

WAGO-SPEEDWAY 767

Manual



767-1301

FC ETHERNET 8DI 24V DC

ETHERNET Fieldbus Coupler

Version 2.2.0

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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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1 Notes about this Documentation

The fieldbus coupler shall only be installed and operated in conjunction with these operating instructions and the system description.



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.



WARNING

Observe release notes!

Please note that, within the SPEEDWAY system, a function is provided **without restriction** only if all system's components have the same system-wide firmware release. Therefore, always observe the appropriate release notes on products used.

NOTICE

Supply layout!

In addition to these operating instructions, you will need the “WAGO *SPEEDWAY 767*, System Description and Information” manual, which can be downloaded at www.wago.com. There you will find information regarding supply layout, etc.

1.1 Validity of these Operating Instructions

These operating instructions are only applicable to the WAGO SPEEDWAY 767 Series fieldbus coupler FC ETHERNET 8DI 24V DC, 767-1301.

1.2 Copyright

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

1.3 Symbols



DANGER

Personal Injury!

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



DANGER

**Personal Injury Caused by Electric Current!**

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



WARNING

Personal Injury!

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



CAUTION

Personal Injury!

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

NOTICE

Damage to Property!

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



NOTICE

Damage to Property Caused by Electrostatic Discharge (ESD)!

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



Note

Important Note!

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



Information

Additional Information:

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

1.4 Number Notation

Table 1: Number Notation

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

1.5 Font Conventions

Table 2: Font Conventions

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

2 Important Notes

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

2.1 Legal Bases

2.1.1 Subject to Changes

WAGO Kontakttechnik GmbH & Co. KG reserves the right to provide for any alterations or modifications that serve to increase the efficiency of technical progress. WAGO Kontakttechnik GmbH & Co. KG owns all rights arising from the granting of patents or from the legal protection of utility patents. Third-party products are always mentioned without any reference to patent rights. Thus, the existence of such rights cannot be excluded.

2.1.2 Personnel Qualification

All sequences implemented on the module may only be carried out by electrical specialists with sufficient knowledge in automation. The specialists must be familiar with the current standards and guidelines for the module and automation environment.

2.1.3 Use in Compliance with Underlying Provisions

The EtherNet/IP fieldbus coupler is used to record and process digital and analog field signals. These can then be transmitted to higher-level control systems.

The fieldbus coupler shall not be used to control safety-related functions; i.e., emergency-off devices shall not be operated with this fieldbus coupler.

The fieldbus coupler may only be operated in combination with components of the WAGO SPEEDWAY 767 Series.

The fieldbus coupler was developed for applications requiring IP 67 (NEMA type 6, 6P) protection.

The fieldbus coupler is expandable by a maximum of 64 I/O modules from the WAGO SPEEDWAY 767 Series.

Applications other than those described in this manual are not permitted.

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)



DANGER

Electric voltage!

Operate the 767 Series components exclusively with 24 VDC PELV (Protective Extra Low Voltage) or SELV (Safety Extra Low Voltage) voltage sources. Failure to comply may result in electric shock.



CAUTION

Hot connection sockets!

Even when taking into account derating, high surface temperatures on the metallic connection sockets and on the enclosure can arise during operation. If the 767 Series component has been in operation, allow it to cool off before moving it.

NOTICE

The highest current carrying capacity of the supply contacts is 4 A!

Always observe the maximum current carrying capacity per supply line (U_{LS} , U_A) for each 767 Series component and the overall power consumption for all 767 components. Neither of these values shall exceed 4 A since an increase in current causes the contacts to overheat and damages the 767 Series components. Information regarding the power demand of each 767 Series component can be found in the corresponding data sheet, which is available from www.wago.com.

NOTICE

Exposed connections!

If connections have not been closed with protective caps, liquid or dirt can penetrate the components of the 767 Series module and ruin it. Therefore, close all unnecessary connections with protective caps, which must be ordered separately, in order to maintain the IP67 degree of protection. (See section “Accessories” of the fieldbus coupler/controller manual.)

- Always keep the cover cap of the DIP switch closed.
- Disconnect the power supply from the system on which you wish to mount the 767 Series device.
- Observe the appropriate accident prevention regulations for your system during assembly, start-up, maintenance, and repairs. For example, BGV A3, “Electrical systems and equipment”.
- The operating instructions for the 767 Series module and the system description must be laid out ready on site.
- Observe the exact positioning (coding) between plug and socket.

- The 767 Series device shall not come into contact with substances having seeping and insulating properties. Otherwise, additional measures shall be taken for the device, such as installation of an enclosure that is resistant to the above-mentioned substance properties.
- Electronic components fulfilling the ESD requirements according to the IEC 61000-6-2 are integrated in the 767 device. As higher voltages may occur, under unfavorable circumstances, due to electrical charge in the field, discharge must be ensured before performing work on the 767 system.
- Ensure that the potential equalization is correctly laid out.
- Keep all cables a sufficient distance away from electromagnetic sources of interference in order to maintain a high level of interference resistance of the 767 system against electromagnetic emissions. Use only shielded cables at the necessary locations, and always observe the appropriate standards for EMC-suitable installations.
- For the power supply and for the S-BUS, use only pre-assembled WAGO system cables, so the specified characteristics of the technical data can be achieved.
- Replace defective or damaged modules (e.g., deformed connections), else function disruptions can occur in the respective fieldbus stations or nodes.
- When laying any cables, make sure that you do not lay them within the shear range of movable machine parts.
- For each activity, observe the corresponding personnel qualification in the corresponding section.
- Observe the marking on the front and rear side of the module.

2.3 Safety Equipment

All 767 Series products are designed to meet the requirements of IP67. This includes complete protection against accidental contact with electrical voltage and currents – even when wet.

2.4 Notes on Operation

When integrating the 767 module in your machine or system, all the currently applicable norms, regulations and guidelines shall be observed during all activities: for example, BGV A3, “Electrical systems and equipment”, DIN EN 418, EN 60204. The emergency stop equipment shall remain effective in all operating modes of the system and machine.

For protection from electromagnetic interferences

- Connect your system to protective earth (PE), and
- Ensure that the cable routing and the installation of the fieldbus cable, S-BUS cable, supply cable, and sensor or actuator cable are correct.

The following elements for 24 V supply shall be present:

- Outer lightning protection on buildings
- Inner lightning protection of supply lines and signal lines
- Safe electrical separation of low voltage 24 VDC through PELV (Protective Extra Low Voltage) or SELV (Safety Extra Low Voltage) voltage sources

2.5 Special Use Conditions for ETHERNET Devices

If not otherwise specified, ETHERNET devices are intended for use on local networks. Please note the following when using ETHERNET devices in your system:

- Do not connect control components and control networks to an open network such as the Internet or an office network. WAGO recommends putting control components and control networks behind a firewall.
- Limit physical and electronic access to all automation components to authorized personnel only.
- Change the default passwords before first use! This will reduce the risk of unauthorized access to your system.
- Regularly change the passwords used! This will reduce the risk of unauthorized access to your system.
- If remote access to control components and control networks is required, use a Virtual Private Network (VPN).
- Regularly perform threat analyses. You can check whether the measures taken meet your security requirements.
- Use “defense-in-depth” mechanisms in your system's security configuration to restrict the access to and control of individual products and networks.

3 Information on ETHERNET

ETHERNET is a technology that has proven remarkably valuable and established for data transmission in information technology and in office communication. Even in the area of private PCs, ETHERNET has experienced a worldwide breakthrough in a very short amount of time.

This technology was developed in 1979 by the companies Xerox, INTEL and DEC as a specification for a local network (LAN). A standardization (IEEE 802.3) took place in 1983. ETHERNET predominantly uses coaxial cable or twisted two-wire line as a transmission medium. The components can be found almost anywhere and are very cost-effective. ETHERNET can be connected to networks which are often pre-existent (LAN, Internet) without any difficulty, and data transmission is carried out with a transfer rate of 10 Mbit/s or 100 Mbit/s.

In addition to the IEEE 802.3 standardization, ETHERNET was also supplied with higher-level communication software, TCP/IP (Transmission Control Protocol/Internet Protocol), for communication between systems. The TCP/IP protocol stack offers high dependability in information transmission.

Application protocols enable the user to create master applications through standardized interfaces and to transmit process data via an ETHERNET interface.

By using ETHERNET as a fieldbus, a uniform data transmission is established between production and office. Connecting the ETHERNET fieldbus node to the Internet makes it possible to retrieve industrial process data worldwide for all types of applications, including from several nodes simultaneously if necessary. This facilitates a cross-locational inspection, visualization, remote maintenance and control of processes.

3.1 Physical Transmission into Networks

3.1.1 Transfer Rates

For data transmission, the ETHERNET standard supports numerous technologies that differ in various characteristic values such as transfer rate, medium, segment length and transmission mode.

Table 3: List of the important transmission standards

10Base2	Uses a coaxial cable (5 mm, 50 Ohm) for a 10 Mbit/s baseband signal for distances up to 185 m in a physical bus topology (often referred to as Thin ETHERNET, ThinNet or Cheapernet).
10Base-T	Uses a twisted pair cable of type 24 AWG UTP or S-UTP for a 10 Mbit/s baseband signal for distances up to 100 m in a physical star topology.
100BaseTX	Specifies 100 MBit/s transmission on two twisted pairs via cabling implemented with category 5 components. According to this category, cables, RJ-45 wall sockets, patch panels, etc., must be designed for 100 MHz transmission frequency.
100BaseFX	Point-to-point ETHERNET connection where fiber-optic cables are utilized for data transmission.

Other transmission standards are also available, such as 100Base-T4 (Fast ETHERNET via twisted pairs) or P802.11 (Wireless LAN) for wireless transmission.

3.1.2 Network Topology

With 10Base-T and 100Base-T, several nodes are wired in a point-to-point manner, according to the ETHERNET standard. For this reason, only the star topology and, for larger networks, the structure of a tree topology should be examined more closely. A computer network is created using components such as hubs and switches.

Star topology

The star topology is a network in which all nodes are connected to a central node. For this purpose, a hub is connected to a bus architecture like a normal PC, and the bus runs inside the hub.

Aside from the simple implementation, the advantages of such an application lie in the expandability of an existing network. A node can be added or removed without the risk of network failure. In addition, only the communication to the respective node is affected in the case of a defective line, thus increasing considerably the failure safety of the entire network.

With the star topology, administratively matching groups can very easily be formed, combined in hierarchical levels and linked in a tree-like structure.

Tree topology

The tree topology is a structure, which is used for larger networks, companies or buildings. In this topology, various smaller networks are connected to each other hierarchically like a tree (branches, limbs and trunk); e.g., via routers.

Guidelines for cabling

General guidelines for setting up a LAN network are provided in "Structured Cabling". There you will find the maximum cable lengths allowed for cabling the grounds, building and levels.

The "Structured Cabling" is standardized in the standards EN 50173, ISO 11801 and TIA 568-A. It forms the basis for a future-oriented, cost-effective network infrastructure independent of application.

Additional information on industrial cabling can be found at www.iaona.de and www.odva.org.

3.1.3 Transmission Modes

ETHERNET supports transfer rates of 10 Mbit/s or 100 Mbit/s in full-duplex and half-duplex mode. To ensure a safe and fast transmission, the fieldbus coupler and its communication partner link partner must be configured for the same transmission mode.

A faulty configuration of the transmission mode can result in a loss of the communication partner, poor network performance or faulty performance of the fieldbus coupler.

The IEEE 802.3u ETHERNET standard offers two possibilities for configuring the transmission modes:

- Static configuration
- Dynamic configuration

Static configuration of transmission mode

Static configuration allows both communication partners to be set to one static transfer rate and duplex mode. The following configurations are possible:

- 10 Mbit/s, half-duplex
- 10 Mbit/s, full-duplex
- 100 Mbit/s, half-duplex
- 100 Mbit/s, full-duplex

Dynamic configuration of transmission mode

The second configuration option is the auto-negotiation mode, which is defined in the IEEE 802.3u standard. Using this mode, the transmission rate and the duplex mode are negotiated dynamically between both communication partners. Auto-negotiation allows the device to automatically select the optimum transmission mode.

To ensure a correct dynamic configuration process, the operation mode for the auto-negotiation of both communication partners must be supported and activated. In some applications, it is beneficial to use the static configuration.

Errors during configuration of transmission mode

Invalid configurations are listed below:

Table 2: Errors during configuration of transmission mode

Problem	Cause	Symptoms
Mismatch of the transmission rate	Occurs if one link partner has been configured with 10 Mbit/s and the other with 100 Mbit/s.	Link failure
Duplex mode mismatch	Occurs when one link partner is running in full-duplex and the other in half-duplex mode.	Faulty or discarded data packets as well as collisions on the medium.
Mismatch using auto-negotiation	Occurs when one link partner is running in auto-negotiation mode and the other one is using a static configuration of the transmission mode in full-duplex operation.	The link partner, which is in auto-negotiation mode, determines the network speed via the parallel detection procedure and sets the duplex mode to half-duplex. If the device is operating in full-duplex mode with static configuration, a duplex mode mismatch will occur (see above).

3.1.4 ETHERNET Hardware Address (MAC-ID)

During production, each ETHERNET device is equipped with a single, globally unique, physical ETHERNET address, also called MAC-ID (Media Access Control Identity). This address can be used by the network operating system for addressing on the hardware level.

The address has a fixed length of 6 bytes (48 bits) and contains the address type, manufacturer's ID and the serial number.

Example of MAC-ID: 00_H.30_H.DE_H.00_H.00_H.01_H.

Addressing separate networks is not possible with ETHERNET. Therefore, higher-level protocols must be used if an ETHERNET network is to be connected with other networks.

If two or more data networks are to be connected with each other, routers must be utilized.

ETHERNET data packet

Data telegrams exchanged on the transmission medium are referred to as "packets" or "ETHERNET packets". The transmission occurs connectionless, i.e. the transmitter receives no confirmation from the receiver. The user data is packed into a frame of address information. The structure of one such packet is shown in the following table:

Preamble	ETHERNET header	ETHERNET user data range	Checksum
8 bytes	14 bytes	46-1500 bytes	4 bytes

Figure 1: ETHERNET Data packet

The preamble is used to synchronize the transmitting station to the receiving station. The ETHERNET header contains the MAC addresses of both transmitter and receiver, as well as a type field. The type field identifies the subsequent protocol via unique coding (e.g., 0800_{hex} = Internet protocol).

3.2 Logical Addressing

3.2.1 IP – Internet Protocol

The Internet protocol separates data telegrams into segments and is responsible for transporting them from one network station to the other. During this process, the participating nodes can either be located in the same network or in different physical networks that are connected to each other with routers. The routers are able to select various network transmission paths through a network connection, thus avoiding overloads and disruptions of individual networks.

However, this includes the possibility of certain segments being chosen that are shorter than others, thus allowing the data telegrams to overtake each other and falsifying the sequence of the data packets. For this reason, guaranteeing a correct transmission must take place at higher levels; e.g., through TCP.

IP data packets

The IP data packets include an abundance of address and additional information in the "Packet Header" aside from the user data which is to be transported.

IP header	IP user data range
------------------	---------------------------

Figure 2: IP Data packet

The most important pieces of information in the IP header are the IP addresses of the transmitter and receiver, as well as the transport protocol used.

3.2.2 IP Addresses

For network communication to take place, each fieldbus node must possess a 32-bit Internet address (IP address). Internet addresses must be unique across the entire network connection.

As shown below, there are various address classes with a network identification (net ID) in differing lengths and a host computer identification (host ID). The net ID defines the network in which the user is located. The host ID identifies a particular user within this network.

For purposes of addressing, the networks are divided into several network classes:

Class A: (Net ID: Byte1, Host ID: Byte2 - Byte4)

e.g.: 101 16 232 22

01100101	00010000	11101000	00010110
0	Net ID	Host ID	

↑ The highest bit in Class A networks is always '0'.
— In other words, the highest byte can lie in the range between '0 0000000' and '0 1111111'.

The address range of Class A networks therefore always lies between 0 and 127 in the first byte.

Class B: (Net ID: Byte1 - Byte2, Host ID: Byte3 - Byte4)

e.g.: 181 16 232 22

10110101	00010000	11101000	00010110
10	Net ID	Host ID	

↑ The highest bits in the Class B networks are always '10'.
— In other words, the highest byte can lie in the range between '10 000000' and '10 111111'.

The address range of Class B networks therefore always lies between 128 and 191 in the first byte.

Class C: (Net ID: Byte1 - Byte3, Host ID: Byte4)

e.g.: 201 . 16 . 232 . 22

11000101	00010000	11101000	00010110
110	Net ID		Host ID

↑ The highest bits in the Class C networks are always '110'.
— In other words, the highest byte can lie in the range between '110 00000' and '110 11111'.

The address range of Class C networks therefore always lies between 192 and 223 in the first byte.

Other network classes (D, E) are used for special functions.

Key data for the IP addresses

Table 4: Key data Class A, B and C

	Address range of network component	Possible number of networks	hosts per network
Class A	0.XXX.XXX.XXX - 127.XXX.XXX.XXX	$128=2^7$	Approx. 16 million (2^{24})
Class B	128.000.XXX.XXX - 191.255.XXX.XXX	Approx. 16 thousand (2^{14})	Approx. 65 thousand (2^{16})
Class C	192.000.000.XXX - 223.255.255.XXX	Approx. 2 million (2^{21})	254 (2^8)

**Note****Set bits**

Never set all bits in a byte to 0 or 1 (byte = 0 or 255). These numbers are reserved for special functions and may not be assigned. For example, the address 10.0.10.10 shall not be used due to the 0 in the second byte.

If a network is to be directly connected to the Internet, universally unique IP addresses are used, which have been assigned by a central domain name registrar. In Germany, for example, assigning takes place via the DE NIC (Deutsches Netzwerk Informations Center) in Karlsruhe.

3.2.3 Subnetworks

To enable routing within large networks, a convention was established in the RFC 950 specification in which a part of the Internet address, the host ID, is subdivided into a subnet number and the actual station number of the node. Using the network number, branching into internal subnetworks can now occur within the subnetwork. However, the entire network is externally visible as a unit. Although the size and status of the subnetwork ID are not specified, the size is dependent on the quantity of subnets to be addressed and the quantity of hosts per subnet.

1	8	16	24	32
1	0	Net ID	Subnet ID	Host ID

Figure 3: Class B address mit field for subnet ID

Subnet mask

The so-called subnet mask was established for coding the subnets in the Internet. The subnet mask is a "bit mask" with which special bits of the IP address can be hid or selected. The mask defines which bits of the host ID are used for the subnet coding and which constitute the ID of the host. The entire IP address range theoretically lies between 0.0.0.0 and 255.255.255.255.

The 0 and the 255 are each reserved from the IP address range for the subnet mask.

The standard masks, which are dependent on the respective network class, appear as follows:

- **Class A subnet mask:**

255	.0	.0	.0
-----	----	----	----

- **Class B subnet mask:**

255	.255	.0	.0
-----	------	----	----

- **Class C subnet mask:**

255	.255	.255	.0
-----	------	------	----

Depending on the division of the subnet, the subnet masks can also include other values in addition to 0 and 255, such as 255.255.255.128 or 255.255.255.248, etc. The subnet mask number is assigned to you by your network administrator.

In conjunction with the IP address, this number determines to which network your PC and your ETHERNET node belong.

The receiver node located in a subnet first computes the correct network address from its own IP address and from the subnet mask. The receiver node only checks the node number when it is connected; if the number is correct, it then reads out the entire packet border. The following is an example of an IP address from a Class B network:

Table 4: Example configuration from a Class B network

IP address:	172.16.233.200	10101100 00010000 11101001 11001000
Subnet mask:	255.255.255.128	11111111 11111111 11111111 10000000
Net ID:	172.16.0.0	10101100 00010000 00000000 00000000
Subnet ID:	0.0.233.128	00000000 00000000 11101001 10000000
Host ID:	0.0.0.72	00000000 00000000 00000000 01001000



Note

Network mask

The network mask specified by the administrator must be indicated just like the IP address when installing the network protocol.

3.2.4 Gateway

Internet subnets are typically connected via gateways. These gateways forward IP packets to other networks or subnets. For a PC or fieldbus node connected to the Internet, this means that the correct IP address of the standard or default-gateway must be indicated, in addition to the IP address and network mask for each network card. This IP address should likewise be provided by your network administrator.

If a PC or fieldbus node realizes that the target PC is not in the same subnet, it sends the packets automatically to the address of the standard or default-gateway. The gateway, in general a router, sends the packets to the correct subnet.

Without an indication of this address, the IP functionality remains limited to the local subnet.

3.2.5 RAW IP

RAW IP does without protocols such as PPP (point-to-point protocol). In RAW IP, TCP/IP packets are exchanged directly without handshaking, making possible a faster connection setup. However, configuration with a fixed IP address must have already taken place. Advantages of RAW IP are high data transfer rate and good stability.

3.2.6 IP Multicast

Multicast refers to a transmission mode from one point to a group, called a point-to-multi-point transmission or a multi-point connection. The advantage of Multicast is that messages can be transmitted simultaneously to several users or closed user groups using one address.

IP Multicasting on the internetworking level is carried out through the "Internet Group Message Protocol" (IGMP). This protocol is used by neighboring routers to mutually inform the other about group assignments.

When distributing Multicast packets in the subnet, the IP assumes that the Data Link Layer provides access to Multicasting. In the case of ETHERNET, Multicast addresses exist with which a packet addressed by them is sent to several recipients via a single sending operation. This rests on the fact that a common medium has the possibility of sending packets to several recipients *simultaneously*. The nodes do not need to inform each other as to what belongs to a Multicast address – each node receives each packet physically.

The address dissolution of IP address to ETHERNET address is triggered algorithmically; IP Multicast addresses are embedded in ETHERNET Multicast addresses.

3.3 Transport Protocols

TCP protocol

Set up on the Internet protocol, the TCP (Transmission Control Protocol) assumes the security of the data transport through the network.

For this purpose, the TCP establishes a connection between two users for the duration of the data transmission. The communication is carried out in full-duplex mode: both users can send and receive data simultaneously. The transmitted user data is provided with a 16-bit checksum by the TCP, and each packet contains a sequence number. The recipient checks whether the packet has been correctly received using the checksum and subsequently clears the sequence number. This results in an acknowledgement number, which is sent back with the next self-sent packet as acknowledgement. This guarantees that the loss of TCP packets is detected and that these packets can be resent in the correct sequence, if necessary.

TCP port numbers

The TCP can also target a specific application (service) on the addressed host supplemental to the IP address (network and host address). For this purpose, the applications in a host (such as the web server, FTP server and others) are addressed via differing port numbers. For known applications, fixed ports are assigned which correspond to each application when setting up the connection.

Examples:

Telnet	Port number: 23
HTTP	Port number: 80

A comprehensive list of the "standard services" can be found in the RFC 1700 specifications (1994).

TCP data packet

The packet header of a TCP data packet consists of at least 20 bytes and includes the port number of both the sender's and recipient's application, the sequence number, the acknowledgement number, etc.

The TCP packet thus originating is implemented into the user data range of an IP packet so that a TCP/IP packet is generated.

TCP header	TCP user data range
------------	---------------------

Figure 4: TCP data packet

UDP

Like the TCP protocol, the UDP protocol is responsible for data transmission. In contrast to the TCP protocol, UDP is not connection-oriented; that is, there are no control mechanisms for the data exchange between sender and receiver. The advantage of this protocol lies in the efficiency of the transmitted data, and therefore in the resultant higher processing speed.

ARP

ARP (short for "Address Resolution Protocol"). This protocol connects the IP address with the physical MAC address of the respective ETHERNET card. It is always used when the data transmission to an IP address takes place within the same logical network as the sender.

3.4 Configuration and Diagnostic Protocols

BootP

The BootP protocol defines a mechanism, which is used to assign a fixed IP address via the MAC ID of a device. The fieldbus coupler is enabled to send requests into the network and to retrieve the necessary network information, such as the IP address of a BootP server. The BootP server waits for incoming BootP requests and generates the corresponding reply from a configuration database.

Dynamic configuration of the IP address via a BootP server provides the user with a flexible and easy way to configure the network.

The BootP Client assists in configuring the network parameters:

Table 5: Meaning of the BootP parameter

Parameter	Meaning
IP address of the Client	Network address of the fieldbus coupler
IP address of the router	If communication takes place outside the local network, the IP address of the router (gateway) is given in this parameter.
Subnet mask	The subnet mask makes it possible for the fieldbus coupler to distinguish which parts of the IP address identify the network and which identify the network stations.
IP addresses of the DNS server	The IP addresses from a maximum of 2 DNS servers can be specified here.
Host name	Name of host
Time offset	For the time zone
Domain name	Name of device
NTP server	Network time protocol server (SNTP)

DHCP

The "Dynamic Host Configuration Protocol" defines a question/answer mechanism for network users with which the MAC ID of a fieldbus node can be assigned a temporary IP address. For this purpose, a network node is enabled to send requests into the network and to retrieve the necessary network information, such as the IP address of a DHCP server. The DHCP server waits for incoming DHCP requests and generates the reply from a configuration database.

Dynamic configuration of the IP address via a DHCP server provides the user with a flexible and easy way to configure the network.

The DHCP Client assists in the dynamic network configuration of the fieldbus coupler by setting the following parameters:

Table 5: Meaning of the DHCP parameter

Parameter	Meaning
IP address of the client	Network address of the fieldbus coupler
IP address of the router	If communication takes place outside the local network, the IP address of the router (gateway) is given in this parameter.
Subnet mask	The subnet mask makes it possible for the fieldbus coupler to distinguish which parts of the IP address identify the network and which identify the network stations.
IP addresses of the DNS server	The IP addresses from a maximum of 2 DNS servers can be specified here.
Lease time	The maximum duration (i.e., how long the fieldbus coupler maintains the assigned IP address) can be defined here.
Renewing time	The renewing time indicates when the fieldbus coupler must renew the lease time.
Rebinding time	The rebinding time indicates after what amount of time the fieldbus coupler must have received its new address.
Time offset	For the time zone
Domain name	Name of device
NTP server	Network time protocol server (SNTP)

For configuration of the network parameters via the DHCP, the fieldbus coupler sends an inquiry independently to the DHCP server after initialization. If there is no reply, the inquiry is sent again after 4 seconds, 8 seconds and 16 seconds. If all inquiries receive no reply, a blink code is released via the I/O LED.

When using a lease time, the values for the renewing time and rebinding time are also indicated. After the renewing time has elapsed, the fieldbus coupler attempts to automatically renew the lease time for its IP address.

If this is unsuccessful when the rebinding time has elapsed, the fieldbus coupler attempts to receive a new IP address. The renewing time should be approximately half of the lease time. The rebinding time should be approximately $\frac{7}{8}$ of the lease time.

DNS

By way of the DNS server, the DNS Client makes it possible to convert logical Internet names, such as www.wago.com, into the corresponding decimal IP address displayed with cut-off points. The addresses of the DNS server are configured using DHCP or the web-based management. Up to two DNS servers can be specified. The host identification can take place with two functions; an internal host table is not supported.

SNTP

The SNTP Client is used for synchronizing the time between a time server (NTP and SNTP servers, versions 3 and 4) and the time module integrated in the fieldbus coupler. The protocol is executed via a UDP port. Only the Unicast addressing is supported.

The SNTP Client is configured via the web-based management. The following parameters must be set:

Table 7: Meaning of the SNTP parameter

Parameter	Meaning
Address of the time server	The address assignment can either be done via an IP address or a host name.
Time zone	To operate the fieldbus coupler with SNTP in various countries, you must specify a time zone. Setting the time zone is relative to GMT (Greenwich Mean Time). A range from -43200 to +50400 seconds can be specified (-12 hrs to +14 hrs).
Update time	The update time specifies the interval in seconds in which the synchronization with the time server should occur.
Enable time client	Specifies whether the SNTP client should be activated or deactivated

HTTP

The "Hypertext Transfer Protocol" is used by WWW (World Wide Web) to transfer hypermedia, text, pictures, audio files, etc.

HTTP currently forms the basis of the Internet and, like the BootP protocol, is based on requests and replies.

The HTTP server implemented on the fieldbus coupler reads out the saved HTML pages. The HTML pages can give information about the fieldbus coupler (status, configuration) or the network.

On some HTML pages, fieldbus coupler settings can also be set or changed via web-based management, e.g. whether the network configuration of the fieldbus coupler should take place via the DHCP, the BootP protocol or from the stored data in EEPROM. The HTTP server uses the port number 80.

FTP

The file transfer protocol makes it possible to exchange files between various network users regardless of the structure of the operating system.

The FTP saves the HTML pages created by the user, the IEC 61131 program and the IEC 61131 source code to the fieldbus coupler and reads them out.

4 Information on EtherNet/IP

EtherNet/IP stands for “ETHERNET Industrial Protocol” and defines an open industry standard which expands the classic ETHERNET to include an industry protocol. This standard was developed collectively by “ControlNet International” (CI) and the “Open DeviceNet Vendor Association”, (ODVA) with support from the “Industrial ETHERNET Association” (IEA).

This communication system allows devices to exchange time-critical application data in an industrial environment. The range of devices spans from simple I/O devices (e.g., sensors) to complex control systems (e.g., robots).

EtherNet/IP is based on the TCP/IP protocol family. Therefore, it takes over the lower four layers of the OSI layer model in unmodified form so that all standard ETHERNET communication modules (PC interface cards, cables, connectors, hubs, switches, etc.) can likewise be used with EtherNet/IP.

Above the transport layer, the “Encapsulation Protocol” can be found with which the “Common Industrial Protocol” (CIP) is used on the TCP/IP and UDP/IP. CIP is already being used as a large, network-independent standard for ControlNet and DeviceNet. Transferring an application on one of these systems can therefore be easily achieved. The data exchange is based on an object model. Thus, ControlNet, DeviceNet and EtherNet/IP all have the same application protocol and can therefore collectively use device profiles and object libraries. These objects make possible a plug-and-play interoperability between complex devices from different manufacturers.

OSI Model of the CIP Protocol

To clarify the commonalities between DeviceNet, ControlNet, CompoNet and EtherNet/IP, the following representation shows the classification of the ISO/OSI communication model.

Table 6: OSI Model of the CIP Protocol

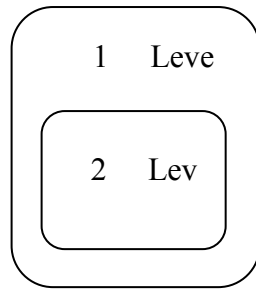
CIP Motion7 application layer	Object library (Communications, applications, time synchronization)			Safety object library	Common Industrial Protocol (CIP)
6 Presentation layer	Data management services Explicit and I/O messages			Safety services and messages	
5 Session layer	Connection management, routing				
4 Transport layer	TCP/UDP	CompoNet Network in transport	ControlNet Network in transport	DeviceNet Network in transport	Network Adaptations of CIP
3 Network layer	Internet protocol				
2 Data link layer	ETHERNET CSMA/CD	CompoNet Time slot	ControlNet CTDMA	CAN CSMA/NBA	
1 Physical layer	ETHERNET	CompoNet	ControlNet	DeviceNet	

Properties of the EtherNet/IP protocol software

The EtherNet/IP product classes are divided into 4 levels with each level containing a particular functionality. Each higher level in turn possesses at least the functionality of a lower level. The fieldbus coupler supports levels 1 and 2 of the EtherNet/IP product classes, which immediately build on each other.

Level 1: explicit messages – server

Level 2: level 1 + I/O messages – server



- UCMM compatible (connectionless, client and server)
- 128 “Encapsulation Protocol Sessions”
- 128 class 3 connections or class 1 (combined)

Class 3 connection – explicit messages
(connection-oriented, client und server)

Class 1 connection – I/O messages
(connection-oriented, client und server)

5 Information on MODBUS

The MODBUS protocol was developed in 1979 and today, MODBUS/TCP is an open Internet Draft Standard of the IETF (Internet Engineering Task Force). The tried and tested original MODBUS services as well as the object model have not been modified and have been adopted by TCP/IP as a transmission medium. Communication takes place via port 502, which is reserved for MODBUS. The MODBUS family thus consists of the classic MODBUS/RTU and MODBUS ASCII (asynchronous transmission via RS-232 or RS-485) and MODBUS/TCP (connection-oriented client-server communication via ETHERNET).

With the MODBUS protocol, any memory location in the process image of the fieldbus coupler can be read out or modified via a higher-level controller or another user. However, the node structure determines which I/O module is located at a specific memory location.

WAGO is expanding the MODBUS family to include MODBUS/UDP. This version uses a connectionless, asynchronous client server communication via ETHERNET.

MODBUS works with the following basic data types:

- Discrete (digital) inputs,
- Coils (digital outputs),
- Input register (16-bit input data) and
- Holding register (16-bit output data).

MODBUS differentiates between digital services and register services. The digital MODBUS services are also called Coil services.

The digital MODBUS services can only determine or change the state of digital I/O modules. Analog I/O modules are ignored or cannot be reached. A data exchange with analog I/O modules is carried out using register services.

The specification identifies the “big endian” format for the byte order in MODBUS telegrams. In this format, the most significant byte (MSB) is written to the lowest memory address. If the telegrams are analyzed on a PC, the byte order must be converted to “little endian” format.

6 Device Description

The fieldbus coupler links the 767 Series to the ETHERNET, for example. A transfer rate of 10 Mbit/s or 100 Mbit/s is possible with the PFC in both half-duplex and full-duplex operation. Two PFC ports are connected internally via an ETHERNET switch. Therefore, the ETHERNET PFC can be integrated not only in star topology, but also in line topology. The maximum distance between two fieldbus couplers is 100 m. Up to 20 fieldbus couplers are cascable, such that a maximum line of 2 km can be achieved.

The EtherNet/IP and MODBUS/TCP and MODBUS/UDP application protocols are provided to you to exchange process data. You can use the application protocols separately or combined. To manage and diagnose the fieldbus coupler, the RFC-specific protocols BootP, DHCP, HTTP, SNMP and FTP are available. These protocols can be configured via web-based management and the "WAGOframe" FDT/DTM frame application. Please see Sections "Web-Based Management (WBM)" and "Parameter Setting via FDT/DTM" for more information.

An internal server is available for Web-based applications. In essence, HTML pages stored in the fieldbus coupler allow access to information on the configuration and status of the fieldbus node via Web browsers. It is also possible to store individual HTML pages using the implemented file system or to start programs directly.

Summary of fieldbus coupler properties:

- Eight digital inputs, type 1, 24VDC
- USB interface for service purposes, as well as parameterization and configuration
- Sealable operation panel for the operating mode switch and address switch (DIP switch)
- Modular and extendable by up to 64 external I/O modules
- Configuration by means of FDT/DTM (incl. diagnostics and simulation)

Detailed information regarding the fieldbus coupler can be found in section “Technical Data”.

6.1 Connectors

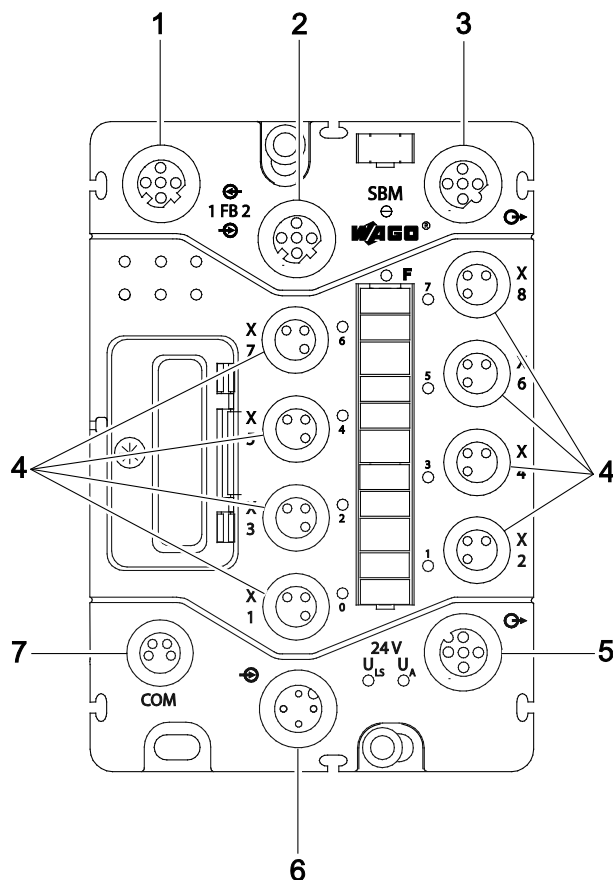


Figure 5: Connectors

Table 7: Legend for figure “Connectors”

Position	Description	Function
1, 2	ETHERNET connections, M12 socket, D-coded	Physical connections for the integration of the fieldbus coupler into the ETHERNET network.
3	S-BUS output M12 socket, B-coded	Physical connection for connecting I/O modules to the S-BUS and for closing the S-BUS.
4	Digital inputs X1 – X8 M8 socket	For connecting digital sensors (e.g., initiators or limit switches).
5	Supply output M12 socket, A-coded	Use of the system and/or field supply for the following I/O module.
6	Supply input M12 plug, A-coded	Infeed of system and field power supply
7	USB interface M8 socket, 4 poles	Parameterization independent of fieldbus, configuring and diagnosing entire fieldbus station and updating device software.

6.2 Marking Possibilities and Fastening

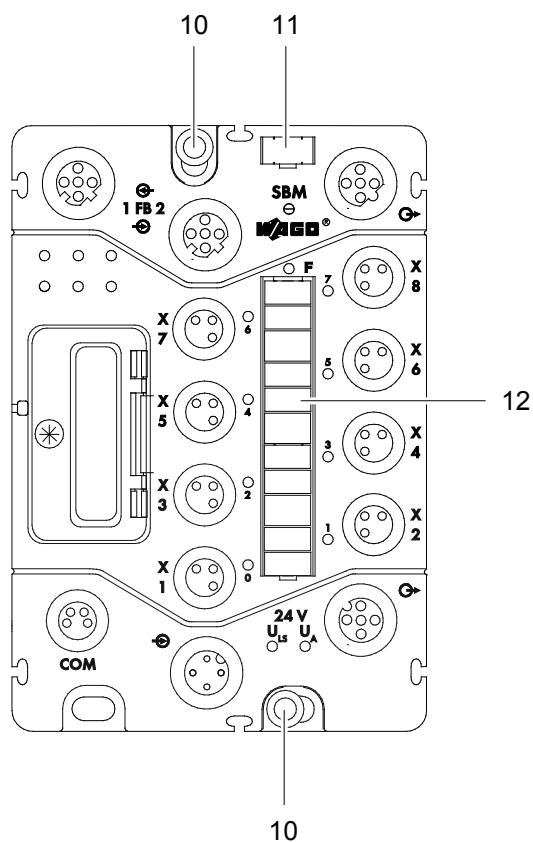


Figure 6: Marking possibilities and fastening

Table 8: Legend for figure “Marking possibilities and fastening”

Position	Description	Function
10	Mounting holes	With integrated function earth (FE) socket for fastening and grounding the fieldbus coupler.
11	Module marker card	For identifying the fieldbus coupler inside a fieldbus station.
12	Channel marker strip	For identifying input channels.

6.3 Display Elements

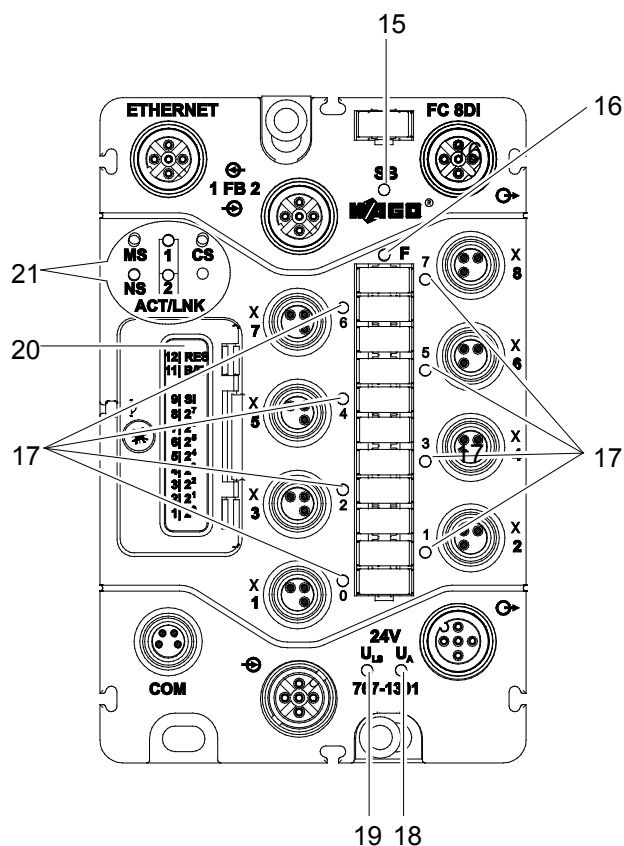


Figure 7: Display elements

Table 9: Legend for Figure “Display Elements”

Position	LED/ Operating element	Color	Meaning
15	SBM	Green, red	Status of S-BUS Master
16	F	Red	Diagnostic information of digital inputs is available.
17	LEDs 0 to 7	Yellow	Input signal pending
18	U_A	Green	Actuator supply is present
19	U_{LS}	Green	Logic supply and sensor supply are present.
20	Address and operating mode switch (DIP switch)	-	Setting the IP address. Executing a hardware reset.

Position	LED	Color	Meaning
21	MS	Green, red	Module status
	NS	Green, red	Network status
	ACT/LNK 1	Green	Status of the physical connection to the ETHERNET network (FB 1)
	ACT/LNK 2	Green	Status of the physical connection to the ETHERNET network (FB 2)
	CS	Green, red	Fieldbus coupler state

Note



Detailed information

Detailed information can be found in Section "Diagnostics".

6.4 Operating Elements

The IP address of the fieldbus coupler can be set via the DIP switch. This is so accessible at the address set on the ETHERNET network. Moreover, the DIP switch makes it possible to execute a hardware reset of the fieldbus coupler. A sealable, transparent cover protects the DIP switch. The assignment of values is as follows:

Table 10: Default settings of DIP switch

Switch	1	2	3	4	5	6	7	8	9	10	11	12
Binary value/ Functions	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	Set Network	-	Boot/ Execute	Reset
Switch setting	On	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off

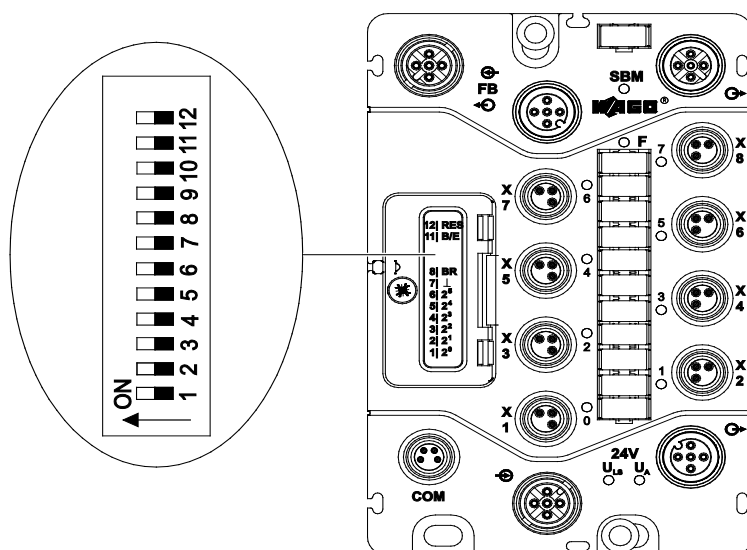


Figure 8: DIP switch. All switches are set on "Off" at delivery

Table 11: Explanation of DIP switch

Switch	On	Off
1 ... 8	Set the IP address (least significant byte, LSB) of the fieldbus coupler using this switch. Addresses ranging from 1 to 254 are permitted. Addresses 0 and 255 are reserved and shall not be used. This functionality is controlled via switch 9 (on/off).	
9	The IP address (LSB) is defined via switches 1 ... 8.	The assignment of IP addresses is based on the mode (e.g., DHCP, BootP), which you configured and selected in the web-based management or WAGOframe.

Switch	On	Off
10	No function.	
11	This DIP switch must always be set to „Off“.	
12	This switch is used to initiate a hardware reset of the fieldbus coupler. You can override this status by returning the switch to "Off."	This switch is used to initiate a hardware reset of the fieldbus coupler. You can override this status by returning the switch to "Off."

Note



Detailed informations

Detailed information can be found in section "Setting a Permanent IP Address using DIP Switches".

6.5 Labeling

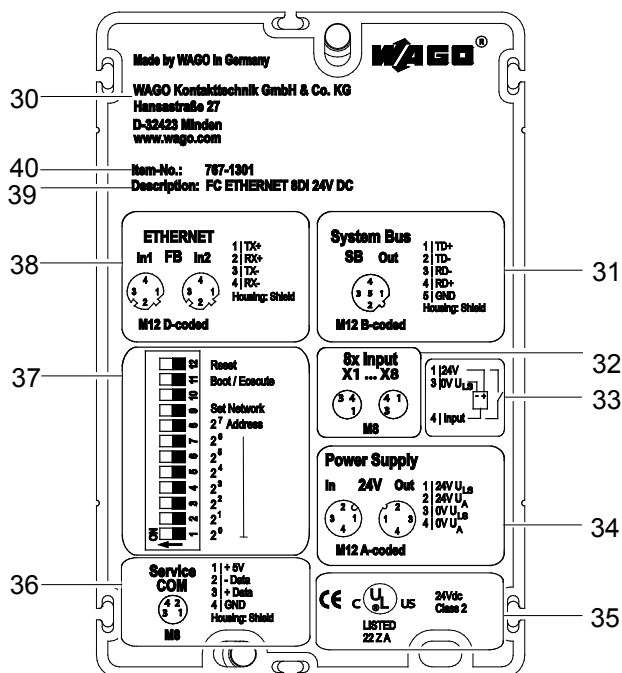


Figure 9: Labeling on the Back Side

Table 12: Legend for Figure “Labeling on the Back Side”

Position	Description
30	Manufacturer's mailing address
31	Connection assignment of S-BUS
32	Connection assignment of digital inputs
33	Connection example
34	Connection assignment of supply input and output
35	Information on approvals and CE marks
36	Connection assignment of USB interface
37	Labeling and assignment of DIP switch
38	Connection assignment of field bus input and output
39	Clear labeling of fieldbus coupler
40	Item number

On the side of the fieldbus coupler a label is printed providing information which is helpful in case of warranty claims:

- Work order number and serial number (50)
- MAC Addresses (51)
Three MAC addresses are stored in the fieldbus coupler:
MAC Address 1: MAC Address of the fieldbus coupler
MAC Address 2: MAC Address of the FB1 ETHERNET connection
MAC Address 3: MAC Address of the FB2 ETHERNET connection
- Manufacturing number (52)

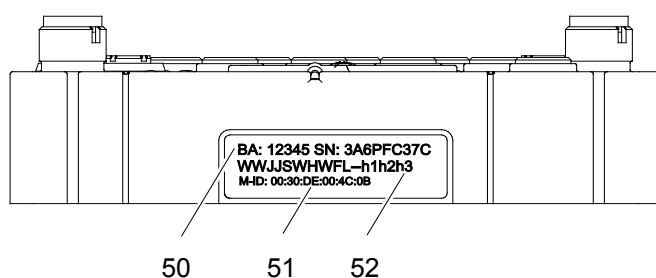


Figure 10: Label on fieldbus coupler

Table 13: Description of manufacturing number

Abbreviation	Description
WW	Week of production
JJ	Year of production
FW	Firmware release index When updating the firmware, please note that, the firmware release index may not be conformed to the printed firmware release index on the side of the fieldbus coupler. The “Electronic Type Label” (see section “Electronic Type Label”) shows the actual firmware release index.
HW	Hardware release index
FL	Firmware loader release index
h1h2h3	Internal manufacturer information

6.6 Schematic Diagram

The following schematic diagram provides an overview of the power supply and principle of operation of the power supply connections, as well as the digital inputs of the fieldbus coupler (see also section “Connecting the Supply Cable” and “Connecting the Sensor Cables”).

Please note that the common power supply of the sensors is distributed to all connections (pin 1 each) of the fieldbus coupler.

