Status byte of counter 2
	D2	Counter value of counter 2
	D3	

These specialty modules represent 2 x 3 bytes and occupy 2 instances in class (0x67).

Table 114: Output Process Image Counter Modules

Output process image		
Instance	**Byte designation**	**Remark**
n	C0	Control byte of counter 1
	D0	Counter setting value counter 1
	D1	
n+1	C1	Control byte of counter 2
	D2	Counter setting value counter 2
	D3	

These specialty modules represent 2 x 3 bytes and occupy 2 instances in class (0x68).

SSI transmitter interface
750-630 (and all versions /000-001, -002, -006, -008, -009, -011, -012, -013)

In the input and output process image, SSI transmitter interface modules occupy 4 data bytes. A total of 4 bytes are occupied in the process image.

Table 115: Input Process Image, SSI Transmitter Interface Modules

Input Process Image		
Instance	**Byte designation**	**Remark**
n	D0	Data bytes
	D1	
n+1	D2	
	D3	

These specialty modules represent 2 x 2 bytes and occupy 2 instances in class (0x67).

SSI transmitter interface
750-630/000-004, -005, -007

In the input process image, SSI transmitter interface modules with status occupy 5 bytes of user data: 4 data bytes and one additional status byte. A total of 6 bytes are occupied in the process image.

Table 116: Input Process Image, SSI Transmitter Interface Modules

Input Process Image		
Instance	**Byte designation**	**Remark**
n	S	Status byte
	-	not used
	D0	Data bytes
	D1	
	D2	
	D3	

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x67).

Incremental encoder interface
750-631

The I/O module 750-631 occupies 5 bytes in the input process image and 3 bytes in the output process image. 6 bytes are occupied in the process image.

Table 117: Input Process Image, Distance and Angle Measurement

Input Process Image		
Instance	**Byte designation**	**Remark**
n	S	Status byte
	D0	Counter word
	D1	
	-	not used
	D2	Latch word
	D3	

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x67).

Table 118: Output Process Image, Distance and Angle Measurement

Output Process Image		
Instance	**Byte designation**	**Remark**
n	C	Control byte
	D0	Counter setting word
	D1	
	-	not used
	-	
	-	

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x68).

Proportional valve module
750-632

The proportional valve module appears in 1-channel operation (1 valve) with 6 bytes, and in 2-channel operation (2 valves) with 12 bytes.

1-channel mode

Table 119: Proportional Valve Module Input Process Image

Input Process Image		
Instance	**Byte designation**	**Remark**
n	S0	Status byte
	MBX_ST	Mailbox status byte
	MBX_DATA	Mailbox data
	V1_STATUS	Valve 1 control
	V1_ACTUAL_L	Valve 1, actual value, low byte
	V1_ACTUAL_H	Valve 1, actual value, high byte

Table 120: Output Process Image, Proportional Valve Module

Output process image		
Instance	**Byte designation**	**Remark**
n	C0	Control byte
	MBX_CTRL	Mailbox control byte
	MBX_DATA	Mailbox data
	V1_CONTROL	Valve 1 control
	V1_SETPOINTVALUE_L	Valve 1, target value, low byte
	V1_SETPOINTVALUE_H	Valve 1, target value, high byte

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

2-channel mode

Table 121: Proportional Valve Module Input Process Image

Input Process Image		
Instance	**Byte designation**	**Remark**
n	S0	Status byte
	MBX_ST	Mailbox status byte
	MBX_DATA1	Mailbox data
	MBX_DATA2	
	MBX_DATA3	
	MBX_DATA4	
	V1_STATUS	Valve 1 control
	V2_STATUS	Valve 2 control
	V1_ACTUAL_L	Valve 1, actual value, low byte
	V1_ACTUAL_H	Valve 1, actual value, low byte
	V2_ACTUAL_L	Valve 2, actual value, low byte
	V2_ACTUAL_H	Valve 2, actual value, low byte

Table 122: Output Process Image, Proportional Valve Module

Output process image		
Instance	**Byte designation**	**Remark**
n	C0	Control byte
	MBX_CTRL	Mailbox control byte
	MBX_DATA1	Mailbox data
	MBX_DATA2	
	MBX_DATA3	
	MBX_DATA4	
	V1_CONTROL	Valve 1 control
	V2_CONTROL	Valve 2 control
	V1_SETPOINTVALUE_L	Valve 1, target value, low byte
	V1_SETPOINTVALUE_H	Valve 1, target value, high byte
	V2_SETPOINTVALUE_L	Valve 2, target value, low byte
	V2_SETPOINTVALUE_H	Valve 2, target value, high byte

These specialty modules represent 1 x 12 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

In Class 0x4, Instance 0x7 of the assembly object, the analog and digital input data occupy 6 or 12 bytes. The output data occupy 6 or 12 bytes in Class 0x4, Instance ID 0x1.

Incremental encoder interface
750-634

The incremental encoder interface module occupies 5 bytes in the input process image, or 6 bytes in cycle duration measurement operating mode, and 3 bytes in the output process image. 6 bytes are occupied in the process image.