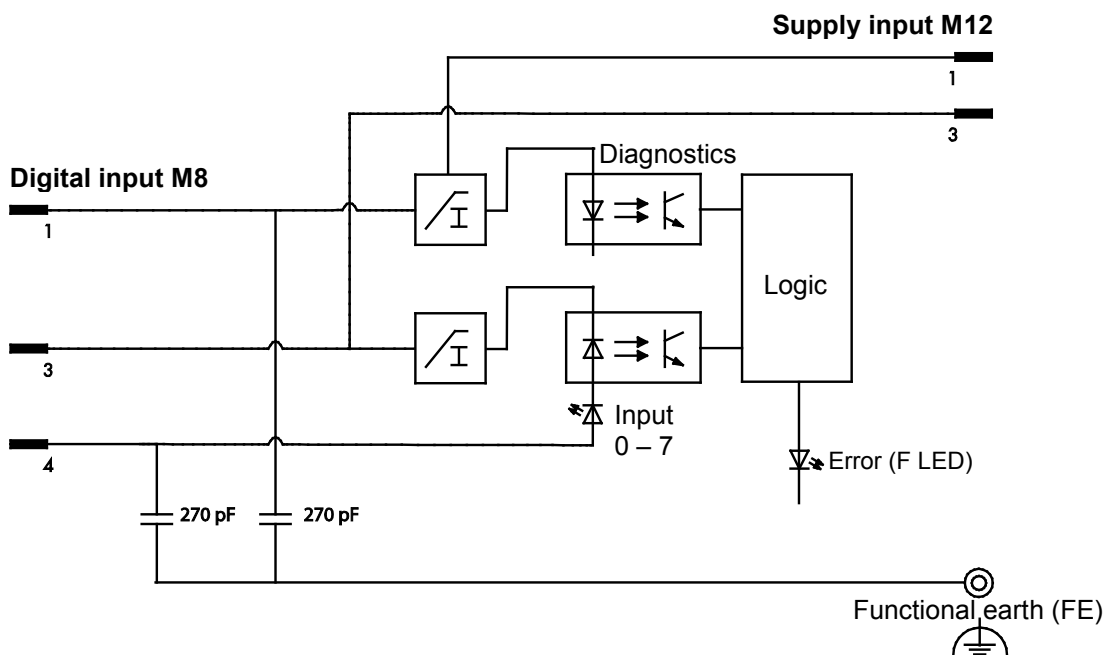


Figure 11: Schematic diagram

6.7 Dimensions

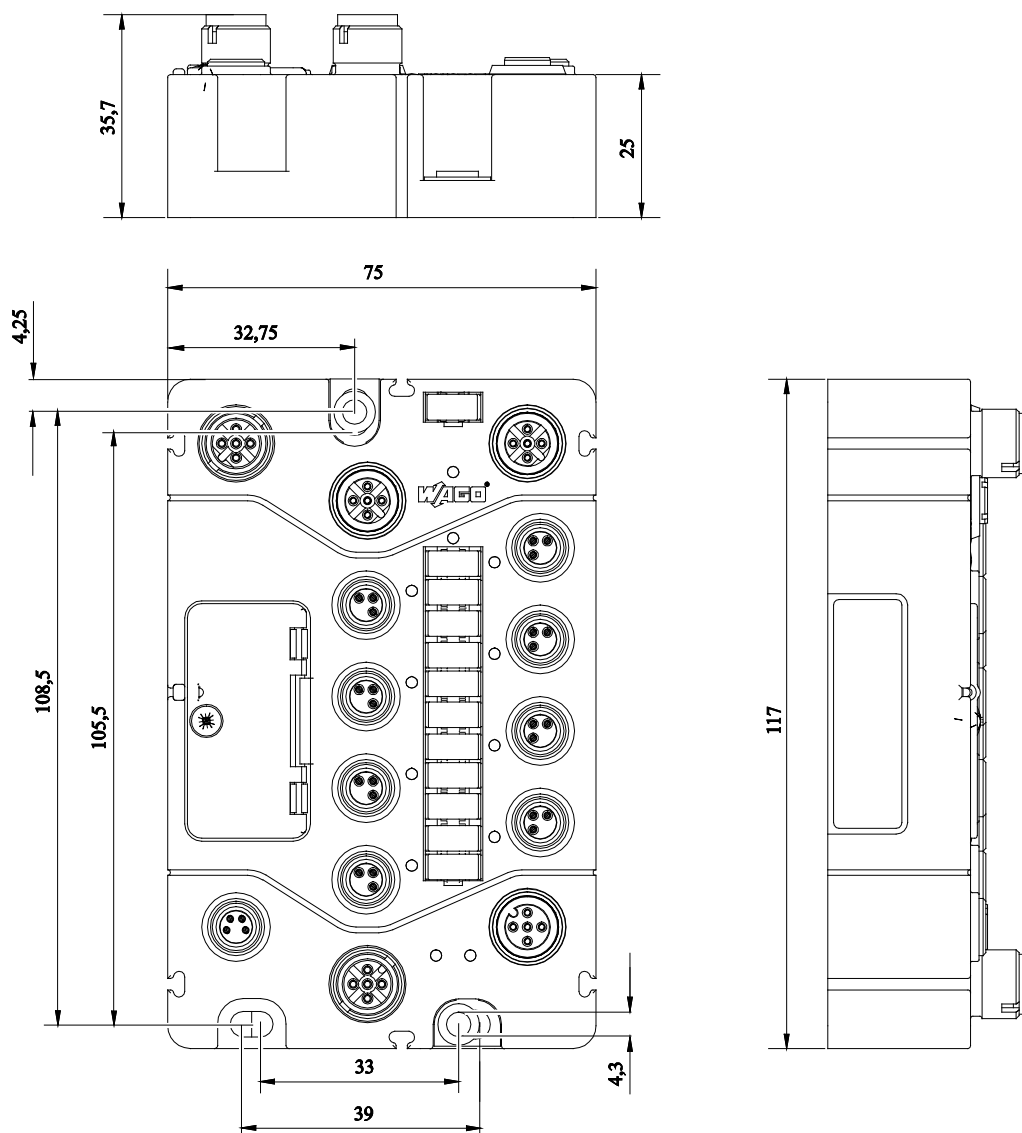


Figure 12: Dimensions of fieldbus coupler in mm

6.8 Technical Data



Note

Different technical data for applications in hazardous areas!

If the device is used in an application in the hazardous area, the technical data contained in the ATEX/IECEX certificate are binding in this application!

6.8.1 Device Data

Table 14: Technical data – Device data

Width	75 mm
Height	35.7 mm
Length	117 mm
Weight	Approx. 400 g

6.8.2 System Data

Table 15: Technical data – System data

Device Type	ETHERNET device
Connection type	M12 connectors, D coded, 4 poles
Baud rate	10/100 Mbit/s
Transmission medium	Copper cable
Station address	1 – 255 (last byte of IP address adjustable via operation panel)
Protocols	MODBUS/TCP, MODBUS/UDP, EtherNet/IP

6.8.3 Supply

Table 16: Technical data – Supply

Connection type	M12 connectors, A coded, 4 poles *
Protections	Reverse voltage protection for $U_{LS} + U_A$ and short-circuit protection for sensor supply
Current carrying capacity of the supply connections	Maximum 8 A (U_{LS} : 4 A, U_A : 4 A)
Supply voltage Logic and sensor voltage U_{LS} Actuator voltage U_A **	24 VDC (-25 % ... +30 %) 24 VDC (-25 % ... +30 %)
Supply current Logic and sensor current I_{LS} Actuator current I_A	Typically 125 mA + sensors (max. 400 mA) 5 mA

* Derating should be observed.

** Also required for supply transmission.

6.8.4 Communication

Table 17: Technical Data – Communication

Connection type	Shielded M12 connector, B coded, 5 poles
Number of expandable modules	64

6.8.5 Inputs

Table 18: Technical Data – Inputs

Number of inputs	8
Connection type	M8 connectors, 3 poles
Wire connection	2- to 3-wire
Input Filter	Parametrizable
Input characteristic	Type 1, acc. to IEC 61131-2
Signal voltage 0	-3 VDC ... +5 VDC
Signal voltage 1	+15 VDC ... +30 VDC
Input wiring	High-side switching
Input voltage	24 VDC (-30 VDC < U_{IN} < +30 VDC)
Input current	Typically 2.8 mA
Cable length, unshielded	≤ 30 m
Wrong connection of inputs	No effect

6.8.6 Configurable Functions

Table 19: Technical Data – Configurable Functions

Fieldbus coupler	See section “Parameterization”
Digital inputs Input filter (per channel) Inversion (per channel) Online simulation (per channel)	0.1/0.5/3/15 /20 ms/filter off on/off (only via FDT/DTM) Lock/unlock; simulation value: 0/1 (only via FDT/DTM)
Diagnostics (per module)	Enable/disable

6.8.7 Diagnostics

Table 20: Technical Data – Diagnostics

Per module	Short circuit/wire break of sensor supply
Per module	Undervoltage ($U_{LS} + U_A$)

6.8.8 Process Image

Table 21: Technical Data – Process Image

Input process image	2048 bytes
Output process image	2048 bytes

6.8.9 Indicators

Table 22: Technical Data – Indicators

MS: ETHERNET module status	LED (green/red)
ACT/LNK 1: ETHERNET FB1 Data exchange/network connection	LED (green)
CS: Controller status	LED (green/red)
NS: ETHERNET network status	LED (green/red)
ACT/LNK 2: ETHERNET FB2 Data exchange/network connection	LED (green)
X1 ... X8: Input signal status	LED (yellow)
F: Error status	LED (red)
U _{LS} + U _A : Supply status	LED (green)
SBM: Status of S-BUS Master	LED (green/red)
LED indicators	Non-latching

6.8.10 Service Interface COM

Table 23: Technical Data – Service Interface

Type	USB standard 1.1
Connection type	M8 connectors, 4 poles

6.8.11 Isolation

Table 24: Technical Data – Isolation

Channel - Channel	No
U _{LS} , U _A , S-BUS, fieldbus	500 VDC each

6.9 Approvals

The following approvals have been granted to 767-1301 fieldbus coupler:



Conformity Marking



cUL_{us} UL508

The following Ex approvals are pending for 767-1301 fieldbus coupler:



BVS 15 ATEX E098X

II 3 G Ex nA IIC T5 Gc

II 3 D Ex tc IIIB T90°C Dc

IECEX BVS 15.0083X

Ex nA IIC T5 Gc

Ex tc IIIB T90°C Dc

6.10 Standards and Guidelines

The fieldbus coupler 767-1301 meets the following standards and guidelines:

EU EMC Directive	2014/30/EU
EMC CE-Immunity to interference	acc. to EN 61000-6-2
EMC CE-Emission of interference	acc. to EN 61000-6-4
EU Directive	2014/34/EU
Explosive atmosphere Devices – General requirements	EN 60079-0
Explosive atmosphere Equipment protection by type of protection “n”	EN 60079-15
Explosive atmosphere Equipment dust ignition protection by enclosure “t”	EN 60079-31
Explosive atmospheres General requirements	IEC 60079-0
Explosive atmospheres Equipment protection by type of protection “n”	IEC 60079-15
Explosive atmospheres Equipment dust ignition protection by enclosure “t”	IEC 60079-31

7 Mounting

The fieldbus coupler can be fastened directly to your system using screws. It can also be mounted on a carrier rail using an adapter (WAGO accessory) or fastened to a profile rail using a surface mounting profile (WAGO accessory).

For mounting on a flat surface, WAGO offers spacers to assist in the mounting process that can be inserted between the 767 Series component. This helps by providing sufficient mounting distance for compact direct mounting, as well as eliminating gaps where dirt could accumulate. A cable tie can be fastened through each of two mounts in the spacer, which together serve to relieve strain from the sensor and actuator cables.

7.1 Information on Mounting

The following information shall always be observed:

- Disconnect the power supply from the system before you start with installation.
- The maximum diameter of the drill hole of the fieldbus coupler's mounting holes is not to exceed 4 mm.
Otherwise, a full contact with function earth (FE) socket of the fieldbus coupler not be guaranteed. This may lead to restrictions in the shielding.
- The cover cap of the DIP switch must be closed and bolted.
- To protect the fieldbus coupler from tensile forces that may arise, do not bridge spaces with it.
- Screw down the fieldbus coupler down only on flat contact surfaces to protect it from warping.
- Ensure that the connectors are not soiled during installation. Dirt and other such substances damage the contacts, allowing corrosion to develop.
- To avoid damaging the fieldbus coupler, do not mount it in shear areas of moving devices.
- Arrange for a sufficient potential equalization in your system.
- Use all mounting holes to mount the fieldbus coupler to your system so all FE connections lie on a ground potential.

Any mounting position is possible.



Note

Ensure a safe mounting position!

In explosion hazardous environments no increased mechanical loads must be present at the installation location. If shocks are possible, a shock protection must be installed between the device and the possible source of the shock.

7.2 Tools and Accessories Required for Mounting

Depending on the mounting type, the following tools are required for installation:

- A screwdriver for M4 fixing screws
- Drilling machine to pre-drill the mounting holes for the fieldbus coupler to be mounted to the system and, if applicable, for the imperforated carrier rail.
- M4 thread cutter (bottoming tap or hand tap set)

The WAGO accessories listed below are required for mounting. The associated item numbers can be found in the “Accessories” section.

- Carrier rail adapter, including fixing screws and perforated or imperforated carrier rails (DIN 35 x 7.5) according to EN 60715, also available from WAGO.

or

- Profile adapter, including fixing screws
- Spacer (optional)

Three M4x12 screws are required for direct mounting of the fieldbus coupler. The length of the screw shaft is to be selected according to the mounting type.

Bore measurements

When fastening the 767 Series component without a threaded hole, the clearance hole must not be wider than 4mm so as to ensure safe contact of the FG (functional ground) connections.

7.3 Direct Mounting on Your System

Mount the fieldbus coupler directly on a level surface of your system, without using WAGO accessories. Direct mounting of the fieldbus coupler is to be carried out as follows:

1. Disconnect the power supply from those devices on which you wish to mount the fieldbus coupler.
2. Mark the drill holes using the hole drilling template printed on the packaging. You can also hold the fieldbus coupler in the desired position and mark the drill holes. Ensure that there is sufficient space around the 767 Series component to enable you to connect all cable without problems.

Note



Direct Mounting

We recommend using WAGO spacers for compact direct mounting. If these are used, the resulting additional distance from the second 767 Series component is to be noted. See section “Mounting the Module” > “Mounting the Spacer in the Case of Compact Arrangement”.

3. Fasten the fieldbus coupler to the grounded frame of your system or to another grounding point with the M4x12 screws via the three mounting holes.

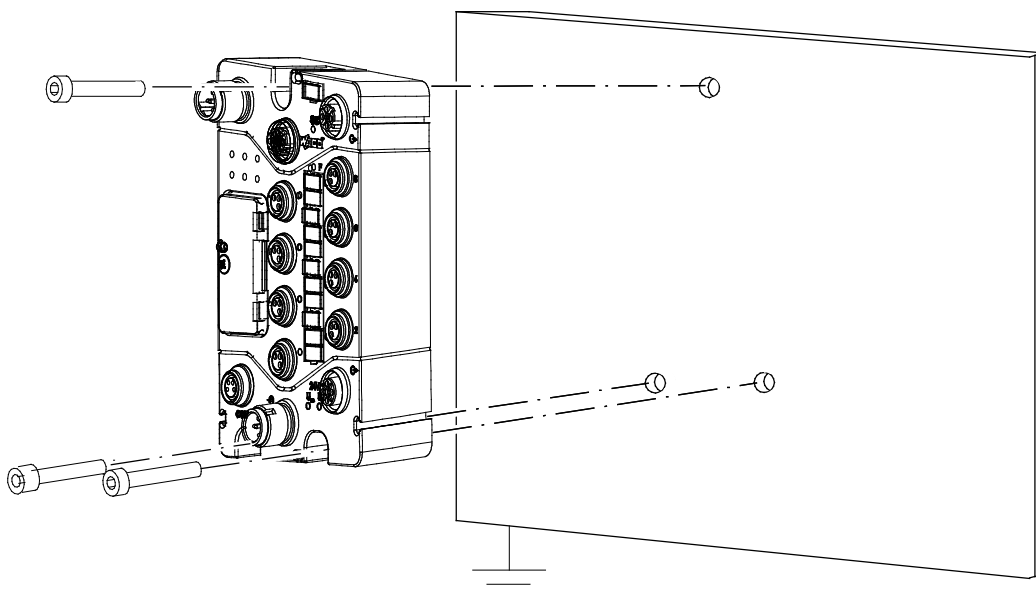


Figure 13: Mounting the fieldbus coupler on the grounded system

7.4 Mounting on a Carrier Rail (only with WAGO Accessories)

7.4.1 Fastening the Carrier Rail Adapter to the Fieldbus Coupler

A carrier rail adapter is required to mount the fieldbus coupler on carrier rails.

Screw together the fieldbus coupler and carrier rail adapter using the M4 threaded screws provided, as shown in the following figure.

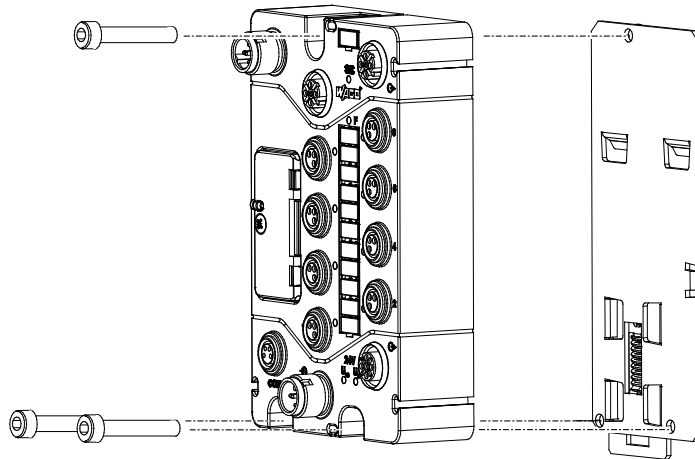


Figure 14: Fastening the fieldbus coupler to the carrier rail adapter

7.4.2 Fastening the Fieldbus Coupler with Carrier Rail Adapter to a Carrier Rail

In order to provide a clear representation, the carrier rail adapter in the figure below is shown without the fieldbus coupler.

When mounting the fieldbus coupler to a carrier rail (DIN rail 35 x 7.5) using a carrier rail adapter, proceed as follows:

1. Disconnect the power supply from those devices on which you wish to mount the fieldbus coupler.
2. Set the fieldbus coupler onto the edge of the carrier rail (61) with the two notches (60).
3. Press the undersurface against the lower carrier rail edge until the latch (62) locks in place.

Note



Use end stops

When mounting the rail vertically or if shock or vibration loading should occur, the use of end stops (item no.: 249-116 or 249-117) for stabilization is required.

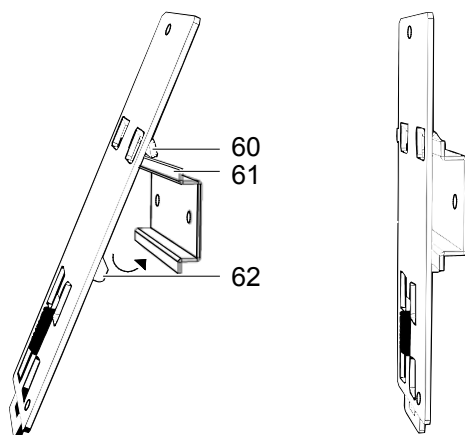


Figure 15: Mounting the carrier rail adapter

7.5 Mounting on a Profile Rail (only with WAGO Accessories)

7.5.1 Fastening the Profile Adapter to the Fieldbus Coupler

Aside from using carrier rail adapters to fasten the fieldbus coupler, you also have the option to fasten it to a profile rail using the profile adapter and nuts, provided that this mounting type is supported by your system. You are to supply the necessary nuts.

Screw together the fieldbus coupler and the profile adapter using the M4 threaded screws provided, as shown in the following figure.

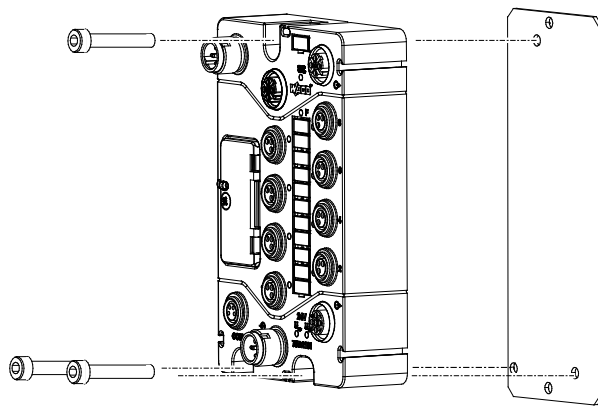


Figure 16: Fastening the fieldbus coupler to the profile adapter

7.5.2 Fastening the Fieldbus Coupler with Profile Adapter to a Profile Rail

To fasten the fieldbus coupler to a profile rail of your system, two nuts are required with one screw each (length of screw threads must be compatible with your system).

1. Disconnect the power supply from those devices on which you wish to mount the fieldbus coupler.
2. Insert the two screws into the holes above and beneath the fastened fieldbus coupler on the profile adapter.
3. Fasten an appropriate nut on each of these screws.
4. Insert the profile adapter with the attached fieldbus coupler into the profile rail of your system. Position it and tighten the screws.

7.6 Replacing the Marker Card and Strip

A blank module marker card (11) and channel marker strip (12) are attached when delivered. For labeling them, proceed as follows:

1. Press the slot screwdriver (maximum slot width: 3mm) into the small opening under the cover and lever it up.
2. Remove the protective cover.
3. Mark the marker card resp. marker strip with a waterproof pen.
4. Reinsert the protective cover and press it firmly in place.

New cards, strips and pens can be obtained from WAGO.

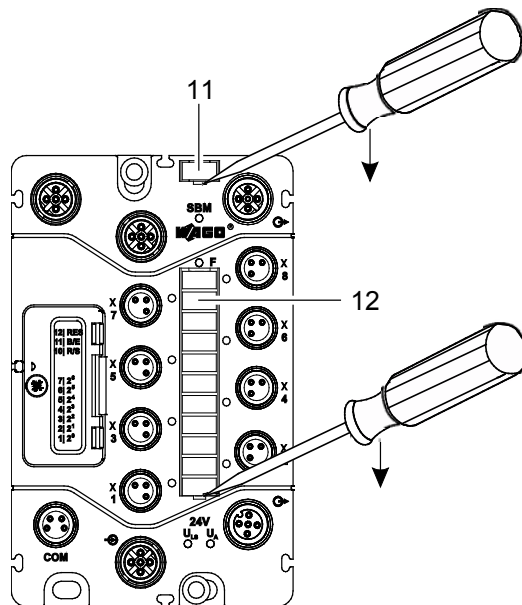


Figure 17: Replacing the marker card and strip

7.7 Mounting the Spacer in the Case of Compact Arrangement

By using the spacer, a sufficient mounting distance can be achieved when directly mounting the 767 Series components, and gaps can be eliminated where otherwise dirt and other substances could accumulate. In addition, it is possible to optimize the cable routing of the sensors and actuators. For this purpose, two fastening lugs each are included on the spacer for cable ties.

1. Disconnect the power supply from those devices on which you wish to mount the fieldbus coupler.
2. The spacer can only be inserted into the appropriate openings of the fieldbus coupler from the bottom. To bind both components, place the fieldbus coupler on the spacer or push the spacer from the bottom into the coupler.
3. Fasten the components on a flat surface by fastening the fieldbus coupler to the grounded frame of your system or to another grounding point with three M4 screws via the mounting holes.

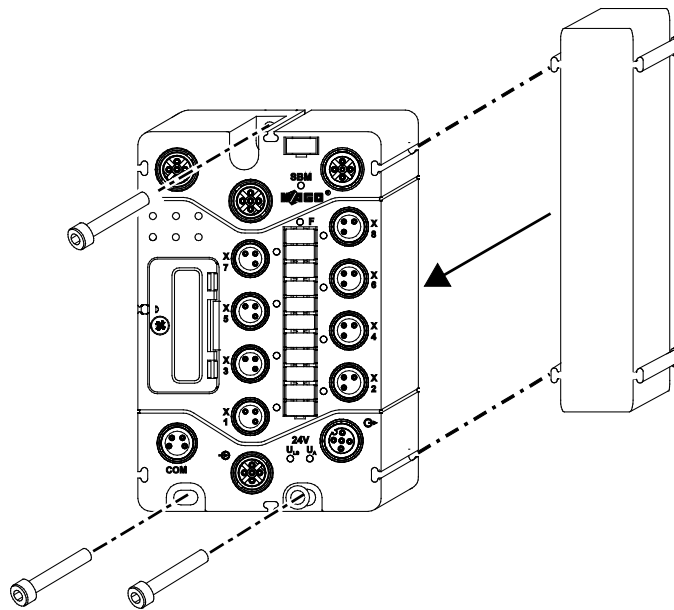


Figure 18: Attaching a spacer

4. When attaching 767 Series component, only one 767 component connected with a spacer can be attached and screwed on to the preceding component due to the mounting direction. The last 767 component is fastened without a spacer.

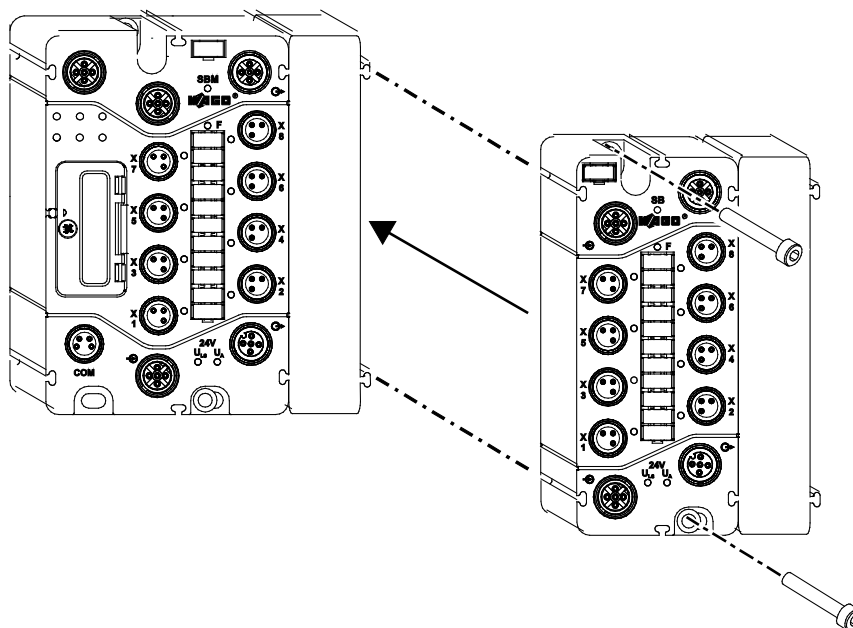


Figure 19: Attaching another 767 component to the fieldbus coupler

8 Connecting Data and Supply Cables

8.1 Notes



DANGER

Electric voltage!

Operate the 767 Series components exclusively with 24 VDC PELV (Protective Extra Low Voltage) or SELV (Safety Extra Low Voltage) voltage sources. Failure to comply may result in electric shock.

NOTICE

The highest current carrying capacity of the supply contacts is 4 A!

Always observe the maximum current carrying capacity per supply line (U_{LS} , U_A) for each 767 Series component and the overall power consumption for all 767 components. Neither of these values shall exceed 4 A since an increase in current causes the contacts to overheat and damages the 767 Series components. Information regarding the power demand of each 767 Series component can be found in the corresponding data sheet, which is available from www.wago.com.

NOTICE

Exposed connections!

If connections have not been closed with protective caps, liquid or dirt can penetrate the components of the 767 Series module and ruin it. Therefore, close all unnecessary connections with protective caps, which must be ordered separately, in order to maintain the IP67 degree of protection. (See section “Accessories” of the fieldbus coupler/controller manual.)

- The connectors must be disconnected from the power supply when screws are tightened.
- Tighten the connectors by hand. To achieve the required torque (see below) for the connector, use the torque wrench with the order number **206-701**.

Torque for M8 connectors: 0.6 Nm

Torque for M12 connectors: 1.0 Nm

NOTICE

Use torque wrench 206-701!

Only use the specified torque wrench. Using mechanical tools can cause the threads to strip.

In this case, replace the module!

- Observe the exact positioning (coding) between plug and socket.

- For both power supply and S-BUS (system bus), use only pre-assembled WAGO system cables. This is the only means whereby the specified characteristics of the technical data can be achieved.
- Keep all cables a sufficient distance away from electromagnetic sources of interference in order to maintain a high level of interference resistance of the 767 system against electromagnetic emissions.
- Observe the minimum bending radiuses of the WAGO system cable. For more information, see the technical data at www.wago.com.
- When laying all cable, ensure that you do not lay it in shear areas of moving machine parts.
- The cable shield of the fieldbus cable must be connected with functional ground on both ends over a wide area.
- Observe the correct layout of the potential equalization.
- Do not use drop lines under any circumstances. This can lead to amplified line reflections and signal distortions, which greatly impair the transmission quality.

8.2 Required Accessories

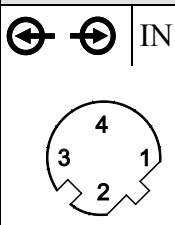
The WAGO accessories listed below are required for connecting the data and supply cable. The associated item numbers can be found in the “Accessories” section.

- S-BUS M12 terminator, IP 67
- S-BUS and supply cables, pre-assembled on both ends, IP 67
- USB cable pre-assembled on both ends, IP 67

8.3 Connecting the Fieldbus Cable

The following table outlines the connection assignments for the ETHERNET connections:

Table 25: ETHERNET connection assignments

Connection	Contact	Description
	1	TX+
	2	RX+
	3	TX-
	4	RX-
	Connecting thread	Shielded

If you do not use a pre-assembled ETHERNET cable, a shielded M12 plug with the IP 67 degree of protection is to be connected to this.

To connect a cable which is pre-assembled on one end only to an RJ-45 plug, proceed as follows:

Contact	Connection	Color		Contact of RJ-45 plug
1	TX+	Yellow	→	1
2	RX+	Blue	→	2
3	TX-	Brown	→	3
4	RX-	White	→	6

Because the Auto MDI(X) functionality for the respective ETHERNET connection FB1 or FB2 is activated, a cross-over cable is not necessary. This functionality automatically detects the direction for sending data and receiving data so that it is irrelevant which cable type is used (crossed or uncrossed).

8.3.1 Connecting a Fieldbus Coupler to an ETHERNET Network

To connect the fieldbus coupler to an ETHERNET network, proceed as follows:

1. Disconnect the power supply from those devices on which you have mounted the fieldbus coupler.
2. Connect the fieldbus coupler with the ETHERNET network by plugging the socket of the ETHERNET cable (F) into the IN connection $\oplus$ (1).
3. Tighten the socket using the knurled-head screw.

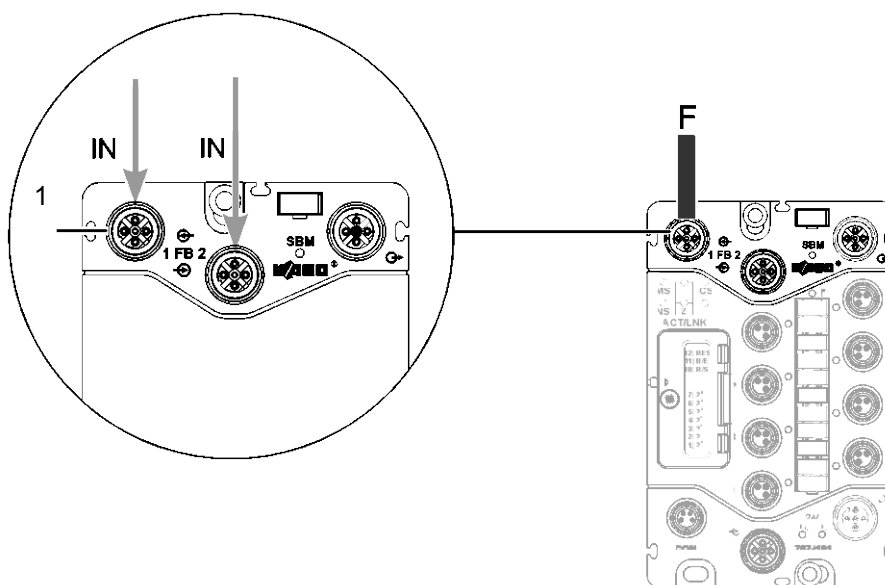


Figure 20: The fieldbus coupler is connected to the ETHERNET network

8.3.2 Connecting Several Fieldbus Couplers inside an ETHERNET Network

The network topology in the following figure consists of a mixed star and line topology. Up to 20 fieldbus couplers can be connected to the ETHERNET network on the line topology. An ETHERNET switch is required to set up a star topology or a mixed topology. The number of fieldbus couplers on a star topology is limited only by the IEEE 802.3 ETHERNET specification.

The connection of several fieldbus couplers with the ETHERNET network can be carried out as shown in the following example:

1. Disconnect the power supply from those devices on which you have mounted the fieldbus coupler.
2. For the star topology, connect the respective ETHERNET cable (W1, W2) with the IN connection $\oplus$ (1) of a fieldbus coupler and an ETHERNET switch, as shown in the following figure. Tighten the plugs of the ETHERNET cable.

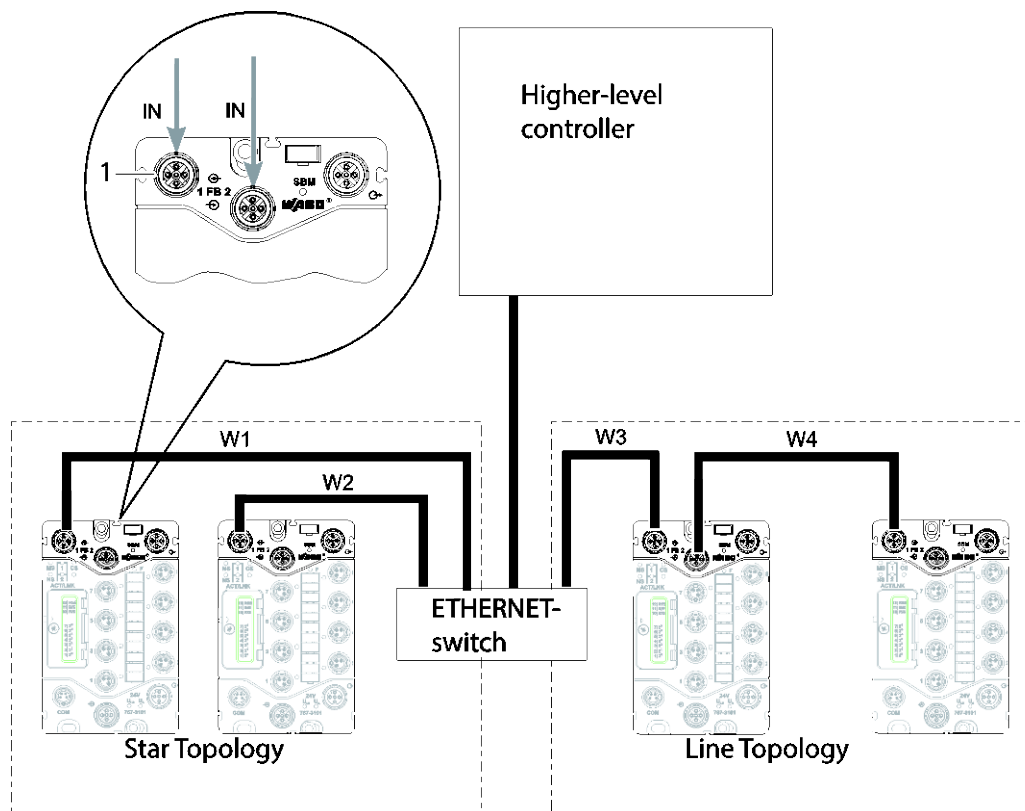


Figure 21: Example setup of a mixed topology with four fieldbus couplers

3. For a line topology, connect the ETHERNET cables (W3, W4) with the connections IN+ (1) and IN- (2) on the fieldbus coupler, as shown in the following figure. Tighten the plugs of the ETHERNET cable.

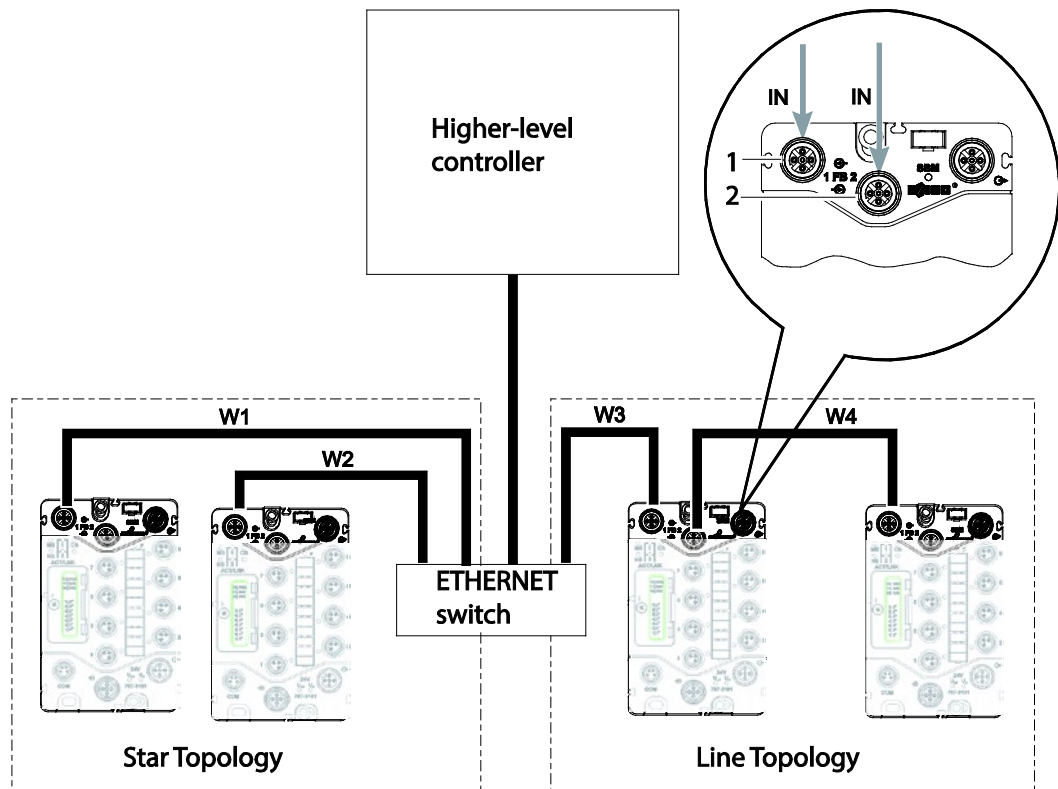


Figure 22: Example setup of a mixed topology with four fieldbus couplers

8.4 Connecting the S-BUS Cable

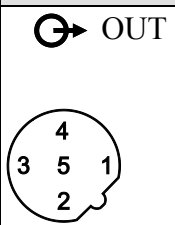
The S-BUS is used for communication between the fieldbus coupler and the connected I/O modules.

Requirement:

- A WAGO S-BUS cable pre-assembled on both ends is readily available to you. This is necessary for optimal signal transmission.
- The S-BUS terminator is available to you, which is necessary for communication.

The following table outlines the assignment of the S-BUS connection.

Table 26: S-BUS connection assignment

Connection	Contact	Description
	1	TD +
	2	TD -
	3	RD -
	4	RD +
	5	GND
	Connecting thread	Shielded

To connect the S-BUS cable to fieldbus couplers and I/O modules, proceed as follows:

1. Disconnect the power supply from those devices on which you have mounted the fieldbus coupler.
2. Connect the S-BUS cable (S1) with the OUT connection  (3) of the fieldbus coupler and the IN connection  (8) of the subsequent I/O module. For example, if two I/O modules have been connected to the fieldbus coupler, connect the S-BUS cables (S1, S2) to the associated IN and OUT connections, as shown in the following figure.
3. Tighten the plugs and sockets using the knurled-head screws.
4. Attach the S-BUS terminator (T) to the last I/O module as shown in the figure and tighten it.

If you do not connect any I/O modules to the S-BUS, screw the S-BUS terminator (T) onto the S-BUS OUT output  (3) of the fieldbus coupler.

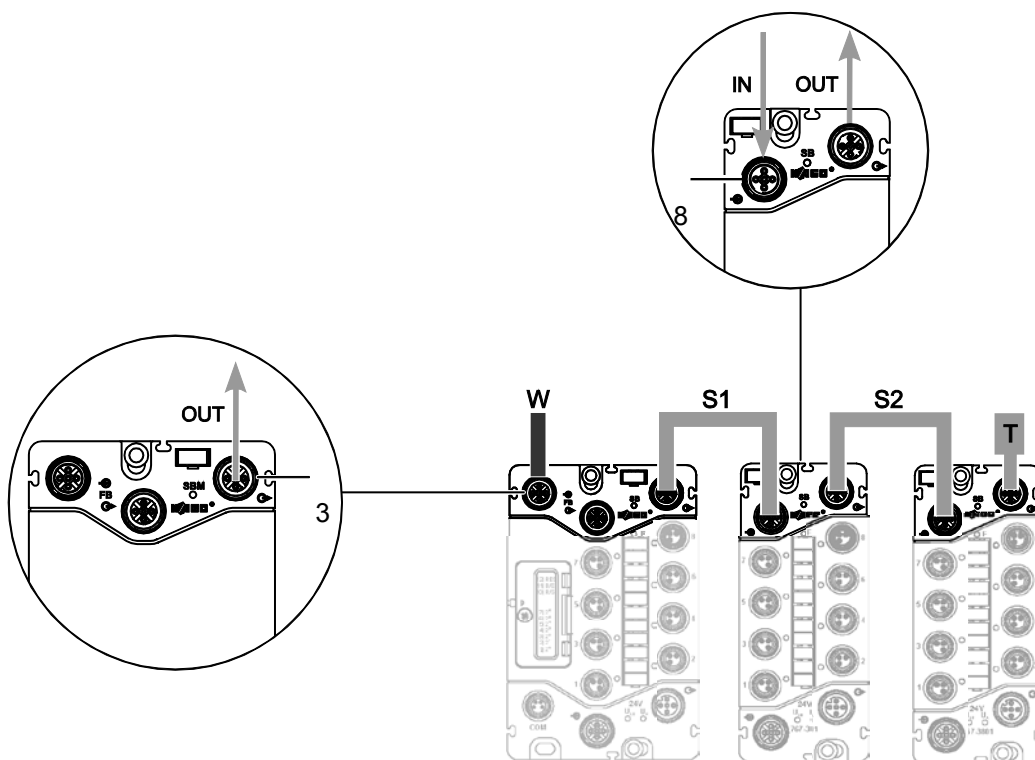


Figure 23: S-BUS is connected to one fieldbus coupler and two I/O modules

8.5 Connecting the Supply Cable

The supply cable provides power to the fieldbus coupler and the connected I/O modules.

Requirement:

- A supply cable for +24 VDC and 0 VDC must be connected to the supply input (6 in the figure on the next page) via appropriate fuses.
- The WAGO supply cable pre-assembled on both ends must be available (K1 and K2 in the figure on the following page).

The following table outlines the assignment of the supply connections:

Table 27: Supply connection assignment

Connection		Contact	Description
 IN	 OUT	1	24 VDC U_{LS}
		2	24 VDC U_A
		3	0 V U_{LS}
		4	0 V U_A

NOTICE

The highest current carrying capacity of the supply contacts is 4 A!

Always observe the maximum current carrying capacity per supply line (U_{LS} , U_A) for each 767 component and the overall power consumption for all 767 components. Neither of these values shall exceed 4A since an increase in current causes the contacts to overheat and damages the 767 components. Information regarding the power demand of each 767 component can be found in the corresponding data sheet, which can be downloaded at www.wago.com.

To connect the supply cable to the fieldbus coupler and I/O modules, proceed as follows:

1. Disconnect the power supply from those devices on which you have mounted the fieldbus coupler.
2. Connect the power supply cable (K0) with the fieldbus coupler by plugging the socket in the IN connection  (6) of the fieldbus coupler.
3. Tighten the socket using the knurled-head screw.
4. Connect the power supply transmission cable (K1) with the OUT connection  (5) of the fieldbus coupler and the IN connection  (8) of the subsequent I/O module.
For example, if two I/O modules have been connected to the fieldbus coupler, connect the power supply transmission cables (K1, K2) to the associated IN and OUT connections as shown in the following figure.
5. Tighten the plugs and sockets using the knurled-head screw.

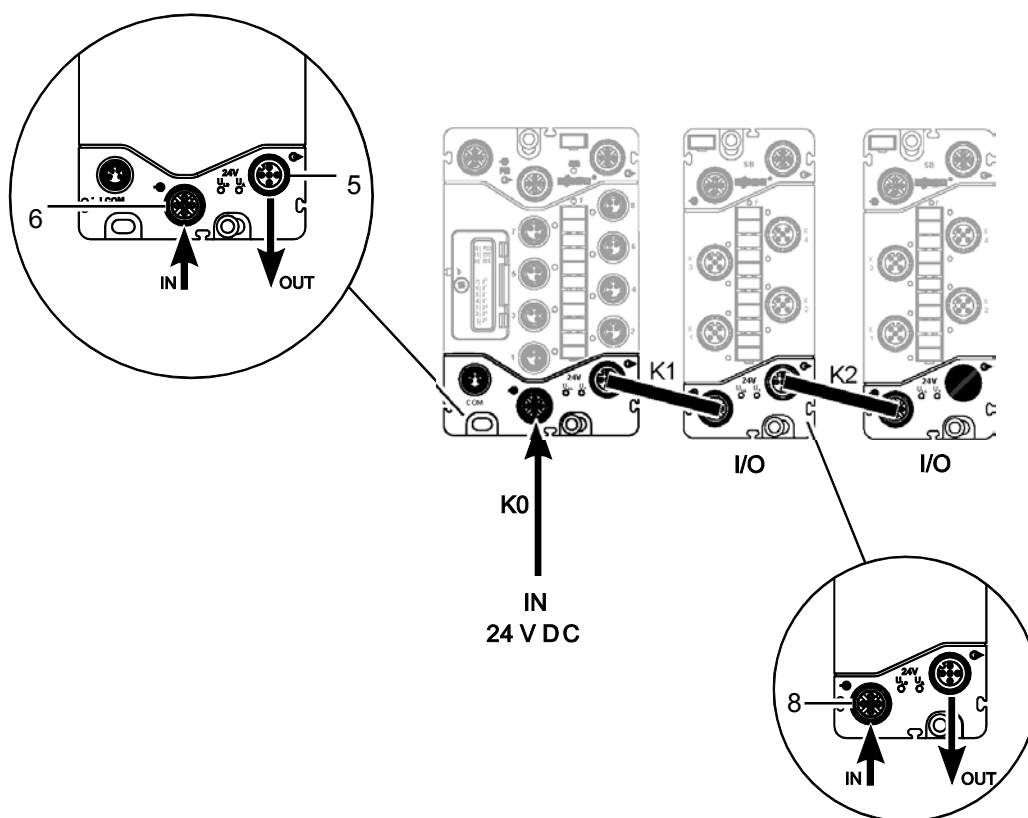


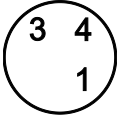
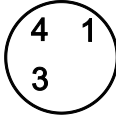
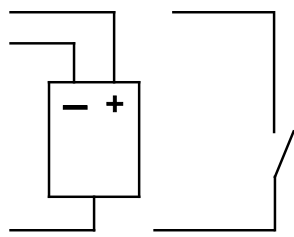
Figure 24: Supply cable connected with fieldbus coupler and I/O modules

8.6 Connecting the Sensor Cables

The sensor cables provide power to the connected sensors and transmit the sensor signals.

When using cables that have not been pre-assembled, make sure that these cables are equipped with M8 plugs rated to IP 67. The following table outlines the assignment of the sensor connections:

Table 28: Connection assignment of digital inputs

Connection		Connection diagram
IN 	IN 	1: 24 V 3: 0 V U_{LS}  4: Input

NOTICE

The highest current carrying capacity of the supply contacts is 4 A!

Ensure that the sensors are supplied with power from the U_{LS} supply line. The sensors' power consumption is to be taken into consideration when determining the present power demand for the U_{LS} supply line.

NOTICE

The total maximum power consumption of the sensors must not exceed 400 mA!

Please note that the combined power consumption of all connected sensors is not to exceed 400 mA. The distribution of power among the existing connections is depending on the individual power requirements of the sensors.

To connect the sensors to the digital inputs X1 ... X8, proceed as follows:

1. Disconnect the power supply from those devices/machines on which you have mounted the fieldbus coupler.
2. Insert the sensor cable plug into a digital input socket (4) of the fieldbus coupler, and tighten it via knurled nut.
3. Screw a protective cap on all unused input sockets to ensure that IP67 degree of protection is provided.

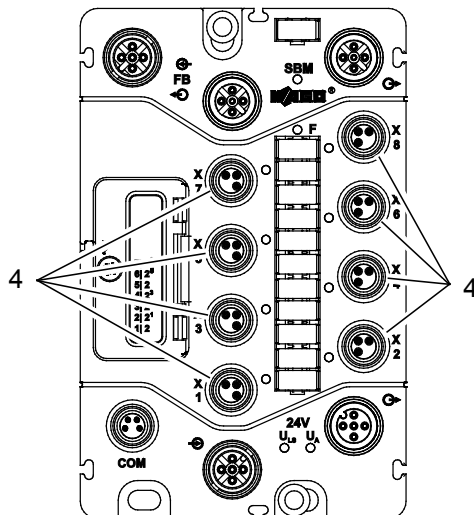


Figure 25: Digital inputs

8.7 Connecting the USB Cable

The fieldbus coupler's USB connection can be used to either configure the fieldbus coupler with an FDT/DTM frame application or to use general service functions. To use the USB connection, the USB driver “WAGO_767_USB_DRIVER_Setup” (item no.: 759-922) must be installed on your computer. This driver can be obtained on the Internet at www.wago.com.

The USB driver is also included on the “WAGOframe” CD-ROM (item no.: 759-370).

After installing the WAGO USB driver, the following COM port is supplied by the USB connection:

- **I/O-Service**
This COM port is needed to configure the fieldbus coupler using WAGOframe.

Note

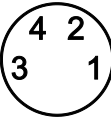


Communication disruption due to faulty data transmission

When using the USB connection, a faulty USB data transmission or an outage can cause communication disruptions. This can be due to additional or inappropriate USB distributors (hubs) or to USB cables that are too long (max. 5 m) or inappropriate. One should therefore refrain from using additional devices if possible.

When using a USB cable that has not been pre-assembled, M8 plugs with the IP 67 degree of protection are to be connected. The following table outlines the assignment of the USB connection:

Table 29: USB connection assignment

Connection	Contact	Description
IN 	1	+ 5 V
	2	- Data
	3	+ Data
	4	GND
	Connecting thread	Shielded

1. Connect your PC with the fieldbus coupler by inserting the USB cable plug into the fieldbus coupler's USB connection COM (7) and tightening it.
2. Switch on the fieldbus coupler. Please refer to section “Switching on the Fieldbus Coupler” for more information. After the fieldbus coupler has been switched on, your operating system detects a new device and installs the USB driver.

Note



Driver installation

During installation of the driver, an MS Windows message may appear several times informing you that the Windows Logo Test failed. Ignore this message and click **[Continue with installation]**.

3. When the USB connection is not in use, screw a protective cap on it to comply with the IP 67 degree of protection.

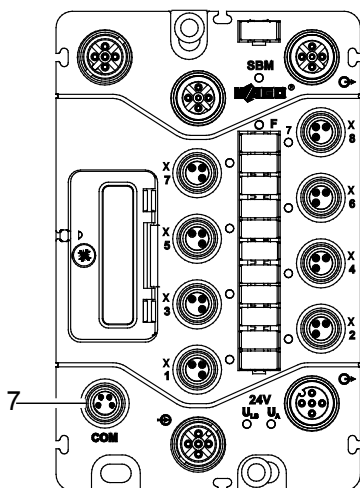


Figure 26: USB interface

9 Commissioning

NOTICE

Exposed connections!

If connections have not been closed with protective caps, liquid or dirt can penetrate the components of the 767 Series module and ruin it. Therefore, close all unnecessary connections with protective caps, which must be ordered separately, in order to maintain the IP67 degree of protection. (See section “Accessories” of the fieldbus coupler/controller manual.)

Before starting up the 767 node, ensure that the following requirements are met:

- The fieldbus coupler is mounted properly (see section “Mounting the Fieldbus Coupler”).
- All necessary supply and sensor lines, as well as the S-BUS and fieldbus cable, are securely fastened onto the appropriate connections (see section “Connection to the Data and Supply Cable”).
- The S-BUS terminator is fastened (see section “Connecting Data and Supply Cables”).
- An appropriate potential equalization is implemented in your system.
- The shielding is carried out properly.
- The power supply of the higher-level controller is switched on (see associated manual).

9.1 Determining the IP Address of the Host PC

For the host PC to be able to communicate with the fieldbus coupler in the ETHERNET network, both must be in the same subnet.

Note: A subnet is a logical division of a network.

Example:

Your host PC has the IP address 192.168.1.1 and the fieldbus coupler should be in the same subnet. For this to be the case, the first three figures of the PC and the fieldbus coupler must agree in the subsequent network mask (with a period separating each): **255.255.255.0**

Host PC

IP address	192.168.1.1
Network mask	255.255.255.0

Subnet address range for the fieldbus coupler

192.168.1.2 ... 192.168.1.254

To determine the IP address of the host PC (with the MS Windows operating system) using the MS DOS prompt, proceed as follows:

1. Click on "Start" and select "Run".
2. Enter the command `cmd` and press the Enter key. A prompt opens.
3. Enter the command `ipconfig` and press the Enter key.
4. The IP address, subnet mask and standard gateway, including the appropriate parameters, are displayed.
5. Now select an IP address for your fieldbus node which must be in the same network as your PC.
6. Take note of the selected IP address:

IP address of your fieldbus node: ----- .----- .----- .-----

9.2 Assignment of an IP Address

To set up a communication between a PC and the fieldbus coupler, each device must be in the position to send data to the other. So that the data can arrive at the right place, the receiver must be clearly specified (addressed). This takes place in IP networks with an IP address.

The fieldbus coupler can obtain its IP address dynamically (from a server) or it can be configured with a static (fixed) IP address.

The dynamic assignment of the IP address can be carried out via the BootP or DHCP protocol in the web-based management or in WAGOframe. Dynamically assigned IP addresses are not saved however. Therefore, a BootP or DHCP server must be available for each restart.

You can configure an IP address via:

- the DIP switch on the fieldbus coupler,
- via web-based management or
- the "WAGOframe" configuration software.

To access the web-based management (WBM) in a browser, the fieldbus coupler requires an IP address. This initial IP address can be assigned via the DIP switch using WAGOframe.



Note

Assignment of dynamic IP addresses

In the default status, the assignment of dynamic IP addresses is activated via the BootP protocol.

9.2.1 Assigning an IP Address via BootP

In the default status, IP address allocation is activated via the BootP protocol. Assigning the IP address using the BootP protocol is illustrated here with the example of the WAGO BootP server.

Requirement:

The WAGO BootP server must be installed on your PC. You can obtain the BootP server on the "Tools & Docs" CD or on the WAGO website.

Configuring the WAGO BootP server

In order to communicate with the fieldbus coupler in the local network, the MAC address of the fieldbus coupler must first be specified and an IP address must then be assigned.

1. Take note of the MAC address (51) of the fieldbus coupler. This can be found on the label on the side of the fieldbus coupler.

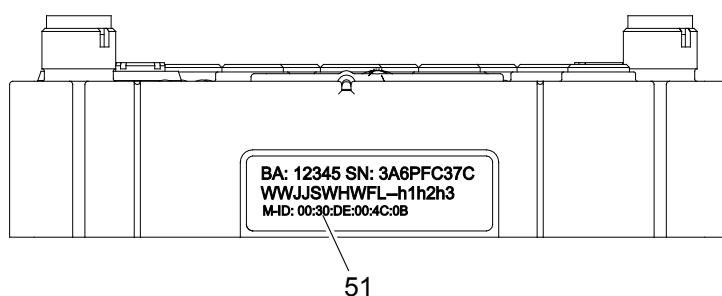


Figure 27: Example of a MAC address on the adhesive label on the left side of the fieldbus coupler

2. Turn on your PC.
3. In the "Start" menu, start the WAGO BootP server by navigating to **Programs >WAGO Software > WAGO BOOTP Server**.
4. Open the configuration file in which you are assigning the MAC address of an IP address from the same network. To do this, click **[Edit BootPtab]** in the BootP server. The configuration file will then be opened.

5. Click on the selected line of the configuration file:

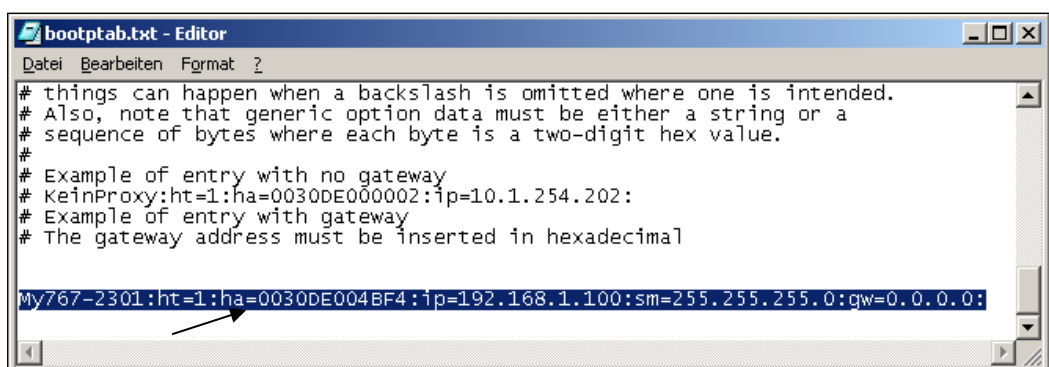


Figure 28: Configuration file (Example)

6. Replace the 12-character MAC address after "ha=" (see arrow) with the address printed on the label (51).
7. Enter an IP address after "ip=". In the example shown here, this is 192.168.1.100. Separate the individual numbers with a decimal point.
8. To address more than one fieldbus node, add a line for each node with the corresponding assignment for each additional fieldbus coupler to the bootptab.txt file. Repeat steps 5 to 7 for this.
9. Save the new settings in bootptab.txt file. To do this, click on "File" in the menu and select "Save".
10. Close the editor.

Table 30: Explanations of the configuration line (Example)

Parameter	Description
My767-2301:	Arbitrary name of ETHERNET node.
ht=1	Network hardware type. For ETHERNET, this is 1.
ha=0030DE004BF4	MAC ID of adhesive label on the side of the fieldbus coupler.
ip=192.168.1.100	IP address for the fieldbus coupler, which is connected to the same network as the host PC.
gw=0.0.0.0	IP address for the gateway. For a local network, you do not need to specify a gateway.
Sm=255.255.255.0	Subnet mask of the subnet to which the fieldbus coupler should belong.

Assigning an IP address using the WAGO BootP server

1. To start the BootP server click the button **[Start]** in the BootP dialog window that is opened. Various messages will be displayed in the window. The error messages indicate that some services (e.g. port 67, port 68) in the operating system have not been defined. You can ignore these error messages.

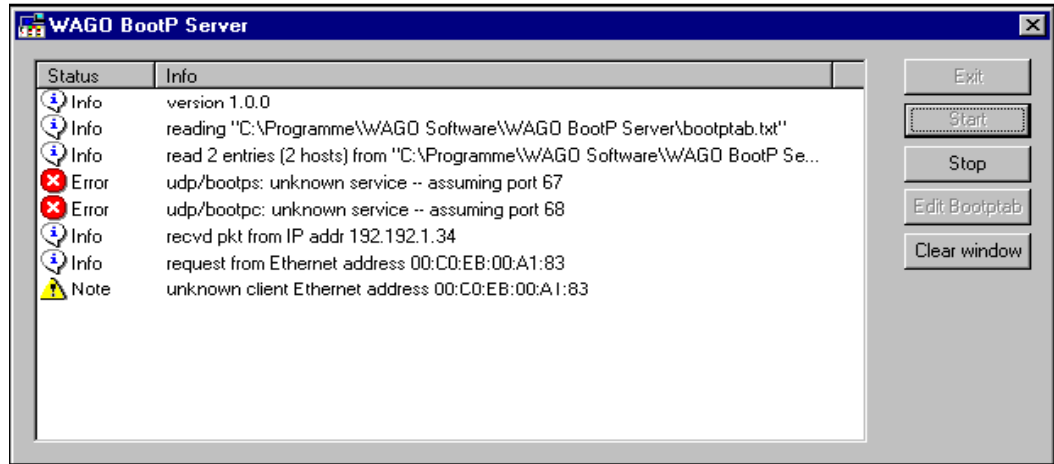


Figure 29: Dialog window of the WAGO BootP server with messages

2. Restart the fieldbus coupler by disconnecting it from the power supply and then reconnecting it.

A request appears from the fieldbus coupler. The BootP server replies that the IP address has been accepted (no errors). The IP address is now temporarily available in the fieldbus coupler, but is not yet permanently saved. When restarted, the fieldbus coupler attempts to obtain a new IP address from the BootP server.
3. Click **[Stop]** and then **[Exit]** to close the BootP Server.
4. To permanently save the IP address in the fieldbus coupler, select the option "Static IP" in the "TCP/IP view of the web-based management. Or use WAGOframe by selecting "Device memory" under the "IP address obtained from" parameter.

9.2.2 Setting a Permanent IP Address using DIP Switches

To integrate the fieldbus coupler into the ETHERNET network, the fieldbus coupler must be assigned an IP address that is unique across the network. This can be done using DIP switches. The address can be any number between 1 and 254. In the default status, the top three bytes (network ID) are assigned "192.168.1." and the subnet mask 255.255.255.0. Use switches 1 – 8 to set the last byte (host ID) of the IP address. To do this, switch 9 (SN) must be set to "On".

Table 31: Default settings of DIP switch

Switch	1	2	3	4	5	6	7	8	9	10	11	12
Binary value/ Functions	2 ⁰ (1)	2 ¹ (2)	2 ² (4)	2 ³ (8)	2 ⁴ (16)	2 ⁵ (32)	2 ⁶ (64)	2 ⁷ (128)	Set Network	-	Boot/ Execute	Reset
Switch setting	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off

Requirement:

The fieldbus coupler must not be connected to the power supply.

If you were to set the IP address 192.168.1.100, you would proceed as follows:

1. Open the cover by unscrewing the M3 screw with a screwdriver.
2. Set switch 9 (SN) to "On" to activate an IP address by means of the DIP switch.
3. For Host ID 100 set switches 3, 6, 7 to "On".
($2^2 + 2^5 + 2^6 = 4 + 32 + 64 = 100$). Please see the figure on the next page.

Note



Set addresses

With the 8 available switches you can set addresses from 1 – 254. Addresses 0 and 255 are reserved and may not be used.

4. Close the cover and screw it securely in place to maintain degree of protection IP 67.



Note

Activate IP addresses

The new IP address is only active when the fieldbus coupler is connected to the power supply.

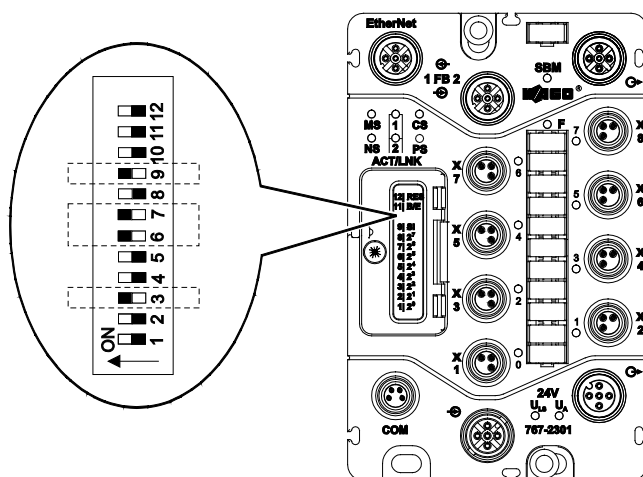


Figure 30: DIP set for the host ID 100

9.2.3 Assigning an IP Address via Web-Based Management

Detailed information on this can be found in Section "TCP/IP" View.

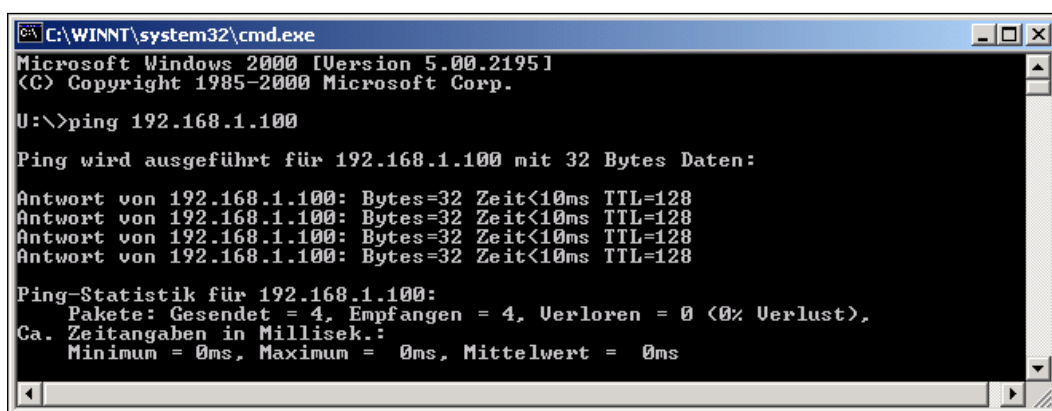
9.2.4 Assigning an IP address via WAGOframe

Detailed information on this can be found in Section "Parameter Setting via FDT/DTM".

9.3 Testing the Network Connection

Carry out a ping network function to check whether the fieldbus coupler can be reached at the IP address you have assigned in the network. To do this, open the prompt in MS Windows by clicking "Start" and selecting **Programs > Run**. Enter `cmd` in the dialog box and click **[OK]**.

1. In the DOS window, enter the command ping and the IP address of the fieldbus coupler; e.g.: `ping 192.168.1.100`.
2. Press the Enter key. Your PC sends out an inquiry that is answered by the fieldbus coupler. This reply appears in the DOS window. If the error message "Timeout" appears, the fieldbus coupler has not responded properly. You then need to check your network settings.



```
C:\WINNT\system32\cmd.exe
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

U:\>ping 192.168.1.100

Ping wird ausgeführt für 192.168.1.100 mit 32 Bytes Daten:

Antwort von 192.168.1.100: Bytes=32 Zeit<10ms TTL=128
Antwort von 192.168.1.100: Bytes=32 Zeit<10ms TTL=128
Antwort von 192.168.1.100: Bytes=32 Zeit<10ms TTL=128
Antwort von 192.168.1.100: Bytes=32 Zeit<10ms TTL=128

Ping-Statistik für 192.168.1.100:
    Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0 (0% Verlust),
    Ca. Zeitangaben in Millisek.:
        Minimum = 0ms, Maximum = 0ms, Mittelwert = 0ms
```

Figure 31: Example of a fieldbus node function test

3. If the test is completed successfully, close the DOS window.

9.4 Switching on the Fieldbus Coupler

After you have set the PROFIBUS station address on the fieldbus coupler, turn on the power supply. The fieldbus coupler and all connected I/O modules are ready for operation after the initialization phase.

Note



Disruption during operation

None of the 767 Series devices are to be removed or added during operation, as this causes a disruption in the 767 station.

10 Configuration

10.1 Access Configuration of Output Modules

The write access to the output module is only possible via MODBUS or EtherNet/IP.

The unique assignment is configured using WAGOframe or the Web-Based Management. This is possible for every I/O module.

The MODBUS protocol for the fieldbus coupler is factory activated (MODBUS TCP, MODBUS UDP). Thus, the output modules can only be modified using MODBUS.

If one fieldbus is exclusively activated (MODBUS or EtherNet/IP), all output modules are automatically assigned to this fieldbus. Activation or deactivation is possible via Web-based management system or via WAGOframe.

The following table gives an example of which fieldbus has write access. MODBUS is considered active when either MODBUS/TCP or MODBUS/UDP or both are activated. The activation steps are executed in ascending order (1 – 4).

Table 32: Example of access configuration for MODBUS and EtherNet/IP

No.	Status of activation	Write access
1	MODBUS/TCP: activate MODBUS/UDP: activated EtherNet/IP: deactivated	MODBUS
2	MODBUS/TCP: activated → deactivated MODBUS/UDP: activated EtherNet/IP: deactivated → activated	MODBUS Because no fieldbus was exclusively activated, the write access remains with MODBUS.
3	MODBUS/TCP: deactivated MODBUS/UDP: activated → deactivated EtherNet/IP: activated	EtherNet/IP
4	MODBUS/TCP: deactivated MODBUS/UDP: deactivated → activated EtherNet/IP: activated	EtherNet/IP Because no fieldbus was exclusively activated, the write access remains with EtherNet/IP.

10.2 The Web-Based Management (WBM)

The Web-Based Management (WBM) serves to configure the fieldbus coupler. An Internet browser is needed in order to use the WBM. Enter the IP address of the fieldbus coupler into the address bar (e.g., <http://192.168.1.100>).

The WBM is password-protected; therefore, you will be prompted to enter a password after selecting a link from the navigation bar. The user names and passwords are explained in Section "User Administration".

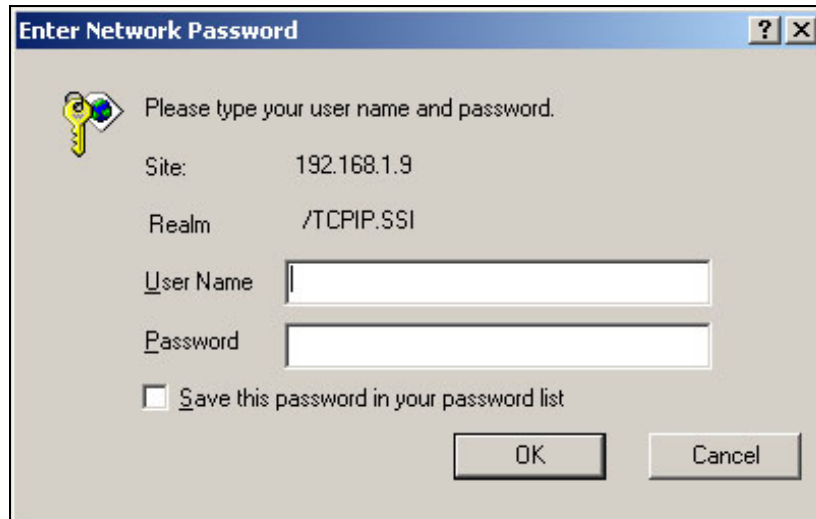
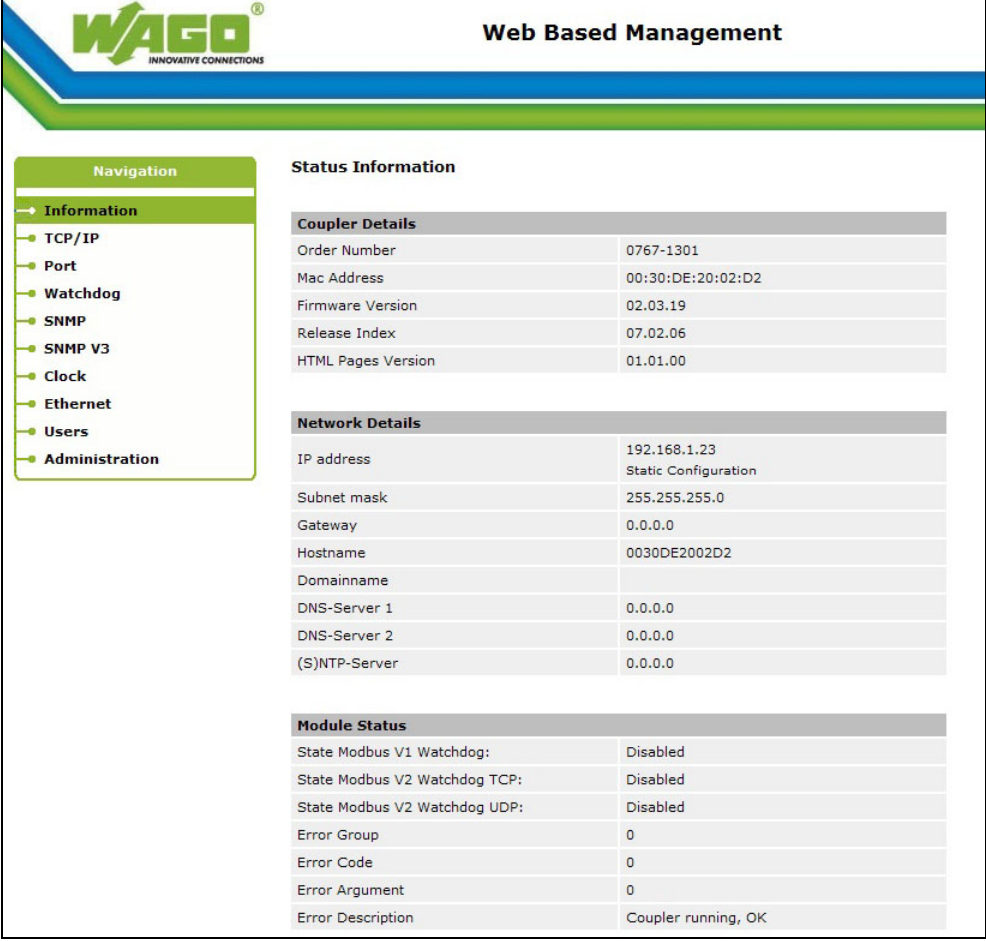


Figure 32: „Authentication required“ dialog box

10.2.1 "Information" View

After entering the IP address, the start page "Information" appears from the web-based management. This site provides information on the fieldbus coupler, the network and the blink code.



WAGO®
INNOVATIVE CONNECTIONS

Web Based Management

Navigation

- **Information**
- TCP/IP
- Port
- Watchdog
- SNMP
- SNMP V3
- Clock
- Ethernet
- Users
- Administration

Status Information

Coupler Details

Order Number	0767-1301
Mac Address	00:30:DE:20:02:D2
Firmware Version	02.03.19
Release Index	07.02.06
HTML Pages Version	01.01.00

Network Details

IP address	192.168.1.23 Static Configuration
Subnet mask	255.255.255.0
Gateway	0.0.0.0
Hostname	0030DE2002D2
Domainname	
DNS-Server 1	0.0.0.0
DNS-Server 2	0.0.0.0
(S)NTP-Server	0.0.0.0

Module Status

State Modbus V1 Watchdog:	Disabled
State Modbus V2 Watchdog TCP:	Disabled
State Modbus V2 Watchdog UDP:	Disabled
Error Group	0
Error Code	0
Error Argument	0
Error Description	Coupler running, OK

Figure 33: "Information" view

The following table explains the parameters listed on the site:

Table 33: Description of the "Information" view parameters

Coupler Details	
Order number	Displays the item number of the fieldbus coupler.
Mac Address	Displays the Mac address, which helps identify and address the fieldbus coupler on the ETHERNET.
Firmware Version	Displays the current status of the firmware.
Release Index	Displays the current status of the release index (Firmware.Hardware.Firmwareloader).
HTML Pages Version	Displays the current status of the version of the WBM pages.
Network Details	
IP address	Displays the source of the IP address and the current IP address of the fieldbus coupler
Subnet Mask	Displays the current subnet mask of the fieldbus coupler.
Gateway	Displays the current gateway address of the fieldbus coupler.
Hostname	Displays the current host name.
Domainname	Displays the current domain name.
DNS-Server 1	Displays the current DNS server address.
DNS-Server 2	Displays the current alternative DNS server address.
(S)NTP-Server	Displays the current (S)NTP server address.
Module Status	
State MODBUS V1 Watchdog:	Displays whether the MODBUS V1 Watchdog is activated. Disabled: not activ* Running: active Expired
State MODBUS V2 Watchdog TCP:	Displays whether the MODBUS V1/TCP Watchdog is activated. Disabled: not activ* Running: active Expired
State MODBUS V2 Watchdog UDP:	Displays whether the MODBUS V1/UDP Watchdog is activated. Disabled: not activ* Running: active Expired
Error Group	The error group, error code and error argument specify an error condition. For more information, see section "Meaning of the Blink Codes and Procedures for Troubleshooting".
Error Code	
Error Argument	
Error Description	Network Details

* Default setting

10.2.2 "TCP/IP" View

The parameters for the ETHERNET configuration can be changed on this TCP/IP configuration site.

1. To confirm your entries, click **[SUBMIT]**.
2. To clear your entries, click **[RESET]**.
3. Your entries are not active until the software has been reset. To reset the software, click on "Administration" in the navigation bar and then **[Software Reset]**. You can also disconnect the power supply from the fieldbus coupler and then reconnect it.

Table 34: Description of the "TCP/IP" view parameters

Table 34: Description of the "TCP/IP" view parameters

Type of IP address configuration	
Static IP	Selection option of static or dynamic IP addressing.
DHCP (dynamic)	
BootP (dynamic)*	
Configuration data	
IP address	Here you can set a static IP address through which the fieldbus coupler is to be accessed. This is active when "Static IP" is activated in the "Type of IP address configuration" field.
Subnet mask	Set the subnet mask here. This is active when "Static IP" is activated in the "Type of IP address configuration" field.
Gateway	Set the gateway here. This is active when "Static IP" is activated in the "Type of IP address configuration" field.
Domain name	Set the domain name here.
DNS server 1	Set the address of the DNS server here.
DNS server 2	Set the address of an alternative DNS server here.
(S)NTP server	Set the IP address of the time server here.
SNTP update time (sec, max. 65535)	Set the cycle time here to specify how often the time should be requested from the time server.

* Default setting

10.2.3 "Port" View

On this protocol configuration page, you can select the protocols that you desire for communication.

1. To confirm your entries, click **[SUBMIT]**.
2. To clear your entries, click **[RESET]**.
3. Your entries are not active until the software has been reset. To reset the software, click on "Administration" in the navigation bar and then **[Software Reset]**. You can also disconnect the power supply from the fieldbus coupler and then reconnect it.

Table 35: Description of the "Port" view parameters

Port Settings	
FTP	When this checkbox is selected, the protocol for file transfer is active.
SNTP	When this checkbox is selected, the time is updated using ETHERNET.
HTTP	When this checkbox is selected, the web server (WBM) is active.
SNMP	When the checkbox is selected, the device's SNMP functionality is available.
EtherNet/IP	When this checkbox is selected, the protocol for exchanging process data using EtherNet/IP is active.
MODBUS/UDP	When this checkbox is selected, the protocol for exchanging process data using MODBUS/UDP is active.
MODBUS/TCP	When this checkbox is selected, the protocol for exchanging process data using MODBUS/TCP is active.
WAGO Services	When the checkbox is selected, you can change the port number for the WAGO Services. You can change the port number directly.

10.2.4 "Watchdog" View

On this page, the MODBUS Watchdogs can be configured.

1. To confirm your entries, click **[SUBMIT]**.
2. To clear the entries that have not yet been saved, click **[RESET]**.
3. Your entries up until the time of connection are not active until the software has been reset. To reset the software, click on "Administration" in the navigation bar and then **[Software Reset]**. You can also disconnect the power supply from the fieldbus coupler and then reconnect it.

MODBUS V1

Table 36: Description of the "Watchdog" view parameters

MODBUS Interface	
MODBUS V1	Standard MODBUS implementation (preset). When selecting V2, the MODBUS, the setting options change.
MODBUS V2	767 MODBUS implementation. When selecting V1, the MODBUS, the setting options change.
Connection Watchdog	
Connection timeout value (100 ms)	The connection watchdog monitors the activity of all TCP connections. If no communication takes place during the parameterized time, the connection is closed and the resources are released.
MODBUS Watchdog	
State MODBUS Watchdog	Actual watchdog states Disabled: not active (0x0000)* Running: active (0x0001) Expired (0x0002)
Watchdog Type Standard	Non-latching watchdog that has to be stopped after tripping from a MODBUS register before it starts again.
Watchdog Type Alternative	Latching watchdog that is started again with the first valid MODBUS/TCP command.
Watchdog Timeout Value (1000 ms)	Specifies in what intervals "MODBUS Requests" are expected from a disconnected MODBUS Master.

Table 36: Description of the "Watchdog" view parameters

Watchdog Trigger Mask (F1 to F16)	Use this entry field to set the function codes (1 – 16) to trigger the watchdog function. The function code can be selected with "1". $(\text{= } 2^{(\text{function code}-1)} + 2^{(\text{function code}-1)} + \dots)$ Example: Function code 5 $\rightarrow 2^{(5-1)} = 2^4 \rightarrow$ bit 4 is set to 1 A value not equal to zero starts the watchdog function. If only codes from unsupported functions are entered in the screen, the watchdog does not start. An existing error is reset and the process image can be described again. Again here, no changes can be made when the watchdog is running. When the watchdog is active, there is no code by which.
Watchdog Trigger Mask (F17 to F32)	The same function as before, but with the function codes 17 to 32. Therefore, this register should be left at the default value.

* Default setting

MODBUS V2

Table 37: Description of the "Watchdog" view parameters

MODBUS Interface	
Connection Watchdog	
Connection Timeout Value (100 ms)	The connection watchdog monitors the activity of all TCP connections. If no communication takes place during the parameterized time, the connection is closed and the resources are released.
MODBUS Watchdog TCP/UDP	
State MODBUS Watchdog	Actual watchdog states Disabled: not active* Running: active Expired
Watchdog Timeout Value (100 ms)	Specifies in what intervals "MODBUS Requests" are expected from a disconnected MODBUS Master.
Watchdog Configuration	Set the properties of the watchdog here.

* Default setting

10.2.5 „SNMP“View

The SNMP V1 and V2c network management protocols are configured on this page.

1. To confirm your entries, click **[SUBMIT]**.
2. To clear your entries, click **[RESET]**.
3. Your entries are not active until the software has been reset. To reset the software, click on “Administration” in the navigation bar and then **[Software Reset]**.
Alternatively, reset the software by cycling the system power supply.

Table 38: Parameter description of the page “SNMP”

SNMP Configuration		
Entry	Value (Default)	Description
System Description	WAGO 0767-1201 FC PROFINET IO	Device name (sysName)
System Location (physical)	local	Location of device (sysLocation)
System Contact	support@wago.com	E-mail contact address (sysContact)
SNMP V1/V2 Manager Configuration		
Entry	Value (Default)	Description
Protocol Enable	SNMP V1/V2c ☒	☒ Activating SNMP Version 1/2c
		☐ Deactivating SNMP-Version 1/2c
Local Community Name	public	Used community name
SNMP V1/V2 Trap Receiver Configuration		
Entry	Value (Default)	Description
Trap Receiver 1	0.0.0.0	IP address of 1. used SNMP manager
Community Name 1	public	1. Community name of the network community used
Trap Version 1	V1 ☒	V1 ☒ V2 ☐ Activating Traps Version 1
	V2 ☐	V1 ☐ V2 ☒ Activating Traps Version 2
Trap Receiver 2	0.0.0.0	IP address of 2. used SNMP manager
Community Name 2	public	2. Community name of the network community used
Trap Version 2	V1 ☒	V1 ☒ V2 ☐ Activating Traps Version 1
	V2 ☐	V1 ☐ V2 ☒ Activating Traps Version 2

10.2.6 „SNMP V3“View

The SNMP V3 network characteristics are configured on this page.

1. To confirm your entries, click **[SUBMIT]**.
2. To clear your entries, click **[RESET]**.
3. Your entries are not active until the software has been reset. To reset the software, click on “Administration” in the navigation bar and then [Software Reset].

Alternatively, reset the software by cycling the system power supply.

Table 39: Parameter description of the page “SNMP V3”

SNMP Configuration V3 (User)		
Entry	Value Example)	Description
1. User / 2. User	activate ☒	☒ Activating user 1 or 2
		☐ Deactivating user 1 or 2
Security Protocol	None ☐	None ☒ MD5 ☐ SHA1 ☐ No encryption of the authentication
	MD5 ☒	None ☐ MD5 ☒ SHA1 ☐ Encryption of the authentication with MD5
	SHA1 ☐	None ☐ MD5 ☐ SHA1 ☒ Encryption of the authentication with SHA1
Security Name	SecurityName-x	Enter the name, if the “Security Protocol” MD5 or SHA1 has been selected.
Security Key	Security Key	Enter the password with at least 8 characters, if “Security Protocol” MD5 or SHA1 has been selected.
Privacy Enable	DES ☒	☒ Activate the DES encryption of the data
		☐ Deactivate the DES encryption of the data
Privacy Key	Privacy Key	Enter the password of at least 8 characters in the encryption with DES
Notification/ Trap Enable	V3 ☒	☒ Activate the notification traps of the SNMP version 3
		☐ Deactivate the notification traps of the SNMP version 3
Notification Receiver IP	192.168.1.10	IP address of the notification manager

10.2.7 "Clock" View

On this page, the real-time clock is configured.

1. To confirm your entries, click **[SUBMIT]**.
2. To clear your entries, click **[RESET]**.
3. Your entries are not active until the software has been reset. To reset the software, click on "Administration" in the navigation bar and then **[Software Reset]**. You can also disconnect the power supply from the fieldbus coupler and then reconnect it.

Table 40: Description of the "Clock" view parameters

Configuration Data	
Time on device	Set the time here.
Date (YYYY-MM-DD)	Set the date here.
Time zone (+/- hour:minute)	Set the time zone here.
Summer time	If this checkbox is activated, the WBM is set to summer time.
Display Mode	
12-hour clock	Switching between 12-hour and 24-hour time display.

10.2.8 "ETHERNET" View

On this ETHERNET configuration page, you can select the transfer rates and diverse switch settings that you wish to use. The fieldbus coupler has three ports for which you can carry out various settings: two outer ports (ETHERNET connections FB1 and FB2) and one internal ETHERNET switch.

1. To confirm your entries, click **[SUBMIT]**.
2. To clear your entries, click **[RESET]**.
3. Your entries are not active until the software has been reset. To reset the software, click on "Administration" in the navigation bar and then **[Software Reset]**. You can also disconnect the power supply from the fieldbus coupler and then reconnect it.

Table 41: Description of the "ETHERNET" view parameters

Speed Configuration	
Enable Port	You can switch the ports on and off. Checkbox selected: port switched on* Checkbox unselected: port switched off
Enable Power-Save Mode	If the port is not used, the power-save mode is activated.
Enable Auto MDI-X	Activates the Auto MDI-X function of the ETHERNET port. This function employs an internal switching functionality to allow the use of either crossed (cross-over) or straight (patch) cable.
Enable Autonegotiation	If this radio button is selected, the automatic search for optimal ETHERNET speed is activated.
10 MBit Half Duplex	If this radio button is selected, the fixed ETHERNET speed is activated.
10 MBit Full Duplex	
100 MBit Half Duplex	
100 MBit Full Duplex	
Enable Full Duplex Flow Control	If there is a connection to a switch which also supports "Flow Control", both devices can agree on a disruption of the flow of data if needed. Checkbox selected: switched on Checkbox unselected: switched off
Bandwidth and Sniffer Configuration	
Limit Mode	This selection box allows you to define which types of messages are restricted. All: Restriction of all ETHERNET messages BC: Broadcast messages MC: Multicast messages FU: Flooded Unicast messages
Input Limit Rate	This selection box allows you to set the restriction of the transfer rate for the input data.
Output Limit Rate	This selection box allows you to set the restriction of the transfer rate for the output data.
Sniffer Port	TCP packets from other ports are forwarded to this port. This function assists in analyzing the network.
Receive Sniff	All incoming packets are forwarded to the sniffer port.
Transmit Sniff	All outgoing packets are forwarded to the sniffer port.

* Default setting

10.2.9 "Users" View

On this page, the passwords of the users **admin**, **user** and **guest** can be changed. Passwords can only be changed by the **admin** user. An overview of passwords can be found in Section "User Management".

1. From the "user" selection box, select the user whose password you wish to change.
2. Enter your new password in the "New password" field.
3. Re-enter the password in the "Confirm password" field to verify spelling.
4. To confirm your entries, click **[SUBMIT]**.
5. To clear your entries, click **[RESET]**. The password of the selected user is changed.

10.2.10 "Administration" View

On this page, you can reset the software or reset all parameters to the default status. You can only use these functions if you are logged on as the **admin** user. An overview of passwords can be found in Section 0.

- 1 To activate modified parameters in the fieldbus coupler, click on **[Software Reset]**.
- 2 To reset all parameters of the WBM to the default status, click on **[Restore Factory Settings]**. This also resets the IP address, causing the connection to the fieldbus coupler to be lost. To assign a permanent IP address, set the DIP switch 9 to "On"; to assign an IP address using BootP, DHCP, etc., set it to "Off".

11 The File System

Two partitions of the file system are available to the user including a RAM disk and a partition in Flash memory.

Table 42: Summary of file system partitions

Partition	Format	Type	Size	Use
R:\	FAT 12	RAM disk	approx. 500 kB	-
U:\	FAT 12	Flash disk	approx. 900 kB	WBM pages

The R:\ partition is designed as nonpermanent RAM disk and can be used to temporarily store data. These files are lost when the system is restarted. To save files permanently, use partitions “U:\”.

You can access the partitions above via FTP.

11.1 User Management

Access to the web-based management and via FTP is password protected. In the default status, the following users and access authorizations are defined:

Table 43: User Management

User name	Password	WBM	FTP	WAGOframe
admin	wago	Full access	Full access	Full access
user	user	Limited access	Full access	Limited access
guest	guest	Limited access	Full access	Read access

Use WBM and WAGOframe to change the passwords.

11.2 Access via FTP

To access the fieldbus coupler using FTP, proceed as follows:

1. Open the DOS console. Click on the start menu and select “Run”. Enter the `cmd` command and click [OK].
2. In the DOS console, enter the `ftp` command with the IP address of the fieldbus coupler. In the following example, the command is:

`ftp 192.168.1.100`
3. To log on to FTP, enter your user name and password.

You are now logged on in FTP. You can now, for example, access the directory with the pages of the web-based management by entering the `CD U:\` command. By means of the regular FTP commands, you have the option of copying these pages to your PC and customizing them.

```

Auswählen C:\WINNT\system32\cmd.exe
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

U:\>ftp 192.168.1.100
Verbindung mit 192.168.1.100 wurde hergestellt.
220 Nucleus FTP Server (Version 1.7) ready.
Benutzer (192.168.1.100:(none)): admin
331 User name okay, need password.
Kennwort:
230 User logged in, proceed.
ftp> cd U:\
250 Requested file action okay, completed.
ftp> cd private
250 Requested file action okay, completed.
ftp> dir
200 Command okay.
150 File status okay; about to open data connection.
drw-rw-rw- 1 owner group 0 Jan 21 13:38 .
drw-rw-rw- 1 owner group 0 Jan 21 13:38 ..
drw-rw-rw- 1 owner group 0 Jan 21 13:38 images
-rw-rw-rw- 1 owner group 3201 Jan 21 13:38 tcpip.ssi
-rw-rw-rw- 1 owner group 5257 Jan 21 13:38 styles.css
-rw-rw-rw- 1 owner group 2484 Jan 21 13:38 state.ssi
-rw-rw-rw- 1 owner group 3883 Jan 21 13:38 port.ssi
-rw-rw-rw- 1 owner group 1993 Jan 21 13:38 clock.ssi
-rw-rw-rw- 1 owner group 679 Jan 21 13:38 index.htm
226 Closing data connection. Requested file action successful.
FTP: 612 Bytes empfangen in 0,00Sekunden 612000,00KB/s
ftp> quit
221 Service closing control connection. Logged out if appropriate.
U:\>_
  
```

Figure 34: Connection setup using FTB in the DOS console

12 EtherNet/IP

12.1 EDS File

The EDS file contains the characteristics of the fieldbus coupler and information regarding its communication capabilities. The EDS file is imported and installed by the corresponding configuration software.

The EDS file can be obtained at www.wago.com. When installing the EDS file, please refer to the information provided in the documentation of the configuration software you are using.

12.2 Process Image

After starting up the fieldbus coupler, it automatically identifies all connected I/O modules. The fieldbus coupler uses this to create a local process image, divided into an input and output data range.

If you have selected the fieldbus EtherNet/IP for the fieldbus coupler, the process image is structured with word alignment. Data larger than one byte is displayed internally in Intel format ("Little Endian"). If both analog and digital I/O modules are connected to the node, the digital input and output data are summarized byte by byte and arranged after the analog data in the process image.

The size of the process image of an ETHERNET node can be identified from the connected 767 Series component. The process image has a total size of 4096 bytes: 2048 bytes of input data and 2048 bytes of output data.



Note

Input and output process image

The input and output process images can accommodate more data than your higher-level controller can transmit. If the data is larger than the telegram of the higher-level controller, use the assembly instances to select which data should be transmitted.

You can obtain access to the process image via the assembly instances or directly via the EtherNet/IP objects. Please see Sections "CIP Classes" and "WAGO-Specific Classes" for more information.

12.3 Process Data Exchange

The assembly instances are required in order to exchange process data between the higher-level controller and the fieldbus coupler. Using these assembly instances, you can write and read the inputs and outputs of the 767 Series components.

12.3.1 Assembly Instances

A process data exchange is initiated using the assembly instances. From the existing static assembly instances (see Section "Assembly Object (04_{hex})"), select one instance for each sending direction.

For transmission of process data from the higher-level controller (originator) to the fieldbus coupler (target), the following assembly instances are available:

- Instance 101: for analog and digital output data
- Instance 102: for digital output data
- Instance 103: for analog output data
- Instance 113: for analog and digital output data with diagnostic acknowledgement

For transmission of process data from the fieldbus coupler to the higher-level controller, the following assembly instances are available:

- Instance 104: for analog and digital input data, including status byte
- Instance 105: for digital input data, including status byte
- Instance 106: for analog input data, including status byte
- Instance 107: for analog and digital input data
- Instance 108: for digital input data
- Instance 109: for analog input data
- Instance 112: for analog and digital input data with status byte, current error and diagnostics

Note



Assembly instance without status information

If you select an assembly instance without status information (107 – 109), information such as fieldbus errors, pending diagnostics and process data status (valid/invalid) are not available and cannot be integrated into the application of the higher-level controller. The status byte is described in class 64hex, attribute 5.

12.3.2 Identifying the Data Length

After you have selected the necessary assembly instance, you need to identify the length of the data in each sending direction of the respective instance for the configuration software of the higher-level controller. You have the following options:

Reading out the lengths via the assembly instances

The simplest option involves reading out the instance attribute 4 from each assembly instance between 101 and 113, which should be used. Attribute 4 of the assembly classes (ID = 4) indicates the total number of data bytes transmitted in this direction.

This number includes the overall size of the respective input or output data, including status byte, error and diagnostics.

The individual data sizes are not identified by reading out the assembly instances. This is only possible using the instance attribute of class 64_{hex}.

Reading out the lengths via class 64_{hex}, instance 1 (see "Section Bus Coupler Configuration Class Object (64_{hex})")

The bit lengths of the analog and digital I/O modules connected to the ETHERNET node are read out via the instance attributes 7 – 10.

Depending on which assembly instance you select for exchanging the input and output data, the status byte is also to be added, as well as three bytes for the current error and/or diagnosis. The lengths of the diagnostic data is made up of a fixed quantity of 10 bytes and a variable quantity. The variable quantity is dependent on the I/O modules connected to the 767 node. This quantity of bytes can be read out via attribute 53.

Detailed information regarding the instance attributes can be found in the corresponding table of class 64_{hex}.

12.3.3 Example with Assembly Instances 101 and 104

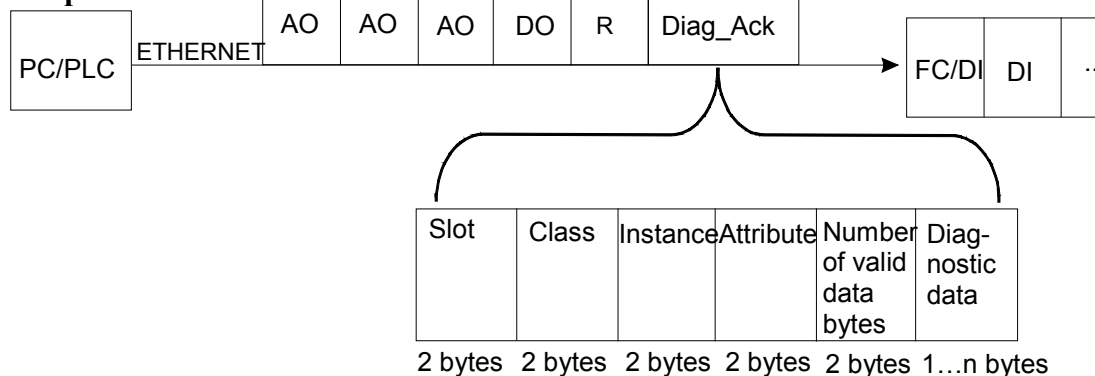
In this example, the assembly instance 101 is used for exchanging data between the higher-level controller and the fieldbus coupler and includes all analog and digital output data. The assembly instance 104, which includes the status byte in addition to the analog and digital input data, is used for exchanging data between the fieldbus coupler and the higher-level controller.

A sample configuration results in the following structure of process data, which is sent from the higher-level controller to the fieldbus coupler:

Physical structure



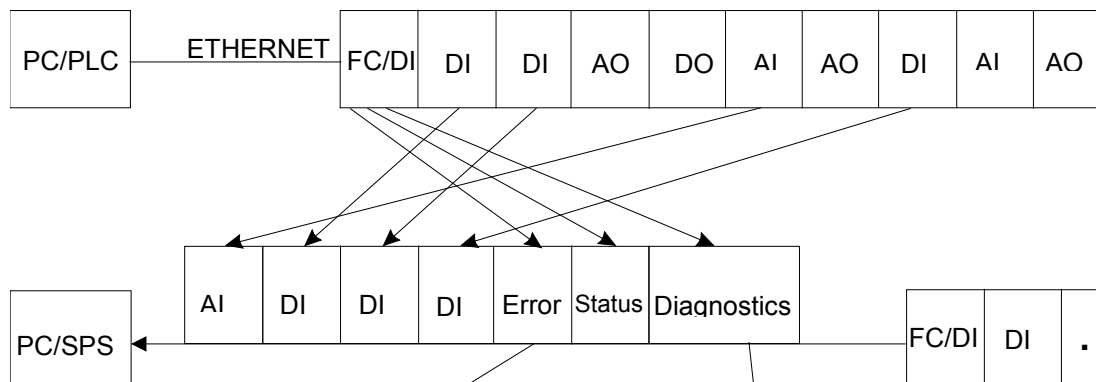
Output data



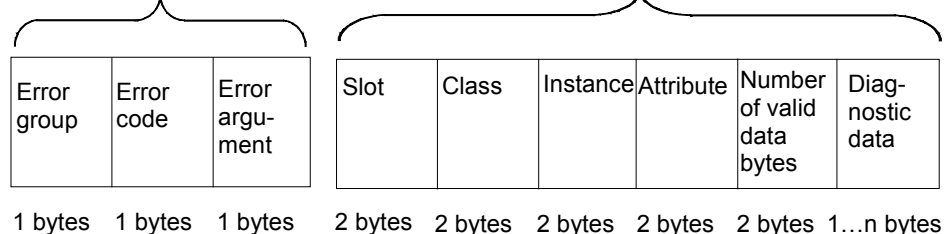
FC/DI: Digital inputs on the fieldbus coupler
 DI: Digital input, 8 bits
 DO: Digital output, 8 bits
 AI: Analog input, 8 bytes
 AO: Analog output, 8 bytes
 Diag_Ack: Diagnostic acknowledgment, 10 bytes + x bytes
 R: Reserved, 4 bytes

Process data sent from the fieldbus coupler to the higher level controller:

Physical structure



Input data



DI: Digital input, 8 bits
 DO: Digital output, 8 bits
 AI: Analog input, 8 bytes
 AO: Analog output, 8 bytes
 Error: 3 bytes
 Status: Error group, Error code, Error argument 1 byte
 Diagnostics: Diagnostic message, 10 bytes + x bytes

12.4 Diagnostics

Certain diagnostic information is made available to you in the network. This can include, for example, error messages and warnings from the fieldbus coupler or the connected I/O modules. You have several options for receiving diagnostic information from the fieldbus coupler:

- Diagnostics integrated in the input and output data,
- Diagnostics via explicit messages,
- Diagnostics mixed via input and output data and explicit messages

The diagnostic information of all connected I/O modules and of the fieldbus coupler is stored in the latter for collection. When storing diagnostic information, bit 3 is also set in the status byte. If more diagnostic information is reported to the fieldbus coupler than is collected, an overflow of the internal memory can occur. If this condition arises, bit 2 is set in the status byte, through which a loss of diagnostic information is reported. From this point on, the respective current diagnostic information is stored and the oldest is discarded. More information on status bytes can be found in the next chapter and under attribute 5 of the configuration class ("Bus Coupler Configuration Class Object (64_{hex})") of the fieldbus coupler.

The following sections describe how to access diagnostic information via the EtherNet/IP protocol. As with the process data, the data here that is larger than one byte is displayed in Intel format ("Little Endian").

12.4.1 Diagnostics Integrated in the Input and Output Data

Using this option, diagnostic information is attached behind the process image. This is performed using assembly instances 104 to 106, 112 or 113. Assembly instances 104 to 106 add the status byte into the process image. A diagnostic information is provided if bit 3 is set in this status byte. For these assembly instances, the information content is not provided via input and output data, but can be read out via explicit messages, for example. For more information, see Section "Diagnostics via Explicit Messages".

In addition to the status byte, the assembly instance 112 also contains additional diagnostic information, which describes the diagnostic type and origin. The fieldbus coupler communicates to the higher-level controller its status and the diagnostic information via the assembly instance 112. Instead of the status byte, the assembly instance 113 has a reserved byte whose content is irrelevant.

The diagnostic information is divided up as follows:

Status byte 1 byte	Slot 2 bytes	Class 2 bytes	Instance 2 bytes	Attribute 2 bytes	Number of valid data bytes 2 bytes	Diagnostic data 1 ... n bytes
Diagnostics						

Example:

In the entire 767 node, the analog output modules deliver a maximum of 4 bytes of diagnostic data. This number can also be read out with an explicit message on class 100, instance 1, attribute 35. The digital output module on slot 3 reports a recent error, which contains the following data:

Diagnostic Message	Status byte	Slot 2 bytes	Class 2 bytes	Instance 2 bytes	Attribute 2 bytes	Number of valid data bytes 2 bytes	Diagnostic data 1 ... n bytes
Data	0x08	0x0003	0x0009	0x0005	0x0081	0x0001	0x01 0x00 0x00 0x00

Status byte:

By means of the placed bit 3 in the status byte (0x08), a pending diagnostic message is displayed.

Slot:

The slot 0x0003 indicates that the third I/O module in the 767 node has displayed a diagnostic message.

Class:

0x0009 designates the "Digital Output Point" class as an error class assigned to the digital output modules.

Instance:

The instance 0x0005 identifies channel 5 of the digital output module as the source of the error.

Attribute:

The attribute 0x0081 (129) indicates the "Open Load" error. The description of the diagnostic source on the basis of class, instance and attribute (CIA) can be found in the manuals of the respective I/O modules (appendix).

Number of valid data bytes:

The length of the diagnostic data is identified by the I/O module that can deliver the greatest number of diagnostic bytes. If only a portion of the diagnostic data is used in a current diagnostic message, this portion is determined by the "Number of valid data bytes". Beginning with the next byte, only the number of bytes specified here is valid.

In the example, the value 0x01 indicates that only the next byte in the diagnostic data contains a valid value. The subsequent 3 bytes are reserved and their content is irrelevant.

Diagnostic data:

The first byte of diagnostic data contains a 1 and thus indicates an incoming diagnosis on channel 3 of the digital output module, such as "Open Load". The value 0 indicates an outgoing diagnosis.

Some diagnostic messages require a confirmation. By means of the assembly instance 113, the diagnostic confirmations are transmitted from the higher-level controller to the fieldbus coupler. The data contents are shown in the following table:

Data from fieldbus coupler to higher-level controller			
Process image	Error (3 bytes)	Status byte	Diagnostic message (10 + x bytes)
Data from higher-level controller to fieldbus coupler			
Process image	Reserved (4 bytes)		Diagnostic confirmation (10 + x bytes)

By reserving 4 bytes, the beginning of the diagnostic message and diagnostic confirmation is identical as it relates to the process image (offset of 4 bytes).