Table 123: Input Process Image, Incremental Encoder Interface Module

Input Process Image		
Instance	**Byte designation**	**Remark**
n	S	Status byte
	D0	Counter word
	D1	
	D2*)	(Cycle duration)
	D3	Latch word
	D4	

*) If the control byte sets the operating mode to cycle duration measurement, D2 together with D3/D4 provides a 24-bit value for the cycle duration.

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x67).

Table 124: Output Process Image, Incremental Encoder Interface Module

Input Process Image		
Instance	**Byte designation**	**Remark**
n	C	Control byte
	D0	Counter setting word
	D1	
	-	not used
	-	
	-	

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x68).

Digital impulse interface
750-635, 753-635

In the input and output process image, the digital impulse interface module occupies a total of 4 bytes of user data: 3 data bytes and 1 additional control/status byte. 4 bytes are occupied in the process image.

Table 125: Input/Output Process Image, Digital Impulse Interface

Input and Output Process Image		
Instance	**Byte designation**	**Remark**
n	C0/S0	Control/status byte
	D0	Data bytes
	D1	
	D2	

These specialty modules represent 1 x 4 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

DC drive controller
750-636

The I/O module occupies 6 bytes of input and output data in the process image. The position data to be sent and received is stored in 4 output bytes and 4 input bytes. 2 control/status bytes are used to control the module and drive. In addition to the position data in the input process image, extended status information can also be shown.

Table 126: DC Drive Controller Input Process Image

Input Process Image				
Instance	**Byte designation**		**Remark**	
n	S0		Status byte S0	
	S1		Status byte S1	
	D0	S2	Actual position (LSB)	Ext. status byte S2
	D1	S3	Actual position	Ext. status byte S3
	D2	S4	Actual position	Ext. status byte S4
	D3	S5	Actual position (MSB)	Ext. status byte S5

Table 127: DC Drive Controller Output Process Image

Output process image		
Instance	**Byte designation**	**Remark**
n	C0	Control byte C0
	C1	Control byte C1
	D0	Setpoint position (LSB)
	D1	Setpoint position
	D2	Setpoint position
	D3	Setpoint position (MSB)

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

Incremental encoder interface
750-637

The incremental encoder interface module appears with 6 bytes of reference data in the input and output area of the process image, 4 data bytes and two additional control/status bytes. 6 bytes are occupied in the process image.

Table 128: Input/Output Process Image, Incremental Encoder Interface Module

Input and Output Process Image		
Instance	**Byte designation**	**Remark**
n	C0/S0	Control/status byte 1
	D0	Data values
	D1	
n+1	C1/S1	Control/status byte 2
	D2	Data values
	D3	

These specialty modules represent 2 x 3 bytes and occupy 2 instances in class (0x67) and 2 instances in class (0x68).

RTC module
750-640

In both the input and output process image, the RTC module occupies 6 bytes of user data: 4 data bytes and 1 additional control/status byte, as well as 1 command byte (ID) each. Six bytes are occupied in the process image with word alignment.

Table 129: Input/Output Process Image, RTC Module

Input and Output Process Image		
Instance	**Byte designation**	**Remark**
n	C/S	Control/status byte
	ID	Command byte
	D0	Data bytes
	D1	
	D2	

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

DALI/DSI master module
750-641

In the input and output process image, the DALI/DSI master module occupies 6 data bytes, 5 data bytes and 1 additional control/status byte. 6 bytes are occupied in the process image.

Table 130: Input Process Image, DALI/DSI Master Module

Input Process Image		
Instance	**Byte designation**	**Remark**
n	S	Status byte
	D0	DALI response
	D1	DALI response
	D2	Message 3
	D3	Message 2
	D4	Message 1

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x67).

Table 131: Output Process Image DALI/DSI Master Module

Output process image		
Instance	**Byte designation**	**Remark**
n	S	Control byte
	D0	DALI command, DSI dimming value
	D1	DALI address
	D2	Parameter 2
	D3	Parameter 1
	D4	Command extension

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x68).

Radio receiver I/O module
750-642

In the input and output process image, the radio receiver I/O module occupies 4 bytes of user data: 3 data bytes and 1 additional control/status byte. However, the 3 bytes of output data are not used. 4 bytes are occupied in the process image.

Table 132: Input Process Image, Radio Receiver I/O Module

Input Process Image		
Instance	**Byte designation**	**Remark**
n	S	Status byte
	D0	Data bytes
n+1	D1	
	D2	

Table 133: Output Process Image, Radio Receiver I/O Module

Output process image		
Instance	**Byte designation**	**Remark**
n	C	Control byte
	-	not used
n+1	-	
	-	

These specialty modules represent 2 x 2 bytes and occupy 2 instances in class (0x67) and 2 instances in class (0x68).

MP Bus Master Module
750-643

In the input and output process image, the MP bus master module occupies 8 bytes of user data: 6 data bytes and 2 additional control/status bytes. 8 bytes are occupied in the process image.