Note



Diagnostic messages

If several diagnostic messages are pending simultaneously, they are transmitted back-to-back. Therefore, the individual diagnostic messages are only available in a cycle; i.e., in an ETHERNET telegram. If available, the next diagnostic message would then be transmitted in the next ETHERNET telegram.

Information



Diagnosis

To confirm the diagnosis, copy the data from the diagnostic message into the diagnostic confirmation.

12.4.2 Diagnostics via Explicit Messages

Using explicit messages, the complete diagnosis can also be read out via attributes. The individual data contents of the diagnostic message or confirmation can be read out from the attributes of class 64_{hex}, instance 1.

Status byte	Slot 2 bytes	Class 2 bytes	Instance 2 bytes	Attribute 2 bytes	Number of valid data bytes 2 bytes	Diagnostic data 1 ... n bytes
Attribute 5		Attribute 54/55				

Attribute 5: This attribute contains the status byte.

Attribute 54: This contains the diagnostic message, which is composed of slot, class, instance, attribute, number of valid data bytes and diagnostic data.

Attribute 55: This contains the diagnostic confirmation, which is composed of slot, class, instance, attribute, number of valid data bytes and diagnostic data.

The descriptions of individual contents, such as slot, etc., can be found in Section "Diagnostics Integrated in the Input and Output Data".

The status byte can be read out via attribute 5 by bit 3 indicating whether or not a diagnosis is pending. This bit remains set as long as diagnostic messages are pending. If the diagnosis is only processed via explicit messages, attribute 5 should be read out in certain time intervals in order to detect a diagnostic message. If a diagnostic message is pending, the diagnostic source can be read out via attribute 54 of this class. If a confirmation of the diagnosis is necessary, the user can employ attribute 55 for this purpose.

The data structure of attribute 54 and 55 corresponds to the structure as sent in the input and output data (see figure shown above). Please note that the data is sent in "little endian" format and that you also confirm it in this format. If no other diagnostic is available, it is then indicated by resetting bit 3 of attribute 5. Furthermore, the whole data content of attribute 54 is set to zero.

Note



Diagnostic message

A diagnostic message can only be read out via attribute 54! If another read action is implemented, either the next pending diagnostic message is delivered or none at all (data content of attribute 54 is zero).

Information



Diagnosis

To confirm the diagnosis, copy the data from the diagnostic message into the diagnostic confirmation.

12.4.3 Diagnostics Mixed via Input and Output Data and Explicit Messages

There are several options for receiving and confirming the diagnosis mixed via input and output data and explicit messages. The assembly instances 104, 105 and 106 offer these alternatives:

- **Instance 104**
For analog and digital input data, including status byte.
- **Instance 105**
For digital input data, including status byte.
- **Instance 106**
For analog input data, including status byte.

In these assembly instances, the status byte is integrated and gives information about a pending diagnosis (bit 3 set). The actual diagnosis can then be read out by means of the explicit messages from class 100, instance 1, attribute 54. With attribute 55 of the same class, the diagnosis is confirmed. For more information, see Section "Diagnostics via Explicit Messages".

Other possibilities for combinations of input and output data and explicit messages are also available to link the diagnostic information to the overall concept.

12.5 Object Model

For network communication, EtherNet/IP utilizes an object model in which all functions and data of the fieldbus coupler are described. Each node in the network is depicted as a collection of objects.

The object model contains terms that are defined as follows:

- **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 series of objects which all represent the same type of system components. A class is the generalization of an object. All objects in a class are identical in form and behavior, but can comprise differing attribute values.
- **Instance:**
A specific and physical occurrence of an object. For example, New Zealand is an instance of the "land" object class. The terms "object," "instance" and "object instance" all refer to a specific instance.
- **Attribute:**
The description of an externally visible characteristic or of an object's function. Attributes typically deliver status information or regulate the function of an object. For example, the ASCII name of an object and the repetition frequency of a periodic object.
- **Service:**
A function supported by an object and/or an object class. CIP defines a group of common services that are applied to the attributes.
- **Behavior:**
Specification of how an object functions. The functions result from various occurrences, which are determined by the object, e.g. receiving service requests, recording internal errors or the sequence of timers.

12.6 CIP Classes

CIP classes are included in the CIP specification of ODVA. They describe the properties (Volume 1) of ETHERNET and CAN independent of their physical interface. The physical interface is described in a separate specification. For EtherNet/IP, this is Volume 2, which describes the adaption of EtherNet/IP to CIP.

For this purpose, WAGO uses classes 1, 2, 4 – 6 and also F4_{hex}, which are described in Volume 1 ("Common Industrial Protocol"). Classes F5_{hex} and F6_{hex} are supported from Volume 2 (EtherNet/IP Adaption of CIP).

The classes in the following table are described in more detail in subsequent sections. The description of WAGO-specific classes begins in Section WAGO-Specific Classes.

Table 44: CIP classes

Class	Name
01 _{hex}	Identity Object
02 _{hex}	Message Router Object
04 _{hex}	Assembly Object
05 _{hex}	Connection Object
06 _{hex}	Connection Manager Object
F4 _{hex}	Port Class Object
F5 _{hex}	TCP/IP Interface Object
F6 _{hex}	ETHERNET Link Object

Table 45: Explanation of table headers

Column Header	Description
Attribute ID	Integer value which is assigned to the respective attribute
NV	NV (non-volatile): The attribute is permanently saved in the fieldbus coupler. V (volatile): The attribute is not permanently saved in the fieldbus coupler.
Name	Identification of the attribute.
Data type	Identification of the CIP data type of the attribute.
Description	Brief description of the attribute.
Default Value	Factory setting

Access	Set: The attribute can be accessed using the Set_Attribute service (writing/modifying the attribute value). Note: If an attribute supports the Set_Attribute service, it can also be accessed with the Get_Attribute service. Get: The attribute can be accessed using the Get_Attribute services (reading the attribute value). Get_Attribute_All: Delivers the content of all attributes. Set_Attribute_Single: Modifies an attribute value. Reset: Performs a restart. 0: Emulates a restart. 1: Emulates a restart and restores the default settings.
---------------	---

12.6.1 Identity Object (01_{hex})

The identity class provides general information about the fieldbus coupler that clearly identifies it.

Class Attributes

Table 46: "Identity Object" class: class attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum instance	1 (0x0001)
3	Get	Max ID Number of Class Attributes	UINT	Maximum number of class attributes (only applies to Get_Attribute_All service)	0 (0x0000)
4	Get	Max ID Number of Instance Attribute	UINT	Maximum number of instance attributes (only applies to Get_Attribute_All service)	0 (0x0000)

Instance Attributes 1

Table 47: "Identity Object" class: instance attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Vendor ID	UINT	Manufacturer identification	40 (0x0028)
2	Get	Device Type	UINT	General type designation of fieldbus coupler	12 (0x000C)
3	Get	Product Code	UINT	Identification of fieldbus coupler	1301 (0x0515)
4	Get	Revision	STRUCT of:	Version of identity object	Firmware dependent
		Major Revision	USINT		
		Minor Revision	USINT		
5	Get	Status	WORD	See *	Dependent on current status
6	Get	Serial Number	UDINT	Serial Number	-
7	Get	Product Name	SHORT_String	Product name	WAGO FC ETHERNET 8DI 24VDC

* Bit 0: Assignment to a master;
 Bit 1=0 (reserved);
 Bit 2: Configured: (= 0: configuration is unchanged; =1: configuration differs from manufacturer's parameters);
 Bit 3 = 0 (reserved);
 Bit 4-7: Extended device status: (= 0010: at least one faulty I/O connection, = 0011: no I/O connection established);
 Bit 8-11: unused
 Bit 12-15 = 0 (reserved)

Overview of Services

Table 48: "Identity Object" class: services

Service Code	Service Available		Service Name	Description
	Class	Instance		
01 hex	Yes	Yes	Get_Attribute_All	Delivers content of all attributes.
05 hex	No	Yes	Reset	Carries out the reset service. Service parameter: 0: Emulates a restart. 1: Emulates a restart and restores the default settings.
0E hex	No	Yes	Get_Attribute_Single	Delivers content of respective attribute.

12.6.2 Message Router Object (02_{hex})

The "Message Router Object" provides connection points (in the form of classes or instances), which can use a client for addressing services (reading, writing). These messages can be transmitted both when connected and when unconnected from the client to the fieldbus coupler.

Class Attributes

Table 49: "Message Router Object" class: class attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Number of Attributes	UINT	Number of attributes	0 (0x0000)
3	Get	Number of Services	UINT	Number of services	0 (0x0000)
4	Get	Max ID Number of Class Attributes	UINT	Maximum number of class attributes	0 (0x0000)
5	Get	Max ID Number of Instance Attributes	UINT	Maximum number of instance attributes	0 (0x0000)

Note



Class attributes

The class attributes are only accessible with the Get_Attribute_All service.

Instance Attributes 1

Table 50: "Message Router Object" class: instance attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Object List	STRUCT of:	-	
		Number	UINT	Number of implemented classes	25 (0x0019)
		Classes	UINT	Implemented classes	0x0001, 0x0002, 0x0004, 0x0006, 0x00F4, 0x00F5, 0x00F6, 0x0064 –0x0074, 0x0082,
2	Get	Number Available	UINT	Maximum number of differing connections	128 (0x0080)

Overview of Services

Table 51: "Message router object" class: services

Service Code	Service Available		Service Name	Description
	Class	Instance		
01 hex	Yes	No	Get_Attribute_All	Delivers content of all attributes
0E hex	No	Yes	Get_Attribute_Single	Delivers content of respective attribute

12.6.3 Assembly Object (04_{hex})

By means of the assembly classes, even several diverse objects can be combined. These could be, for example, input and output data, status and control information or diagnostic information. WAGO uses the manufacturer-specific instances in order to provide these objects for you in various arrangements. This gives you an efficient way to exchange process data. The following is a description of the individual instances with their contents and arrangements.

Class Attributes

Table 52 “Assembly Object” class: class attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	2 (0x0002)
2	Get	Max Instance	UINT	Highest instance	113 (0x0071)

Instance Attributes 101 (65 hex)

This assembly instance contains analog and digital output data.

Table 53: “Assembly Object” class: instance attributes 101 (65 hex)

Attribute ID	Access	Name	Data Type	Description	Default Value
3	Get/Set	Data	ARRAY of BYTE	Only analog and digital output data are contained in the process image	-
4	Get	Data Size	ARRAY of BYTE	Number of bytes in process image	-

Instance Attributes 102 (66 hex)

This assembly instance contains digital output data only.

Table 54: “Assembly Object” class: instance attributes 102 (66 hex)

Attribute ID	Access	Name	Data Type	Description	Default Value
3	Get/Set	Data	ARRAY of BYTE	Only digital output data is contained in the process image	-
4	Get	Data Size	ARRAY of BYTE	Number of bytes in process image	-

Instance Attributes 103 (67 hex)

This assembly instance contains analog output data only.

Table 55: “Assembly Object” class: instance attributes 103 (67 hex)

Attribute ID	Access	Name	Data Type	Description	Default Value
3	Get/Set	Data	ARRAY of BYTE	Only analog output data is contained in the process image	-
4	Get	Data Size	ARRAY of BYTE	Number of bytes in process image	-

Instance Attributes 104 (68 hex)

This assembly instance contains analog and digital input data and the status only.

Table 56: “Assembly Object” class: instance attributes 104 (68 hex)

Attribute ID	Access	Name	Data Type	Description	Default Value
3	Get	Data	ARRAY of BYTE	Only analog and digital input data and the status are contained in the process image.	-
4	Get	Data Size	ARRAY of BYTE	Number of bytes in process image	-

Instance Attributes 105 (69 hex)

This assembly instance contains digital input data and the status only.

Table 57: “Assembly Object” class: instance attributes 105 (69 hex)

Attribute ID	Access	Name	Data Type	Description	Default Value
3	Get	Data	ARRAY of BYTE	Only digital input data and the status are contained in the process image	-
4	Get	Data Size	ARRAY of BYTE	Number of bytes in process image	-

Instance Attributes 106 (6A_{hex})

This assembly instance contains analog input data and the status only.

Table 58: “Assembly Object” class: instance attributes 106 (6A_{hex})

Attribute ID	Access	Name	Data Type	Description	Default Value
3	Get	Data	ARRAY of BYTE	Only analog input data and the status are contained in the process image	-
4	Get	Data Size	ARRAY of BYTE	Number of bytes in process image	-

Instance Attributes 107 (6B_{hex})

This assembly instance contains analog and digital input data.

Table 59: “Assembly Object” class: instance attributes 107 (6B_{hex})

Attribute ID	Access	Name	Data Type	Description	Default Value
3	Get	Data	ARRAY of BYTE	Only analog and digital input data are contained in the process image	-
4	Get	Data Size	ARRAY of BYTE	Number of bytes in process image	-

Instance Attributes 108 (6C_{hex})

This assembly instance contains digital input data.

Table 60: “Assembly Object” class: instance attributes 108 (6C_{hex})

Attribute ID	Access	Name	Data Type	Description	Default Value
3	Get	Data	ARRAY of BYTE	Only digital input data is contained in the process image	-
4	Get	Data Size	ARRAY of BYTE	Number of bytes in process image	-

Instance Attributes 109 (6D_{hex})

This assembly instance contains analog input data.

Table 61: “Assembly Object” class: instance attributes 109 (6D_{hex})

Attribute ID	Access	Name	Data Type	Description	Default Value
3	Get	Data	ARRAY of BYTE	Only analog input data is contained in the process image	-
4	Get	Data Size	ARRAY of BYTE	Number of bytes in process image	-

Instance Attributes 112 (70_{hex})

This assembly instance contains analog and digital input data, current errors, the status and the diagnosis.

Table 62: “Assembly Object” class: instance attributes 112 (70_{hex})

Attribute ID	Access	Name	Data Type	Description	Default Value
3	Get	Data	ARRAY of BYTE	Only analog and digital input data, current errors, the status and the diagnosis are contained in the process image.	-
4	Get	Data Size	ARRAY of BYTE	Number of bytes in process image	-

Instance Attributes 113 (71_{hex})

This assembly instance contains analog and digital output data, 4 reserved bytes^{*}, the status and the diagnostic confirmation.

Table 63: “Assembly Object” class: instance attributes 113 (71_{hex})

Attribute ID	Access	Name	Data Type	Description	Default Value
3	Get/Set	Data	ARRAY of BYTE	Only analog and digital output data, 4 reserved bytes [*] , the status and the diagnostic confirmation are contained in the process image.	-
4	Get	Data Size	ARRAY of BYTE	Number of bytes in process image	

^{*} These reserved bytes merely assist in providing the identical data width of the status and diagnostic information as the assembly instance 112: 1 byte status + 3 byte error.

Overview of Services

Table 64: “Assembly Object” class: services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute.
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value.

The software inspects the writing of attribute 3 of assembly instances 101 through 103 ... 113. If the limit value has been exceeded, it is identified and, if necessary, corrected. However, a write request is not rejected. This means that if less data is received than expected, only this data is written. If more data is received than expected, the received data at the upper limit is deleted. In the case of explicit messages, however, a defined CIP is generated even though the data has been written

Instance Attribute 198 (C6_{hex}) "Input Only"

This instance assists in setting up the connection when no outputs are to be addressed or when inputs are requested that are already being used in an exclusive owner connection. The data length of this instance is always zero.

This instance can only be used in the "consumed path" (from the viewpoint of the slave).

Instance Attribute 199 (C7_{hex}) "Listen Only"

With this instance, a connection can be set up that attaches to an existing exclusive owner connection. Here the new connection has the same transmission parameters as the exclusive owner connection. If the exclusive owner connection is terminated, this connection is likewise automatically terminated. The data length of this instance is always zero.

This instance can only be used in the "consumed path" (from the viewpoint of the slave).

12.6.4 Connection Object (05_{hex})

Because the connections are established and terminated via the connection manager, the class and instance attributes of this class are not visible.

12.6.5 Connection Manager Object (06_{hex})

The "Connection Manager Object" provides the internal resources that are required for the input and output data and explicit messages. In addition, the administration of this resource is an assignment of the "Connection Manager Object".

For each connection (input and output data or explicit), another instance of the connection class is created. The connection parameters are extracted from the "Forward Open" service, which is responsible for establishing a connection.

The following services are supported for the first instance:

- Forward_Open
- Unconnected_Send
- Forward_Close

No class and instance attributes are visible.

12.6.6 Port Class Object (F4_{hex})

The "Port Class Object" specifies the existing CIP ports on the fieldbus coupler. There is one instance for each CIP port.

Class Attributes

Table 65: "Port Class Object" class: class attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	1 (0x0001)
3	Get	Num Instances	UINT	Number of current ports	1 (0x0001)
8	Get	Entry Port	UINT	Instance of port object from which the request arrived	1 (0x0001)
9	Get	All Ports	Array of Struct UINT	Array of instance attributes 1 and 2 of all instances	0 (0x0000) 0 (0x0000) 4 (0x0004) 2 (0x0002)

Instance Attributes 1

Table 66: "Port Class Object" class: instance attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Port Type	UINT	-	4 (0x0004)
2	Get	Port Number	UINT	CIP port number	2 (0x0002) (EtherNet/IP)
3	Get	Port Object	UINT	Number of 16-bit words in the subsequent path	2 (0x0002)
			Padded EPATH	Object that manages this port	0x20 0xF5 0x24 0x01 (corresponds to TCP/IP interface object)
4	Get	Port Name	Short String	Port name	“ ”
7	Get	Node Address	Padded EPATH	Port segment (IP address)	Depends on IP address

Overview of Services

Table 67: "Port Class Object" class: services

Service Code	Service Available		Service Name	Description
	Class	Instance		
01 hex	Yes	Yes	Get_Attribute_All	Delivers content of all attributes
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute

12.6.7 TCP/IP Interface Object (F5_{hex})

The "TCP/IP Interface Object" provides for the configuration of the TCP/IP network interface of a fieldbus coupler. Examples of configurable objects include the IP address, the network mask and the gateway address of the fieldbus coupler.

The underlying physical communications interface that is connected with the TCP/IP interface object can be any interface supported by the TCP/IP protocol. Examples of components that can be connected to a TCP/IP interface object include the following: an ETHERNET interface 802.3, an ATM interface or a serial interface for protocols such as PPP. The TCP/IP interface object provides an attribute, which is identified by the link-specific object for the connected physical communications interface. The link-specific object should typically provide link-specific counters as well as any link-specific configuration attributes.

Each device must support exactly one instance of the TCP/IP interface object for each TCP/IP-compatible communications interface. A request for access to the first instance of the TCP/IP interface object must always refer to the instance connected with the interface, which is used to submit the request.

Class Attributes

Table 68: "TCP/IP Interface Object" class: class attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	1 (0x0001)
3	Get	Num Instance	UINT	Number of currently instanced connections	1 (0x0001)

Instance Attributes 1

Table 69: "TCP/IP Interface Object" class: instance attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get	V	Status	DWORD	Interface status	-
2	Get	V	Configuration Capability	DWORD	Interface flags for possible configuration types	23 (0x00000017)
3	Get/Set	NV	Configuration Control	DWORD	Determines how the fieldbus coupler arrives at its TCP/IP configuration after the first restart.	17 (0x00000011)

Table 69: "TCP/IP Interface Object" class: instance attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
4	Get	V	Physical Link Object	STRUCT of	-	
			Path	UINT	Number of 16-bit words in the subsequent path	2 (0x0002)
				Padded EPATH	Logical path that points to the physical link object	0x20 0xF6 0x24 0x03 (corresponds to the ETHERNET Link Object)
5	Set	NV	Interface Configuration	STRUCT of	-	
			IP Address	UDINT	IP address	0
			Network Mask	UDINT	Network mask	255 (0xFF) 255 (0xFF) 0 (0x00) 0 (0x00)
			Gateway Address	UDINT	IP address of the standard gateway	0
			Name Server	UDINT	IP address of the primary name server	0
			Name Server 2	UDINT	IP address of the secondary name server	0
			Domain Name	STRING	Standard domain name	„“
6	Get/Set	NV	Host Name	STRING	Device name	MAC-ID

Overview of Services

Table 70: "TCP/IP Interface Object" class: services

Service Code	Service Available		Service Name	Description
	Class	Instance		
01 hex	Yes	Yes	Get_Attribute_All	Delivers content of all attributes.
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute.
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value

12.6.8 ETHERNET Link Object (F6_{hex})

The "ETHERNET Link Object" contains link-specific counter and status information for an ETHERNET 802.3 communications interface. Each device must support exactly one instance of the ETHERNET Link Object for each ETHERNET IEEE 802.3 communications interface on the module. An ETHERNET link object instance for an internal interface can also be used for the devices, e.g. an internal port with an integrated switch.

Class Attributes

Table 71: "ETHERNET Link Object" class: class attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	3 (0x0003)
2	Get	Max Instance	UDINT	Maximum number of instances	3 (00000003)
3	Get	Num Instances	UDINT	Number of currently instanced connections	3 (00000003)

Instance Attribute 1

Table 72: "ETHERNET Link Object" class: instance attributes 1

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Interface Speed	UDINT	Transfer rate	10 (0x0A) oder 100 (0x64)
2	Get	Interface Flags	DWORD	Interface configuration information/status information Bit 0: Link status Bit 1: Half/full duplex Bit 2 – 4: Detection status Bit 5: Manual settings require reset Bit 6: Local hardware error Bit 7 – 31: Reserved	Value is dependent upon ETHERNET connection.
3	Get	Physical Address	ARRAY of 6 UINTs	MAC address	MAC ID of the fieldbus coupler
6	Get/Set	Interface Control	STRUCT of:	Configuration of physical interface	
		Control Bits	WORD	Interface control bits Bit 0: Automatic detection Bit 1: Default duplex mode Bit 2 – 15: Reserved	0x0001
		Forced Interface Speed	UINT	Preset interface speed	0 (0x0000)

Table 72: "ETHERNET Link Object" class: instance attributes 1

Attribute ID	Access	Name	Data Type	Description	Default Value
7	Get	Interface Type	USINT	Interface type: Value 0: Unknown Value 1: Internal interface; e.g., in the case of an integrated switch. Value 2: Twisted pair (e.g., 100Base-TX). Value 3: Glass fiber (e.g., 100Base-FX). Values 4 – 256: Reserved	2 (0x02)
8	Get	Interface State	USINT	Interface status: Value 0: Unknown Value 1: Interface active and ready to send/receive. Value 2: Interface deactivated. Value 3: Interface is testing. Values 4 – 256: Reserved	-
9	Get/Set	Admin State	USINT	Administration status: Value 0: Reserved Value 1: Activate interface. Value 2: Deactivate interface. If this is the sole CIP interface, a request to deactivate is acknowledged with an error (error code 0x09) Values 3 – 256: Reserved	1 (0x01)
10	Get	Interface Label	SHORT_STRING	Readable identification	"Port 1"

Instance Attributes 2

Table 73: "ETHERNET Link Object" class: instance attributes 2

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Interface Speed	UDINT	Transfer rate	10 (0x0A) or 100 (0x64)
2	Get	Interface Flags	DWORD	Interface configuration information/status information Bit 0: Link status Bit 1: Half/full duplex Bit 2 – 4: Detection status Bit 5: Manual settings require reset Bit 6: Local hardware error Bit 7 – 31: Reserved	Value is dependent upon ETHERNET connection.
3	Get	Physical Address	ARRAY of 6 UINTs	MAC address	MAC ID of the fieldbus coupler
6	Get/Set	Interface Control	STRUCT of:	Configuration of physical interface	-
		Control Bits	WORD	Interface control bits Bit 0: Automatic detection Bit 1: Default duplex mode Bit 2 – 15: Reserved	1 (0x0001)
		Forced Interface Speed	UINT	Preset interface speed	0 (0x0000)
7	Get	Interface Type	USINT	Interface type: Value 0: Unknown Value 1: Internal interface; e.g., in the case of an integrated switch. Value 2: Twisted pair (e.g., 100Base-TX). Value 3: Glass fiber (e.g., 100Base-FX). Values 4 – 256: Reserved	2 (0x02)
8	Get	Interface State	USINT	Interface status: Value 0: Unknown Value 1: Interface active and ready to send/receive. Value 2: Interface deactivated. Value 3: Interface is testing. Values 4 – 256: Reserved	-

Table 73: "ETHERNET Link Object" class: instance attributes 2

Attribute ID	Access	Name	Data Type	Description	Default Value
9	Get/Set	Admin State	USINT	Administration status: Value 0: Reserved Value 1: Activate interface. Value 2: Deactivate interface. If this is the sole CIP interface, a request to deactivate is acknowledged with an error (error code 0x09) Values 3 – 256: Reserved	1 (0x01)
10	Get	Interface Label	SHORT_STRING	Readable identification	"Port 2"

Instance Attributes 3

Table 74: "ETHERNET Link Object" class: instance attributes 3

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Interface Speed	UDINT	Transfer rate	100 (0x64)
2	Get	Interface Flags	DWORD	Interface configuration information/status information Bit 0: Link status Bit 1: Half/full duplex Bit 2 – 4: Detection status Bit 5: Manual settings require reset Bit 6: Local hardware error Bit 7 – 31: Reserved	Value is dependent upon ETHERNET connection.
3	Get	Physical Address	ARRAY of 6 UINTs	MAC address	MAC ID of the fieldbus coupler
6	Get	Interface Control	STRUCT of:	Configuration of physical interface	
		Control Bits	WORD	Interface control bits Bit 0: Automatic detection Bit 1: Default duplex mode Bit 2 – 15: Reserved	0x0002
		Forced Interface Speed	UINT	Preset interface speed	100 (0x0064)

Table 74: "ETHERNET Link Object" class: instance attributes 3

Attribute ID	Access	Name	Data Type	Description	Default Value
7	Get	Interface Type	USINT	Interface type: Value 0: Unknown Value 1: Internal interface; e.g., in the case of an integrated switch. Value 2: Twisted pair (e.g., 100Base-TX). Value 3: Glass fiber (e.g., 100Base-FX). Values 4 – 256: Reserved	1 (0x01)
8	Get	Interface State	USINT	Interface status: Value 0: Unknown Value 1: Interface active and ready to send/receive. Value 2: Interface deactivated. Value 3: Interface is testing. Values 4 – 256: Reserved	-
9	Get	Admin State	USINT	Administration status: Value 0: Reserved Value 1: Activate interface. Value 2: Deactivate interface. If this is the sole CIP interface, a request to deactivate is acknowledged with an error (error code 0x09) Values 3 – 256: Reserved	1 (0x01)
10	Get	Interface Label	SHORT_STRING	Readable identification	"Internal port 3"

Overview of Services

Table 75: "ETHERNET Link Object" class: services

Service Code	Service Available		Service Name	Description
	Class	Instance		
01 hex	Yes	Yes	Get_Attribute_All	Delivers content of all attributes.
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute.
10hex	No	Yes	Set_Attribute_Single	Modifies an attribute value.

12.7 WAGO-Specific Classes

This manufacturer-specific addition contains information on the 767 Series components that is not contained in the CIP classes. The WAGO-specific classes are listed in the appendix.

Table 76: WAGO-specific classes

Name	Class	Information
Coupler configuration Object	64 _{hex}	For more information, refer to the relevant sections.
Node information class	82 _{hex}	
Discrete Input Point	65 _{hex}	
Discrete Input Point Extended 1	69 _{hex}	
Discrete Input Point Extended 2	6D _{hex}	
Discrete Input Point Extended 3	71 _{hex}	
Discrete Output Point	66 _{hex}	
Discrete Output Point Extended 1	6A _{hex}	
Discrete Output Point Extended 2	6E _{hex}	
Discrete Output Point Extended 3	72 _{hex}	
Analog Input Point	67 _{hex}	
Analog Input Point Extended 1	6B _{hex}	
Analog Input Point Extended 2	6F _{hex}	
Analog Input Point Extended 3	73 _{hex}	
Analog Output Point	68 _{hex}	
Analog Output Point Extended 1	6C _{hex}	
Analog Output Point Extended 2	70 _{hex}	
Analog Output Point Extended 3	74 _{hex}	
IOM Input Point Class	83 _{hex}	
IOM Output Point Class	84 _{hex}	

13 MODBUS

The 767 Series modular concept makes it possible to attach up to 64 external I/O modules to the fieldbus coupler. However, the variable node design as well as the large number of differing I/O modules make it impossible to statically assign input and output data to fixed MODBUS addresses. The only exceptions are the “digital” MODBUS services. For these, the MODBUS address is identical to the channel number, i. e., the 47th digital input can always be found at the MODBUS address “46”.

By adding or removing I/O modules, the structure of the process images is changed which also changes the MODBUS addresses of the individual I/O module channels.

The MODBUS communication is performed via service calls. To do this, the MODBUS master (client) sends a request telegram to port 502 of the MODBUS slave (server). The MODBUS slave returns the result of the service call in a response telegram to the MODBUS master.

The most important elements of a MODBUS telegram are:

Table 77: Elements of a MODBUS telegram

Term	Description
FunctionCode (FC)	Service identifier: Read or write operation to bits or words
Address	Operation start address
Count	Number of bits or words depending on the service

The service identifier or “FunctionCode” (FC) first determine whether a read or write operation is involved. It also determines the basic data type to which the operation is to be applied. Therefore, the meaning of the parameters “Address” and “Count” is also dependent on the function code. Thus “address :=3” can stand for a bit or a word in the input or output process image.

The MODBUS protocol is largely based on the following basic data types:

Table 78: Basic data types of the MODBUS protocol

Data Type	Length
Discrete Inputs	1 bit
Coils	1 bit
Input Register	16 bit

One or more “FunctionCodes” are defined for each basic data type.

Although digital and analog process data from the fieldbus coupler and I/O modules is combined in a process image, the first digital output or input is always reached with the “digital” MODBUS services at address 0. You get to the first analog output or input via the word services.



Note

Socket connections

The fieldbus coupler supports up to 15 socket connections simultaneously via MODBUS/TCP. For MODBUS/UDP, there are up to 5 telegrams that can be stored temporarily.

13.1 Process Image

After starting up the fieldbus coupler, it automatically identifies all connected I/O modules. The fieldbus coupler uses this to create a local process image, divided into an input and output data range. The data from the analog I/O modules and subsequently the data from the digital I/O modules are initially stored in these areas.

The size of the process image can be identified from the connected 767 components.

13.2 Process Data Exchange

Data exchange between the MODBUS/TCP master and the I/O modules is achieved using the MODBUS functions implemented in the fieldbus coupler via bit-by-bit or word-by-word reading and writing routines. There are four different types of process data in the fieldbus coupler:

- Input words
- Output words
- Input bits
- Output bits

13.3 Accessing the Process Image via MODBUS Functions

The following table describes the access types, which can be used to access logical address ranges.

Table 79: MODBUS function codes (FC)

FC	Name	Description
FC1	Read coils	Several digital output values are read out
FC2	Read inputs discrete	Read several digital input and output values
FC3	Read holding registers	Read several analog input and output values
FC4	Read input registers	Read several analog input and output values
FC5	Write coil	A single digital output value is written
FC6	Write single register	A single analog output value is written
FC15	Force multiple coils	Several digital output values are written
FC16	Write multiple registers	Several analog output values are written
FC22	Write register screen	Write individual bits to a register using an AND or OR screen
FC23	Read/write multiple registers	Write and read operation on analog input and output values

Note



Note the number system when addressing!

The examples listed use the hexadecimal system (e.g., 0x000) as the number format. Addressing starts with 0.

Depending on the software controller, the format and start of addressing can vary. In this case, all addresses are to be converted accordingly.

13.3.1 Register Services

With the register services, you can identify or modify the status of analog input and output modules using the function codes FC3, FC4 and FC6, FC16, FC22 and FC23.

Table 80: Read analog input terminals using FC3, FC4, FC23

MODBUS address		Description
HEX	DEC	
0x0000 – 0x00FF	0 – 255	Read analog or digital input values (part 1). Physical address space of the input data of 256 words.
0x0100 – 0x01FF	256 – 511	Invalid range ("Illegal data address")
0x0200 – 0x02FF	512 – 767	Read back of analog or digital output values (part 1). Physical size of the address space: 256 words.
0x0300 – 0x0FFF	768 – 4095	Invalid range ("Illegal data address")
0x1000 – 0x2FFF	4096 – 12287	Configuration register. See section "Configuration Register".
0x3000 – 0x5FFF	12288 – 24575	Invalid range ("Illegal data address")
0x6000 – 0x62FB	24576 – 25339	Read the input data (part 2). Additional address space of 764 words.
0x62FC – 0x6FFF	25340 – 28671	Invalid range ("Illegal data address")
0x7000 – 0x72FB	28672 – 29435	Read output data (part 2). Additional address space of 764 words.

Table 81: Write analog output terminals using FC6, FC16, FC22, FC23

MODBUS address		Description
HEX	DEC	
0x0000 – 0x00FF	0 – 255	Write analog or digital output values (part 1). Physical address space of the output data of 256 words.
0x0100 – 0x01FF	256 – 511	Invalid range ("Illegal data address")
0x0200 – 0x02FF	512 – 767	Write analog or digital output values (part 1). Physical size of the address space: 256 words. Note: Here you write the same output values of the address range 0x0000 – 0x00FF.
0x0300 – 0x0FFF	768 – 4095	Invalid range ("Illegal data address")
0x1000 – 0x2FFF	4096 – 12287	Configuration register. See section "Configuration Register".
0x3000 – 0x5FFF	12288 – 24575	Invalid range ("Illegal data address")
0x6000 – 0x62FB	24576 – 25339	Write the output data (part 2). Additional address space of 764 words.
0x62FC – 0x6FFF	25340 – 28671	Invalid range ("Illegal data address")
0x7000 – 0x72FB	(28672 – 29435)	Write the output data (part 2). Additional address space of 764 words. Note: Here you write the same output values of the address range 0x6000 – 0x62FC.
0x72FC – 0x7FFF	29436 – 32767	Invalid range ("Illegal data address")

13.3.2 Bit Services

With the digital bit services, you can identify or modify the status of digital input and output modules using the function codes FC1, FC2 and FC5, FC15.

Table 82: Read digital input terminals using FC1, FC2

MODBUS address		Description
HEX	DEC	
0x0000 – 0x01FF	0 – 511	Read the first 512 input values
0x0200 – 0x03FF	512 – 1023	Read the first 512 output values
0x0400 – 0x7FFF	1024 – 32767	Invalid range ("Illegal data address")
0x8000 – 0x85F7	32768 – 34295	Read the input values in the range of 513 to 2039
0x85F8 – 0x8FFF	34296 – 36863	Invalid range ("Illegal data address")
0x9000 – 0x95F7	36864 – 38391	Read the output values in the range of 513 to 2039
0xA000 – 0xFFFF	40960 – 65535	Invalid range ("Illegal data address")

Table 83: Write digital output terminal using FC5, FC15

MODBUS address		Description
HEX	DEC	
0x0000 – 0x01FF	0 – 511	Write the first 512 output values.
0x0200 – 0x03FF	512 – 1023	Write the first 512 output values.
0x0400 – 0x7FFF	1024 – 32767	Invalid range ("Illegal data address")
0x8000 – 0x85F7	32768 – 34295	Write the output values in the range of 513 to 2039.
0x85F8 – 0x8FFF	34296 – 36863	Invalid range ("Illegal data address")
0x9000 – 0x95F7	36864 – 38391	Write the output values in the range of 513 to 2039.
0x95F8 – 0xFFFF	38392 – 65535	Invalid range ("Illegal data address")

13.3.3 Configuration Register

By using the configuration register, you can configure the fieldbus coupler and read information using it. Access register using MODBUS functions FC4 “Read Input Registers” and FC6 “Write Single Register”.

Table 84: Configuration register for MODBUS V1

Address	Access	Length (word)	Description
0x1000	R/W	1	Read/write watchdog time
0x1001	R/W	1	Watchdog coding screen 1-16
0x1002	R/W	1	Watchdog coding screen 17-32
0x1003	R/W	1	Watchdog trigger
0x1004	R	1	Minimum trigger time
0x1005	R/W	1	Stop watchdog (write sequence 0xAAAA, 0x5555)
0x1006	R	1	Watchdog status
0x1007	R/W	1	Watchdog restart (write sequence 0x1)
0x1008	RW	1	Stop watchdog (write sequence 0x55AA or 0xAA55)
0x1009	R/W	1	MODBUS and http connection stop at a watchdog timeout
0x100A	R/W	1	Watchdog configuration
0x100B	W	1	Save watchdog parameters
0x1020	R	1 – 2	Display error group via LED
0x1021	R	1	Display error argument and error code via LED
0x1022	R	1 – 4	Number of analog output data in the process image (in bits)
0x1023	R	1 – 3	Number of analog input data in the process image (in bits)
0x1024	R	1 – 2	Number of digital input data in the process image (in bits)
0x1025	R	1	Number of digital input data in the process image (in bits)
0x1028	R/W	1	Boot configuration
0x1029	R	9	MODBUS/TCP statistics
0x102A	R	1	Number of TCP connections
0x1030	R/W	1	Configuration MODBUS/TCP timeout
0x1031	R	1	Read the MAC ID of the fieldbus coupler
0x2000	R	1	Constant 0x0000
0x2001	R	1	Constant 0xFFFF
0x2002	R	1	Constant 0x1234
0x2003	R	1	Constant 0xAAAA
0x2004	R	1	Constant 0x5555
0x2005	R	1	Constant 0x7FFF
0x2006	R	1	Constant 0x8000
0x2007	R	1	Constant 0x3FFF
0x2008	R	1	Constant 0x4000
0x2010	R	1	Firmware index
0x2011	R	1	Series designation (767)
0x2012	R	1	Fieldbus type (1301 or 2301)
0x2013	R	1	Firmware versions (major revision)
0x2014	R	1	Firmware versions (minor revision)
0x2020	R	16	Fieldbus coupler short description
0x2021	R	8	Firmware compile time
0x2022	R	8	Firmware compile date
0x2023	R	32	Firmware loader version
0x2030	R	65	Description of the connected I/O modules (0 – 64)
0x2040	W	1	Software reset (write sequence 0x55AA or 0xAA55)
0x2041	W	1	Format the user drive
0x2042	W	1	Extract the HTML pages from the firmware
0x2043	W	1	Default settings
0x2099	R/W	1	MODBUS version change (compatibility mode for Release 1)

ToS (Type of Service) is a part of the IP protocol and is used for prioritization of IP data packets in the network. Specifies is this in RFC2474.

The specification of the ToS value for Modbus Response TCP and UDP via a MODBUS register. All 6 bit of the ToS field may be affected.

Default value = 0

The adjustment has been implemented in the MODBUS register 0x1038. Possible values are 0 ... 63. For all other values, an exception is returned.

13.3.4 Watchdog Behavior

A timing function (timeout) is periodically initiated in the fieldbus coupler by the higher-level controller for monitoring the TCP connection. Because this time is always restarted before communication takes place, it cannot reach its upper value in the case of error-free communication. If this time has run out, a fieldbus failure exists. In this case, the fieldbus coupler answers all subsequent MODBUS “TCP/IP requests” with the exception code 0x0004 (slave device failure).

Separate registers exist in the fieldbus coupler for controlling the watchdog and requesting its status through the higher-level controller.

The watchdog is not yet activated when the power supply is switched on. The timeout value must first be determined (register 0x1000). The watchdog can be activated by writing a value other than 0 in the register (0x1001).

13.3.4.1 Watchdog Register

Table 85: Register address 0x1000

Register address 0x1000 (4096 _{dec})	
Value	Watchdog time
Access	Read/write
Default	0x0000
Description	The register saves the value for the timeout. The default value must be changed to a value not equal to zero, so that the watchdog can be started. The time is set in multiples of 100 ms, e.g., 0x0009 means a timeout time of 0.9 seconds. This value cannot be changed when the watchdog is running. There is no code by which the current data value can be written again while the watchdog is active.

Table 86: Register address 0x1001

Register address 0x1001 (4097 _{dec})	
Value	Watchdog function coding screen, function code 1...16
Access	Read/write
Default	0x0000
Description	Use this screen to set the function codes to trigger the watchdog function. The function code can be selected with "1". $(= 2^{(\text{function code}-1)} + 2^{(\text{function code}-1)} + \dots)$ Example: Function code 5 $\rightarrow 2^{(5-1)} = 2^4 \rightarrow$ bit 4 is set to 1 A value not equal to zero starts the watchdog function. If only codes from unsupported functions are entered in the screen, the watchdog does not start. An existing error is reset and the process image can be described again. Again here, no changes can be made when the watchdog is running. When the watchdog is active, there is no code by which the current data value can be written again.

Table 87: Register address 0x1002

Register address 0x1002 (4098 _{dec})	
Value	Watchdog function coding screen, function code 17...32
Access	Read/write
Default	0x0000
Description	The same function as before, but with the function codes 17 to 32. These codes are not supported. Therefore, this register should be left at the default value. There is no exception code by which the current data value can be written again while the watchdog is active.

Table 88: Register address 0x1003

Register address 0x1003 (4099 _{dec})	
Value	Watchdog trigger
Access	Read/write
Default	0x0000
Description	This register is used for an alternative trigger method. The watchdog is triggered by writing different values to this register. Successive values must differ in size. The watchdog starts when values not equal to zero are written. A watchdog error is reset and it is again possible to write process data.

Table 89: Register address 0x1004

Register address 0x1004 (4100 _{dec})	
Value	Minimum current trigger time
Access	Read/write
Default	0xFFFF
Description	This register saves the current smallest watchdog trigger time. When the watchdog is triggered, the saved value is compared to the current value. If the current value is smaller than the saved value, it is replaced by the current value. The unit is 100 ms/digit. The saved value is modified by writing new values. This has no effect on the watchdog. The value 0x0000 is not permitted.

Table 90: Register address 0x1005

Register address 0x1005 (4101 _{dec})	
Value	Stop watchdog
Access	Read/write
Default	0x0000
Description	If the value 0xAAAA followed by the value 0x5555 is written to this register, the watchdog stops. The watchdog error response is blocked. A watchdog error is reset and it is again possible to write to the process data.

Table 91: Register address 0x1006

Register address 0x1006 (4102 _{dec})	
Value	While watchdog runs
Access	Read
Default	0x0000
Description	Current watchdog status at 0x0000: Watchdog inactive at 0x0001: Watchdog active at 0x0002: Watchdog timed out

Table 92: Register address 0x1007

Register address 0x1007 (4103 _{dec})	
Value	Restart watchdog
Access	Read/write
Default	0x0001
Description	Writing 0x1 to the register starts the watchdog again. If the watchdog was stopped before the overflow, it is not started again.

Table 93: Register address 0x1008

Register address 0x1008 (4104 _{dec})	
Value	Just pause watchdog
Access	Read/write
Default	0x0000
Description	By writing the values 0x0AA55 or 0X55AA, the watchdog is paused if active. The watchdog error response is temporarily disabled. An existing watchdog error is reset and it is again possible to write to the watchdog register.

Table 94: Register address 0x1009

Register address 0x1009 (4105 _{dec})	
Value	Close MODBUS socket after watchdog timeout
Access	Read/write
Description	0: MODBUS socket is not closed 1: MODBUS socket is closed

Table 95: Register address 0x100A

Register address 0x100A (4106 _{dec})	
Value	Alternative watchdog
Access	Read/write
Default	0x0000
Description	Write a time value to register 0x1000 Register 0x100A = 0x0001: Watchdog is switched to active The watchdog is started with the first MODBUS telegram. Each MODBUS/TCP command triggers the watchdog. All outputs are set to zero after the watchdog time has elapsed. The outputs can be set again by writing again. The register 0x100A is permanent and also registers 0x1000. When the watchdog is on, the time value in register 0x1000 can no longer be modified.

Table 96: Register address 0x100B

Register address 0x100B (4107 _{dec})	
Value	Save Watchdog Parameters
Access	Write
Default	0x0000
Description	By writing "1" to register 0x100B, registers 0x1000, 0x1001, 0x1002 are set to permanent.

13.3.4.2 Diagnostics Registers

The following registers can be read to determine an error in the fieldbus node.

Table 97: Register address 0x1020

Register address 0x1020 (4128 _{dec})	
Value	LED Error Group
Access	Read
Description	Indication of the group number

Table 98: Register address 0x1021

Register address 0x1021 (4129 _{dec})	
Value	LED Error Code/Argument
Access	Read
Description	Indication of the error code and error argument

13.3.4.3 Configuration Registers

The following registers can be read to determine the configuration of the connected I/O modules:

Table 99: Register address 0x1022

Register address 0x1022 (4130 _{dec})	
Value	CnfLen.AnalogOut
Access	Read
Description	Number of I/O bits for the process data words of the outputs

Table 100: Register address 0x1023

Register address 0x1023 (4131 _{dec})	
Value	CnfLen.AnalogInp
Access	Read
Description	Number of I/O bits for the process data words of the inputs

Table 101: Register address 0x1024

Register address 0x1024 (4132 _{dec})	
Value	CnfLen.DigitalOut
Access	Read
Description	Number of I/O bits for the process data bits of the outputs

Table 102: Register address 0x1025

Register address 0x1025 (4133 _{dec})	
Value	CnfLen.DigitalInp
Access	Read
Description	Number of I/O bits for the process data bits of the inputs

Table 103: Register address 0x1028

Register address 0x1028 (4136 _{dec})	
Value	Boot options
Access	Read/write
Description	Boot configuration: 1: BootP 2: DHCP 4: EEPROM

Table 104: Register address 0x1029

Register address 0x1029 (4137 _{dec}) with up to 9 words	
Value	MODBUS/TCP statistics
Access	Read/write
Description	1 word SlaveDeviceFailure → Terminal bus error, fieldbus error with watchdog switched on 1 word BadProtocol → Error in MODBUS/TCP header 1 word BadLength → Incorrect telegram length 1 word BadFunction → Invalid function code 1 word BadAddress → Invalid register address 1 word BadData → Invalid value 1 word TooManyRegisters → Number of registers to be processed too high, read/write 125/100 1 word TooManyBits → Number of coils to be processed too high, read/write 2000/800 1 word ModTcpMessageCounter → Number of MODBUS/TCP telegrams received The register is reset by writing 0xAA55 or 0x55AA.

Table 105: Register address 0x102A

Register address 0x102A (4138 _{dec}) with up to 1 word	
Value	MODBUS/TCP connections
Access	Read
Description	Number of TCP connections

Table 106: Register address 0x1030

Register address 0x1030 (4144 _{dec}) with up to 1 word	
Value	Configuration MODBUS/TCP timeout
Access	Read/write
Default	0x0000
Description	This register saves the value for TCP connection monitoring. The time base is 100 ms, the minimum value is 10 ms. Open TCP connections are automatically closed if the time entered was exceeded per connection. A query on the connection triggers the watchdog.

Table 107: Register address 0x1031

Register address 0x1031 (4145 _{dec}) with up to 3 words	
Value	Read the MAC ID of the fieldbus coupler
Access	Read
Description	Output of the MAC ID, length 3 words

Table 108: Register address 0x2030

Register address 0x2030 (8240 _{dec}) with up to 65 words	
Value	Description of the connected I/O module
Access	Read I/O modules 0...64
Description	Output: e.g., "3801" for the input module 767-3801

Table 109: Register address 0x2040

Register address 0x2040 (8256 _{dec})	
Value	Perform software reset
Access	Write (write sequence 0xAA55 or 0x55AA)
Description	The fieldbus coupler performs a restart by writing the values 0xAA55 or 0x55AA.

Table 110: Register address 0x2041

Register address 0x2041 (8257 _{dec})	
Value	Flash format
Access	Write (write sequence 0xAA55 or 0x55AA)
Description	The Flash file system is reformatted.

Table 111: Register address 0x2042

Register address 0x2042 (8258 _{dec})	
Value	Extract files
Access	Write (write sequence 0xAA55 or 0x55AA)
Description	The default files (HTML pages) of the fieldbus coupler are extracted and written to the Flash file system.

Table 112: Register address 0x2043

Register address 0x2043 (8259 _{dec})	
Value	0x55AA
Access	Write
Description	Default settings

13.3.4.4 Firmware Information Register

The following registers are used to read information about the fieldbus coupler firmware.

Table 113: Register address 0x2010

Register 0x2010 (8208_{dec}) with up to 1 word	
Value	Revision
Access	Read
Description	Firmware index, e.g., 0005 for version 5

Table 114: Register address 0x2011

Register address 0x2011 (8209_{dec}) with up to 1 word	
Value	Series code
Access	Read
Description	WAGO series number, e.g., 0767 for WAGO SPEEDWAY 767

Table 115: Register address 0x2012

Register address 0x2012 (8210_{dec}) with up to 1 word	
Value	Item number
Access	Read
Description	WAGO item number, e.g., 1301 for the fieldbus coupler 767-1301, etc.

Table 116: Register address 0x2013

Register address 0x2013 (8211_{dec}) with up to 1 word	
Value	Major sub item code
Access	Read
Description	Firmware version major revision

Table 117: Register address 0x2014

Register address 0x2014 (8212_{dec}) with up to 1 word	
Value	Minor sub item code
Access	Read
Description	Firmware version minor revision

Table 118: Register address 0x2020

Register address 0x2020 (8224 _{dec}) with up to 16 words	
Value	Description
Access	Read
Description	Information about the fieldbus coupler, 16 words

Table 119: Register address 0x2021

Register address 0x2021 (8225 _{dec}) with up to 8 words	
Value	Description
Access	Read
Description	Time of the firmware version, 8 words

Table 120: Register address 0x2022

Register address 0x2022 (8226 _{dec}) with up to 8 words	
Value	Description
Access	Read
Description	Date of the firmware version, 8 words

Table 121: Register address 0x2023

Register address 0x2023 (8227 _{dec}) with up to 32 words	
Value	Description
Access	Read
Description	Information about programming the firmware, 32 words

13.3.4.5 Constant Register

The following registers contain constants that can be used to test communication with the master:

Table 122: Register address 0x2000

Register address 0x2000 (8192 _{dec})	
Value	Zero
Access	Read
Description	Constant with zero

Table 123: Register address 0x2001

Register address 0x2001 (8193 _{dec})	
Value	Ones
Access	Read
Description	Constant with ones. • “-1” if constant is declared as “signed int” • “MAXVALUE” if constant is declared as “unsigned int”

Table 124: Register address 0x2002

Register address 0x2002 (8194 _{dec})	
Value	1,2,3,4
Access	Read
Description	Constant value for testing whether high and low bytes are exchanged (Intel/Motorola format). Should appear in the master as 0x1234. If 0x3412 appears, high and low bytes must be exchanged.

Table 125: Register address 0x2003

Register address 0x2003 (8195 _{dec})	
Value	Screen 1
Access	Read
Description	Constant that displays whether all bits are present. Used together with register 0x2004.

Table 126: Register address 0x2004

Register address 0x2004 (8196 _{dec})	
Value	Screen 1
Access	Read
Description	Constant that displays whether all bits are present. Used together with register 0x2003.