Table 134: Input/Output Process Image, MP Bus Master Module

Input/Output Process Image		
Instance	**Byte designation**	**Remark**
n	C0/S0	Control/status byte
	C1/S1	Additional control/status byte
	D0	Data bytes
	D1	
	D2	
	D3	
	D4	
	D5	

These specialty modules represent 1 x 8 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

***Bluetooth*® RF transceiver**
750-644

The length of the process image of the *Bluetooth*® I/O module can be adjusted to a fixed size of 12, 24 or 48 Byte.

It consists of one control byte (input) or one status byte (output), one empty byte, one 6-, 12- or 18-byte overlayable mailbox (mode 2) and the *Bluetooth*® process data with a size of 4 to 46 bytes.

The *Bluetooth*® I/O module uses between 12 to 48 bytes in the process image. The size of the input and output process images is always the same.

The first byte contains the control/status byte; the second contains an empty byte.

Process data attach to this directly when the mailbox is hidden. When the mailbox is visible, the first 6, 12 or 18 bytes of process data are overlaid by the mailbox data, depending on their size. Bytes in the area behind the optionally visible mailbox contain basic process data. The internal structure of the *Bluetooth*® process data can be found in the documentation for the *Bluetooth*® RF Transceiver.

Table 135: Output Process Image, *Bluetooth*® RF Transceiver

Input/Output Process Image		
Instance	**Byte designation**	**Remark**
n	C0/S0	Control/status byte
	-	not used
	D0	Mailbox (0, 6, 12 or 18 bytes) and process data (4 ... 46 bytes)
	D1	
	D2	
	…	
	D46	

The I/O module 750-644 represents a specialty module. Its process data (12, 24 or 48 bytes) occupy one instances in classes 0x67 and 0x68.

2-channel vibration velocity/bearing condition monitoring VIB I/O
750-645

In both input and the output process image, the vibration velocity/bearing condition monitoring VIB I/O module occupies 12 bytes of user data: 8 data bytes and 4 additional control/status bytes. 12 bytes are occupied in the process image.

Table 136: Vibration Velocity/Bearing Condition Monitoring VIB I/O

Input/Output Process Image		
Instance	**Byte designation**	**Remark**
n	C0/S0	Control/status byte (log. channel 1, sensor input 1)
	D0	Data bytes (log. channel 1, sensor input 1)
	D1	
n+1	C1/S1	Control/status byte (log. channel 2, sensor input 2)
	D2	Data bytes (log. channel 2, sensor input 2)
	D3	
n+2	C2/S2	Control/status byte (log. channel 3, sensor input 1)
	D4	Data bytes (log. channel 3, sensor input 1)
	D5	
n+3	C3/S3	Control/status byte (log. channel 4, sensor input 2)
	D6	Data bytes (log. channel 4, sensor input 2)
	D7	

These specialty modules represent 4 x 3 bytes and occupy 4 instances in class (0x67) and 4 instances in class (0x68).

DALI Multi-Master module
753-647

The DALI Multi-Master module occupies a total of 24 bytes in the input and output process image.

The DALI Multi-Master module can be operated in “Easy” mode (default) and “Full” mode. "Easy" mode is used to transmit simply binary signals for lighting control. Configuration or programming via DALI master module is unnecessary in “Easy” mode.

Changes to individual bits of the process image are converted directly into DALI commands for a pre-configured DALI network. 22 bytes of the 24-byte process image can be used directly for switching of ECGs, groups or scenes in the Easy mode. Switching commands are transmitted via DALI and group addresses, where each DALI and each group address is represented by a 2-bit pair.

The structure of the process data is described in detail in the following tables.

Table 155: Overview of Input Process Image in the “Easy” Mode

Input Process Image		
Instance	**Byte designation**	**Remark**
n	S	Status, active broadcast: Bit 0: 1-/2-button mode Bit 2: Broadcast status ON/OFF Bit 1,3-7: -
	-	reserved
	DA0…DA3	Bit pair for DALI address DA0: Bit 1: Bit set = ON Bit not set = OFF Bit 2: Bit set = Error Bit not set = No error Bit pairs DA1 to DA63 similar to DA0.
	DA4…DA7	
	DA8…DA11	
	DA12…DA15	
	DA16…DA19	
	DA20…DA23	
	DA24…DA27	
	DA28…DA31	
	DA32…DA35	
	DA36…DA39	
	DA40…DA43	
	DA44…DA47	
	DA48…DA51	
	DA52…DA55	
	DA56…DA59	
	DA60…DA63	
	GA0…GA3	Bit pair for DALI group address GA0: Bit 1: Bit set = ON Bit not set = OFF Bit 2: Bit set = Error Bit not set = No error
	GA4…GA7	
	GA8…GA11	
	GA12…GA15	

Table 155: Overview of Input Process Image in the “Easy” Mode

<table>
<tr><th colspan="3">Input Process Image</th></tr>
<tr><th>Instance</th><th>Byte designation</th><th>Remark</th></tr>
<tr><td rowspan="2"></td><td>-</td><td rowspan="2">Not used</td></tr>
<tr><td>-</td></tr>
</table>