Table 127: Register address 0x2005

Register address 0x2005 (8197 _{dec})	
Value	Largest positive number
Access	Read
Description	Constant to check the arithmetic

Table 128: Register address 0x2006

Register address 0x2006 (8198 _{dec})	
Value	Largest negative number
Access	Read
Description	Constant to check the arithmetic

Table 129: Register address 0x2007

Register address 0x2007 (8199 _{dec})	
Value	Largest half positive number
Access	Read
Description	Constant to check the arithmetic

Table 130: Register address 0x2008

Register address 0x2008 (8200 _{dec})	
Value	Largest half negative number
Access	Read
Description	Constant to check the arithmetic

14 Diagnostics

14.1 LED Signaling

For the local diagnostic, the fieldbus coupler contains various LEDs that display the operating state of both the fieldbus coupler and the S-BUS. This information can also be displayed with WAGOframe. For more information, see section “Readout of Blink Codes using WAGO DTMs”.

14.2 ETHERNET Status Messages

The following table lists the ETHERNET status messages that are indicated by the LEDs (21) on the fieldbus coupler. Information regarding remedies of certain causes is also provided.

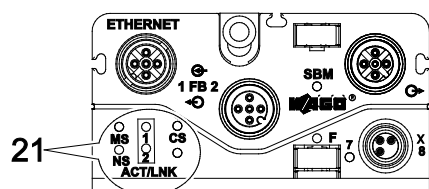


Figure 35: LEDs, which display status messages

Table 131: ETHERNET status messages

LED	Color/Status	Cause	Remedy/Information
MS	Off	The fieldbus coupler is not connected to the power supply.	Check the power supply for the fieldbus coupler. Check the cable for damage.
	Green	The fieldbus coupler is operating correctly.	-
	Green, flashing	The 767 node is not yet fully configured.	Configure the fieldbus coupler (e.g., by assigning an IP address).
	Red, flashing	A repairable error exists in the 767 node.	Contact WAGO support.
	Red	A non-repairable error exists in the 767 node.	Contact WAGO support.
	Red/green, flashing	Self test	-

Table 131: ETHERNET status messages

LED	Color/Status	Cause	Remedy/Information
NS	Off	No IP address has been assigned to the fieldbus coupler. The fieldbus coupler is not connected to the power supply.	Check the power supply for the fieldbus coupler. Check the cable for damage. Assign the fieldbus coupler an IP address.
	Green	A connection to the higher-level controller is established.	-
	Green, flashing	No connection to the higher-level controller is established.	-
	Red, flashing	At least one connection has reported a timeout.	Check the "packet rate". Check the cable for damage.
	Red	The IP address used by the fieldbus coupler already exists in the same network.	Assign the fieldbus coupler a different IP address.
	Red/green, flashing	Self test	-
ACT/LNK 1	Off	Fieldbus coupler has no connection with the physical network.	Check the cable connection of the FB1 ETHERNET connection.
	Green	Connection to physical network exists.	-
	Green, flashing	Data is being exchanged via ETHERNET.	-
ACT/LNK 2	Off	Fieldbus coupler has no connection with the physical network.	Check the cable connection of the FB2 ETHERNET connection.
	Green	Connection to physical network exists.	-
	Green, flashing	Data is being exchanged via ETHERNET.	-

14.3 Operational Messages of the Fieldbus Coupler

The following table lists the operational messages that are signaled via LEDs. Information regarding remedies of certain causes is also provided.

Note



Disable diagnoses

Use the diagnostic overview (see section “Parameterizing” > “Diagnostic Overview and Parameters of Inputs”) to disable specific diagnostics (see F-LED). In this case, the LED is disabled (off).

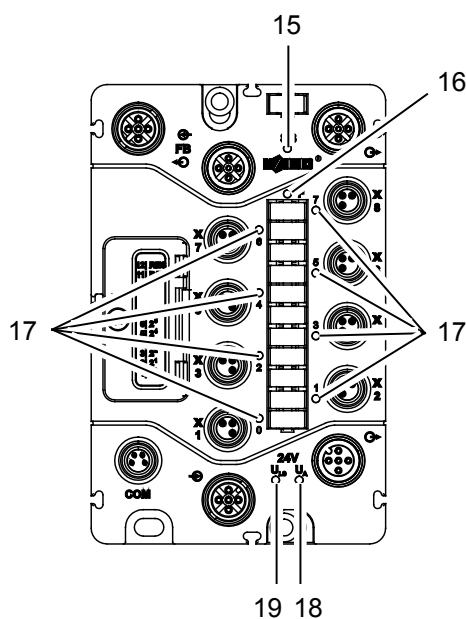


Figure 36: LEDs which display operational messages

Table 132: Operational messages of the fieldbus coupler

Pos.	LED	Color	Cause	Correction
15	SBM	Green flashing	S-BUS is being started.	-
		Green	S-BUS is functioning without problems.	-
		Red	Disruption on the S-BUS.	Check whether all components are connected to the S-BUS. Also check the S-BUS connection and S-BUS cable
16	F	Red	Group error. At least one diagnostic message is available on the digital inputs.	Check the power supply of the connected sensors.
17	I/O	Yellow	Input signal pending	-
18	U _A	Green	Actuator supply is present.	-
		OFF	Actuator supply is not present.	Connect the power supply and check the voltage level, if applicable.
19	U _{LS}	Green	Logic supply and sensor supply are present.	-
		OFF	Logic supply and sensor supply are not present.	Connect the power supply and check the voltage level, if applicable.

14.4 Error Messages from the Fieldbus Coupler via LED Signals

Error messages or warnings from the fieldbus coupler are displayed in WAGOframe. They are also displayed via the CS LED (21) as a blink code.

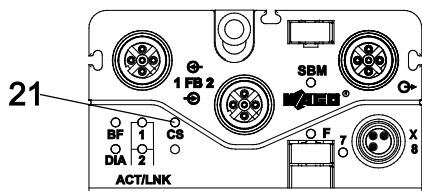


Figure 37: Indicator of blink codes via CS LED

An error is always displayed as **three blinking sequences** in a cyclic manner:

1. The first blinking sequence indicates the **group number**.
The starting point in identifying the error is the group number, from which the error groups can be determined. The number of blink pulses indicates the specific error group.
Example:
Group number 1: Group of S-BUS errors.
2. After a short pause, the second blinking sequence appears and indicates the **error code**. The number of blink pulses indicates the specific error code that describes the type of error.
Example:
Error code 5: S-BUS terminator not attached to last I/O module.
3. After another pause, the third blinking sequence appears and indicates the error argument. The number of blink pulses indicates the **error argument**, which provides supplemental descriptions of the error; for example, on which of the 767 components an error is present.
Example:
Entry 0 ... 63: In which of the connected I/O modules this error has arisen.
For example, if “5” is indicated in the blink code, the error arose in the fifth I/O module (the “0” denotes the digital inputs of the fieldbus coupler)

The group number, error code and error argument are displayed as blink codes that are to be converted into numbers. The blink code can display numbers with single, double or triple digits. A zero is always expressed in four cycles of 20 Hz; zeroes preceding a digit(s) are ignored.

14.4.1 Progression of Blink Sequence

The following table outlines the progression of the blink codes over time. If there is no number in the second position ("1" in the number "10") or third position ("1" in the number "100") for the group number, error code or error argument, the subsequent pause does not take place; instead, the next sequence is initiated (designated in ***bold and cursive*** font in the following table).

Table 133: Overview of the blink codes

Description	Frequency	Additional explanations
Start sequence blinks	10 cycles with 12.5 Hz each (12.5 times per second)	Initiation of start phase
Pause	1 s	
Group number		
Group number (third (100) position)	Repeats: 0.5 s on and 0.5 s off	Repeats according to group number
Pause	2 s	-
Group number (second (10) position)	Repeats: 0.5 s on and 0.5 s off	Repeats according to group number
Pause	2 s	-
Group number (first (1) position)	Repeats: 0.5 s on and 0.5 s off	Repeats according to group number
<i>Pause</i>	<i>2 s</i>	-
<i>Blinks</i>	<i>40 ms</i>	Initiation of error code
<i>Pause</i>	<i>2 s</i>	
Error code		
Error code (third (100) position)	Repeats: 0.5 s on and 0.5 s off	Repeats according to error code
Pause	2 s	-
Error code (second (10) position)	Repeats: 0.5 s on and 0.5 s off	Repeats according to error code
Pause	2 s	-
Error code (first (1) position)	Repeats: 0.5 s on and 0.5 s off	Repeats according to error code
<i>Pause</i>	<i>2 s</i>	-
<i>Blinks</i>	<i>40 ms</i>	Initiation of error argument
<i>Pause</i>	<i>2 s</i>	
Error argument		
Error argument (third (100) position)	Repeats: 0.5 s on and 0.5 s off	Repeats according to error argument
Pause	2 s	-
Error argument (second (10) position)	Repeats: 0.5 s on and 0.5 s off	Repeats according to error argument
Pause	2 s	-
Error argument (first (1) position)	Repeats: 0.5 s on and 0.5 s off	Repeats according to error argument
Pause	4 s	-
Progression restarts when start sequence blinks		

14.4.2 Example of an Error Message via Blink Code

The following example clarifies an error message as indicated by the blink code. An S-BUS error is displayed when the software update for the sixth I/O module fails.

Initialization:

1. The CS LED begins with the initiation of the start phase: quick flashing of about 1 s
2. A one-second pause occurs.

Group number 1: S-BUS error

3. The CS LED blinks once for the first digit: 0.5 s on and off.
4. The initiation of the error code follows with a pause of two seconds, 40ms of blinking and another pause of two seconds.

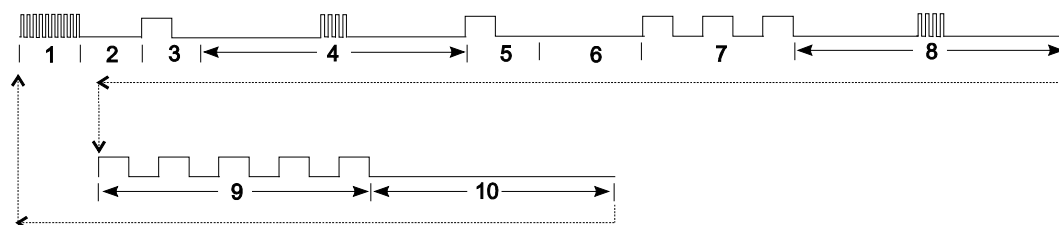
Error code 13: software update for I/O module failed

5. The CS LED blinks once for the first digit.
6. A two-second pause occurs.
7. The CS LED blinks 3 times for the second digit.
8. The initiation of the error argument follows with a pause of two seconds, 40ms of blinking and another pause of two seconds.

Error argument 5: I/O module in the sixth slot

9. The CS LED blinks 5 times for the first digit.
10. A four-second pause occurs.

The blink code starts when the start phase is initiated. This process is repeated if only one error is present; if more are present, the next pending error is processed.



14.4.3 Meaning of the Blink Codes and Procedures for Correcting Them

In this section, all errors and warnings are listed that are given by the CS LED and BUS LED.

The errors and warnings are divided into the following error groups:

Table 134: List of error groups

Group Number	Description	Indicator
1	S-BUS error	CS LED
2	S-BUS warning	
3	-	
4	-	
5	General internal hardware errors	
6	General internal hardware warnings	
7	General software errors	
8	General software warnings	
9	-	
10	-	
11	Fieldbus-specific software errors	
12	Fieldbus-specific software warnings	
13	Firmware loader error	
14	Error with firmware download	

If the subsequent errors and warnings are not corrected with the indicated measures, please contact the WAGO AUTOMATION Support. Be ready to give them the blink code that is displayed.

Phone: +49 571 887 555
 Fax: +49 571 887 8555
 E-mail: support@wago.com

Table 135: Group Number 1: S-BUS Error

Error code	Error argument	Cause	Correction
1	0 ... 64	Error during S-BUS initialization.	Check the cable for damage. Perform a restart by disconnecting the power supply and then reconnecting it.
2			
3			
4			
5	0 ... 64	Error during S-BUS initialization. The last I/O module could not be initialized.	Check the cables to and from the last I/O module. Make sure that the S-BUS terminator is plugged into the last I/O module or are not connected to the fieldbus coupler as 64 I/O modules.
6	0 ... 64	Error when starting S-BUS. An S-BUS disruption exists on the I/O module that is located in front of the I/O module indicated by the error argument.	Check the cable for damage. Perform a restart by disconnecting the power supply and then reconnecting it.
	255	The "Restart" function (see "S-BUS-Master" in section "Parameterization") is deactivated; a short disruption occurred on the S-BUS. This could not be localized since the disruption on the S-BUS no longer existed during investigation of the disruption point.	
7	0 ... 64	Error when starting S-BUS.	
8			
9			
10			
11	1	A disruption in the S-BUS has arisen.	Check whether the S-BUS cable is connected properly. Check the S-BUS cable for damages.
12	1	Switching to software update mode is not possible.	Perform a restart by disconnecting the power supply and then reconnecting it.
13	0 ... 64	Software update for I/O module failed.	
14	1	Authentication failed.	Perform a restart by disconnecting the power supply and then reconnecting it.
	2		

Table 135: Group Number 1: S-BUS Error

Error code	Error argument	Cause	Correction
15	0 ... 64	Current software is defective. S-BUS operation only possible in recovery mode to load new software.	Perform a firmware update of the I/O modules.
16	1	Error when starting the S-BUS.	
	2		
	3	Error when stopping the S-BUS	
17	0	Error at the digital inputs of the fieldbus coupler	Perform a restart by disconnecting the power supply and then reconnecting it.
18	0 ... 64	Communication test with an I/O module failed. The physical address of this module is indicated by the error argument.	
19	0	Error when initializing the S-BUS	Perform a restart by disconnecting the power supply and then reconnecting it. If you cannot eliminate the error, please contact WAGO support.
...	255		
23			
24			
25	0 ... 64	The parameters of an I/O module are invalid.	Retry the IOM update via WAGOframe.
26		The physical address of this module is indicated by the error argument.	

Table 136: Group Number 2: S-BUS Warnings

Error code	Error argument	Cause	Correction
1	1	Cycle time of S-BUS cannot be applied.	Specify a higher cycle time.
2	1	Restart of S-BUS was performed.	-
	2	Communication on the S-BUS was stopped.	-
	3	Error reaction of S-BUS was activated.	-
3	0	Invalid OPH configuration	Check the maximum configuration definition, the configuration level definition and the physical node configuration.
4	255	Firmware update of I/O module	The modules switch to the mode for updating the firmware. In this mode, no process data is exchanged.
5	0 ... 255	User settings for sensor-/actor delay are invalid.	Change user settings for sensor-/actor delay.

Table 137: Group Number 5: General Internal Hardware Errors

Error code	Error argument	Cause	Correction		
1	1	Error when accessing flash memory.	Perform a restart by disconnecting the power supply and then reconnecting it.		
	2				
	7	Error when initializing the USB stack.			
2	1	EEPROM error	Contact WAGO support.		
	2				
	3	Real-time clock (RTC) is defective.			
	4				
3	1	RAM error			
	2				
	3				
4	1	Error in internal coprocessor.	Perform a restart by disconnecting the power supply and then reconnecting it. If you cannot eliminate the error, please contact WAGO support.		
	2				
	3				
	4				
5	1				
	2				
	3				
	4				
6	1	Combination of hardware and software not allowed.	Perform a firmware update on the fieldbus coupler		
	9	EEPROM error	Perform a restart by disconnecting the power supply and then reconnecting it.		
7	255	Internal fault	These blink codes assist the support team in further error investigation. Please be ready to give them the group number, error code and error argument.		
...					
18					

Table 138: Group Number 6: General Internal Hardware Warnings

Error code	Error argument	Cause	Correction
1	1	Fieldbus coupler has not been connected to power supply for six days (back-up capacitor of RTC empty).	Set the real-time clock via WAGOframe.

Table 139: Group Number 7: General Software Errors

Error Code	Error Argument	Cause	Correction
1	0 – 254	Internal fault	Perform a restart by disconnecting the power supply and then reconnecting it. If you cannot eliminate the error, please contact WAGO support.
2	1 – 7		
3	1 – 5		
4	1		
6	1 – 10		
7	1		
8	1 – 31		
9	1	Internal fault	Perform a restart by disconnecting the power supply and then reconnecting it. If you cannot eliminate the error, please contact WAGO support.
	2		
	3		
	4		
	5		
	10	Error in the parameter database of the fieldbus coupler.	Select the checkbox “Create nominal system configuration” in the SPH-DTM to save the current parameters of the I/O modules again to the file system of the fieldbus coupler (parameter database is created). If you cannot eliminate the error, please contact WAGO support.
	11	Parameter database version is not supported.	
	12	The number of I/O modules does not match the number entered in the parameter database (I/O module removed or added).	
	13	Error in the parameter database of the fieldbus coupler.	
	14	Internal fault	Perform a restart by disconnecting the power supply and then reconnecting it. If you cannot eliminate the error, please contact WAGO support.
	15		
	16		
	20	Order number(s) for I/O module(s) differ(s) from that saved in the parameter database (e.g., 767-6401 instead of 767-6402).	Replace the I/O module by the I/O module with the correct order number. The “Bus address of the first faulty component” parameter appears in the SPH-DTM. This shows you the I/O module to be replaced (e. g., “Bus address 3” refers to the 3rd I/O module on the fieldbus coupler).
9	21	The firmware release index from I/O module(s) does not match that saved in the parameter database. (Only occurs when the “FW/HW Release Index Check I/O Module” checkbox is enabled in the SPH.)	Update the firmware of the I/O module affected.

Table 139: Group Number 7: General Software Errors

Error Code	Error Argument	Cause	Correction
	22	The hardware release index from I/O module(s) does not match that saved in the parameter database. (Only occurs when the “FW/HW Release Index Check I/O Module” checkbox is enabled in the SPH.)	Update the parameter database in the fieldbus coupler for the I/O module affected. Enter the position of the respective I/O module in the “Bus address of I/O modul to update” parameter.
	23	Internal fault	Perform a restart by disconnecting the power supply and then reconnecting it. If you are unable to correct the problem using the aforementioned measures, contact WAGO Support.
	24		
	25	The saved parameters cannot be transferred to the I/O module because: - There is an incompatible firmware version (after creating the parameter database, one or more modules that have an incompatible firmware version as opposed to the original(s) were switched from a 767 node. or - A communication error has occurred.	Perform a restart by disconnecting the power supply and then reconnecting it. If this does not correct the error, update the firmware of the I/O module affected. If you are unable to correct the problem using the aforementioned measures, contact WAGO Support.
	30	Error in the parameter database of the fieldbus coupler.	Select the checkbox “Create nominal system configuration” in the SPH-DTM to save the current parameters of the I/O modules again to the file system of the fieldbus coupler (parameter database is created). If the problem persists, contact WAGO support.
	31	Internal fault	Perform a restart by disconnecting the power supply and then reconnecting it. If you cannot eliminate the error, please contact WAGO support.
	32		
	33		
	34		
	40		

Table 139: Group Number 7: General Software Errors

Error Code	Error Argument	Cause	Correction
10	1 – 9	Internal fault	These blink codes assist the support team in further error investigation. Please be ready to give them the group number, error code and error argument.
11	1		
12	1	The construction of the 767-station has changed. It 767 components were removed or added.	Perform a restart by disconnecting the power supply and then reconnecting it

Table 140: Group number 8: general software warnings

Error Code	Error Argument	Cause	Correction
2	2	Automatic parameterization of the I/O modules is not permitted.	Select the “Do not overwrite I/O module parameters” checkbox in the SPH. Disable this option if you want to allow automatic parameterization for all I/O modules or to update the parameter database.

Table 141: Group Number 9: Specific Hardware Errors

Error code	Error argument	Cause	Correction
The blink codes for the general software warnings assist the WAGO support team in further error investigation. Please be ready to give them the group number, error code and error argument.			

Table 142: Group Number 11: Fieldbus-specific Software Error

Error code	Error argument	Cause	Correction
1	1	Invalid MAC address	Check the MAC address.
	2	Assignment of IP address has failed.	Check the configuration of the IP address.
	3	Error during ETHERNET initialization	Perform a restart by disconnecting the power supply and then reconnecting it.
	4		
	4		
	5		
	6		
	7	DHCP lease time elapsed	Check connection to DHCP server.
	8	IP address already exists in the same network.	Change your IP address.
2	1	Error during FTP initialization	Contact WAGO support.
	2	Error during SNTP initialization	
	3	Error during MODBUS initialization	
	4	Error during ETHERNET /IP initialization	
	5	Internal error	
	6	Error during service protocol initialization	
	7	Error during SNMP initialization	
3	1	Error during SNTP configuration	Check the configuration of the SNTP parameters.
4	-	ETHERNET errors specific to the operating system	Contact WAGO support.
5	1	Fieldbus runtime error	Contact WAGO support.
	2		
	3		
	4		
	5		
	6		
6	1	The MODBUS Watchdog was triggered.	Restart the MODBUS Watchdog. See Chapter "Configuration Register".

Table 143: Group number 12: fieldbus-specific software warnings

Error Code	Error Argument	Cause	Correction
5	1	No diagnostic data available	Perform a restart by disconnecting the power supply and then reconnecting it.
			Check the data cables for correct fit and for damages.
	2	Configured response to a fieldbus error cannot be set.	Perform a restart by disconnecting the power supply and then reconnecting it.
	3		
	4	Internal error	

Table 144: Group Number 13: Firmware Loader Error

Error code	Error argument	Cause	Correction
1	1	No firmware in fieldbus coupler.	Perform a firmware update using the USB interface.
	2	Firmware checksum error.	
	3		
2	1	USB communication disrupted.	Perform a restart by disconnecting the power supply and then reconnecting it.
	2		
	3		
	4		
	5		
	6		
	7		
	8		
3	1	EEPROM error or incompatible firmware	
	2		
	3		
	4		
	5		
	6		
	7		
4	1	Internal fault	
	2		
5	1		Perform a restart by disconnecting the power supply and then reconnecting it.
	2		
6	1	Access to flash memory not possible	Perform a firmware update using the USB interface
	2		
	3		
	4	Wrong firmware version	
	5	Internal fault	
7	1	Error in firmware file	
	2		
	3		
	4		
	5		
	6		
	7		
8	1	Real-time clock (RTC) is defective	-
	2		
	3		

Table 144: Group Number 13: Firmware Loader Error

Error code	Error argument	Cause	Correction
9	1	Code processor error	Perform a restart by disconnecting the power supply and then reconnecting it.
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
10	1		
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
11	1	Error when accessing Interrupt Controller.	
	2		
12	1	SDRAM error	

Table 145: Group Number 14: Error with Firmware Download

Error code	Error argument	Cause	Correction
1	0	Switching to software update mode is not possible.	Perform a restart by disconnecting the power supply and then reconnecting it.
2	0 ... 64	Software update for I/O module failed. The error argument indicates the logical module address.	
3	1	Internal fault	These blink codes assist the support team in further error investigation. Please be ready to give them the group number, error code and error argument.
	2		
	3		
	4		

14.5 Readout of Blink Codes using WAGO DTMs

Error messages or warnings from the fieldbus coupler are also displayed in WAGOframe under the “Blink code” entry. For this to function, the WAGOframe software (or another FDT border application) and the WAGO DTMs must be installed on your PC. For more information, see section “Parameterization via FDT/DTM”. An overview of the meaning of the blink codes can be found in section “Meaning of the Blink Codes and Procedures for Correcting Them”.

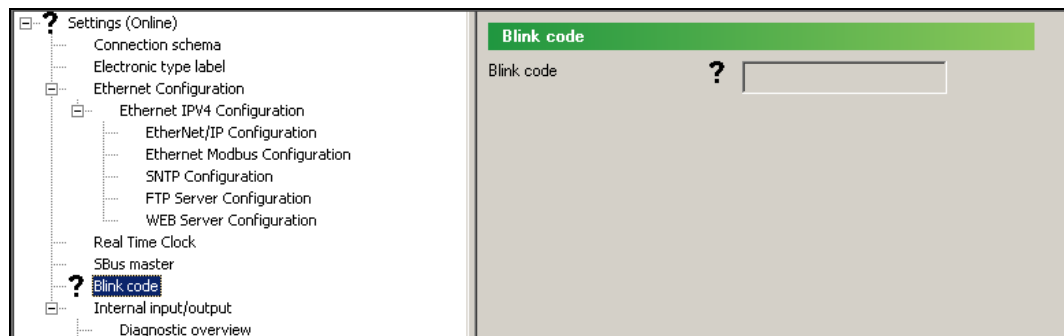


Figure 38: Example of the blink code display under the “Blink code” parameter in WAGOframe

Note



Web-based management

Error messages or warnings from the fieldbus coupler are also displayed in the web-based management on the “Information” page.

15 Parameterizing

This section explains device parameterization with the help of an FDT border application (FDT/DTM) using WAGOframe.

DANGER

Changing parameters!

When parameters are incorrectly modified with an FDT/DTM border application (e.g. WAGOframe), machine components could be placed in a dangerous state and personnel and machines could be at risk.

Before changing the parameters, ensure that the machine components are in a safe and defined state and switch off the higher-level controller.

Also ensure before start-up that no personnel remain in the danger area of the machine components.

FDT is an abbreviation for “Field Device Tool”. This refers to an application that can be utilized for parameterization of the fieldbus devices independent of the fieldbus being used. For this purpose, the application needs supplementation in the form of software components, which establish the communication with the individual devices and supply the adjustable parameters. These software components are called DTM (Device Type Manager) and produced by the device manufacturers.

FDT/DTM represents an open concept in which the individual components of various manufacturers work together. The concept thus reduces the number of proprietary, manufacturer-specific software solutions and cultivates a uniform operating concept inside a comprehensive operating program.

For the parameterization of a 767 node, an appropriate DTM is available for each 767 component. Use this DTM to parameterize the 767 components. The 767 components can be parameterized either online or offline. The offline mode enables the parameterization of a 767 component that is not yet present. In the offline mode, first store the parameter in a project and later transfer it to the 767 components.

In the online mode, there is a direct connection between the display and the connected 767 components. If a 767 component is in the online mode, its name is displayed in **bold** and *italic* font in the network window.

15.1 Installing the FDT/DTM Components

The following sections deal exclusively with WAGOframe.

When using another FDT/DTM frame application, install only the USB driver (item no.: 759-922), the Service Interface DTM (item no.: 759-371) and the WAGO DTM (item no.: 759-361) on your computer. These can be obtained on the Internet at www.wago.com.

Information on configuring the fieldbus coupler using WAGO DTM can be obtained in section “Parameterizing”.

1. Insert the “WAGOframe” CD into your CD-ROM drive.
2. The start screen appears. Select the desired installation language. A product selection window opens. If Autostart is not activated, open the “Language.htm” file.



Figure 39: Start screen of WAGOframe CD

3. To install the necessary 767 programs, click on the appropriate link. A window opens displaying the corresponding installation programs.

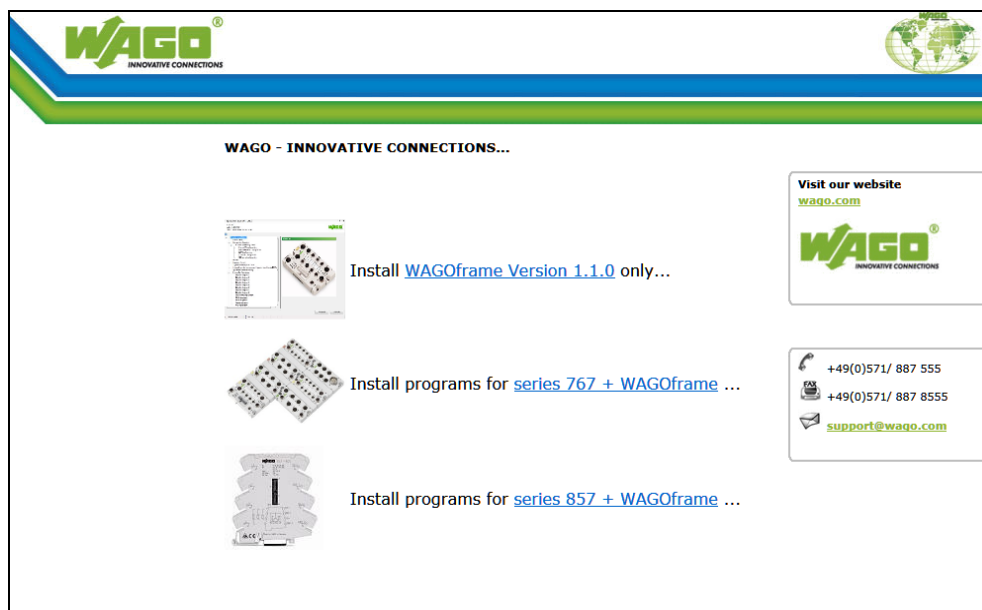


Figure 40: Window for product selection 1

4. To enable you to use the devices of the 767 series, install the FDT/DTM components shown below by clicking on the appropriate link. The “File Download” dialog box opens. To install the programs, click **[Open]**.
 - USB driver, 759-922
 - WAGOframe (installation is only necessary if an FDT/DTM border application has been installed on your PC), 759-370
 - WAGO service interface DTM, 759-371
 - DTM for the fieldbus coupler and I/O modules, 759-361
 - DTM for the system update, 759-362

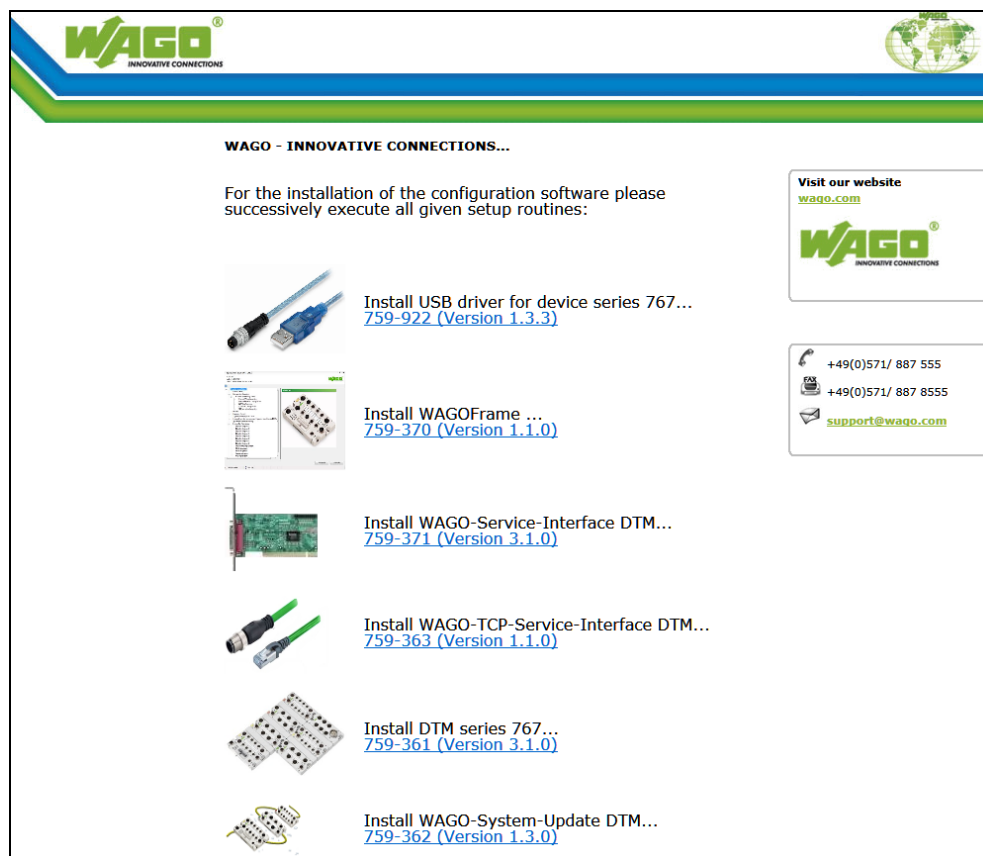


Figure 41: Window for product selection 2

5. After installing all necessary 767 programs connect your computer with the fieldbus coupler via the USB cable. See also section "Connecting Data and Supply Cables" > "Connecting the USB Cable".

15.2 Starting WAGOframe

1. Start the FDT border application by double-clicking on the WAGOframe logo on your desktop.



Figure 42: WAGOframe logo

2. You can also start WAGOframe from the start menu of your operating system by clicking on “Start” and selecting **Programs > WAGO Software > WAGOframe**.
3. When the “Device Selection Wizard” opens, select “Expert Mode”. The “Point to Point Mode” only applies to the configuration of directly connected devices with no S-BUS (such as WAGO Jumpflex). Click [Next].

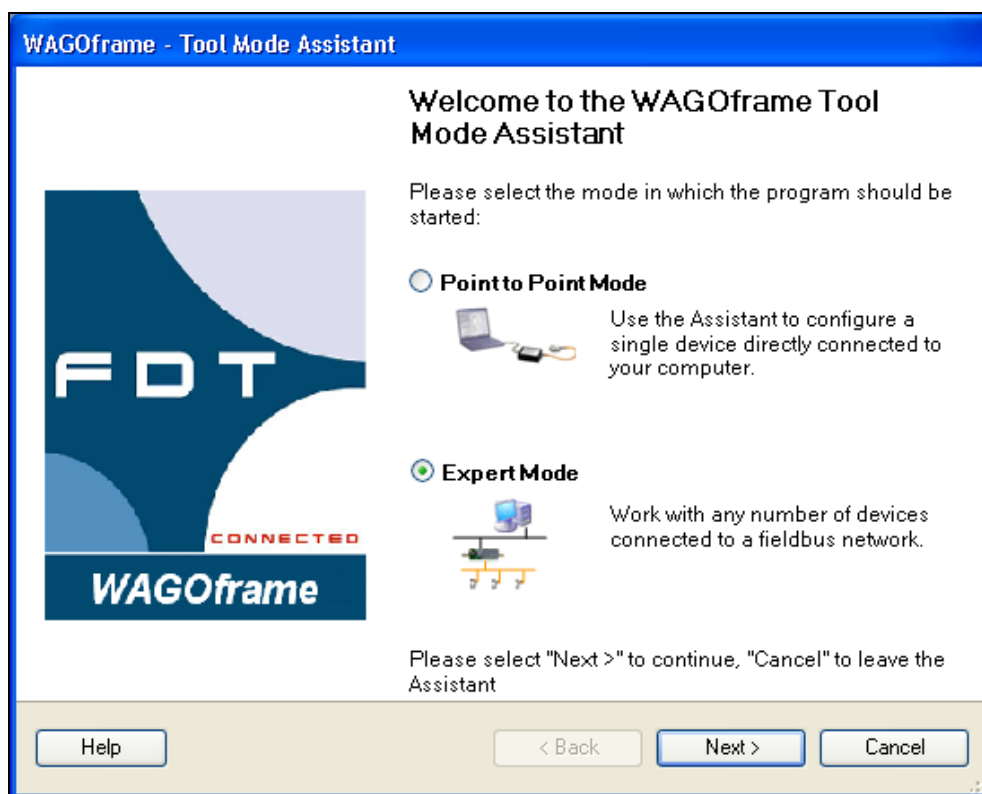


Figure 43: “Device Selection Wizard”

4. When opened for the first time, the “Query WAGOframe” dialog box appears. Click [Yes] to automatically set up the device catalog on your PC. After the device catalog has been updated, all 767 components for which a DTM is installed are listed.

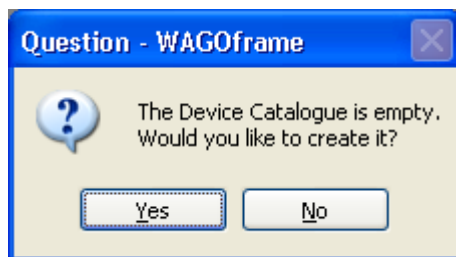


Figure 44: “Query WAGOframe” dialog box (exemplary)

15.3 Expansion of Device Catalog to include 767 Components

WAGOframe automatically detects newly installed DTMs at the next start-up. To expand the device catalog, proceed as follows:

1. To update the device catalog, navigate to the menu bar and select **View > Device Catalog**.
2. In the “Query WAGOframe” dialog box, click [Yes] to update the device catalog.

After updating, the device drivers for the 767 components appear in the device catalog.

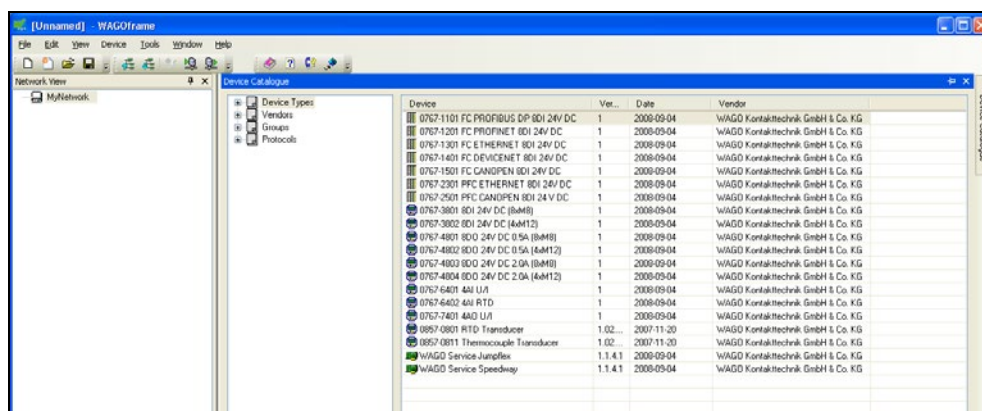


Figure 45: View of device catalog (example)

15.4 Setting Up Network Manually

In order to work with the 767 components, the exact node structure topology must be copied into the “Network View” of WAGOframe.



Note

Setting up the network

Depending on the application, you can create the network manually (see this section), automatically (see section “Set up network automatically”) or using the Life list (see section “Life list”).

15.4.1 Adding the Communication DTM

So that you can parameterize the fieldbus coupler and the I/O modules connected with it, establish a connection to your PC via the USB interface.



Note

Access via ETHERNET

You can access WAGOframe also via ETHERNET (only 767-1201, -1301, -2301). See section “Parameterization via WAGOframe” > “Service Communication via ETHERNET”.

1. Right-click on “Network” in the “Network View” pane.
2. In the context menu, select **Add...**. The “Add...” dialog box opens.

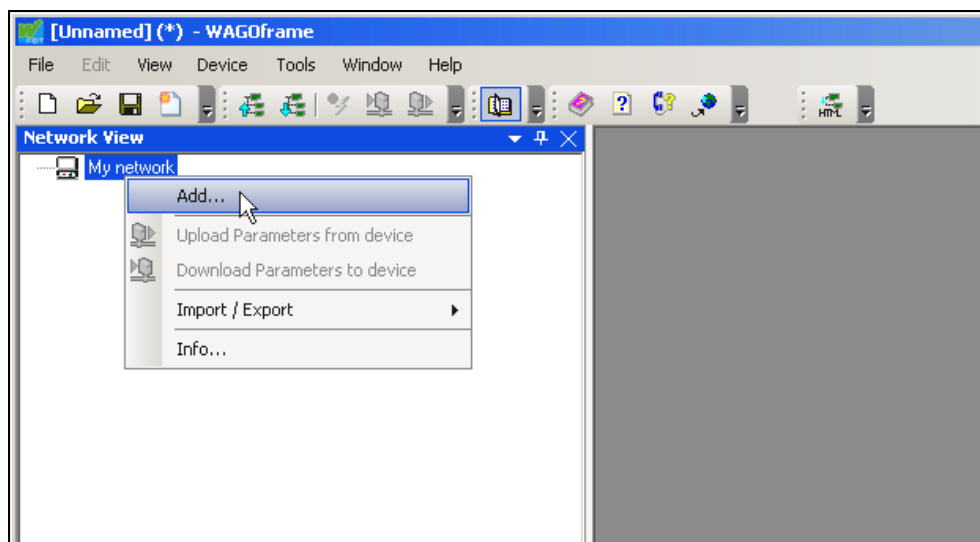


Figure 46: Adding the communication DTM (example)

3. In the “Add” dialog box, select “WAGO Service Speedway”.
4. Click **[OK]** to confirm your selection.

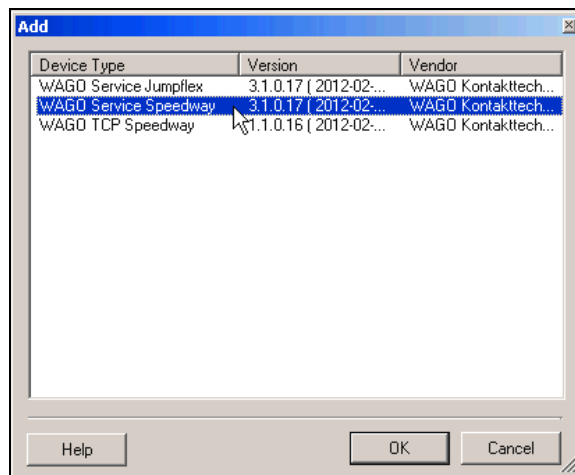


Figure 47: Selecting the communication DTM (example)

15.4.2 Selecting the Communications Interface for WAGOframe

This chapter is only relevant if you use “Online Parameter Setting”.

Requirement:

The fieldbus coupler must be switched on and your PC must be connected with the USB interface. For more information, see section “Connection to the Data and Supply Cable” > “Connecting the USB Cable”.

1. Double-click on the “WAGO Service Speedway” DTM in the “Network View” pane. The DTM for the interface configuration opens.
2. Select the COM port that you use from the **Interface selection** box. If the list of available interfaces is empty, check whether the fieldbus coupler is switched on and connected to your PC via the USB cable.
If you establish the connection via **[Go online]** later, the COM port is checked. If it is incorrect, it is automatically selected.
3. Click **[Apply]** and then **[Close]**.

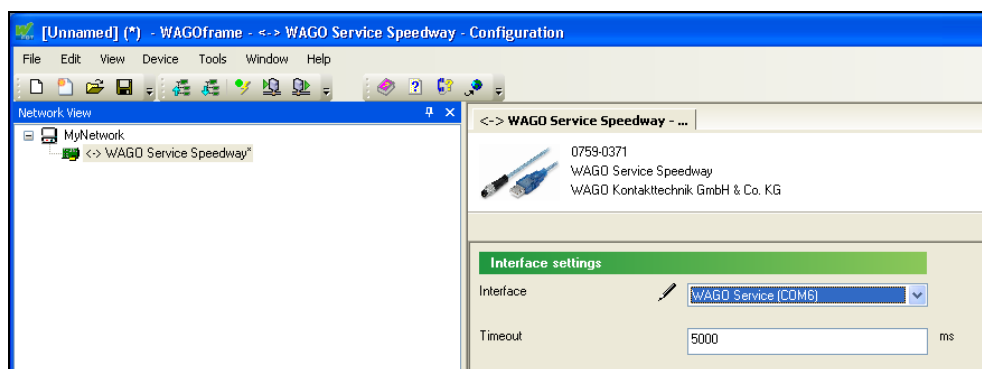


Figure 48: The DTM for the interface configuration (example)



Note

COM Port

This COM port number remains constant for the fieldbus coupler currently connected. When connecting a different fieldbus coupler to the PC, the COM port also changes. In this case, “WAGO Service Speedway” attempts to select the new COM port automatically. If several fieldbus couplers are connected to the PC, select the correct COM port.

The “WAGO SPEEDWAY Portmapper” is used to specify a constant COM port. The software is contained on the “WAGOframe” CD-ROM.

15.4.3 Adding a Fieldbus Coupler

To incorporate the fieldbus coupler into WAGOframe, proceed as follows:

1. Right-click on the “WAGO Service Speedway” DTM in the “Network View” pane.
2. In the context menu, select **Add....** The “Add...” dialog box opens.

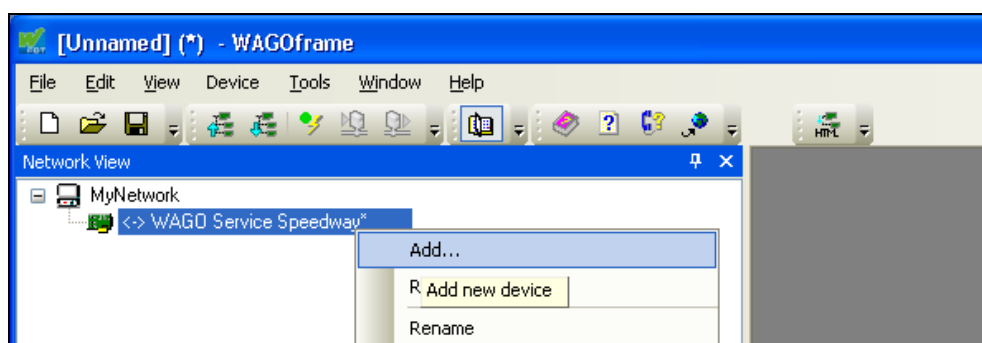


Figure 49: Adding a fieldbus coupler (example)

3. In the “Add...” dialog box, select the fieldbus coupler that you use.
4. Click [OK] to submit your selection.

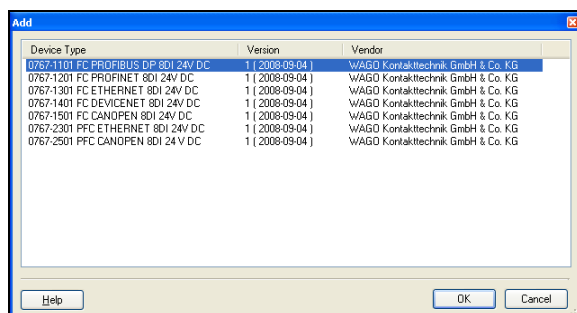


Figure 50: Adding the fieldbus coupler (example)

15.4.4 Adding the I/O Modules

To incorporate the I/O modules that you use into WAGOframe, proceed as follows:

1. Right-click on the “<Speedway:> 0767-xxxx” device driver in the “Network View” pane.
2. In the context menu, select **Add...**. The “Add...” dialog box opens.

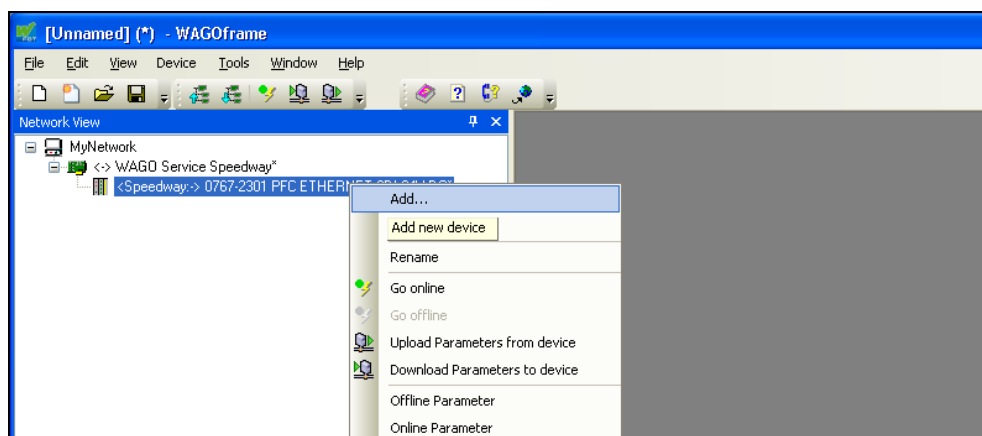


Figure 51: Adding the I/O modules (example)

3. In the “Add...” dialog box, select the I/O module's device type.
4. Click **[OK]** to confirm your selection.

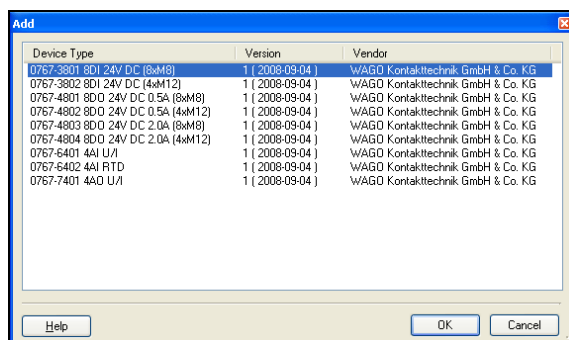


Figure 52: Selecting an I/O module (example)

- Repeat steps one through four until the module arrangement is concordant with your fieldbus node. In our example, two I/O modules were added.

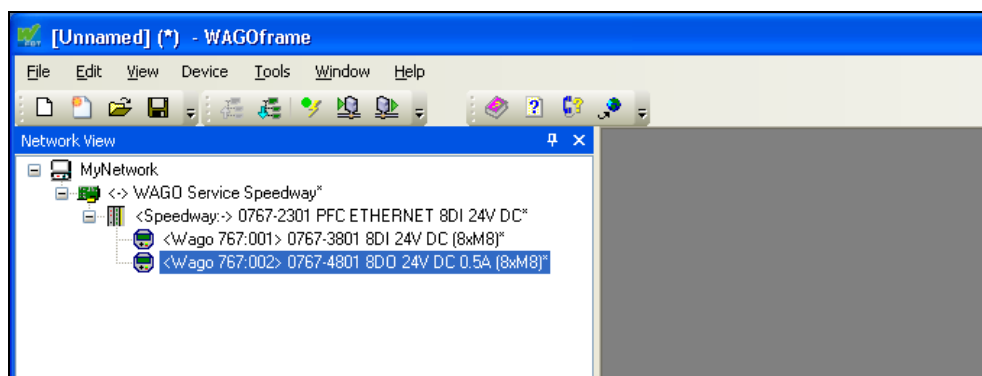


Figure 53: Two added I/O modules

To avoid having to apply the physical process image of the 767 components created in WAGOframe in the “Network View” again, you can save the topology as a project file. Click **[File] > [Save]**.

15.5 Online and Offline Parameter Setting

The options of online and offline parameter setting are available for configuring the 767 components. The offline mode enables the parameterization of a 767 component that is not yet present. In the offline mode, first store the parameters in a project and later transfer them to the 767 components. In the online mode, there is a direct connection between the display and the connected 767 components. If a 767 component is in the online mode, its name is displayed in ***bold and italic*** font in the network window.

15.5.1 Offline Parameter Setting

Requirement:

To configure the fieldbus coupler in offline mode, the network structure of the 767 node must have been transferred to WAGOframe (see section “Parameterization via WAGOframe” > “Setting Up Network Manually”).

For offline configuration, proceed as follows:

1. Right-click on the “<Speedway:> 0767-xxxx” device driver of the fieldbus coupler in the “Network View” pane.
2. In the context menu, select **Offline Parameter**. The configuration interface opens with the fieldbus coupler parameters. Details on these parameters can be found in section “Parameterizing”.