DA = DALI address
GA = Group address

Table 156: Overview of the Output Process Image in the “Easy” mode

<table>
<tr><th colspan="3">Input Process Image</th></tr>
<tr><th>Instance</th><th>Byte designation</th><th>Remark</th></tr>
<tr><td rowspan="24">n</td><td>C</td><td>Broadcast ON/OFF and activate:
Bit 0: Broadcast ON
Bit 1: Broadcast OFF
Bit 2: Broadcast ON/OFF/dimming
Bit 3: Broadcast short ON/OFF
Bit 4…7: reserved</td></tr>
<tr><td>-</td><td>reserved</td></tr>
<tr><td>DA0…DA3</td><td rowspan="16">Bit pair for DALI address DA0:
Bit 1: short: DA switch ON
long: dimming, brighter
Bit 2: short: DA switch OFF
long: dimming, darker
Bit pairs DA1 to DA63 similar to DA0.</td></tr>
<tr><td>DA4…DA7</td></tr>
<tr><td>DA8…DA11</td></tr>
<tr><td>DA12…DA15</td></tr>
<tr><td>DA16…DA19</td></tr>
<tr><td>DA20…DA23</td></tr>
<tr><td>DA24…DA27</td></tr>
<tr><td>DA28…DA31</td></tr>
<tr><td>DA32…DA35</td></tr>
<tr><td>DA36…DA39</td></tr>
<tr><td>DA40…DA43</td></tr>
<tr><td>DA44…DA47</td></tr>
<tr><td>DA48…DA51</td></tr>
<tr><td>DA52…DA55</td></tr>
<tr><td>DA56…DA59</td></tr>
<tr><td>DA60…DA63</td></tr>
<tr><td>GA0…GA3</td><td rowspan="4">Bit pair for DALI group address GA0:
Bit 1: short: GA switch ON
long: dimming, brighter
Bit 2: short: GA switch OFF
long: dimming, darker

Bit pairs GA1 to GA15 similar to GA0.</td></tr>
<tr><td>GA4…GA7</td></tr>
<tr><td>GA8…GA11</td></tr>
<tr><td>GA12…GA15</td></tr>
<tr><td>Bit 0…7</td><td rowspan="2">Switch to scene 0…15</td></tr>
<tr><td>Bit 8…15</td></tr>
</table>

DA = DALI address
GA = Group address

These specialty modules represent 1 x 24 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

LON® FTT module
753-648

The process image of the LON® FTT module consists of a control/status byte and 23 bytes of bidirectional communication data that is processed by the WAGO-I/O-*PRO* function block “LON_01.lib”. This function block is required for the function of the LON® FTT module and makes a user interface available on the control side.

Serial interfaces with alternative data format
750-650, (and the versions /000-002, -004, -006, -009, -010, -011, -012, -013)
750-651, (and the versions /000-002, -003)
750-653, (and the versions /000-002, -007)

Note

The process image of the version with adjustable operating mode corresponds to the process image of the respective standard I/O module!
The operating mode of the configurable /003-000 serial interface versions can be set with WAGO-I/O-Check. Based on the operating mode, the process image of these I/O modules is then the same as that of the respective version.

In the input and output process image, serial interface modules using an alternative data format occupy 4 bytes of user data: 3 data bytes and 1 additional control/status byte. 4 bytes are occupied in the process image.

Table 137: Input/Output Process Image of the Serial Interfaces

Input/Output Process Image		
Instance	**Byte designation**	**Remark**
n	C/S	Control/status byte
	D0	Data bytes
n+1	D1	
	D2	

These specialty modules represent 2 x 2 bytes and occupy 2 instances in class (0x67) and 2 instances in class (0x68).

Serial interfaces with standard data format
750-650/000-001, -014, -015, -016
750-651/000-001,
750-653/000-001, -006

In the input and output process image, serial interface modules using the standard data format occupy 6 bytes of user data: 5 data bytes and 1 additional control/status byte. 6 bytes are occupied in the process image.

Table 138: Input/Output Process Image of the Serial Interfaces with Standard Data Format

Input/Output Process Image		
Instance	**Byte designation**	**Remark**
n	C/S	Control/status byte
	D0	Data bytes
	D1	
	D2	
	D3	
	D4	

These specialty modules represent 1 x 6 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

Serial interface RS-232 / RS-485
750-652

Serial transmission mode: The data to be sent and received is stored in up to 46 input/output bytes of the process image in serial transmission mode. The data flow is controlled with the control/status byte. The input bytes form the memory area for up to 47 characters, which were received by the interface in "Data Exchange" mode. The characters to be sent are passed in the output bytes.

Table 139: Input/Output Process Image of the Serial Interface, Serial Transmission Mode

Input/Output Process Image			
Instance		**Byte designation**	**Remark**
n	8 bytes	S0/C0	Control/status byte S0
		S1/C1	Control/status byte S1
		D0	Data byte 0
		D1	Data byte 1
		D2	Data byte 2
		…	…
		D5	Data byte 5
	24 bytes	D6	Data byte 6
		…	…
		D21	Data byte 21
	48 bytes	D22	Data byte 22
		…	…
		D45	Data byte 45

Data exchange mode: The data to be sent and received is stored in up to 47 input and output bytes. The data flow is controlled with the control/status byte.

Table 140: Input/Output Process Image of the Serial Interface, Data Exchange Mode

Input/Output Process Image			
Instance		Byte designation	Remark
n	8 bytes	S0/C0	Control/status byte S0
		D0	Data byte 0
		D1	Data byte 1
		D2	Data byte 2
		…	…
		D6	Data byte 6
	24 bytes	D7	Data byte 7
		…	…
		D22	Data byte 22
	48 bytes	D23	Data byte 23
		…	…
		D46	Data byte 46

These specialty modules represent 1 x 8, 1 x 24 or 1 x 48 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

Data exchange module
750-654 (and the versions /000-001)

In the input and output process image, data exchange modules occupy 4 data bytes. 4 bytes are occupied in the process image.

Table 141: Input/Output Process Image, Data Exchange Modules

Input/Output Process Image		
Instance	Byte designation	Remark
n	D0	Data bytes
	D1	
n+1	D2	
	D3	

These specialty modules represent 2 x 2 bytes and occupy 2 instances in class (0x67) and 2 instances in class (0x68).

WAGO AS-Interface Master
750-655

The image process size for the AS-interface master module is adjustable to 12, 24, 32, 40 or 48 bytes. It consists of a control or status byte, a mailbox with 0, 6, 10, 12 or 18 bytes and 0–32 bytes of AS-interface process data. The AS-interface master module occupies 12–48 bytes in the process image.

The first byte contains the control/status byte, the second contains an empty byte. Subsequently, mailbox data is mapped when the mailbox is permanently superimposed (Mode 1). While in operating mode with a suppressible mailbox

(Mode 2), the mailbox and the cyclical process data are mapped next. The remaining bytes contain the remaining process data.

Table 142: Input/Output Process Image, WAGO AS-Interface Master Module

Input/Output Process Image		
Instance	**Byte designation**	**Remark**
n	C0/S0	Control/status byte
	-	not used
	D0	Mailbox (0, 6, 12 or 18 bytes) and process data (0 ... 32 bytes)
	D1	
	D2	
	…	
	D46	

These specialty modules represent 1 x 12...48 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

4-channel IO-Link master

750-657

The length of the process image of the 4-channel IO-Link Master can be adjusted to a fixed size of 4, 6, 8, 10, 12, 16, 20 or 24 bytes.

Table 143: Input/Output Process Image, I/O-Link Master

Input/Output Process Image				
Instance		**Byte designation**	**Remark**	
n	4 bytes	S0/C0	Control/status byte	
		FC0	Acyclic channel	Register byte 0
		MB0	Mailbox byte	Register byte 1
		SIO	SIO Byte	
	6 bytes	D0	Data byte 0	
		D1	Data byte 1	
	8 bytes	D2	Data byte 2	
		D3	Data byte 3	
	10 bytes	D4	Data byte 4	
		D5	Data byte 5	
	12 bytes	D6	Data byte 6	
		D7	Data byte 7	
	16 bytes	D8	Data byte 8	
		D9	Data byte 9	
		D10	Data byte 10	
		D11	Data byte 11	
	20 bytes	D12	Data byte 12	
		D13	Data byte 13	
		D14	Data byte 14	
		D15	Data byte 15	

Table 144: Input/Output Process Image, I/O-Link Master

Input/Output Process Image			
Instance		**Byte designation**	**Remark**
		D16	Data byte 16
		D17	Data byte 17
		D18	Data byte 18
	24 bytes	D19	Data byte 19

These specialty modules represent 1 x 4, 1 x 6 … 1 x 24 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

CAN gateway

750-658

The length of the process image of the CAN Gateway module can adjusted to a fixed size of 8, 12, 16, 20, 24, 32, 40 or 48 bytes.

"Sniffer" and "Transparent" Operating Modes

Table 145: CAN Gateway Input/Output Process Image

Input/Output Process Image		
Instance	**Byte designation**	**Remark**
n	C0/S0	Control/status byte
	MBX0	2 … (PI size - 3)
	…	
	MBXx	
	D0	5 … 45 data bytes
	…	
	Dx	

"Mapped" Operating Mode

Table 146: CAN Gateway input/output process image

Input/Output Process Image		
Instance	**Byte designation**	**Remark**
n	C0/S0	Control/status byte
	MBX0	2 … (PI size - 3)
	…	
	MBXx	
	T	Toggle byte
	D0	4 … 44 data bytes
	…	
	Dx	

These specialty modules represent 1 x 8, 1 x 12 … 1 x 48 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

Stepper module
750-670
750-671
750-672
750-673

The stepper module makes a 12-byte input/output process image available.

The data to be sent and received is stored in up to 7 input/output bytes depending on the operating mode. If the mailbox is activated, the first 6 data bytes are overlaid with mailbox data.