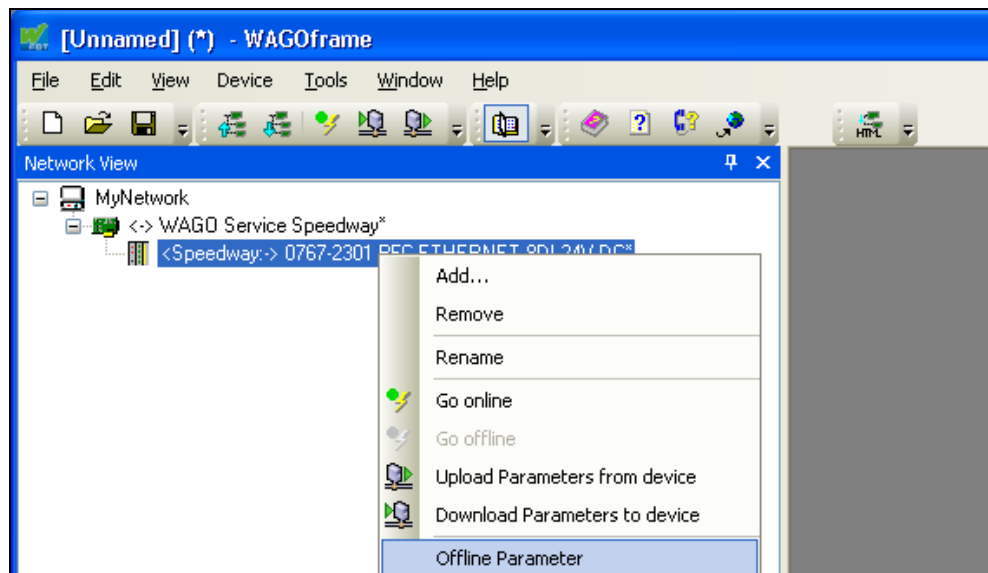


Figure 54: Opening the configuration interface (offline, example)

3. To configure the I/O modules, right-click on one of the I/O modules in the “Network View”.
4. In the context menu, select **Offline Parameter**. The configuration interface opens with the corresponding I/O module parameters. Information on these parameters can be found in the respective I/O module manual.

5. Save the configuration in a project by clicking on **[Accept]** and **[File] > [Save]**.
6. Transfer the project file to the respective 767 component. To transfer parameters, right-click on the fieldbus coupler or on the respective I/O module and select **Download Parameters to device** from the context menu.

15.5.2 Online Parameter Setting

Requirement:

To configure the fieldbus coupler in online mode, the network structure of the 767 node must have been transferred to WAGOframe (see section “Parameterization via WAGOframe” > “Setting Up Network Manually”). You can also utilize the “Set Up Network” option as described in section “Parameterizing” > “Setting Up Network Manually”.

For offline configuration, proceed as follows:

1. Right-click on the “<Speedway:> 0767-xxxx” device driver in the “Network View” pane.
2. In the context menu, select **Go online**. When the progress bar reaches 100%, a connection to the fieldbus coupler has been established. Repeat this step for each desired I/O module.

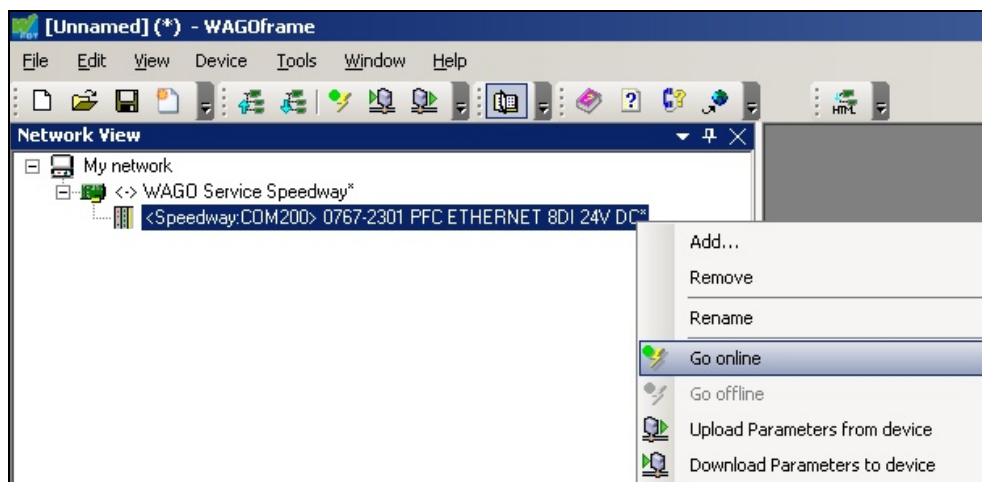


Figure 55: Setting up a connection to the fieldbus coupler (example)

3. In the context menu, select **Online Parameter**. The configuration interface opens with the fieldbus coupler parameters. Details on these parameters can be found in section “Parameterizing”.

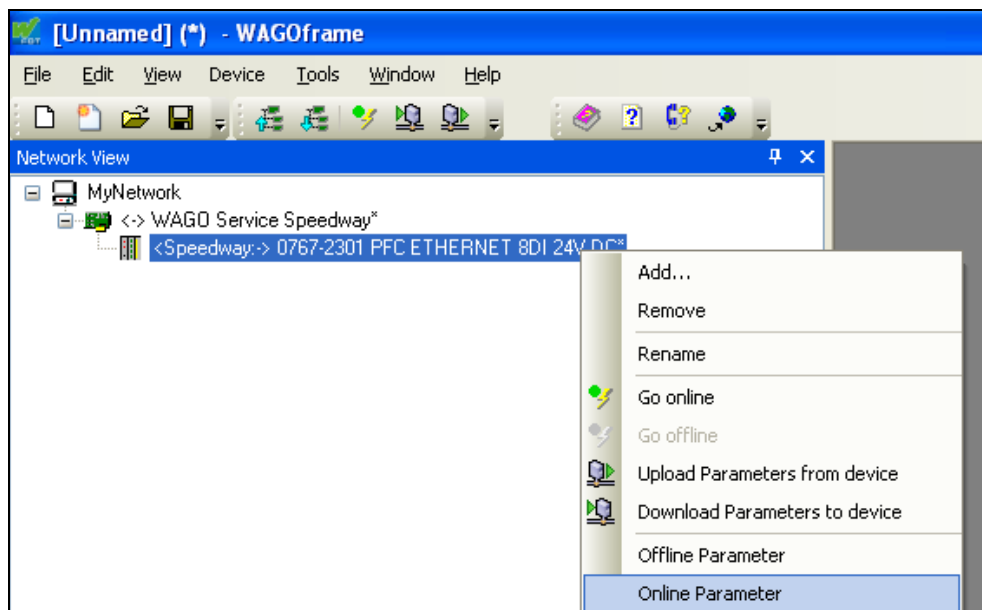


Figure 56: Opening the configuration interface (online, example)

4. To configure the I/O modules, right-click on one of the I/O modules in the “Network View”.
5. In the context menu, select **Online Parameter**. The configuration interface opens with the corresponding I/O module parameters. Information on these parameters can be found in the respective I/O module manual.

Note



Online Parameter Setting

If you are unable to select the “Online Parameter Setting” entry, the “Offline Parameter Setting” interface may still be open. Close the interface.

6. To save the parameters in the respective 767 components, click **[Write]**.
7. To read the current parameterization in the respective 767 components, click **[Read]**.

15.6 The “Additional Functions” and “Scan” Selections

Requirement:

You have switched on the fieldbus coupler, connected your PC with the USB connection and established a communication link to the 767 components (“Go online” in the context menu).

The “**Additional Functions**” selection from the context menu provides the following additional functionalities in addition to the possibility of parameterization:

- **Change bus address**
Here you can change the S-BUS addresses for individual I/O modules.
- **I/O owner assignment**
Here you can specify to which process image (e.g., fieldbus) an I/O module should belong.
- **Diagnostics setup**
Here you can enable or disable synchronous diagnostics and diagnostic confirmation of the I/O modules, as well as the integrated digital inputs of the fieldbus coupler.
- **Service page**
You can use the Service page to restore the default state for selected 767 components.
- **User management**
In the user management, you can change the preset passwords (see section “User Management”) for the guest, user and admin users. In addition, you can reset all passwords to their default state.
- **File system**
Here you administer the file system of the fieldbus coupler.

The “**Scan**” selection from the context menu offers the following options:

- **Set up network**
Add all 767 components connected to the PC by the USB cable to the network view.
- **Life list**
Add individual 767 components connected to the PC by the USB cable to the “Network View”.

15.6.1 Changing the Bus Address

Requirement: Disconnect the communication link to the fieldbus coupler (“Go offline” in the context menu).

If you wish to simply configure select I/O modules instead of the entire topology, add these I/O modules manually to the Network View. For these I/O modules to be accessible at the correct bus address, you must assign them the correct addresses. To do so, please proceed as follows:

1. Right-click on the coupler in the “Network View” pane.
2. In the context menu, select **Additional Functions > Change bus addresses**. A window opens with a list of the bus nodes.

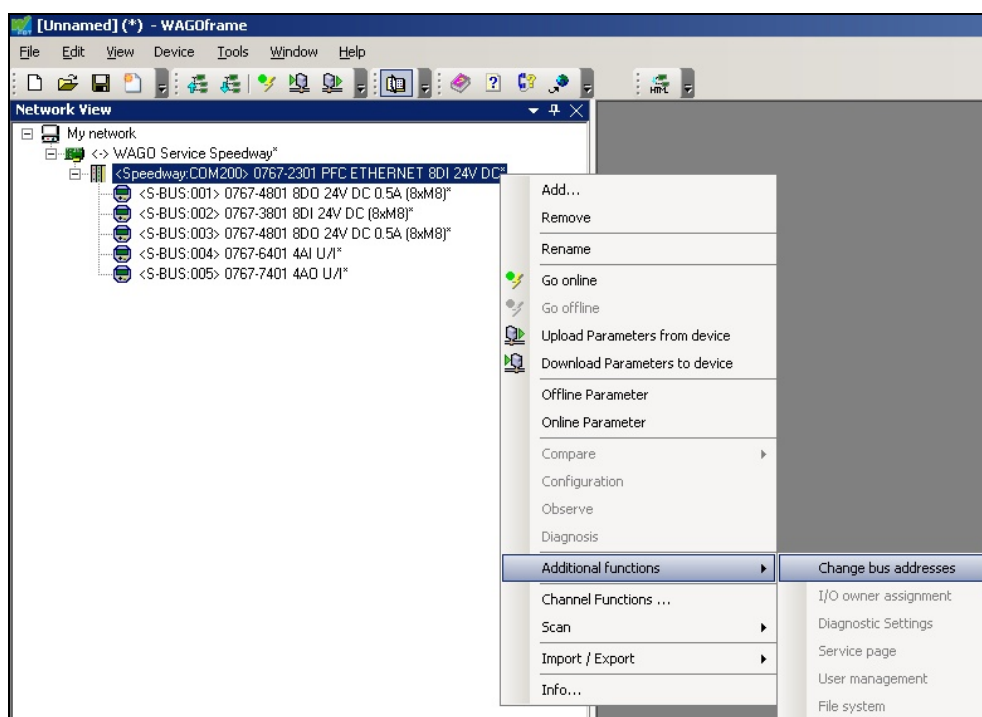


Figure 57: Opening the “List of Bus Nodes” window (example)

3. Now select an I/O module from the “List of Bus Nodes” to which you wish to assign a new bus address. The current address is displayed in the **New Bus Address** field. Enter here the desired new address and click [Apply].

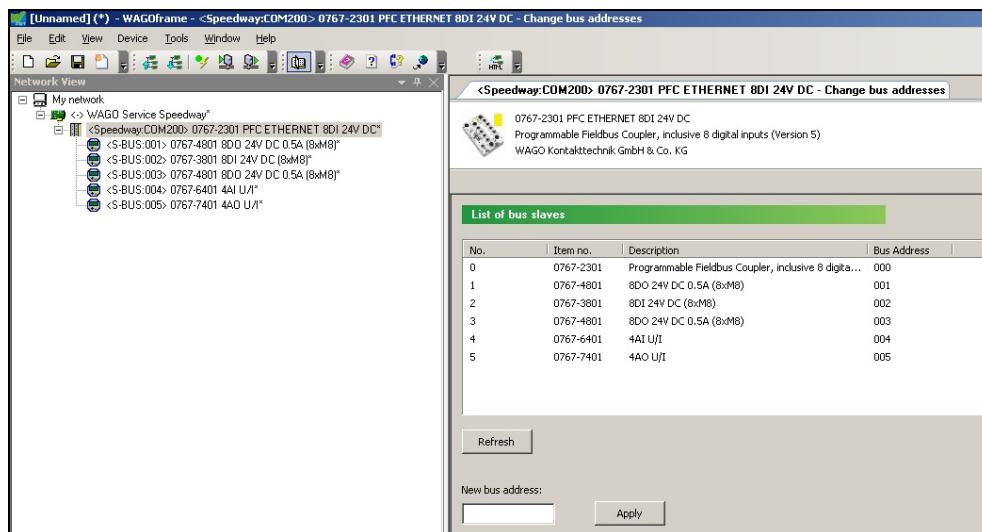


Figure 58: Assigning new bus addresses for the I/O modules (example)

15.6.2 Assigning the I/O Owner

To configure the assignment of an I/O module to a fieldbus or to the runtime environment proceed as follows:

1. Right-click on the coupler in the "Network View" pane. In the context menu, select **Additional Functions** > **I/O owner assignment**. A window opens with a list of the bus nodes.

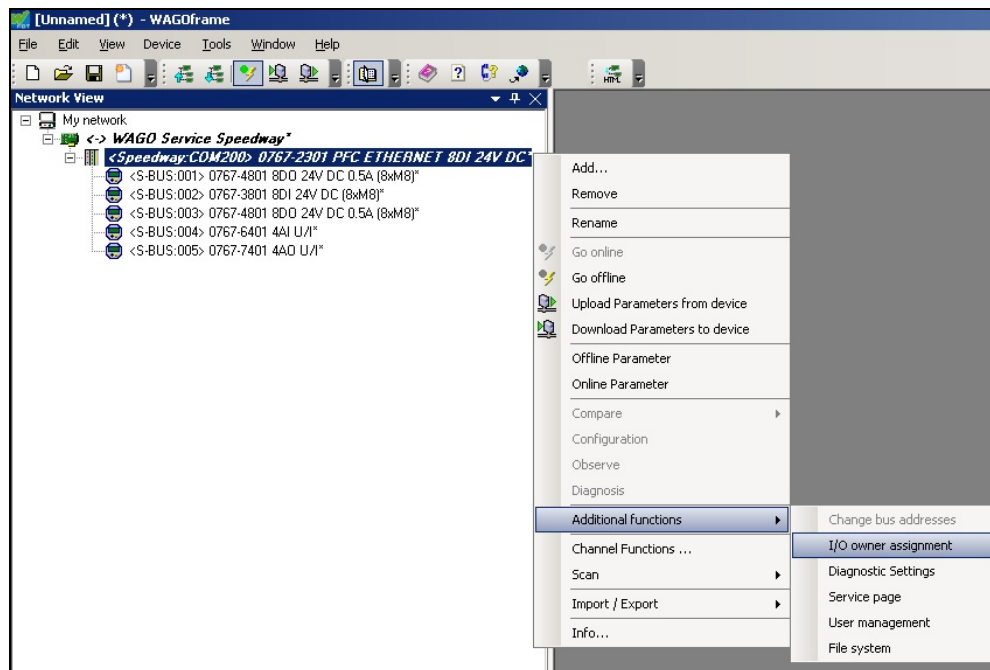


Figure 59: Opening the "Assign Owner" window (example)

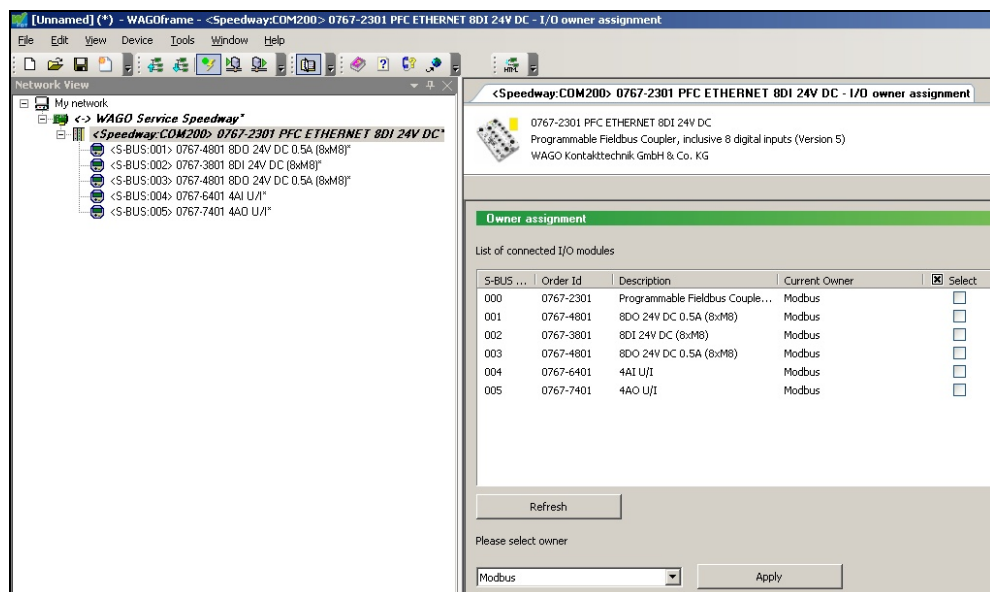


Figure 60: "Assign Owner" window (example)

2. Select the I/O module that you wish to configure via the "Select" selection box.
3. Select the new user (fieldbus or runtime system) for the selected I/O modules from the selection box. Click **[Apply]** to confirm.

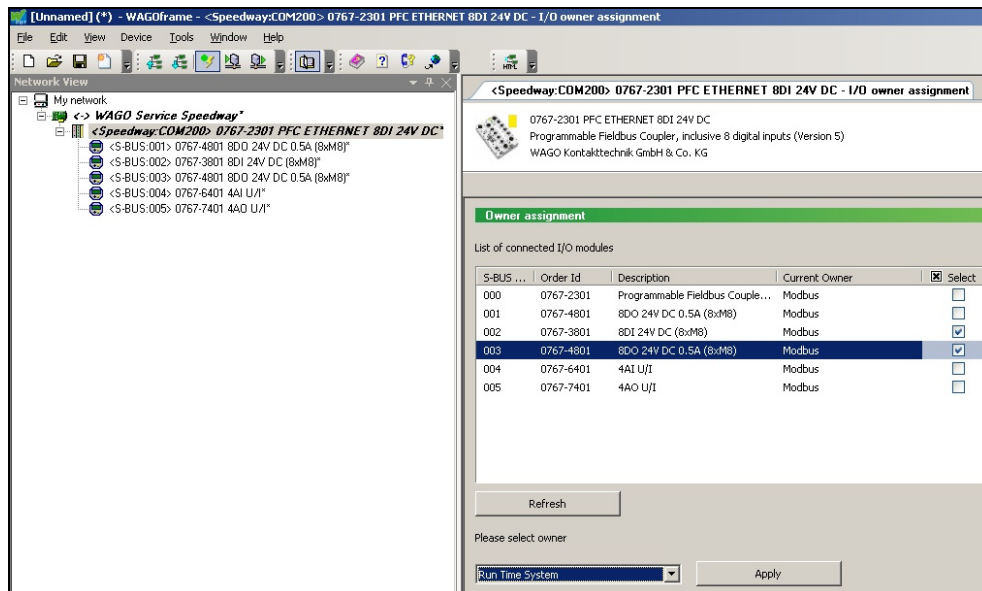


Figure 61: Selecting a new user for the selected I/O modules (example)



Note

Important Note!

If you want to apply the settings, click **[Yes]** in the window. The 767 node is restarted.

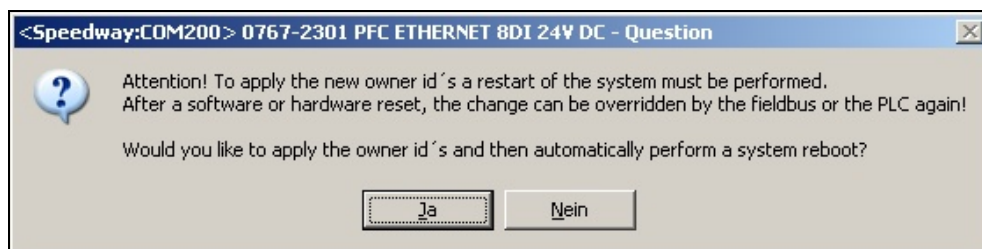


Figure 62: Warning (example)

4. If the changes were successfully carried out, can be seen in the updated list.

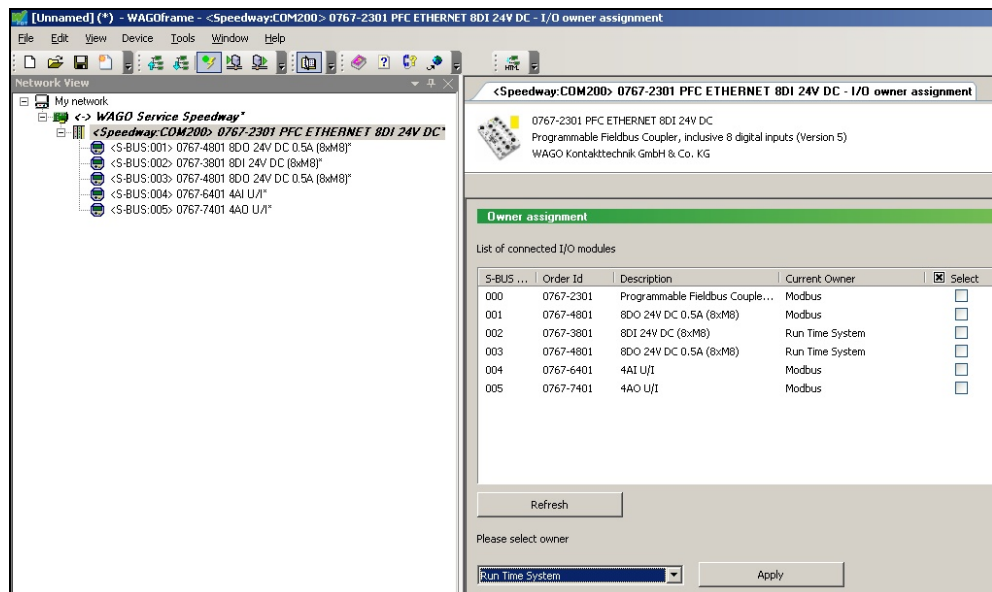


Figure 63: Runtime system chosen as new user for the selected I/O modules (example)

Note



Configuration

Because configuring the fieldbus or runtime (at 767-1301 not available) environment accurately sets the assignment, you will normally not need to change the assignments. Configuration is only necessary if the assignment is incorrect.

15.6.3 Service Page

The Service page is used to restore the default state for selected 767 components.

1. Right-click on the fieldbus coupler in the “Network View” window.
2. In the context menu, select **Additional Functions > Service Page**.

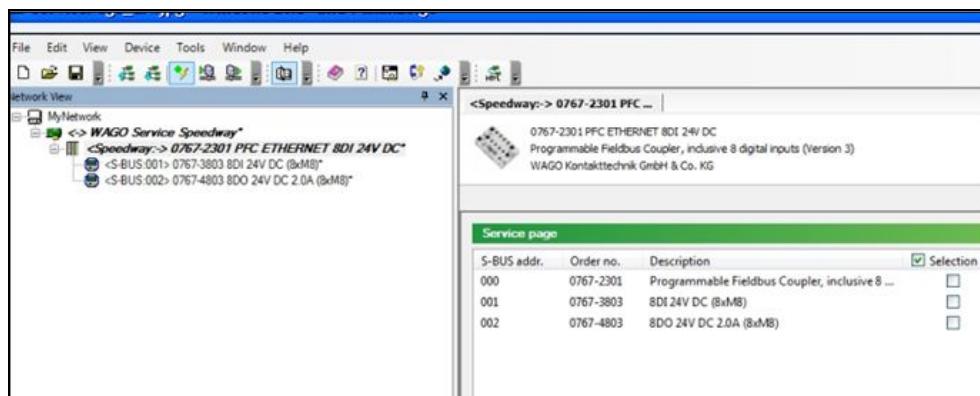


Figure 64: Service page (example)

Table 146: Service page

Parameter/button	Description
S-BUS Addr.	Displays the physical position of the devices in the 767 node. 000: Fieldbus coupler 001: First I/O module connected to the fieldbus coupler 002: Second I/O module connected to the fieldbus coupler
Item No.	Item number of a 767 component
Designation	Designation of a 767 component
Selection	Selection of the 767 components that should be reset to the default state.
[Update list]	Update the 767 components displayed in the DTM after changing the physical topology (e.g., I/O module removed or added).
[Restore factory]	Reset the selected 767 components to the default state.
[Reset]	Reset of the 767 components

15.6.4 User Management

Use the user management to change the preset passwords for the users **guest**, **user** and **admin** or set the changed passwords back to the default.

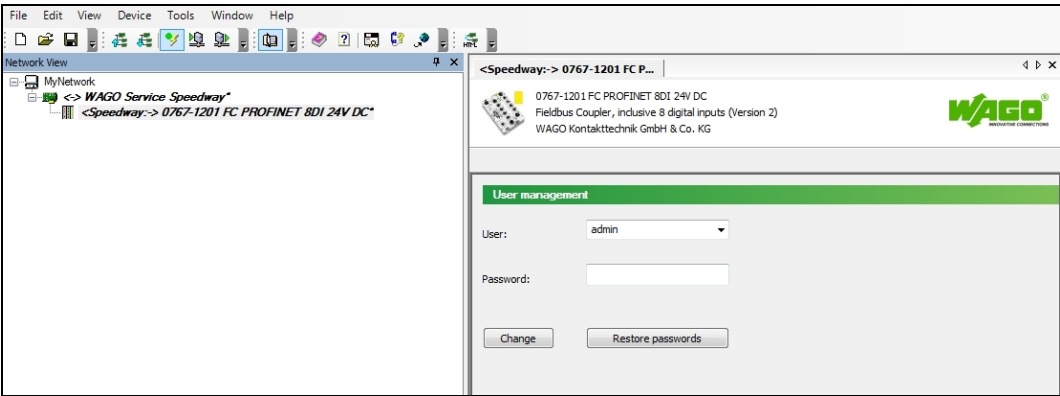


Figure 65: User management (example)

Table 147: User management

Parameter/button	Description
User	Select a user whose password should be changed.
Password	Enter a password for the selected user. Only ASCII characters are permitted.
[Change]	Save the new password for the selected user. A dialog appears. Enter admin to confirm the new password and click [OK].
[Reset password]	Reset the password to the default state. This must be performed by a superuser with a special password. Obtain the password indicating the ID listed in the dialog for WAGO Support.



Figure 66: Prompt to reset passwords

15.6.5 File System

Use the file system function to administer the file system on the fieldbus coupler. You can format drives, extract data from the firmware, create or delete directories, upload, download and delete files.

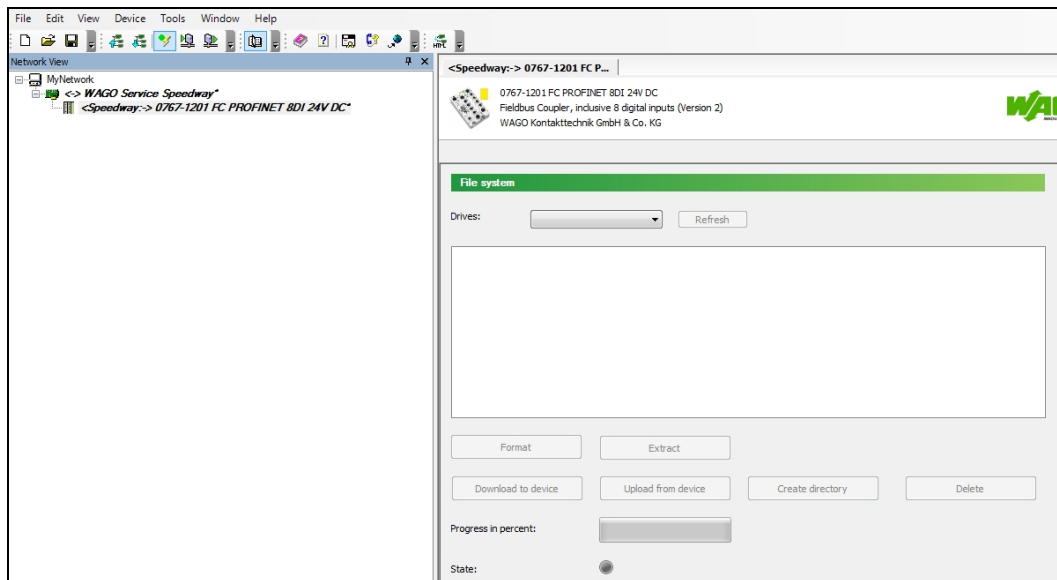


Figure 67: File system (example)

Table 148: File system

Parameter/button	Description
Drives	Select the fieldbus coupler drive: U:\ (WBM pages) – not available for 767-2501 P:\ (CODESYS-Program) – only for 767-2301 and 767-2501
[Reread]	Reread the drive currently selected.
[Format]	Format the drive selected under “Drives”. All files are deleted.
[Extract]	Extract files from the firmware (WBM, system settings, etc.). Note: Any changes made to the existing files may be overwritten when files are extracted again!
[Download to device]	Copy files from the file system of the PC to the fieldbus coupler. Without selection: Data is saved to the top level of the file system. Selected folder: Data is saved to the selected folder.
[Upload from device]	Copy files from the fieldbus coupler to the PC (e.g., to edit them).
[Create directory]	Create a new director (folder) Without selection: The new directory is created at the top level of the file system. Selected folder: The new directory is created in the selected folder of the file system.
[Delete]	Delete selected files or directories (folders). You can only delete empty directories (folders).
State	Status display of an operation: Green: The selected procedure is completed. Yellow: The selected procedure is active. Red: Error in the action just executed.

15.6.6 Set up network automatically

This involves inserting all 767 components into the topology that are connected to the USB connection.

1. Right-click on a coupler in the “Network View” pane or directly on the “WAGO Service Speedway” DTM.
2. In the context menu, select **Scan > Create Network**.
If the “WAGO Service Speedway” DTM is selected, all components connected to the 767 nodes will be carried over into the topology. If your coupler is selected, only the I/O modules will be attached to the coupler.

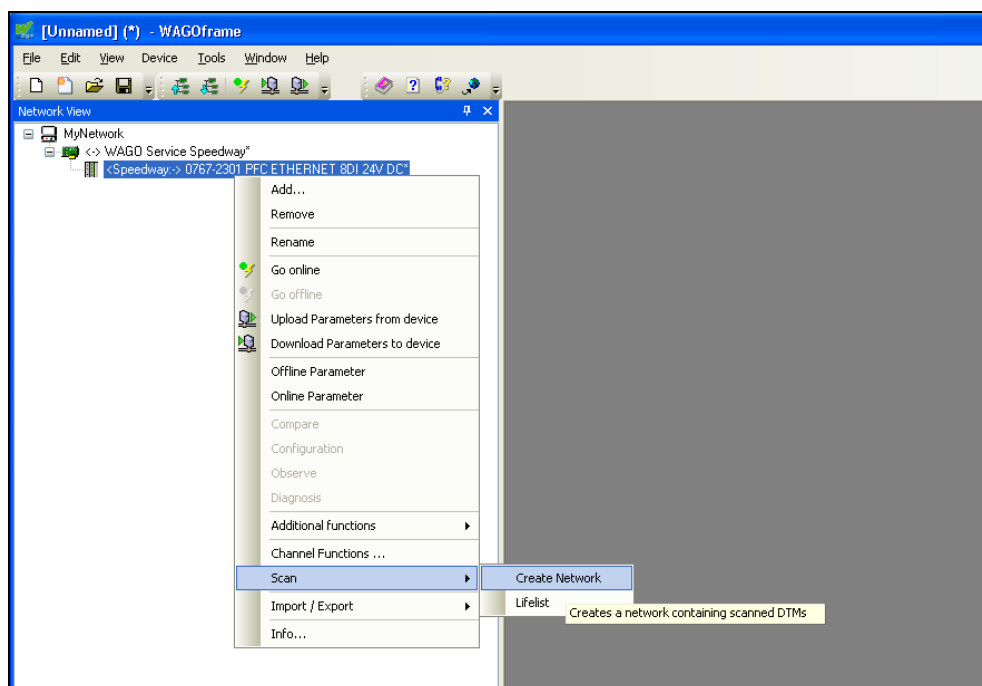


Figure 68: Setting up the network (example)

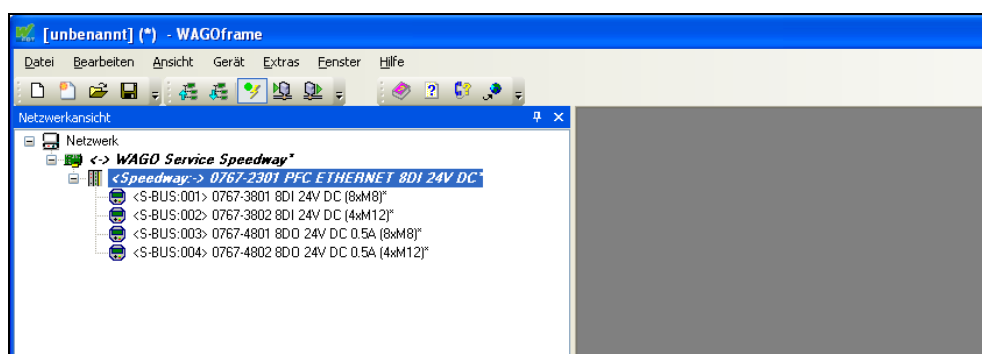


Figure 69: Components connected to the 767 node (example)

15.6.7 Life List

The life list is used to search for all devices connected to the S-BUS in order to select them for configuration directly.

You have the option to use the “WAGO Service Speedway” DTM to search for the connected fieldbus coupler or to use the device driver for the fieldbus coupler to search for I/O modules connected to it.

To search for fieldbus couplers or I/O modules, proceed as follows:

1. Right-click on the respective device driver in the “Network View” pane. In this example, the device driver for the fieldbus coupler is selected to search for the I/O modules connected to it.
2. In the context menu, select **Scan > Life List**. The life list opens.

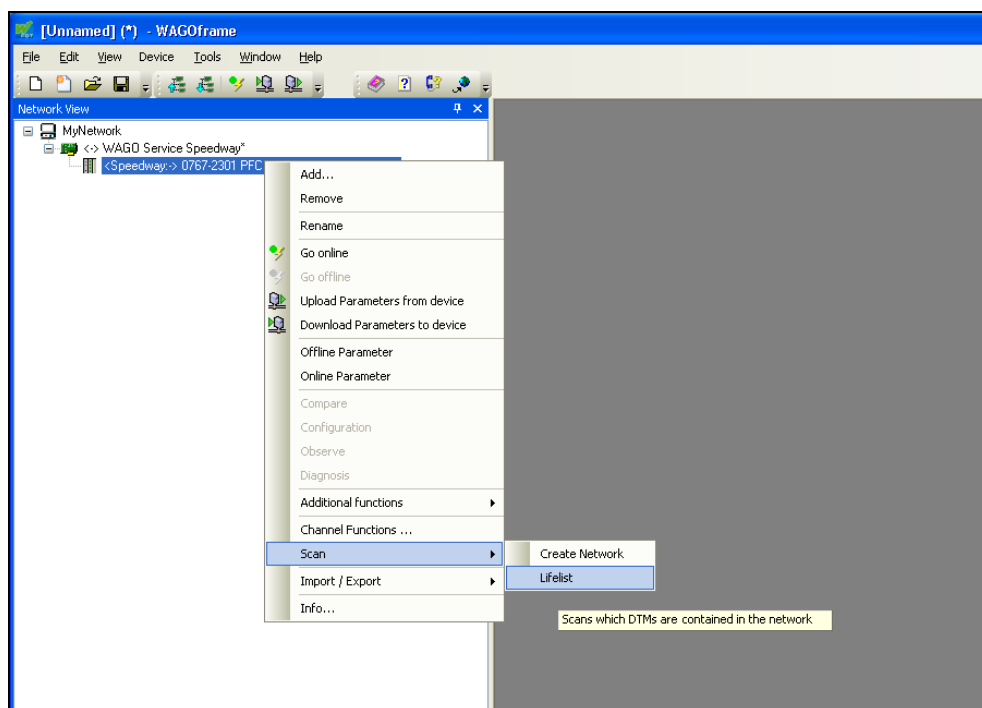


Figure 70: Searching for connected I/O modules using the life list (example)

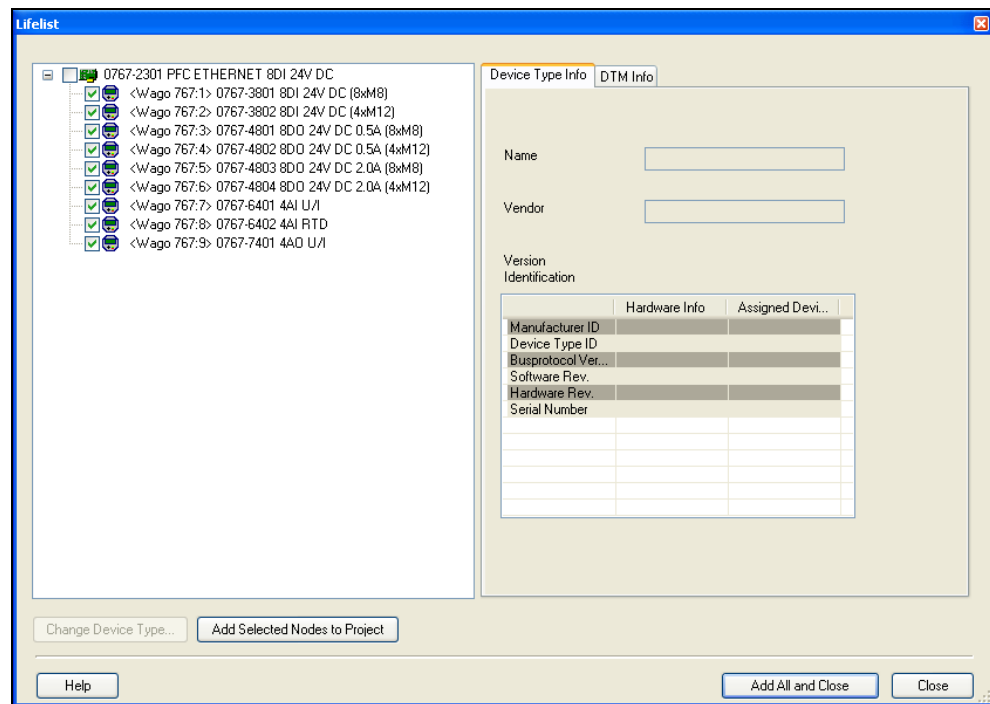


Figure 71: Connected I/O modules of the selected fieldbus coupler (example)

- Now select from the list those devices that you wish to carry over into the “Network View” for configuration. Click **[Add Selected Nodes to Project]** and then **[Close]**.

15.6.8 System Update

15.6.8.1 Notes on System Update

Firmware update for the 767 Series components is performed via system update. To ensure that the fieldbus node remains consistent and executable after updating the firmware, system update must be performed for both fieldbus coupler and connected I/O modules.

NOTICE

System update!

Before updating, observe the following measures to prevent any possible damage to the 767 system:

- The power supply must not be disconnected while updating!
- To exclude any interference by the fieldbus, the fieldbus cable must be disconnected before updating!

Preconditions for update via USB:

- You have installed the DTM (759-370) WAGOframe.
- You have installed the DTM (759-371) WAGO service interface.
- You have installed the DTM (759-922) USB driver.
- You have installed the DTM (759-362) system update.
- Update packages are available for the connected 767 Series components.

Preconditions for update via ETHERNET:

- You have installed the DTM (759-370) WAGOframe.
- You have installed the DTM (759-363) WAGO TCP service interface (for update via ETHERNET).
- You have installed the DTM (759-362) system update.
- Update packages are available for the connected 767 Series components.

System Update Procedure

To perform a system update for each 767 Series component, please complete the following steps:

1. Read 767 components' parameters and save them on your PC.
2. Update 767 Series components' firmware.
3. Rewrite parameters from your PC to the 767 Series components.
4. Set parameters to valid and finish the procedure.

15.6.8.2 Service Communication via USB

This section describes how to access your SPEEDWAY node via the WAGO USB communication cable (756-4101/0042-0030).

15.6.8.2.1 Adding the Communication DTM USB

So that you can parameterize the fieldbus coupler and the I/O modules connected with it via the USB connection, establish a connection between your PC and the 767 node via the WAGO communication cable.

1. Select the respective COM port (I/O Service Port COM (xx)) in the interface settings.



Note

Access to the port

Make sure that the selected port is not blocked by other applications.

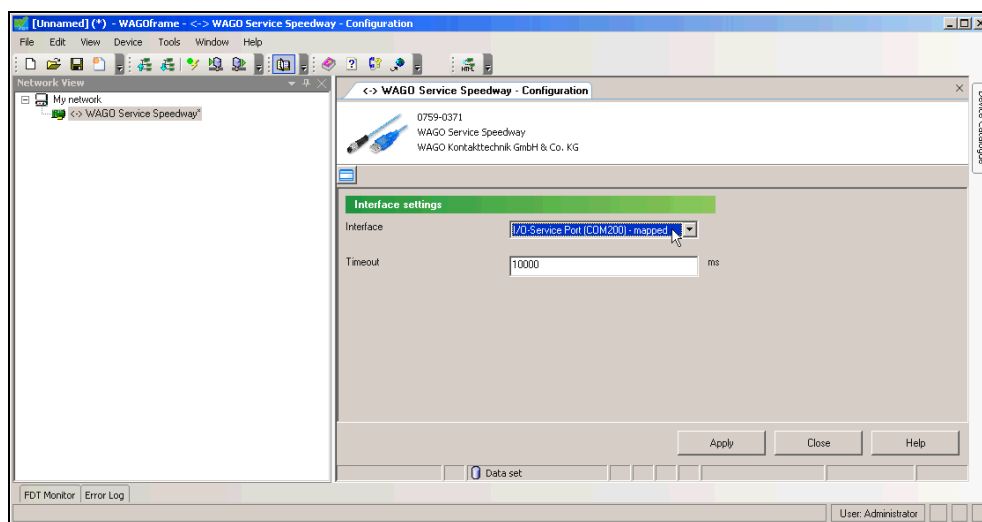


Figure 72: Select COM port

2. Right-click on “Network” in the “Network View” window.
3. In the context menu, select **Add**. The “Add...” dialog opens.

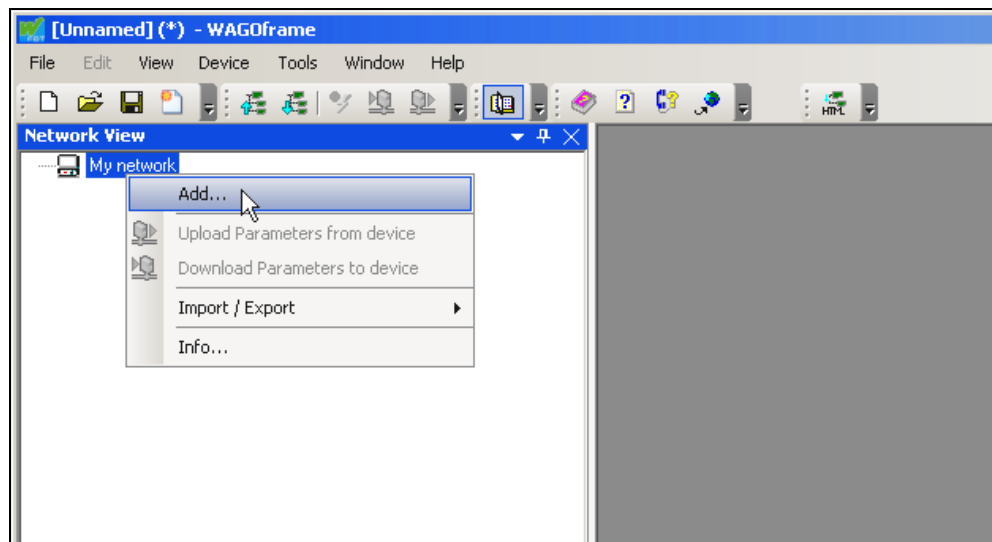


Figure 73: Adding the communication DTM

4. In the “Add” dialog, select “WAGO Service Speedway”.
5. Click [OK] to confirm your selection.

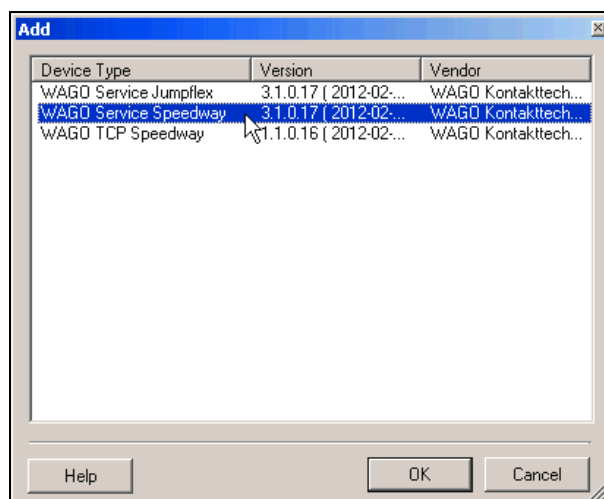


Figure 74: Selecting the communication DTM USB

15.6.8.2.2 Adding the DTM System Update

To add the DTM system update to WAGOframe, please proceed as follows:

1. In “Network View”, right-click on the “WAGO Service Speedway” DTM.
2. In the **Add...** context menu, select “Add”. The “Add” dialog box opens.

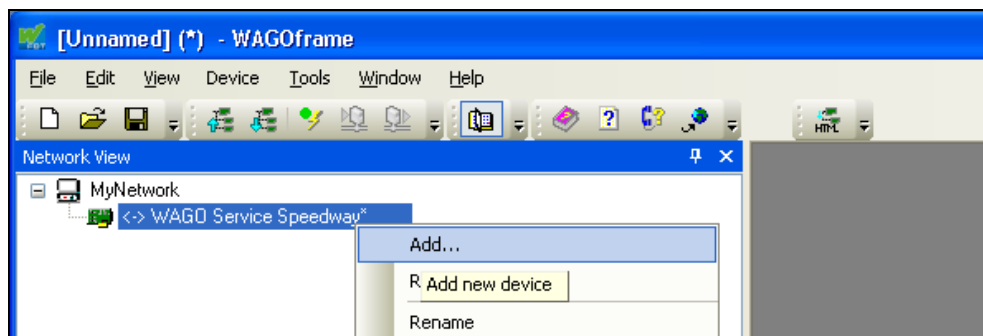


Figure 75: Adding the DTM system update

3. In the “Add” dialog box, select the DTM **0767 System Update**.
4. Click **[OK]** to confirm your selection.

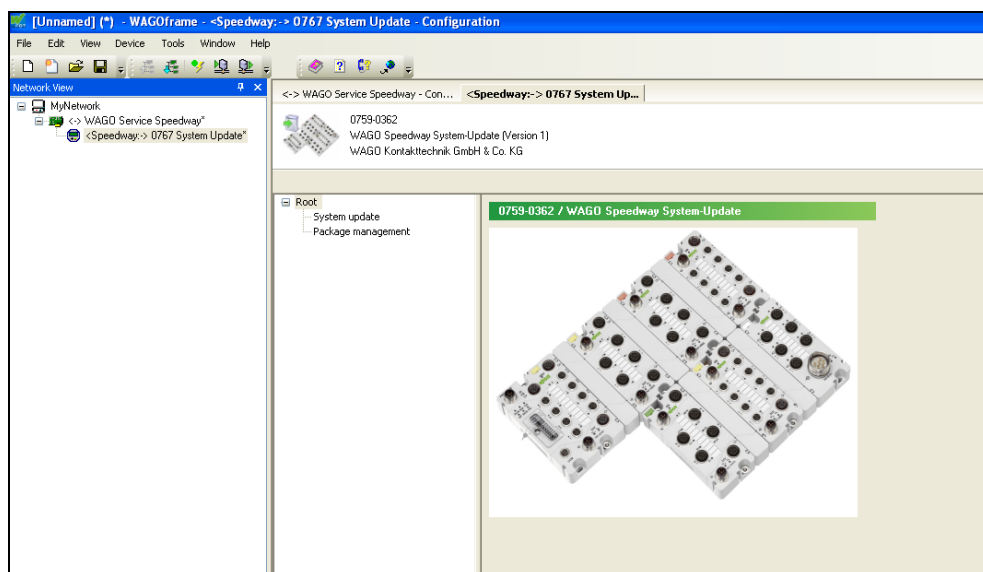


Figure 76: System update 1 (example)

15.6.8.2.3 Go online to 767 Nodes using Update DTM

The firmware can only be updated when a communication connection exists between Update DTM and 767 node. Please proceed as follows:

1. In the “Network View”, right-click on the “<Speedway:> 0767 System Update” device driver.
2. In the context menu, select **Go online**. When the progress bar displays 100% and the entry is displayed in ***bold italics***, the communication connection is established.

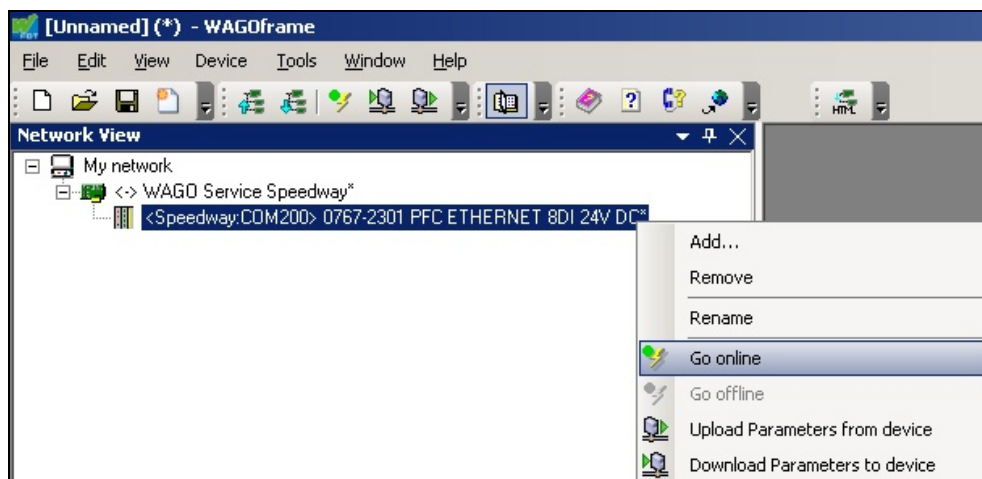


Figure 77: Go online to 767 node (example)

15.6.8.2.4 Updating the 767 Components

The current firmware is available from WAGO Support. Send an e-mail with the subject “Current Speedway Firmware” and the item number of the respective 767 components to: support@wago.com.

Import firmware packages

To use the received firmware packages, import them into the DTM system update. Please proceed as follows:

1. Save the received firmware packages with the “*.wup” extension to any directory on your PC.
2. Open the DTM user interface by double clicking “**0767 System Update**” in the network view.