Table 147: Input/Output Process Image, Stepper Module

Input/Output Process Image				
Instance	**Byte designation**		**Remark**	
n	C0/S0		Control/status byte	
	-		Reserved	
	D0	MBX0	Data bytes	Mailbox bytes (mailbox activated)
	D1	MBX1		
	D2	MBX2		
	D3	MBX3		
	D4	MBX4		
	D5	MBX5		
	D6	-		Reserved
	C3/S3		Status byte (mode specific)	
	C2/S2		Status byte (mode specific)	
	C1/S1		Status byte (mode specific)	

These specialty modules represent 1 x 12 bytes and occupy 1 instance in class (0x67) and 1 instance in class (0x68).

11.2.5 System Modules

System Modules with Diagnostics

750-610, -611

Power supply modules (750-610 and -611) with diagnostics provide 2 bits in the input process image to monitor the power supply.

Table 148: Input Process Image, System Modules with Diagnostics

Input Process Image							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
						Diagnostic bit S 2 Fuse	Diagnostic bit S 1 Voltage

The system modules occupy 2 instances in class (0x65).

Binary Spacer Module

750-622

The binary spacer module (750-622) can operate as a 2-channel digital input module or output module and, depending on the setting, and occupies 1, 2, 3 or 4 bits per channel.

Accordingly, 2, 4, 6 or 8 bits are occupied either in the input process image or in the output process image.

Table 149: Input/Output Process Image, Binary Spacer Module

Input/Output Process Image							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
(Data bit DI 8)	(Data bit DI 7)	(Data bit DI 6)	(Data bit DI 5)	(Data bit DI 4)	(Data bit DI 3)	Data bit DI 2	Data bit DI 1

The input modules occupy 2, 4, 6 or 8 instances in class (0x65). The output modules occupy 2, 4, 6 or 8 instances in class (0x65).

12 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.

12.1 Marking Configuration Examples

12.1.1 Marking for Europe According to ATEX and IEC-Ex

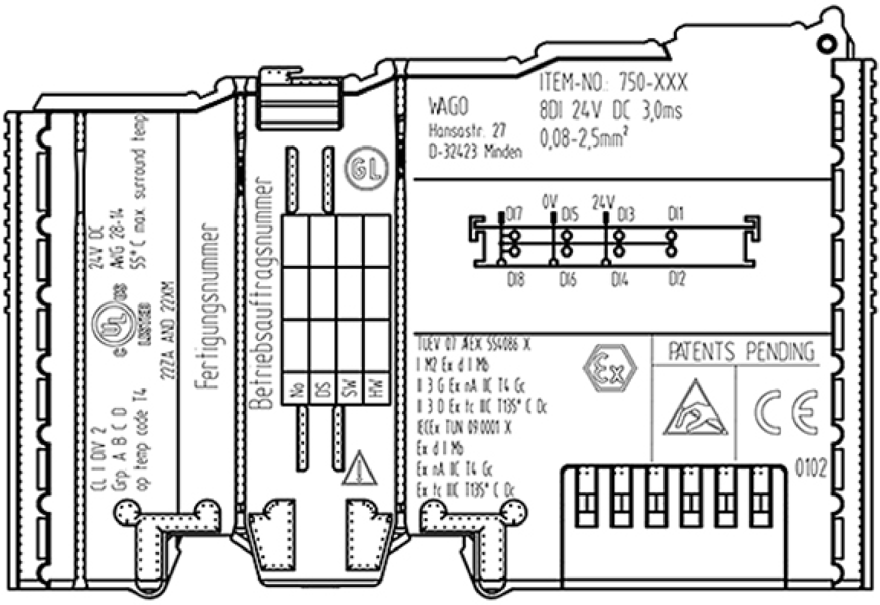


Figure 48: Side Marking Example for Approved I/O Modules According to ATEX and IECEx

Figure 49: Text Detail – Marking Example for Approved I/O Modules According to ATEX and IECEx.

Table 150: Description of Marking Example for Approved I/O Modules According to ATEX and IECEx

Printing on Text	Description
TÜV 07 ATEX 554086 X IECEx TUN 09.0001 X	Approving authority and certificate numbers
Dust	
II	Equipment group: All except mining
3D	Category 3 (Zone 22)
Ex	Explosion protection mark
tc Dc	Type of protection and equipment protection level (EPL):protection by enclosure
IIIC	Explosion group of dust
T 135°C	Max. surface temperature of the enclosure (without a dust layer)
Mining	
I	Equipment group: Mining
M2	Category: High level of protection
Ex	Explosion protection mark
d Mb	Type of protection and equipment protection level (EPL): Flameproof enclosure
I	Explosion group for electrical equipment for mines susceptible to firedamp
Gases	
II	Equipment group: All except mining
3G	Category 3 (Zone 2)
Ex	Explosion protection mark
nA Gc	Type of protection and equipment protection level (EPL): Non-sparking equipment
nC Gc	Type of protection and equipment protection level (EPL): Sparking apparatus with protected contacts. A device which is so constructed that the external atmosphere cannot gain access to the interior
IIC	Explosion group of gas and vapours
T4	Temperature class: Max. surface temperature 135°C

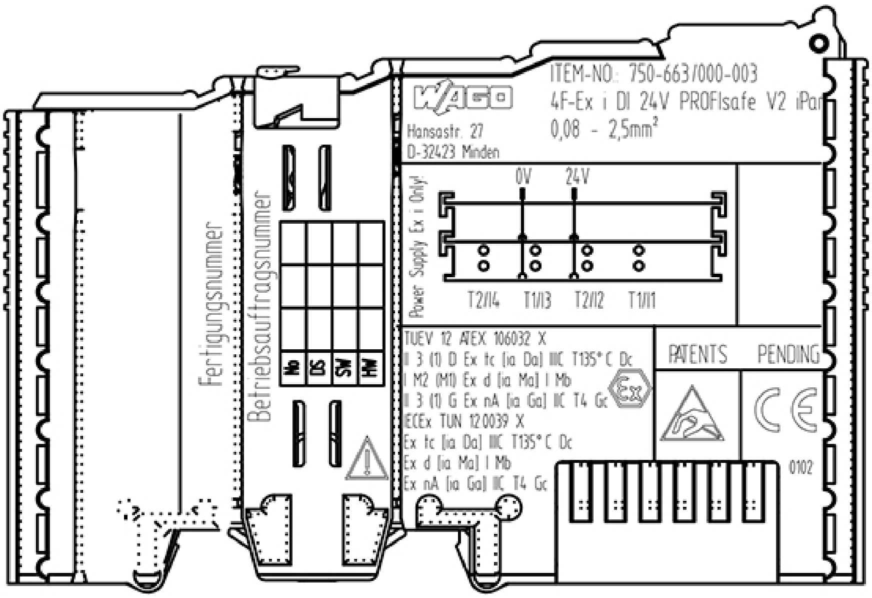


Figure 50: Side Marking Example for Approved Ex i I/O Modules According to ATEX and IECEx.

TUEV 12 ATEX 106032 X
II 3 (1) D Ex tc [ia Da] IIIC T135°C Dc
I M2 (M1) Ex d [ia Ma] I Mb
II 3 (1) G Ex nA [ia Ga] IIC T4 Gc
IECEx TUN 12.0039 X
Ex tc [ia Da] IIIC T135°C Dc
Ex d [ia Ma] I Mb
Ex nA [ia Ga] IIC T4 Gc

Figure 51: Text Detail – Marking Example for Approved Ex i I/O Modules According to ATEX and IECEx.

Table 151: Description of Marking Example for Approved Ex i I/O Modules According to ATEX and IECEx

Inscription Text	Description
TÜV 07 ATEX 554086 X IECEx TUN 09.0001X TÜV 12 ATEX 106032 X IECEx TUN 12.0039 X	Approving authority and certificate numbers
Dust	
II	Equipment group: All except mining
3(1)D	Category 3 (Zone 22) equipment containing a safety device for a category 1 (Zone 20) equipment
3(2)D	Category 3 (Zone 22) equipment containing a safety device for a category 2 (Zone 21) equipment
Ex	Explosion protection mark
tc Dc	Type of protection and equipment protection level (EPL): protection by enclosure
[ia Da]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 20
[ib Db]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 21
IIIC	Explosion group of dust
T 135°C	Max. surface temperature of the enclosure (without a dust layer)
Mining	
I	Equipment Group: Mining
M2 (M1)	Category: High level of protection with electrical circuits which present a very high level of protection
Ex d Mb	Explosion protection mark with Type of protection and equipment protection level (EPL): Flameproof enclosure
[ia Ma]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety electrical circuits
I	Explosion group for electrical equipment for mines susceptible to firedamp

Table 151: Description of Marking Example for Approved Ex i I/O Modules According to ATEX and IECEx

Gases	
II	Equipment group: All except mining
3(1)G	Category 3 (Zone 2) equipment containing a safety device for a category 1 (Zone 0) equipment
3(2)G	Category 3 (Zone 2) equipment containing a safety device for a category 2 (Zone 1) equipment
Ex	Explosion protection mark
nA Gc	Type of protection and equipment protection level (EPL): Non-sparking equipment
[ia Ga]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 0
[ia Gb]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 1
IIC	Explosion group of gas and vapours
T4	Temperature class: Max. surface temperature 135°C