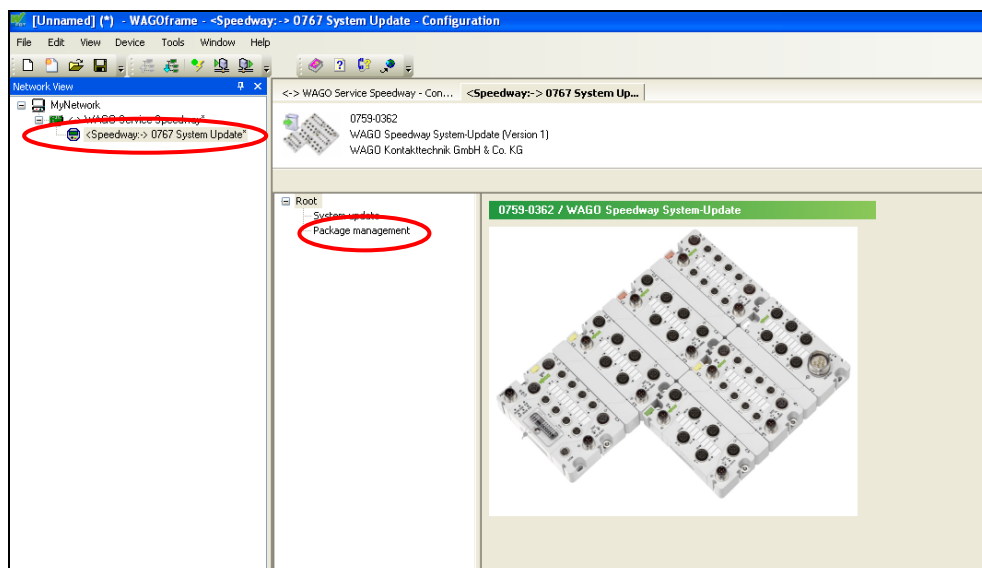


Figure 78: Package management 1 (example)

3. Click “Package Management” in the left window of WAGOframe.
4. To import the received firmware files, click **[Import]**. In the window that opens, go to the directory where you have saved the firmware files and select the file to be used. Click **[Open]** to apply the files.

Note



Adding firmware files.

Multiple firmware files can be added by selecting more than one.

Delete firmware packages

To maintain a clear “Package Management” interface, you can remove unneeded update packages from the view. Please proceed as follows:

1. Select the required firmware files in the right window.
2. Click **[Delete]** to remove the selected firmware packages.

Note



Context menu.

“Select/deselect all” is possible from the context menu.

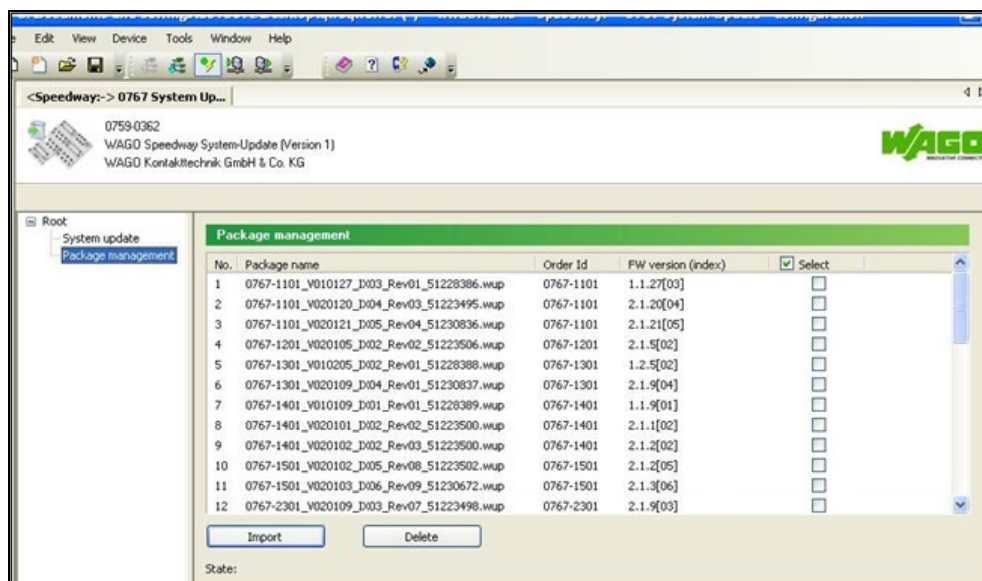


Figure 79: Package management 2 (example)

System update



Note

Updating the firmware

When updating the firmware of the fieldbus coupler, the saved module parameters may be overwritten. Therefore, check your existing configuration after updating the firmware.

Perform the system update here. The module settings you made normally remain unchanged. Otherwise, a corresponding warning message appears. If you still want to update the firmware, the 767 components are returned to their default state.

1. Click “System Update” in the left window.

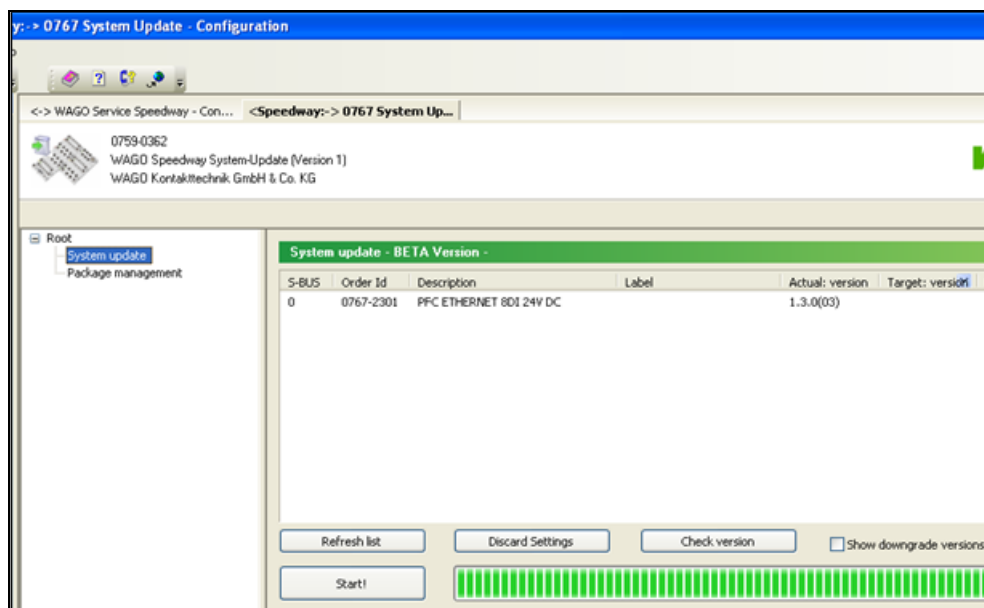


Figure 80: System update 2 (example)

2. The fieldbus coupler and all connected I/O modules are listed in the right window. All 767 components that can be updated are pre-selected. If the pre-selection is incorrect or if specific 767 components should not be updated, deselect them ("Update?" column).
 "Actual: Version": Firmware currently present on the device
 "Target: Version": Version of the firmware that should be loaded into the 767 components. If multiple "Target" versions can be selected, select the one relevant to you.
3. Click [**Start!**] to update the system. The 767 components are marked in yellow while being updated.

Note



Firmware actualization

During the firmware updating process, the fieldbus coupler disconnects each of its COM ports. A PC equipped with Windows 2000 will detect this, and a Windows message appears. This is not an error message. Confirm the message by pressing [OK].

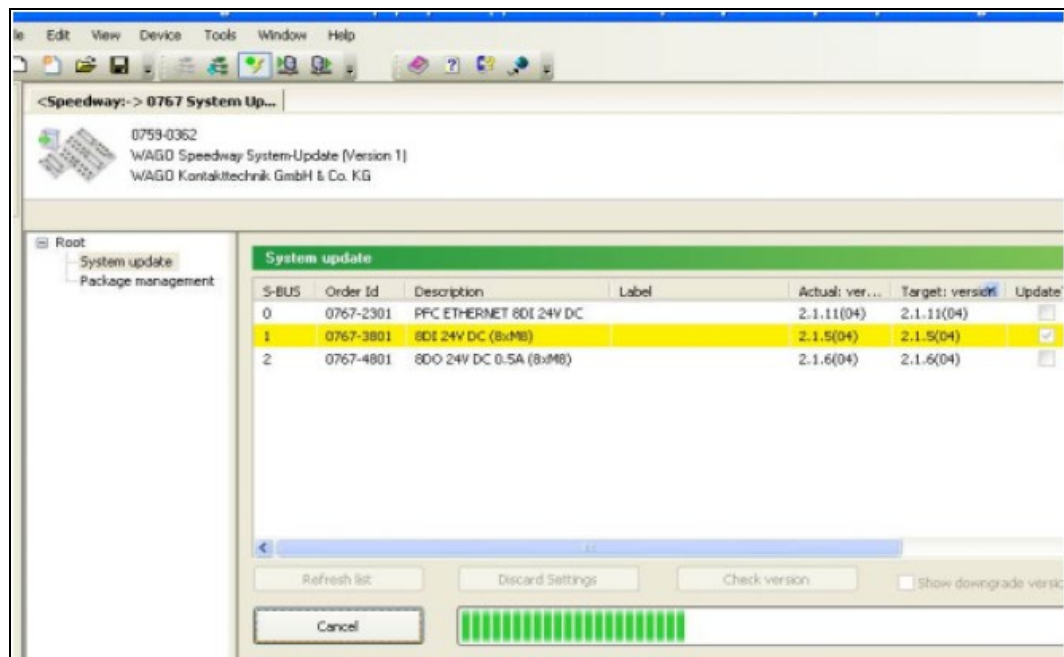


Figure 81: System Update 2 (example)

Table 149: Buttons

Button	Description
[Update List]	Use this function to read the node design and the view updates.
[Discard Settings]	Discard the selections and settings performed by you.
Display downgrade versions	If this checkbox is selected, the versions to downgrade a device are also displayed in the list of target versions.
[Start!]/[Abort]	Start/abort system update.

4. If the system update is finished, the updated 767 components are displayed in green (see figure).

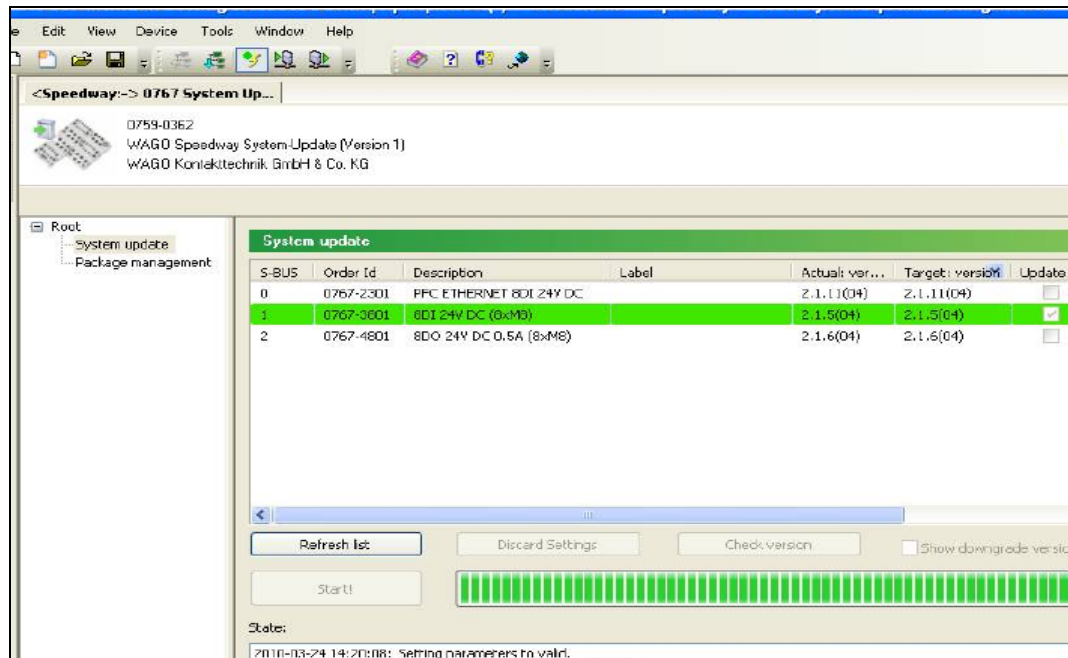


Figure 82: System Update 3 (example)

During system update, all relevant information is stored on your PC. Update can be repeated subsequently if the system update fails (components are displayed in red). In this case, original parameters remain unchanged.

If the update for a device fails, please contact WAGO Support.

15.6.8.3 Service Communication via ETHERNET

This section describes how to access your SPEEDWAY Station via ETHERNET with the DTM.

15.6.8.3.1 Adding the Communication DTM ETH

So that you can parameterize the fieldbus coupler and the I/O modules connected with it, establish a connection between your PC and the ETHERNET network. The service interface 6626 is preset. You can set the port under “Address Range”. Note that the port cannot be blocked by a firewall.

- 1 Right-click on “Network” in the “Network View” window.
- 2 In the context menu, select **Add**. The “Add...” dialog opens.

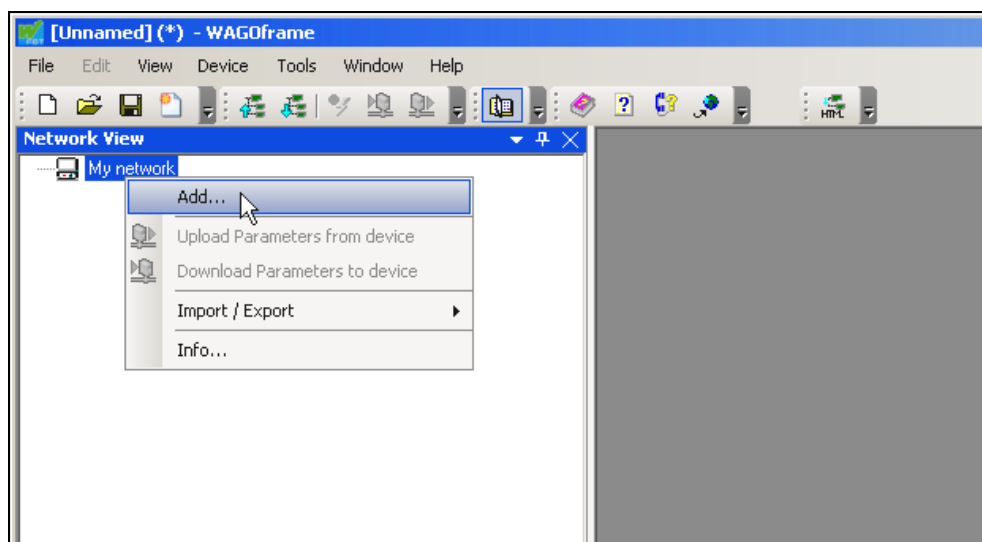


Figure 83: Adding the Communication DTM

- 3 In the “Add” dialog, select “WAGO TCP Speedway”.

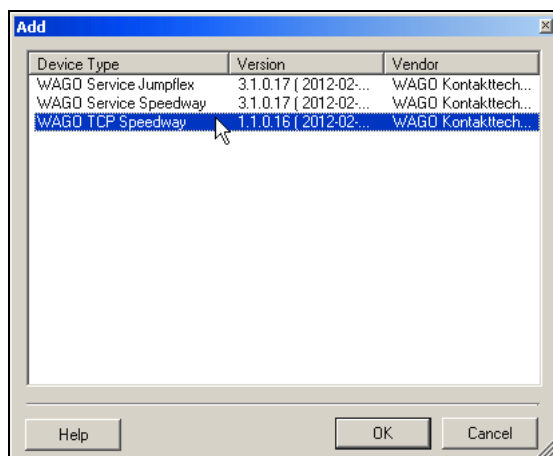


Figure 84: Selecting the Communication DTM TCP

- 4 Click **[OK]** to confirm your selection.

15.6.8.3.2 ETHERNET Communication (DTM is offline)

- 1 Double-click on the “WAGO TCP Speedway” communication DTM in the “Network View” window. The DTM for the interface configuration opens.



Note

Setting the Port

You can only set the port as long as no DTM has been added below the “WAGO TCP Speedway”!

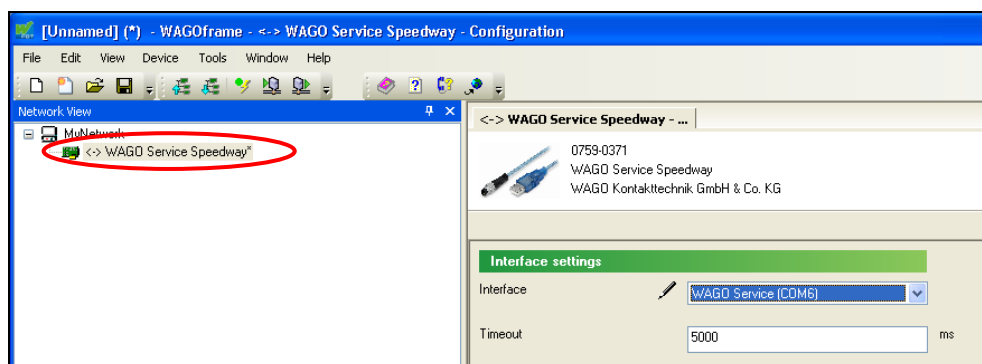


Figure 85: DTM for the Interface Configuration

- 2 In “Network View”, right-click on “WAGO TCP Speedway” and select the **Add ...** entry in the context menu. The “Add” dialog opens.
- 3 In the “Add” dialog, select the corresponding fieldbus coupler. Click **[OK]** to confirm your selection. The fieldbus coupler appears in “Network View” at the bottom right.



Note

Additional Information

Additional information (adding the I/O modules, etc.) is available in the section “Manual Setup of the Network”.

So that the DTM added in “Network View” (e.g. 767-2301) can communicate with the physical fieldbus coupler, both DTMs must be linked to each other.

- 4 Enter the exact IP address or the IP address range of the 767 network under “Address Range”, so that the 767 components are recognized during the network scan.

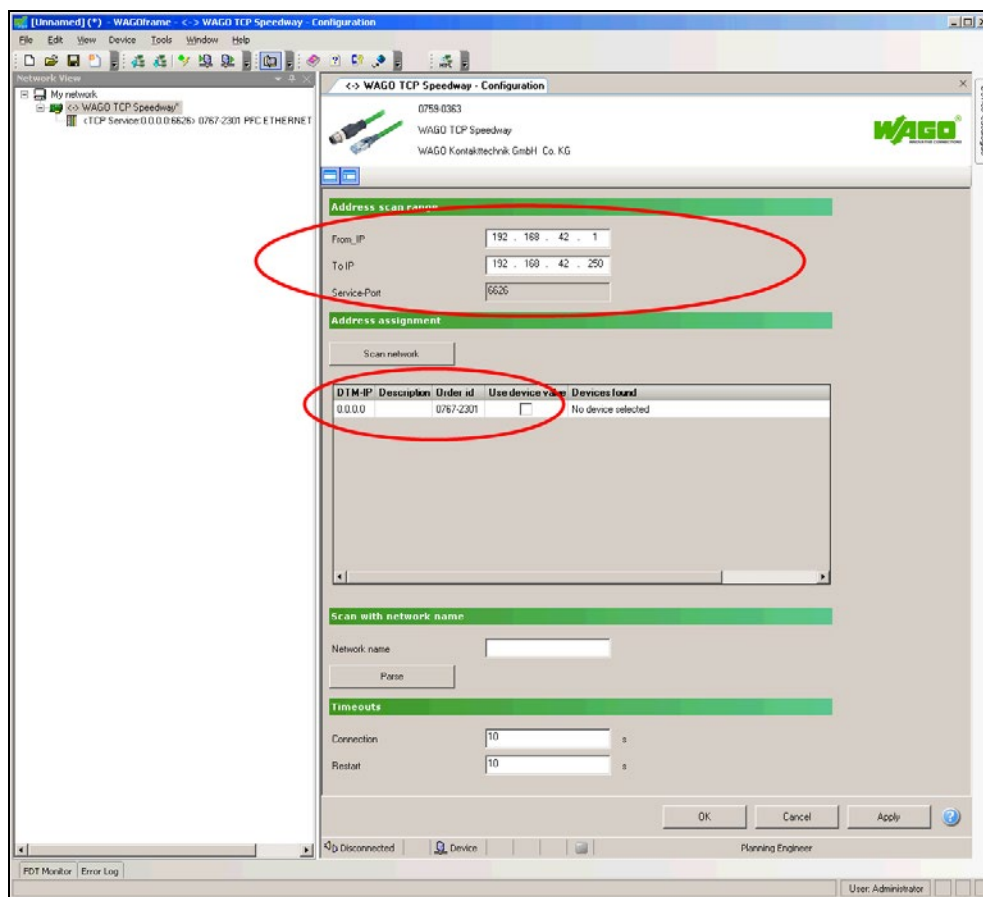


Figure 86: Selecting the Address Range

- 5 Click **[Scan Network]**. The physical fieldbus couplers appear with their IP address in the “Device found” pane.
- 6 Assign the IP address of the physical fieldbus coupler to the fieldbus coupler DTM from the “Network View” by selecting the correct IP address from the list that appears below the “Device found” pane. Click **[Apply]** to complete the link.

If you want to apply the IP address to the settings of the linked DTM, activate the “Apply Device Value” checkbox and click **[Apply]**.

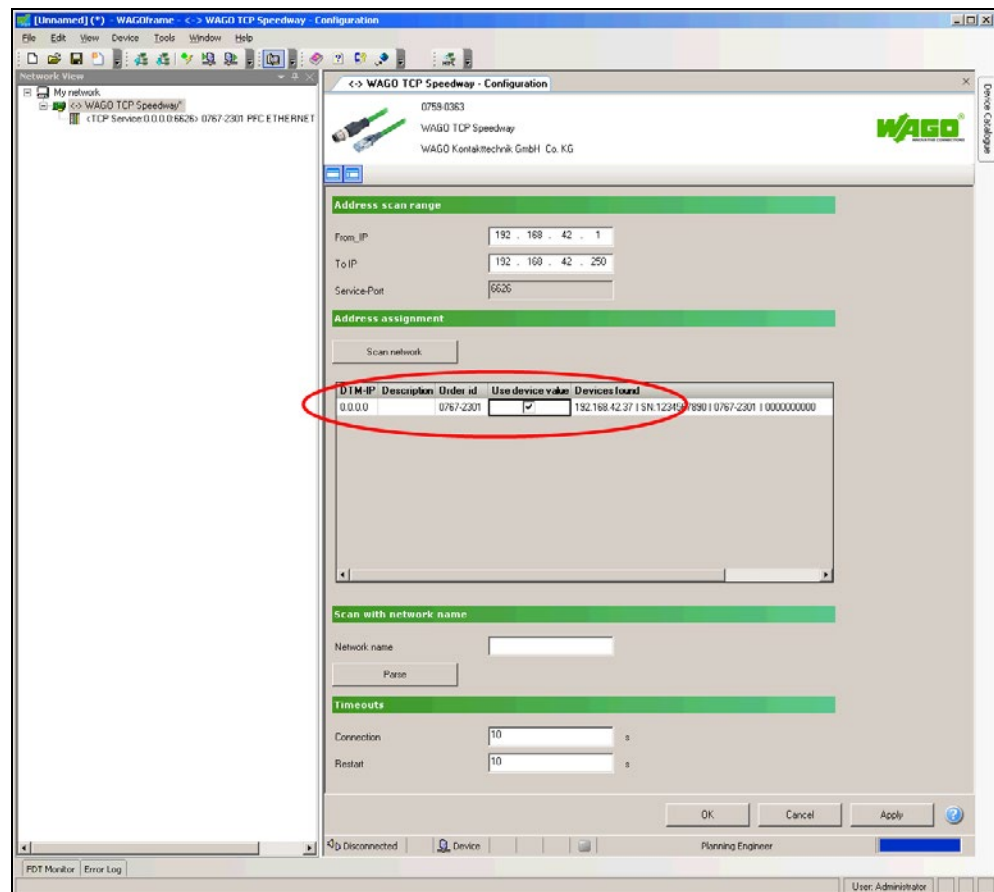


Figure 87: Apply Device Value

- 7 Parameterize the 767 components and save the parameterization as a project file. Transfer the project file later to the respective 767 components.

Note



Additional Information

Additional information is available in the section “Online and Offline Parameterization”.

15.6.8.3.3 ETHERNET Communication (DTM is online)

- 1 Double-click on the “WAGO TCP Speedway” communication DTM in the “Network View” window. The DTM for the interface configuration opens.
- 2 Enter the IP address or IP address range of the 767 network and click [Apply].
- 3 In “Network View”, right-click on the “WAGO TCP Speedway”. In the context menu, select Scan > Set Up Network. All 767 components in the specified IP address range are automatically added to the “Network View”.

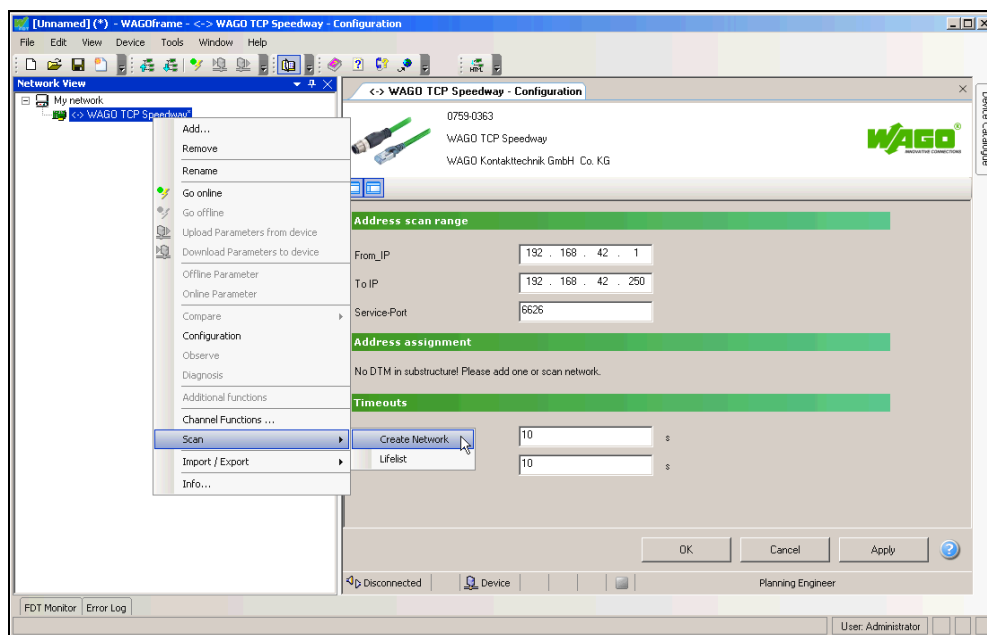


Figure 88: Network Setup

- 4 To set the parameters, right-click on the respective 767 components. In the context menu select “Online Parameterization”. The parameterization interface opens with the parameters of the respective 767 components.

**Note****Additional Information**

Additional information is available in the section “Online and Offline Parameterization”.

System Update

Note



Updating the Firmware

When updating the firmware of the fieldbus coupler, the saved module parameters may be overwritten. Therefore, check your existing configuration after updating the firmware.

Note



Update via ETHERNET

If the fieldbus coupler is set to BootP or DHCP before the update and the respective server is not available during and after the update, the error message “Update failed” may appear in the DTM although the update is done. The cause is that the fieldbus coupler retains the communication settings during the update. The fieldbus coupler is only reset to BootP or DHCP at the end of the update.

15.7 Parameterization

All parameters listed here can be set using WAGOframe (or another FDT/DTM border application) for the fieldbus coupler. If you use a fieldbus for the parameterization, only certain parameters are configurable, depending on fieldbus type.

The following sections contain information on the parameters and their descriptions.

To open the parameterization user interface (DTM) of a 767 component, double-click on the appropriate 767 component in the “Network View”. The parameterization user interface can also be opened by right-clicking on **Offline Parameter** or **Online Parameter** in the context menu.

If several parameterization user interfaces are open, select one via the corresponding tabs. If you switch a 767 component from the online mode to the offline mode or vice versa, close the parameterization user interface and reopen it.

Depending on the selection of parameterization user interfaces, various buttons are at your disposal:

Table. 150: DTM buttons

Button	Description
[Read] (Online mode only)	Reads and displays the parameters found in the 767 components.
[Write] (Online mode only)	Writes the modified values to the 767 components.
[Close] (Online and offline mode)	Closes the parameterization user interface (DTM).
[Apply] (Offline mode only)	Applies the entries in the project. Please note that the project should also be subsequently saved (File > Save).
[Help] (Online and offline mode)	Opens the online help for an entry that has been previously selected in the DTM (e.g., digital inputs, global setting).
	Shows/hides parameter overview.
	Displays the product data sheet. A PDF reader must be installed on your PC.
	Opens the DTM online help.

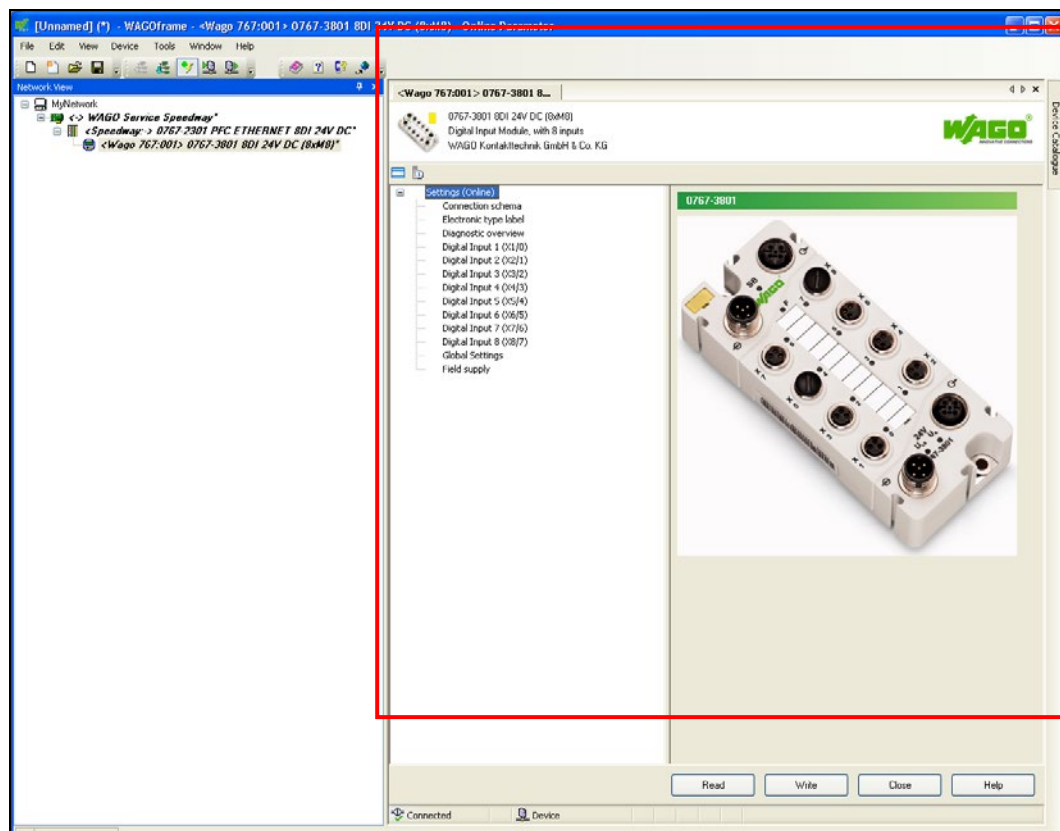


Figure 89: Example of an opened DTM with the available parameters

15.7.1 General Parameters

Electronic type label

Table 151: Information about the fieldbus coupler

Parameter	Description
Vendor	Manufacturer
Release index	FW.HW.FL FW: Actual firmware release index When updating the firmware, please note that the firmware release index may not be conformed to the printed firmware release index on the side of the fieldbus coupler. HW: Hardware release index FL: Actual firmware loader release index
Firmware revision	General information on the module
Firmware loader revision	
Order number	
Description	
Serial number	
Date of production	
Designation	Electronic marking field (max. 40 characters)

General fieldbus information

Table 152: General fieldbus information

Parameter	Description
Cyclic data exchange enabled	Enable or disable here a cyclic data exchange with the fieldbus. Checkbox selected: Cyclic data exchange enabled. Checkbox not selected: Cyclic data exchange disabled.

Date/Time

Table 153: Time settings

Parameter	Description
Daylight saving time	Activate or deactivate summer time here.
Time zone	Select your time zone here.
Actual time	Set the date and time here.
UTC	World time display

To transfer the current local time from your PC to the fieldbus coupler, click **[Apply PC time]** and then **[Write]**.

DIP switch

Display of the switch positions of the existing DIP switches on the fieldbus coupler.

S-BUS Master

Table 154: S-BUS master

Parameter	Description
Max. restarts	In the input field, enter how often the fieldbus coupler should start up again following an S-BUS disruption. 0x0: No restart 0x1 – 0xFFFFFFFF: Number of restarts 0xFFFFFFFF: Endless restarts
Actual baud rate	Actual baud rate
Actual S-BUS cycle time	Actual S-BUS cycle time

Blink Code

Table 155: Display of errors

Parameter	Description
Blink code	Display of blink code (error group, error code and error argument).

A list of blink codes and error descriptions, as well as information on error correction, can be found in section “Meaning of the Blink Codes and Procedures for Correcting Them”.

System Parameter Handling (SPH)

The SPH identifies changes to the configuration of a 767 node and automatically parameterizes I/O modules. When a configured I/O module must be replaced due to a defect, you do not need to set the parameters of the new I/O module. The stored parameters are automatically transferred to the new I/O module.

Requirement: The exchanged I/O module must have the same item number as the previous one.

To activate the SPH function, proceed as follows:

1. Select “Create nominal system configuration” to store the currently set parameters of the I/O modules in the file system of the fieldbus coupler (parameter database is created).
2. If you consider the firmware status of the new I/O module relevant, select the “FW/HW release index check I/O modules” checkbox. This requires that the exchanged I/O module has the same firmware and hardware status as the defective I/O module. If the firmware status is deviant, a blink code is

emitted in the “Error Code” field and on the CS LED of the fieldbus coupler. In this case, the firmware should be updated. For more information, see section “System Update”.

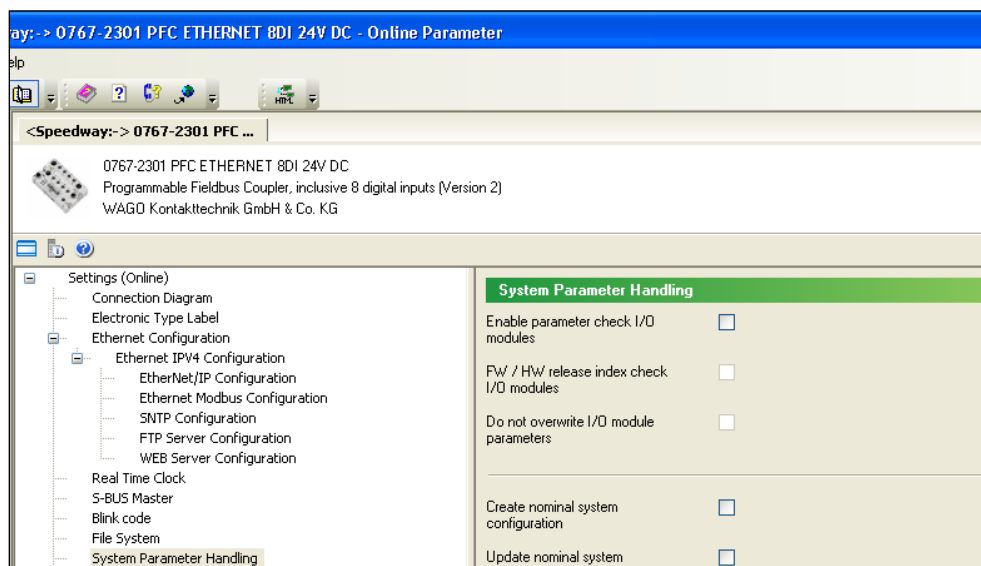


Figure 90: System parameter handling 1 (example)

3. Select “Enable parameter check I/O modules” to enable automatic configuration. A dialog box appears. Click **[YES]** if you have not created a database yet. Click **[NO]** if you have already created a database (step 1). Otherwise, you will overwrite the existing database.

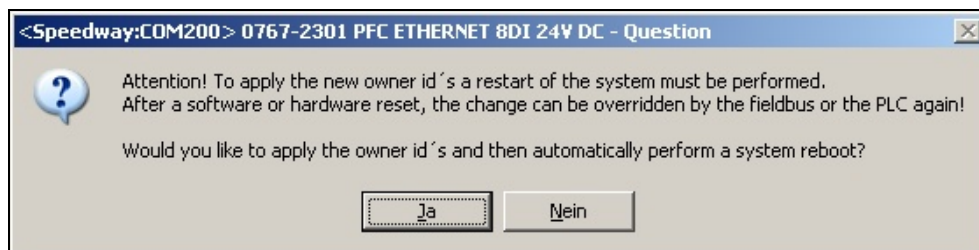


Figure 91: Warning (example)

The stored parameters are now compared with the current parameters at each start-up. If this process reveals that parameters differ, these parameters are automatically overwritten by the stored values in the I/O module.

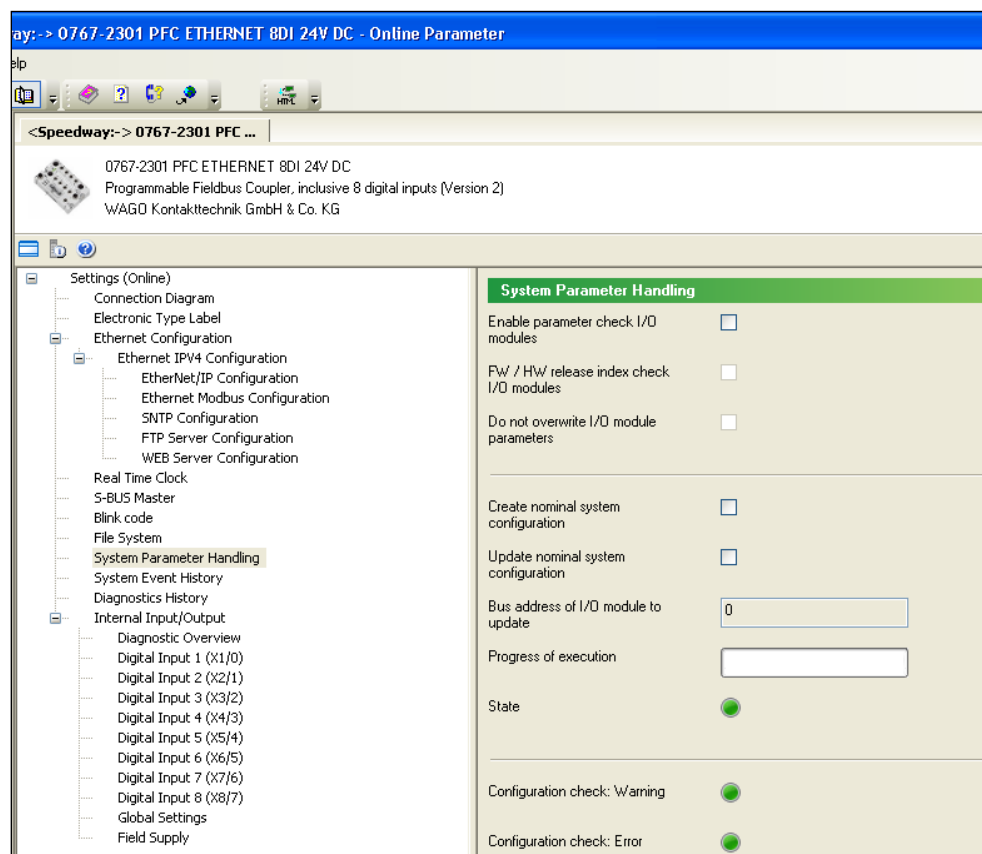


Figure 92: System parameter handling 2 (example)

Table 156: Overview of adjustable parameters for “System Parameter Handling SPH”

Parameter	Description
Enable parameter check I/O modules	Select this checkbox to enable the parameter check for the I/O modules and for the integrated inputs of the fieldbus coupler.
FW/HW release index check I/O modules	Select this checkbox to check the FW/HW release index of the I/O modules. The checkbox is only activated when “Enable parameter check I/O modules” is checked.
Do not overwrite I/O module parameters	Select this checkbox to prevent an automatic overwrite of the I/O module parameters. The checkbox is only activated when “Enable parameter check I/O modules” is checked.
Create nominal system configuration	Select this checkbox to create the parameter database.
Update nominal system configuration	Select this checkbox to update the system configuration for an I/O module. To do this, select the address of the I/O module from the “Bus address of I/O module to update” field. To update the I/O area of the coupler, select address 0.
Bus address of I/O module to be updated	Enter here the bus address of the I/O module that is to be updated. The checkbox is only activated when “Enable parameter check I/O modules” is checked. The first I/O module on the fieldbus coupler has bus address 1, the second has bus address 2, etc.
Progress of execution	The progress of the “Create nominal system configuration” and “Update nominal system configuration” parameters is shown here.

Table 156: Overview of adjustable parameters for “System Parameter Handling SPH”

Parameter	Description
State	The status of the “Create nominal system configuration” and “Update nominal system configuration” parameters is shown here: Green: Procedure OK Yellow: Procedure active Red: Error
Button [Export]	Use [Export] to store the SPH data on the PC.
Button [Import]	Use [Import] to import the SPH data from the PC to the fieldbus coupler.
Configuration check: Warning	The warning message is displayed when the “I/O module parameter not overwritten” parameter is activated, but a change between stored and current parameters has been detected. Green: No warning during configuration check Red: Warning during configuration check
Configuration check: Error	An error message is shown here when an error is discovered during the configuration check or the automatic configuration (see Section “Meaning of the Blink Codes and Procedures for Troubleshooting”): Green: No error during configuration check Red: Error during configuration check
Error code	The error code is displayed here for the configuration check error or warning that has occurred. The display is only activated when a warning or error has arisen.
Bus address of first failed component	The bus address of the first failed I/O module is displayed here. The display is only activated when a warning or error has arisen. If the error cannot be localized, the address “65535” (hex.: 0xFFFF) is displayed.

System Event History

The system event history contains a display of all system events from the fieldbus coupler. These events are also displayed as a blink code via the CS LED (see Section “Meaning of the Blink Codes and Procedures for Correcting Them”). The system events are permanently saved in the fieldbus coupler.

Table 157: Overview of system event history

Parameter	Description
Memory overflow	The status of the circular buffer is displayed here. Green: Circular buffer OK Red: Circular buffer overflow (old events are overwritten)
Entries	All events are displayed in the table. No.: Ongoing number of events Error: Notification type (Incoming: incoming notification Outgoing: outgoing notification) Error code: Error code (see Section “Meaning of the Blink Codes and Procedures for Correcting Them”) Data: Additional information on the error code Counter: Event counter (increases with repeated occurrence of identical events) Time stamp: Occurrence of events in local time of fieldbus coupler
Clear entries	Select this checkbox to delete all events.

Diagnostics History

All diagnostics of the fieldbus coupler and I/O modules are stored in the diagnostics history. The collective diagnostics are not permanently saved.

Table 158: Overview of diagnostics history

Parameter	Description
Entries	The entries of the diagnostics history are displayed in the table. The last chronological entry is always first in the table. ID: Current number of diagnostic entry S-BUS address: Bus address of the fieldbus coupler/I/O module Param. add.: Parameter address Time stamp: Occurrence of diagnostics in local time of fieldbus coupler Data: Additional information on the diagnostics
Clear entries	Input here the number of entries to be deleted. The oldest entries are deleted first. When the quantity entered is greater than the current number of entries, all entries are deleted.
Stop update	Stop the cyclic reading of the diagnostic messages.
ID of last entry	The consecutive number of the last entry in the history is displayed here.
Maximum size of history	The maximum size of the diagnostics history is displayed here in bytes.
Current history size	The current size of the diagnostics history is displayed here in bytes.
[Save]	Saves the diagnostic messages to the PC.

15.7.2 Fieldbus-Specific Parameters

ETHERNET Configuration

Table 159: Parameters for ETHERNET configuration

Parameter	Description
MAC ID	Information that is only displayed when the fieldbus coupler is in online mode.
Interface	
Host name (active)	
Domain name (active)	
Host name (device memory)	Enter here the host name that is to be used when restarting the fieldbus coupler.
Domain name (device memory)	Enter here the domain name that is to be used when restarting the fieldbus coupler.

EtherNet/IPV4 Configuration

Table 160: Parameters for configuring the EtherNet/IPV4

Parameter	Description
IP address (active)	Information that is only displayed when the fieldbus coupler is in online mode.
Subnet mask (active)	
Gateway address (active)	
IP address DNS 1 (active)	
IP address DNS 2 (active)	
IP address obtained from ...	Select here the assignment of the IP address: - Device memory - BootP - DHCP Note: If you use the DIP switch to set an IP address, the options listed here for assigning the IP address are irrelevant!
IP address (device memory)	Enter here the static IP address that is to be used when restarting the fieldbus coupler. "Device memory" must be selected for this to take place (see parameter "IP address obtained from ...") Note: If you use the DIP switch to assign an IP address, then assigning the first 3 bytes of the IP address via WAGOframe is not possible!
Subnet mask (device memory)	Enter here the static subnet mask that is to be used when restarting the fieldbus coupler.
Gateway address (device memory)	Enter here the gateway address that is to be used when restarting the fieldbus coupler.
DIP switch IP address	Switch on the first 3 bytes of the IP address here when you use the DIP switch for assigning an IP address.
IP address DNS1 (device storage)	Enter here the DNS server address that is to be used when restarting the fieldbus coupler.
IP address DNS2 (device storage)	Enter here the address of an alternative DNS server that is to be used when restarting the fieldbus coupler.

Fieldbus Service Communication

Table 161: Parameters for Fieldbus Service Communication

Parameters	Description
Service Communication via Fieldbus	Activate and deactivate the EtherNet/IP protocol.
IP Port of Service Communication	Set the IP port of the service communication.

EtherNet/IP Configuration

Table 162: Parameters for configuring the EtherNet/IP

Parameter	Description
Start EtherNet/IP server	Activate and deactivate the EtherNet/IP protocol here.
Field bus error reaction	Set the desired response of the fieldbus coupler to a fieldbus error here. - Set outputs to 0 Sets the outputs of the I/O modules to 0 - Keep last values Retains the last values of the outputs of the I/O modules
S-BUS error reaction	The response of the fieldbus coupler to an S-BUS error appears: - Set input values to 0 (sets the process value of the input modules to 0)
RUN/IDLE header originator -> target (O->T)	With this parameter, you can activate the RUN/IDLE header from the sender to the receiver.
RUN/IDLE header target -> originator (T->O)	With this parameter, you can activate the RUN/IDLE header from the receiver to the sender.
ODVA vendor id	40 (WAGO)
ODVA product code	1301
ODVA serial number	Unique serial number for product identification
ODVA product name	WAGO PFC ETHERNET 8DI 24 V DC

ETHERNET MODBUS Configuration V1

Table 163: Parameters for Configuring the ETHERNET MODBUS V1

Parameter	Description
Modbus version (device memory)	Select the MODBUS version. (compatibility mode for Release 1) - Variant 1 (Release 1) - Variant 2 (Release 3)
Modbus version (active)	Display of which MODBUS version is active.
Enable TCP server	Disable or enable the MODBUS/TCP server.
Enable UDP server	Disable or enable the MODBUS/UDP server.
Connection watchdog	Enter here the time duration after which the MODBUS/TCP connection is to be closed if communication is not established during this period.
Close connection after timeout	You have the following setting options: 0: - 1: After the watchdog has timed out, the MODBUS/TCP connection is automatically closed.
Watchdog type	Select the watchdog type: 0: With function code trigger. 1: Function code trigger not relevant.
Watchdog time	Set the time for monitoring (100 ms step).
Function code triggers 1 – 16	Reset the watchdog using the MODBUS function codes 1 – 16. All function codes are relevant.
Function code triggers 17 – 32	Reset the watchdog using the MODBUS function codes 17 – 32. All function codes are relevant.
Watchdog status	The current watchdog status is indicated here. “Stopped” The watchdog is not started. “Constantly” The watchdog is active. “Expired” Watchdog timeout.

ETHERNET MODBUS Configuration V2

Table 164: Parameters for ETHERNET MODBUS Configuration V2

Parameter	Description
Modbus version (Device memory)	You can here select the MODBUS version. (Compatibility mode for Release 1) - Option 1 (Release 1) - Option 2 (Release 3)
Modbus version (active)	Display which MODBUS version is enabled.
Start TCP server	Disable or enable here the MODBUS/TCP server.
Start UDP server	Disable or enable here the MODBUS/UDP server.
Connection watchdog	Here, enter the time which the MODBUS/TCP connection to be closed when during this period there is no connection.
Watchdog TCP Timeout	You can here specify the watchdog TCP timeout in multiples of 100 ms. This register can only describe as the “Watchdog TCP Status” in the “Stopped” state. The value is retentive. A value of 0 is not valid.
Watchdog TCP Configuration	You can here configure the behavior of the watchdog. For this you can disable and enable various functions via the following control fields. Startup watchdog Checkbox disabled: The watchdog is not started. Checkbox enabled: The watchdog will start automatically. The condition is that the “Watchdog TCP Status” in the “Stopped” is and for “Watchdog TCP Timeout” is a time specified. Fieldbus fault reaction Checkbox disabled: The fieldbus failure reaction is not triggered. It will maintain the recent process values of the output modules. Checkbox enabled: The fieldbus failure reaction is triggered. The process values of the output modules are set to 0. Error on CS LED flashing Checkbox disabled: There is no output from the blink codes fieldbus specific software error by CS LED. Checkbox enabled: The fieldbus specific software errors are output via blink codes via CS LED. (Error code 11-6-1, see section “Meaning of the Blink Codes and Procedures for Correcting Them”). The activation of the control fields is retentive.

Table 164: Parameters for ETHERNET MODBUS Configuration V2

Parameter	Description
Watchdog TCP Status	The current watchdog status is indicated here. “Stopped” The watchdog is not started. “Constantly” The watchdog is active. “Expired” Watchdog timeout.
Watchdog UDP Timeout	You can here specify the watchdog UDP timeout in multiples of 100 ms. This register can only describe as the “Watchdog TCP Status” in the “Stopped” state. The value is retentive. A value of 0 is not valid.
Watchdog UDP Configuration	You can here configure the behavior of the watchdog. For this you can disable and enable various functions via the following control fields. Startup watchdog Checkbox disabled: The watchdog is not started. Checkbox enabled: The watchdog will start automatically. The condition is that the “Watchdog UDP Status” in the “Stopped” is and for “Watchdog UDP Timeout” is a time specified. Fieldbus fault reaction Checkbox disabled: The fieldbus failure reaction is not triggered. It will maintain the recent process values of the output modules. Checkbox enabled: The fieldbus failure reaction is triggered. The process values of the output modules are set to 0. Error on CS LED flashing Checkbox disabled: There is no output from the blink codes fieldbus specific software error by CS LED. Checkbox enabled: The fieldbus specific software errors are output via blink codes via CS LED. (Error code 11-6-1, see section “Meaning of the Blink Codes and Procedures for Correcting Them”). The activation of the control fields is retentive.
Watchdog UDP Status	The current watchdog status is indicated here. “Stopped” The watchdog is not started. “Constantly” The watchdog is active. “Expired” Watchdog timeout.