12.1.2 Marking for America According to NEC 500

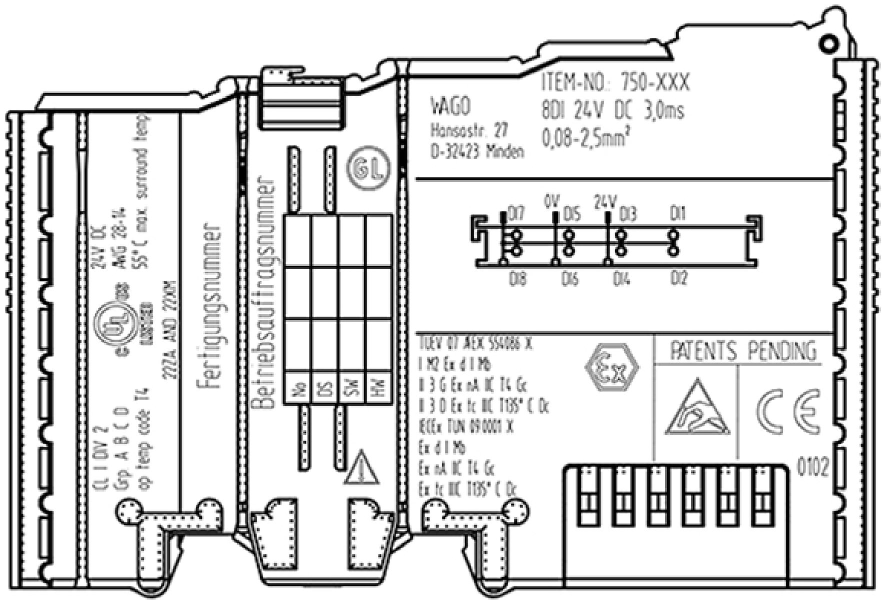


Figure 52: Side Marking Example for I/O Modules According to NEC 500

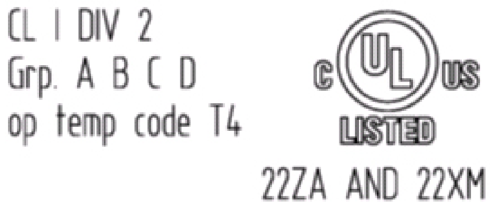


Figure 53: Text Detail – Marking Example for Approved I/O Modules According to NEC 500

Table 152: Description of Marking Example for Approved I/O Modules According to NEC 500

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

12.2 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.

12.2.1 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 and EN 60079-31.
   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. 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.
   This is although and in particular valid for the interfaces “Memory-Card”, “USB”, “Fieldbus connection”, “Configuration and programming interface”, “antenna socket”, “D-Sub”, “DVI-port” and the “Ethernet interface”. These interfaces are not energy limited or intrinsically safe circuits. An operating of those circuits is in the behalf of the operator.
5. For the types 750-606, 750-625/000-001, 750-487/003-000, 750-484 and 750-633 the following shall be considered: The Interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in EN 60664-1.
6. For replaceable fuses the following shall be considered: Do not remove or replace the fuse when the apparatus is energized.
7. The following warnings shall be placed nearby the unit:
   WARNING – DO NOT REMOVE OR REPLACE FUSE WHEN ENERGIZED
   WARNING – DO NOT SEPARATE WHEN ENERGIZED
   WARNING – SEPARATE ONLY IN A NON-HAZARDOUS AREA

12.2.2 Special Conditions for Safe Use (ATEX Certificate TÜV 12 ATEX 106032 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-*** Ex i 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 and EN 60079-31.
   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. 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. 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.
4. For the type the following shall be considered: The Interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in EN 60664-1.

12.2.3 Special Conditions for Safe Use (IEC-Ex Certificate TUN 09.0001 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) IEC 60079-0, IEC 60079-11, IEC 60079-15 and IEC 60079-31. 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.
   This is although and in particular valid for the interfaces “Memory-Card”, “USB”, “Fieldbus connection”, “Configuration and programming interface”, “antenna socket”, “D-Sub”, “DVI-port” and the “Ethernet interface”. These interfaces are not energy limited or intrinsically safe circuits. An operating of those circuits is in the behalf of the operator.
5. For the types 750-606, 750-625/000-001, 750-487/003-000, 750-484 and 750-633 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 replaceable fuses the following shall be considered: Do not remove or replace the fuse when the apparatus is energized.
7. The following warnings shall be placed nearby the unit:
   WARNING – DO NOT REMOVE OR REPLACE FUSE WHEN ENERGIZED
   WARNING – DO NOT SEPARATE WHEN ENERGIZED
   WARNING – SEPARATE ONLY IN A NON-HAZARDOUS AREA

12.2.4 Special Conditions for Safe Use (IEC-Ex Certificate IECEx TUN 12.0039 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-*** Ex i 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 60079-31.
   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. 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.
4. For the type 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.

12.2.5 Special Conditions for Safe Use According to ANSI/ISA 12.12.01

A. “This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.”
B. “This equipment is to be fitted within tool-secured enclosures only.”
C. “WARNING Explosion hazard - substitution of components may impair suitability for Class I, Div. 2.”
D. “WARNING – Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous” has to be placed near each operator accessible connector and fuse holder.
E. 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.”
F. For devices with EtherCAT/Ethernet connectors “Only for use in LAN, not for connection to telecommunication circuits.”
G. “WARNING - Use Module 750-642 only with antenna module 758-910.”
H. For Couplers/Controllers and Economy bus modules only: The instructions shall contain the following: “The configuration interface Service connector is for temporary connection only. Do not connect or disconnect unless the area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion.”
I. Modules containing fuses only: “WARNING - Devices containing fuses must not be fitted into circuits subject to over loads, e.g. motor circuits.”
J. Modules containing SD card reader sockets only: “WARNING - 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 operating and assembly instructions.
The manual, containing these special conditions for safe use, must be readily available to the user.

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