SNTP Configuration

Table 165: Parameters for configuring the SNTP

Parameter	Description
Enable SNTP	Select here whether you would like the system time to be automatically updated via the SNTP.
Update interval	Set the length (in s) of the synchronization interval here.
Server timeout	Select here the maximum time (in ms) that may elapse before the server responds to an SNTP request.
IP address SNTP server (active)	Displays the IP address currently used for the SNTP server.
IP address SNTP server (device storage)	Enter an IP address for the SNTP server here, which is to be used when restarting the fieldbus coupler.

FTP Server Configuration

Table 166: Parameters for configuring the FTP server

Parameter	Description
Enable FTP server	Activate or deactivate the FTP server here.

WEB Server Configuration

Table 167: Parameters for configuring the WEB server

Parameter	Description
Enable WEB server	Activate or deactivate the Web server here.
Port number	Communications port for the Web server. Default setting: 80

SNMP Configuration

Table 168: Parameter for the SNMP Configuration

Parameters	Description
Activate SNMP	Choose if you want to enable or disable SNMP.
Device description	The device name of the fieldbus coupler is displayed.
Email contact address	The email contact address is displayed.
Device location	The location of the device is displayed.
Activate SNMP V1/V2c	Choose if you want to enable or disable SNMP V1/V2c.
Community name used	The community name used is displayed.
1st trap receiver	The IP address for the 1st trap receiver is displayed.
1st trap community name used	The 1st name of the network community used is displayed.
1st trap version	Choose if you want to enable trap version 1 or 2.
2nd trap receiver	The IP address for the 2nd trap receiver is displayed.
2nd trap community name used	The 2nd name of the network community used is displayed.
2nd trap version	Choose if you want to enable trap version 1 or 2.

SNMP V3 Configuration

Table 169: Parameters for the SNMP V3 Configuration

Parameters	Description
Activate user 1 / user 2	Choose if you want to enable or disable user 1.
Authentication type	Select the authentication type. - None - MD5 - SHA1
Authentication name	Enter the authentication name if you have selected MD5 or SHA1 as the authentication type.
Authentication key	Enter the password with at least 8 characters if you have selected MD5 or SHA1 as the authentication type.
Enable encryption	Choose if you want to enable or disable DES encryption.
Encryption password	Enter the password with at least 8 characters if you have selected DES encryption.
Activate notification/trap	Choose if you want to enable or disable notification/trap.
Notification recipient	The IP address of the notification recipient is displayed.

15.7.3 Diagnostic Overview and Parameters of Inputs

Diagnostic Overview

The currently pending diagnostics existing on the module are displayed here. In this view of the DTM, you can enable simulation of the diagnostics, as well as disable transmission of the diagnostics. When disabling transmission, make sure that the display behavior of each LED changes that indicates the specific diagnostics (section “Operational Messages of the Fieldbus Coupler via LED Signals”).

The diagnostic overview is only available in online mode.

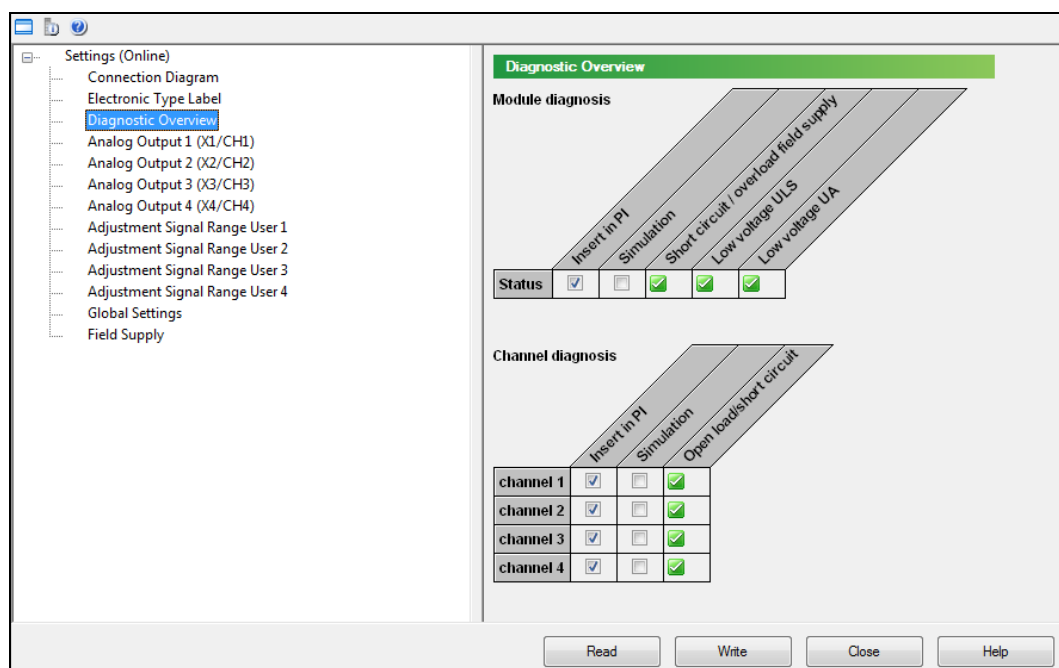


Figure 93: Diagnostic overview of the fieldbus coupler (example)

Table 170: Diagnostic setup

Parameter	Description
Insert in PI	This parameter disables/enables transmission of diagnostics. Doing so has no effect on the size of the process image, but does affect its content.
Simulation	If you have selected the “Insert in PI” checkbox, the “Simulation” parameter is released. You can select the diagnostics you want to simulate. Click the [Write] button to transfer the simulated values to the module.
Status	Displays whether there is a diagnostics: X mark: There is a diagnostic message. Check mark: There is no diagnostic message.

Table 171: Information about existing module diagnostics

Diagnostics	Description
Short circuit/overload field supply	The device has detected a short circuit or overload of the field supply (only possible when field supply is switched on).
Low voltage U_{LS}	If an undervoltage of the logic or sensor supply (U_{LS}) of $< 18\text{ V}$ occurs on the device, a corresponding diagnostic message is generated and the F-LED illuminates. The substitute value strategy that you have parameterized is used on the digital inputs.
Low voltage U_A	If an undervoltage of the actuator supply (U_A) of $< 18\text{ V}$ occurs on the device, a corresponding diagnostic message is generated and the F-LED illuminates. The undervoltage of the actuator supply has no functional effect on the device.

Parameters of Digital Inputs

Table 172: Adjustable parameters of the digital inputs

Parameter	Description
Designation	Electronic marking field (max. 40 characters).
Input value	The current input signal is displayed here. If the “Simulation Input Value” parameter has been selected, select here the input value that is to be simulated: If simulation is switched off* Checkbox unselected: Input value (0) Checkbox selected: Input value (1) If simulation is switched on Checkbox unselected: Input is simulated with value 0 Checkbox selected: Input is simulated with value 1
Signal inverting	You can invert the currently pending input signal here. Checkbox unselected*: Input signal is reproduced in the process image in the same manner as at the input Checkbox selected: Input signal is reproduced in the process image in an inverted manner
Filter time	Set the input filter for the measured signals here. You have the following options: none 0.1 ms 0.5 ms 3 ms* 15 ms 20 ms

Table 172: Adjustable parameters of the digital inputs

Parameter	Description
Substitute Value Strategy	This releases, if the field bus supports, the substitute value or the last input value in cases such as a fieldbus interruption. You have the following options: - Switch to substitute value* - Retain last value
Substitute Value	Enter here the process value that is used in case of an error. In the case of an error (fieldbus interruption), this value is used with the “Switch to Substitute Value” substitute value strategy. Checkbox unselected: 0* Checkbox selected: 1
Simulation input value	This simulation can be used to simulate input values. Checkbox unselected*: The value at the inputs is carried over into the process image. Checkbox selected: The simulation value is inserted into the process data independent of the input value. The “Input Value” parameter is selected.

* Default setting

Global Settings

Table 173: Adjustable parameters for the entire fieldbus coupler

Parameter	Description
Simulation diagnostic	If the checkbox is selected, you can simulate a low voltage diagnostic. To generate a low voltage diagnostic, one or both of the two checkboxes “Low voltage U_{LS} ” and “Low voltage U_A ” must be selected. <i>Default setting: unselected</i>
Low voltage U_{LS}	In the case of an undervoltage of the logic and sensor supply (U_{LS}) or the actuator supply (U_A), the corresponding diagnostic is displayed here.
Low voltage U_A	

Parameters of Field Supply

Table 174: Adjustable parameters of the field supply

Parameter	Description
Enable field supply	Switch on the field supply (24VDC) for the sensors here. <i>Default setting: selected</i>
Autorestart delay	In the event of a short circuit, the sensor supply is switched off for a parametrizable amount of time. Here, enter the delay time (in 100-ms increments); after this time, the sensor supply is restarted. If the short circuit still exists, the process is repeated.
Simulation diagnostic	The simulation can be used to simulate a short circuit. <i>Default setting: unselected</i>
Short circuit/overload	If simulation is deactivated, the respective error is displayed upon emergence. If simulation is activated, you can simulate one of the errors by selecting the appropriate parameter.

16 Service

This section contains information on maintenance and service.

16.1 Updating the Firmware

Information on updating the firmware can be found in section “System Update”.

16.2 Replacing the Fieldbus Coupler

To replace the fieldbus coupler, e.g., to change variants, proceed as described in the following sections.

16.2.1 Disconnecting the Cables

Before removing the connectors, clean the fieldbus coupler to ensure that no dirt or other material comes in contact with the connections. This can lead to damage of the contacts.

To unplug the cables, proceed as follows:

1. Disconnect the power supply from those devices on which you have mounted the fieldbus coupler.



CAUTION

Hot connection sockets!

Even when taking into account derating, high surface temperatures on the metallic connection sockets and on the enclosure can arise during operation. If the 767 Series component has been in operation, allow it to cool off before moving it.

2. Unscrew all screw connections and remove the cables.

16.2.2 Removing the Fieldbus Coupler from your System

To remove the fieldbus coupler from the framework of your system, proceed as follows:

1. Disconnect the power supply from those devices on which you have mounted the fieldbus coupler.
2. Release the fieldbus coupler from the framework of your system by unscrewing the M4 screws.

16.2.3 Removing the Fieldbus Coupler from the Carrier Rail

In order to keep a clear representation, the mounting rail adapter in the following figure (B, C) is shown without the fieldbus coupler.

If the fieldbus coupler is mounted on a mounting rail, proceed with the removal as follows:

1. Disconnect the power supply from those devices on which you have mounted the fieldbus coupler.
2. To remove the fieldbus coupler, press down the release eyebolt of the mounting rail adapter using a slot screwdriver (B) and remove it from the mounting rail (C).

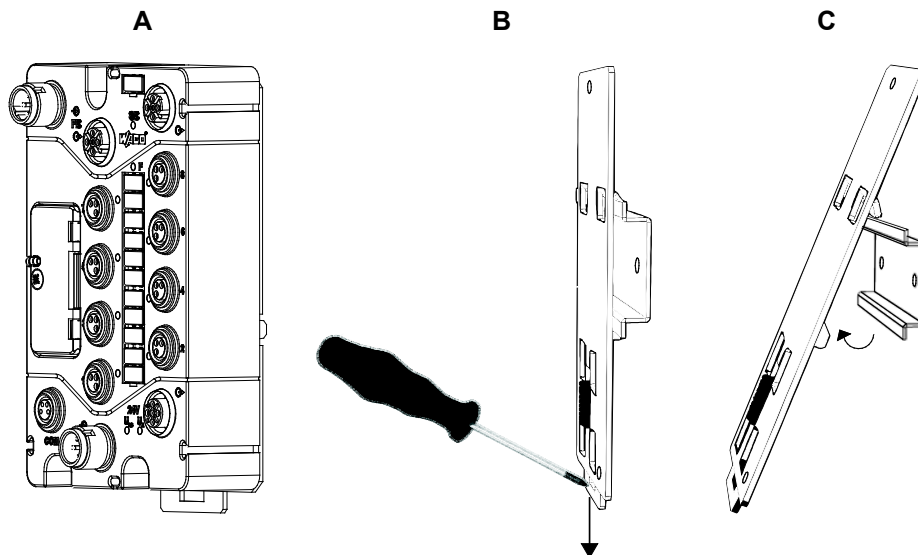


Figure 94: Removing the fieldbus coupler (with the mounting rail adapter) from the mounting rail

16.2.4 Removing the Fieldbus Coupler from the Profile Adapter

If the fieldbus coupler is mounted on a profile adapter, proceed with the removal as follows:

1. Disconnect the power supply from the device on which you have mounted the fieldbus coupler before attempting to remove.
2. Unscrew the screws on which the nuts are fastened and remove the fieldbus coupler from the profile rail of your system.
3. Unscrew the screws that connect the fieldbus coupler with the profile adapter.

16.2.5 Connecting a New Fieldbus Coupler

To connect the fieldbus coupler, proceed as described in sections “Mounting the Fieldbus Coupler” through “Start-Up”.

16.3 Disposal

Do not dispose of the 767 components in the household waste; observe the laws which apply to them. You can also contact a certified waste management company.

17 Use in Hazardous Environments

The modular system *WAGO-SPEEDWAY 767* (electrical equipment) is designed for use in Zone 2 and 22 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 fieldbus coupler and the I/O module of the series *WAGO-SPEEDWAY 767* has the required approval or is subject to the range of application of the ATEX directive.

17.1 Marking Configuration Examples

17.1.1 Marking for Europe According to ATEX and IEC-Ex

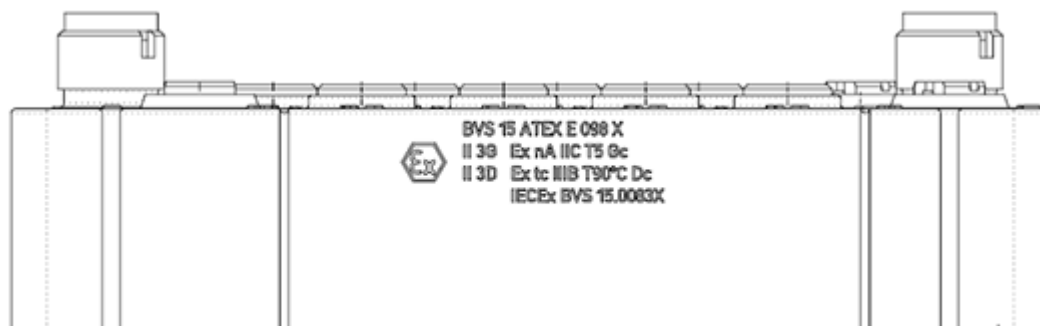


Figure 95: Side Marking Example for approved WAGO SPEEDWAY 767 Series Fieldbus Coupler according to ATEX and IECEx

Table 175: Legend for Figure “Side Marking Example for approved WAGO SPEEDWAY 767 Series Fieldbus Coupler according to ATEX and IECEx”

Printing on Text	Description
BVS 15 ATEX E098X IECEx BVS 15.0083X	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
IIIB	Explosion group of dust
T90°C	Max. surface temperature of the enclosure (without a dust layer)
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
IIC	Explosion group of gas and vapours
T5	Temperature class: Max. surface temperature 100 °C

17.2 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.

17.2.1 Special Conditions for Safe Use (ATEX Certificate BVS 15 ATEX E098X)

1. The Modular I/O-System has to be protected against UV emitting light.
2. The permitted ambient temperature range is -25°C ... $+50^{\circ}\text{C}$.
3. The Modular I/O-System has to be installed in a way that it is protected against any mechanical and electrostatical hazards. This may be realized by a protection measure according to the documentation mentioned in the Test Report. In this case the earthing of the metal cage has to be established by the end user.
4. The plug shall be in accordance with all applicable clauses of IEC/EN 60079-0 and IEC/EN 60079-15. A minimum degree of protection IP54 according to IEC/EN 60529 shall be ensured. This may be realized by accessories series 756 of WAGO Kontakttechnik GmbH & Co. KG. In this case the torque is 0.6 Nm.

17.2.2 Special Conditions for Safe Use (IEC Ex Certificate IECEx BVS 15.0083X)

1. The Modular I/O-System has to be protected against UV emitting light.
2. The permitted ambient temperature range is -25°C ... $+50^{\circ}\text{C}$.
3. The Modular I/O-System has to be installed in a way that it is protected against any mechanical and electrostatical hazards. This may be realized by a protection measure according to the documentation mentioned in the Test Report. In this case the earthing of the metal cage has to be established by the end user.
4. The plug shall be in accordance with all applicable clauses of IEC/EN 60079-0 and IEC/EN 60079-15. A minimum degree of protection IP54 according to IEC/EN 60529 shall be ensured. This may be realized by accessories series 756 of WAGO Kontakttechnik GmbH & Co. KG. In this case the torque is 0.6 Nm.

18 Accessories

In this chapter you will find a list of the most important accessory components that you need to begin operating the fieldbus coupler. The carrier rails, spacers, etc., as well as the entire accessories program from the AUTOMATION field, can be found in the Internet www.wago.com or in the “AUTOMATION” catalog.

18.1 S-BUS Cable, Assembled on One End

Table 176: S-BUS cable, assembled on one end, B coded

Description	Length	Item number	PU
S-BUS cable, M12 socket, straight, one free cable end	2.0 m	756-1301/0060-0020	1
S-BUS cable, M12 socket, straight, one free cable end	5.0 m	756-1301/0060-0050	
S-BUS cable, M12 socket, straight, one free cable end	10.0 m	756-1301/0060-0100	
S-BUS cable, M12 socket, straight, one free cable end	20.0 m	756-1301/0060-0200	
S-BUS cable, M12 socket, right angle, one free cable end	2.0 m	756-1302/0060-0020	
S-BUS cable, M12 socket, right angle, one free cable end	5.0 m	756-1302/0060-0050	
S-BUS cable, M12 socket, right angle, one free cable end	10.0 m	756-1302/0060-0100	
S-BUS cable, M12 socket, right angle, one free cable end	20.0 m	756-1302/0060-0200	
S-BUS cable, M12 plug, straight, one free cable end	2.0 m	756-1303/0060-0020	
S-BUS cable, M12 plug, straight, one free cable end	5.0 m	756-1303/0060-0050	
S-BUS cable, M12 plug, straight, one free cable end	10.0 m	756-1303/0060-0100	
S-BUS cable, M12 plug, straight, one free cable end	20.0 m	756-1303/0060-0200	
S-BUS cable, M12 plug, right angle, one free cable end	2.0 m	756-1304/0060-0020	
S-BUS cable, M12 plug, right angle, one free cable end	5.0 m	756-1304/0060-0050	
S-BUS cable, M12 plug, right angle, one free cable end	10.0 m	756-1304/0060-0100	
S-BUS cable, M12 plug, right angle, one free cable end	20.0 m	756-1304/0060-0200	

18.2 S-BUS Cable, Assembled on One End, Suitable for Drag Chains

Table 177: S-BUS cable, assembled on one end, B coded, suitable for drag chains

Description	Length	Item number	PU
S-BUS cable, M12 socket, straight, one free cable end	2.0 m	756-1501/0060-0020	1
S-BUS cable, M12 socket, straight, one free cable end	5.0 m	756-1501/0060-0050	
S-BUS cable, M12 socket, straight, one free cable end	10.0 m	756-1501/0060-0100	
S-BUS cable, M12 socket, straight, one free cable end	20.0 m	756-1501/0060-0200	
S-BUS cable, M12 socket, right angle, one free cable end	2.0 m	756-1502/0060-0020	
S-BUS cable, M12 socket, right angle, one free cable end	5.0 m	756-1502/0060-0050	
S-BUS cable, M12 socket, right angle, one free cable end	10.0 m	756-1502/0060-0100	
S-BUS cable, M12 socket, right angle, one free cable end	20.0 m	756-1502/0060-0200	
S-BUS cable, M12 plug, straight, one free cable end	2.0 m	756-1503/0060-0020	
S-BUS cable, M12 plug, straight, one free cable end	5.0 m	756-1503/0060-0050	
S-BUS cable, M12 plug, straight, one free cable end	10.0 m	756-1503/0060-0100	
S-BUS cable, M12 plug, straight, one free cable end	20.0 m	756-1503/0060-0200	
S-BUS cable, M12 plug, right angle, one free cable end	2.0 m	756-1504/0060-0020	
S-BUS cable, M12 plug, right angle, one free cable end	5.0 m	756-1504/0060-0050	
S-BUS cable, M12 plug, right angle, one free cable end	10.0 m	756-1504/0060-0100	
S-BUS cable, M12 plug, right angle, one free cable end	20.0 m	756-1504/0060-0200	

18.3 S-BUS Cable, Assembled on Both Ends

Table 178: S-BUS cable, assembled on both ends, B coded

Description	Length	Item number	PU
S-BUS cable, M12 socket, M12 plug, straight	0.2 m	756-1305/0060-0002	1
S-BUS cable, M12 socket, M12 plug, straight	0.3 m	756-1305/0060-0003	
S-BUS cable, M12 socket, M12 plug, straight	0.5 m	756-1305/0060-0005	
S-BUS cable, M12 socket, M12 plug, straight	1.0 m	756-1305/0060-0010	
S-BUS cable, M12 socket, M12 plug, straight	2.0 m	756-1305/0060-0020	
S-BUS cable, M12 socket, M12 plug, straight	5.0 m	756-1305/0060-0050	
S-BUS cable, M12 socket, M12 plug, straight	10.0 m	756-1305/0060-0100	
S-BUS cable, M12 socket, M12 plug, straight	20.0 m	756-1305/0060-0200	
S-BUS cable, M12 socket, M12 plug, straight	50.0 m	756-1305/0060-0500	
S-BUS cable, M12 socket, M12 plug, angular	0.2 m	756-1306/0060-0002	
S-BUS cable, M12 socket, M12 plug, angular	0.3 m	756-1306/0060-0003	
S-BUS cable, M12 socket, M12 plug, angular	0.5 m	756-1306/0060-0005	
S-BUS cable, M12 socket, M12 plug, angular	1.0 m	756-1306/0060-0010	
S-BUS cable, M12 socket, M12 plug, angular	2.0 m	756-1306/0060-0020	
S-BUS cable, M12 socket, M12 plug, angular	5.0 m	756-1306/0060-0050	
S-BUS cable, M12 socket, M12 plug, angular	10.0 m	756-1306/0060-0100	
S-BUS cable, M12 socket, M12 plug, angular	20.0 m	756-1306/0060-0200	
S-BUS cable, M12 socket, M12 plug, angular	50.0 m	756-1306/0060-0500	

18.4 S-BUS Cable, Assembled on Both Ends, Suitable for Drag Chains

Table 179: S-BUS cable, assembled on both ends, B coded, suitable for drag chains

Description	Length	Item number	PU
S-BUS cable, M12 socket, straight, M12 plug, straight	0.2 m	756-1505/0060-0002	1
S-BUS cable, M12 socket, straight, M12 plug, straight	0.3 m	756-1505/0060-0003	
S-BUS cable, M12 socket, straight, M12 plug, straight	0.5 m	756-1505/0060-0005	
S-BUS cable, M12 socket, straight, M12 plug, straight	1.0 m	756-1505/0060-0010	
S-BUS cable, M12 socket, straight, M12 plug, straight	2.0 m	756-1505/0060-0020	
S-BUS cable, M12 socket, straight, M12 plug, straight	5.0 m	756-1505/0060-0050	
S-BUS cable, M12 socket, straight, M12 plug, straight	10.0 m	756-1505/0060-0100	
S-BUS cable, M12 socket, straight, M12 plug, straight	20.0 m	756-1505/0060-0200	
S-BUS cable, M12 socket, straight, M12 plug, straight	50.0 m	756-1505/0060-0500	
S-BUS cable, M12 socket, angular, M12 plug, angular	0.2 m	756-1506/0060-0002	
S-BUS cable, M12 socket, angular, M12 plug, angular	0.3 m	756-1506/0060-0003	
S-BUS cable, M12 socket, angular, M12 plug, angular	0.5 m	756-1506/0060-0005	
S-BUS cable, M12 socket, angular, M12 plug, angular	1.0 m	756-1506/0060-0010	
S-BUS cable, M12 socket, angular, M12 plug, angular	2.0 m	756-1506/0060-0020	
S-BUS cable, M12 socket, angular, M12 plug, angular	5.0 m	756-1506/0060-0050	
S-BUS cable, M12 socket, angular, M12 plug, angular	10.0 m	756-1506/0060-0100	
S-BUS cable, M12 socket, angular, M12 plug, angular	20.0 m	756-1506/0060-0200	
S-BUS cable, M12 socket, angular, M12 plug, angular	50.0 m	756-1506/0060-0500	

18.5 S-BUS Cable, Not Fitted With Connectors

Table 180: S-BUS cable, not fitted with connectors

Description	Length	Item number	PU
S-BUS cable, not fitted with connectors	25.0 m	756-1300/0000-0250	1
S-BUS cable, not fitted with connectors	50.0 m	756-1300/0000-0500	
S-BUS cable, not fitted with connectors	100.0 m	756-1300/0000-1000	

18.6 S-BUS Cable, Not Fitted With Connectors, Suitable for Drag Chains

Table 181: S-BUS cable, not fitted with connectors, suitable for drag chains

Description	Length	Item number	PU
S-BUS cable, not fitted with connectors	25.0 m	756-1500/0000-0250	1
S-BUS cable, not fitted with connectors	50.0 m	756-1500/0000-0500	
S-BUS cable, not fitted with connectors	100.0 m	756-1500/0000-1000	

18.7 S-BUS Terminator and USB Cable

Table 182: S-BUS terminator and USB cable

Description	Item number	PU
S-BUS terminator, M12 plug, straight, B coded	756-9409/0060-0000	1
USB communication cable	756-4101/0042-0030	

18.8 Accessories for S-BUS

Table 183: Accessories for S-BUS

Description	Item number	PU
M12 plug, straight, B coded can be preassembled; shielded spring clamp technology	756-9401/0060-0000	1
M12 plug, angular, B coded can be preassembled; shielded spring clamp technology	756-9403/0060-0000	
M12 socket, straight, B coded can be preassembled; shielded spring clamp technology	756-9402/0060-0000	
M12 socket, angular, B coded can be preassembled; shielded spring clamp technology	756-9404/0060-0000	
M12 terminator, connection straight	756-9405/0060-0000	

18.9 Power Supply Cable, Assembled on One End

Table 184: Power supply cable, assembled on one end, A coded

Description	Length	Item number	PU
Power supply cable, M12 socket, straight, one free cable end	2.0 m	756-3101/0040-0020	1
Power supply cable, M12 socket, straight, one free cable end	5.0 m	756-3101/0040-0050	
Power supply cable, M12 socket, straight, one free cable end	10.0 m	756-3101/0040-0100	
Power supply cable, M12 socket, straight, one free cable end	20.0 m	756-3101/0040-0200	
Power supply cable, M12 socket, right angle, one free cable end	2.0 m	756-3102/0040-0020	
Power supply cable, M12 socket, right angle, one free cable end	5.0 m	756-3102/0040-0050	
Power supply cable, M12 socket, right angle, one free cable end	10.0 m	756-3102/0040-0100	
Power supply cable, M12 socket, right angle, one free cable end	20.0 m	756-3102/0040-0200	
Power supply cable, M12 plug, straight, one free cable end	2.0 m	756-3103/0040-0020	
Power supply cable, M12 plug, straight, one free cable end	5.0 m	756-3103/0040-0050	
Power supply cable, M12 plug, straight, one free cable end	10.0 m	756-3103/0040-0100	
Power supply cable, M12 plug, straight, one free cable end	20.0 m	756-3103/0040-0200	
Power supply cable, M12 plug, right angle, one free cable end	2.0 m	756-3104/0040-0020	
Power supply cable, M12 plug, right angle, one free cable end	5.0 m	756-3104/0040-0050	
Power supply cable, M12 plug, right angle, one free cable end	10.0 m	756-3104/0040-0100	
Power supply cable, M12 plug, right angle, one free cable end	20.0 m	756-3104/0040-0200	

18.10 Power Supply Cable, Assembled on Both Ends

Table 185: Power supply cable, assembled on both ends, A coded

Description	Length	Item number	PU
Power supply cable, M12 socket, M12 plug, straight	0.2 m	756-3105/0040-0002	1
Power supply cable, M12 socket, M12 plug, straight	0.3 m	756-3105/0040-0003	
Power supply cable, M12 socket, M12 plug, straight	0.5 m	756-3105/0040-0005	
Power supply cable, M12 socket, M12 plug, straight	1.0 m	756-3105/0040-0010	
Power supply cable, M12 socket, M12 plug, straight	2.0 m	756-3105/0040-0020	
Power supply cable, M12 socket, M12 plug, straight	5.0 m	756-3105/0040-0050	
Power supply cable, M12 socket, M12 plug, straight	10.0 m	756-3105/0040-0100	
Power supply cable, M12 socket, M12 plug, straight	20.0 m	756-3105/0040-0200	
Power supply cable, M12 socket, M12 plug, angular	0.2 m	756-3106/0040-0002	
Power supply cable, M12 socket, M12 plug, angular	0.3 m	756-3106/0040-0003	
Power supply cable, M12 socket, M12 plug, angular	0.5 m	756-3106/0040-0005	
Power supply cable, M12 socket, M12 plug, angular	1.0 m	756-3106/0040-0010	
Power supply cable, M12 socket, M12 plug, angular	2.0 m	756-3106/0040-0020	
Power supply cable, M12 socket, M12 plug, angular	5.0 m	756-3106/0040-0050	
Power supply cable, M12 socket, M12 plug, angular	10.0 m	756-3106/0040-0100	
Power supply cable, M12 socket, M12 plug, angular	20.0 m	756-3106/0040-0200	

18.11 Power Supply Cable, Not Fitted With Connectors

Table 186: Power supply cable, not fitted with connectors

Description	Length	Item number	PU
Power Supply cable, not fitted with connectors	25.0 m	756-3100/0000-0250	1
Power Supply cable, not fitted with connectors	50.0 m	756-3100/0000-0500	
Power Supply cable, not fitted with connectors	100.0 m	756-3100/0000-1000	

18.12 Accessories for Power Supply Cable

Table 187: Accessories for power supply cable

Description	Item number	PU
M12 plug, straight, screw clamp connection PG9	756-9203/0040-0000	1
M12 plug, right angle, screw clamp connection PG9	756-9206/0040-0000	
M12 socket, straight, screw clamp connection PG9	756-9213/0040-0000	
M12 socket, right angle, screw clamp connection PG9	756-9216/0040-0000	

18.13 ETHERNET, PROFINET Cable, Assembled on One End

Table 188: ETHERNET, PROFINET cable, assembled on one end, D coded

Description	Length	Item number	PU
ETHERNET, PROFINET cable, M12 plug, straight, one free cable end	2.0 m	756-1201/0060-0020	1
ETHERNET, PROFINET cable, M12 plug, straight, one free cable end	5.0 m	756-1201/0060-0050	
ETHERNET, PROFINET cable, M12 plug, straight, one free cable end	10.0 m	756-1201/0060-0100	
ETHERNET, PROFINET cable, M12 plug, straight, one free cable end	20.0 m	756-1201/0060-0200	
ETHERNET, PROFINET cable, M12 plug, angular, one free cable end	2.0 m	756-1202/0060-0020	
ETHERNET, PROFINET cable, M12 plug, angular, one free cable end	5.0 m	756-1202/0060-0050	
ETHERNET, PROFINET cable, M12 plug, angular, one free cable end	10.0 m	756-1202/0060-0100	
ETHERNET, PROFINET cable, M12 plug, angular, one free cable end	20.0 m	756-1202/0060-0200	

18.14 ETHERNET, PROFINET Cable, Assembled on Both Ends

Table 189: ETHERNET, PROFINET cable, assembled on both ends, D coded

Description	Length	Item number	PU
ETHERNET, PROFINET cable, M12 plug, straight, M12 plug, straight	2.0 m	756-1203/0060-0020	1
ETHERNET, PROFINET cable, M12 plug, straight, M12 plug, straight	5.0 m	756-1203/0060-0050	
ETHERNET, PROFINET cable, M12 plug, straight, M12 plug, straight	10.0 m	756-1203/0060-0100	
ETHERNET, PROFINET cable, M12 plug, straight, M12 plug, straight	20.0 m	756-1203/0060-0200	
ETHERNET, PROFINET cable, M12 plug, angular, M12 plug, angular	2.0 m	756-1204/0060-0020	
ETHERNET, PROFINET cable, M12 plug, angular, M12 plug, angular	5.0 m	756-1204/0060-0050	
ETHERNET, PROFINET cable, M12 plug, angular, M12 plug, angular	10.0 m	756-1204/0060-0100	
ETHERNET, PROFINET cable, M12 plug, angular, M12 plug, angular	20.0 m	756-1204/0060-0200	

18.15 Accessories for ETHERNET and PROFINET

Table 190: Accessories for ETHERNET and PROFINET

Description	Item number	PU
M12 plug, straight, D coded can be preassembled; shielded spring clamp technology	756-9501/0060-0000	1
M12 plug, angular, D coded can be preassembled; shielded spring clamp technology	756-9501/0040-0000	
Adapter, angular, M12 socket, D coded/RJ-45 socket	756-9503/0040-0000	
Adapter, straight, M12 socket, D coded/RJ-45 socket	756-9504/0040-0000	
ETHERNET Connector RJ-45, IP 20	750-975	
PROFINET Connector RJ-45, IP 20	750-976	

18.16 Torque Wrench M8 and M12

Table 191: Torque wrench M8 and M12

Description	Item number	PU
Torque Wrench M8 and M12	206-701	1

18.17 Carrier Rail / Profile Adapters and Spacer Module

Table 192: Carrier rail / profile adapters and spacer module

Description	Item number	PU
Carrier rail adapter	767-121	1
Profile adapter	767-123	
Spacer module	767-111	

18.18 Protective Caps

Table 193: Protective caps

Description	Item number	PU
M8 protective caps for connection sockets	756-8101	1
M12 protective caps for connection sockets	756-8102	
M12 protective caps for connection plugs	756-8103	

19 Appendix

19.1 WAGO-Specific Classes

The following table provides explanations of the column headers that can appear in the tables of the classes:

Table 194: Explanation of table headers

Column Header	Description
Attribute ID	Integer value which is assigned to the respective attribute
NV	NV (non-volatile): The attribute is permanently saved in the fieldbus coupler. V (volatile): The attribute is not permanently saved in the fieldbus coupler.
Name	Identification of the attribute.
Data type	Identification of the CIP data type of the attribute.
Description	Brief description of the attribute.
Default Value	Factory setting
Access	Set: The attribute can be accessed using the Set_Attribute service (writing/modifying the attribute value). Note: If an attribute supports the Set_Attribute service, it can also be accessed with the Get_Attribute service. Get: The attribute can be accessed using the Get_Attribute services (reading the attribute value). Get_Attribute_All: Delivers the content of all attributes. Set_Attribute_Single: Modifies an attribute value.

The following table provides an overview of all WAGO-specific classes:

Table 195: WAGO-specific classes

Name	Class	Information
Coupler configuration Object	64 _{hex}	See appropriate section.
Node information class	82 _{hex}	
Discrete Input Point	65 _{hex}	
Discrete Input Point Extended 1	69 _{hex}	
Discrete Input Point Extended 2	6D _{hex}	
Discrete Input Point Extended 3	71 _{hex}	
Discrete Output Point	66 _{hex}	
Discrete Output Point Extended 1	6A _{hex}	
Discrete Output Point Extended 2	6E _{hex}	
Discrete Output Point Extended 3	72 _{hex}	
Analog Input Point	67 _{hex}	
Analog Input Point Extended 1	6B _{hex}	
Analog Input Point Extended 2	6F _{hex}	
Analog Input Point Extended 3	73 _{hex}	
Analog Output Point	68 _{hex}	
Analog Output Point Extended 1	6C _{hex}	
Analog Output Point Extended 2	70 _{hex}	
Analog Output Point Extended 3	74 _{hex}	
IOM Input Point Class	83 _{hex}	
IOM Input Point Class	83 _{hex}	

19.1.1 Bus Coupler Configuration Class Object (64_{hex})

The fieldbus coupler configuration class allows reading and configuration of some important fieldbus process parameters. The following listings explain in details all supported instances and attributes.

Class Attributes

Table 196: “Bus Coupler Configuration Class Object” Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	1 (0x0001)

Instance Attributes 1

Table 197: “Bus Coupler Configuration Class Object” Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
5	Get	V	Fieldbus Process State	USINT	Fieldbus coupler state Bit 0: Error of process input data (0x01) Bit 1: Error of process output data (0x02) Bit 2: Loss of diagnostic information (0x04) Bit 3: Module diagnostics (0x08) Bit 7: Fieldbus error (0x80)	0 (0x00)
7	Get	NV	Configured Length of Analog Outputs	UINT	Number of I/O bits of analog outputs	-
8	Get	NV	Configured Length of Analog Inputs	UINT	Number of I/O bits of analog inputs	-
9	Get	NV	Configured Length of Digital Outputs	UINT	Number of I/O bits of digital outputs	-
10	Get	NV	Configured Length of Digital Inputs	UINT	Number of I/O bits of digital inputs	-
11	Get/Set	NV	Fieldbus Fault Reaction	USINT	Response to fieldbus error 1: Set all outputs to 0 2: No reaction	1 (0x01)

Table 197: “Bus Coupler Configuration Class Object” Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
45	Get	V	Error Code	USINT	Error code of I/O LED	0 = no error
46	Get	V	Error Argument	USINT	Error argument of I/O LED	0 = no error
52	Get/Set	NV	S-BUS Fault Reaction	USINT	Response to S-BUS error 1: Set all inputs in the process image to 0 2: No reaction	1 (0x01)
53	Get	V	Max Diagnostic Data Size	UINT	Maximum quantity of purely diagnostic data in bytes	-
54	Get	V	Diagnostic Message	ARRAY OF USINT	Diagnostic consisting of diagnostic path and diagnostic data	-
55	Get/Set	V	Diagnostic Message Acknowledge	USINT ARRAY	Diagnostic confirmation consisting of diagnostic path and diagnostic data	-
57	Get	V	Error Group	USINT	Error group of the I/O LED	0 = no error
120	Get/Set	NV	Header Configuration Originator to Target	UINT	Indication of whether the RUN/IDLE header is used from the originator to the target. 0: Is used 1: Is not used	0 (0x0000)
121	Get/Set	NV	Header Configuration Target to Originator	UINT	Indication of whether the RUN/IDLE header is used from the target to the originator. 0: Is used 1: Is not used	1 (0x0001)

Overview of Services

Table 198: “Bus Coupler Configuration Class Object” Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value

19.1.2 Discrete Input Point Classes

There are 4 DIP classes allowing access to the node containing up to 1020 individual digital input points.

19.1.2.1 Discrete Input Point Class (65_{hex})

This class allows the reading of data of a particular digital input point. A digital input point (DIP) can be a part of digital input module or a digital input and output module. Each DIP can have a maximum width of 8 bits. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 199: “Discrete Input Point” Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Digital Input Values 1 through 255)

Table 200: “Discrete Input Point” Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get	V	Value	BYTE	Object value	-
2	Get	V	Value Length	BYTE	Value length in bits	-

Overview of Services

Table 201: “Discrete Input Point” Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute

19.1.2.2 Discrete Input Point Extended 1 (69_{hex})

The extension of the "discrete input point" class enables the reading of data from a 767 node that contains over 255 digital input points (DIPs). The instance scope of this class covers DIPs from 256 to 510 in the node. Each DIP can have a width of up to 8 bits. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 202: "Discrete Input Point Extended 1" Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Digital Input Values 256 through 510)

Table 203: "Discrete Input Point Extended 1" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get	V	Value	BYTE	Object value	-
2	Get	V	Value Length	BYTE	Value length in bits	-

Overview of Services

Table 204: "Discrete Input Point Extended 1" Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute

19.1.2.3 Discrete Input Point Extended 2 (6D_{hex})

The second extension of the "discrete input point" class enables the reading of data from a 767 node that contains over 510 DIPs. The instance scope of this class covers DIPs from 511 to 765. Each DIP can have a width of up to 8 bits. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 205: "Discrete Input Point Extended 2" Class: Class Attribute

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Digital Input Values 511 through 765)

Table 206: "Discrete Input Point Extended 2" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get	V	Value	BYTE	Object value	-
2	Get	V	Value length	BYTE	Value length in bits	-

Overview of Services

Table 207: "Discrete Input Point Extended 2" Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute

19.1.2.4 Discrete Input Point Extended 3 (71_{hex})

The third extension of the "discrete input point" class enables the reading of data from a 767 node that contains over 765 DIPs. The instance scope of this class covers DIPs from 766 to 1020. Each DIP can have a width of up to 8 bits. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 208: "Discrete Input Point Extended 3" Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Digital Input Values 766 through 1020)

Table 209: "Discrete Input Point Extended 3" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get	V	Value	BYTE	Object value	-
2	Get	V	Value length	BYTE	Value length in bits	-

Overview of Services

Table 210: "Discrete Input Point Extended 3" Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute

19.1.3 Discrete Output Point Classes

There are 4 DOP classes allowing access to the node containing up to 1020 individual digital output points.

19.1.3.1 Discrete Output Point Class (66_{hex})

This class enables data exchange for a particular digital output point. A digital output point (DOP) can be a part of digital output module or a digital input and output module. Each DOP can have a width of up to 8 bits. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 211: “Discrete Output Point” Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Digital Output Values 1 through 255)

Table 212: “Discrete Output Point” Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get/Set	V	Value	BYTE	Object value	-
2	Get	V	Value length	BYTE	Value length in bits	-

Overview of Services

Table 213: “Discrete Output Point” Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value

19.1.3.2 Discrete Output Point Extended 1 (6A_{hex})

The first extension of the "discrete output point" class enables data exchange in a 767 node that contains over 255 DOPs. The instance scope of this class covers DOPs from 256 to 510. Each DOP can have a width of up to 8 bits. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 214: "Discrete Output Point Extended 1" Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Digital Output Values 256 through 510)

Table 215: "Discrete Output Point Extended 1" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get/Set	V	Value	BYTE	Object value	-
2	Get	V	Value length	BYTE	Value length in bits	-

Overview of Services

Table 216: "Discrete Output Point Extended 1" Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value

19.1.3.3 Discrete Output Point Extended 2 (6E_{hex})

The second extension of the "discrete output point" class enables data exchange in a 767 node that contains over 510 DOPs. The instance scope of this class covers DOPs from 511 to 765. Each DOP can have a width of up to 8 bits. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 217: "Discrete Output Point Extended 2" Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Digital Output Values 511 through 765)

Table 218: "Discrete Output Point Extended 2" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get/Set	V	Value	BYTE	Object value	-
2	Get	V	Value length	BYTE	Value length in bits	-

Overview of Services

Table 219: "Discrete Output Point Extended 2" Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value

19.1.3.4 Discrete Output Point Extended 3 (72_{hex})

The third extension of the "discrete output point" class enables data exchange in a 767 node that contains over 765 DOPs. The instance scope of this class covers DOPs from 766 to 1020. Each DOP can have a width of up to 8 bits. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 220: "Discrete Output Point Extended 3" Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Digital Output Values 766 through 1020)

Table 221: "Discrete Output Point Extended 3" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get/Set	V	Value	BYTE	Object value	-
2	Get	V	Value length	BYTE	Value length in bits	-

Overview of Services

Table 222: "Discrete Output Point Extended 3" Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value

19.1.4 Analog Input Point Classes

There are 4 AIP classes allowing access to the 767 node containing up to 1020 individual analog input points.

19.1.4.1 Analog Input Point Class (67_{hex})

This class enables the reading of data of a particular analog input point. An analog input point is part of an analog input module. Each AIP can contain up to 65535 bytes. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 223: “Analog Input Point” Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Analog Input Values 1 through 255)

Table 224: “Analog Input Point” Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get	V	Value	BYTE ARRAY	Object value	-
2	Get	V	Value length	BYTE	Value length in bytes	-
3	Get	V	Extended value length	WORD	Extended value range of values larger than 254 bytes	-

Overview of Services

Table 225: “Analog Input Point” Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute

19.1.4.2 Analog Input Point Extended 1 (6B_{hex})

The first extension of the "analog input point" class enables the reading of data from a 767 node that contains over 255 AIPs. The instance scope of this class covers AIPs from 256 to 510. Each AIP can contain up to 65535 bytes. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 226: "Analog Input Point Extended 1" Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Analog Input Values 256 through 510)

Table 227: "Analog Input Point Extended 1" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get	V	Value	BYTE ARRAY	Object value	-
2	Get	V	Value length	BYTE	Value length in bytes	-
3	Get	V	Extended value length	WORD	Extended value range of values larger than 254 bytes	-

Overview of Services

Table 228: "Analog Input Point Extended 1" Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute

19.1.4.3 Analog Input Point Extended 2 (6F_{hex})

The second extension of the "analog input point" class enables the reading of data from a 767 node that contains over 510 AIPs. The instance scope of this class covers AIPs from 511 to 765. Each AIP can contain up to 65535 bytes. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 229: "Analog Input Point Extended 2" Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Analog Input Values 511 through 765)

Table 230: "Analog Input Point Extended 2" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get	V	Value	BYTE ARRAY	Object value	-
2	Get	V	Value length	BYTE	Value length in bytes	-
3	Get	V	Extended value length	WORD	Extended value range of values larger than 254 bytes	-

Overview of Services

Table 231: "Analog Input Point Extended 2" Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute

19.1.4.4 Analog Input Point Extended 3 (73_{hex})

The third extension of the "analog input point" class enables the reading of data from a 767 node that contains over 765 AIPs. The instance scope of this class covers AIPs from 766 to 1020. Each AIP can contain up to 65535 bytes. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 232: "Analog Input Point Extended 3" Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Analog Input Values 766 through 1020)

Table 233: "Analog Input Point Extended 3" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get	V	Value	BYTE ARRAY	Object value	-
2	Get	V	Value length	BYTE	Value length in bytes	-
3	Get	V	Extended value length	WORD	Extended value range of values larger than 254 bytes	-

Overview of Services

Table 234: "Analog Input Point Extended 3" Class: Class Attributes

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute

19.1.5 Analog Output Point Classes

There are four AOP classes allowing access to the node containing up to 1020 individual analog output points.

19.1.5.1 Analog Output Point (68_{hex})

This class enables the reading of data of a particular analog output point. An analog output point is part of an analog output module. Every AOP can contain up to 65535 bytes. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 235: “Analog Output Point” Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Analog Output Values 1 through 255)

Table 236: “Analog Output Point” Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get/Set	V	Value	BYTE ARRAY	Object value	-
2	Get	V	Value length	BYTE	Value length in bytes	-
3	Get	V	Extended value length	WORD	Extended value range of values larger than 254 bytes	-

Overview of Services

Table 237: “Analog Output Point” Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value

19.1.5.2 Analog Output Point Extended 1 (6C_{hex})

The first extension of the "analog output point" class enables the reading of data from a 767 node that contains over 255 AOPs. The instance scope of this class covers AOPs from 256 to 510. Every AOP can contain up to 65535 bytes. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 238: "Analog Output Point Extended 1" Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Analog Output Values 256 through 510)

Table 239: "Analog Output Point Extended 1" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get/Set	V	Value	BYTE ARRAY	Object value	-
2	Get	V	Value length	BYTE	Value length in bytes	-
3	Get	V	Extended value length	WORD	Extended value range of values larger than 254 bytes	-

Overview of Services

Table 240: "Analog Output Point Extended 1" Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value

19.1.5.3 Analog Output Point Extended 2 (70_{hex})

The second extension of the "analog output point" class enables the reading of data from a 767 node that contains over 510 AOPs. The instance scope of this class covers AOPs from 511 to 765. Every AOP can contain up to 65535 bytes. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 241: "Analog Output Point Extended 2" Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Analog Output Values 511 through 765)

Table 242: "Analog Output Point Extended 2" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get/Set	V	Value	BYTE ARRAY	Object value	-
2	Get	V	Value length	BYTE	Value length in bytes	-
3	Get	V	Extended value length	WORD	Extended value range of values larger than 254 bytes	-

Overview of Services

Table 243: "Analog Output Point Extended 2" Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value

19.1.5.4 Analog Output Point Extended 3 (74_{hex})

The third extension of the "analog output point" class enables the reading of data from a 767 node that contains over 765 AOPs. The instance scope of this class covers AOPs from 766 to 1020. Every AOP can contain up to 65535 bytes. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 244: "Analog Output Point Extended 3" Class: Class Attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances	-

Instance Attributes of Instances 1 through 255 (Analog Output Values 766 through 1020)

Table 245: "Analog Output Point Extended 3" Class: Instance Attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get/Set	V	Value	BYTE ARRAY	Object value	-
2	Get	V	Value length	BYTE	Value length in bytes	-
3	Get	V	Extended value length	WORD	Extended value range of values larger than 254 bytes	-

Overview of Services

Table 246: "Analog Output Point Extended 3" Class: Services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value

19.1.6 IOM Input Point Class (83_{hex})

This class provides information about an individual I/O modules. This includes the breadth of process information for the input points of the I/O module in bytes. In addition, this class also provides access to the process information of the module. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 247: "IOM Input Point Class" class: class attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances: 65	-

Instance Attributes of Instances 1 through 65 (I/O module 1 through 65)

Table 248: „IOM Input Point Class“ class: Instance attributes

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get	V	Value	BYTE ARRAY	Object value	-
2	Get	V	Value Length	BYTE	Value length in bytes	-



Note

Reference of the instances

The instances comply with the respective position of the I/O modules connected to the fieldbus coupler. Instance 1 refers to the integrated digital inputs or outputs of the fieldbus coupler. Instance 2 refers to the first I/O module connected to the fieldbus coupler, instance 3 to the second I/O module, etc. If an I/O module has no input point, then instance attribute 2 (Value Length) has the value 0.

Overview of Services

Table 249: "IOM Input Point Class" class: services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute

19.1.7 IOM Output Point Class (84_{hex})

This class provides information about an individual I/O modules. This includes the breadth of process information for the output points of the I/O module in bytes. In addition, this class also provides access to the process information of the module. The following tables provide an overview of the instances and attributes supported by WAGO:

Class Attributes

Table 250: “IOM Output Point Class” class: class attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances: 65	-

Instance Attributes of Instances 1 through 65 (I/O module 1 through 65)

Table 251: „IOM Output Point Class“ class: Instance attribut

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get/Set	V	Value	BYTE ARRAY	Object value	-
2	Get	V	Value Length	BYTE	Value length in bytes	-

Note



Reference of the instances

The instances comply with the respective position of the I/O modules connected to the fieldbus coupler. Instance 1 refers to the integrated digital inputs or outputs of the fieldbus coupler. Instance 2 refers to the first I/O module connected to the fieldbus coupler, instance 3 to the second I/O module, etc. If an I/O module has no output point, then instance attribute 2 (Value Length) has the value 0.

Overview of Services

Table 252: “IOM Output Point Class” class: services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute
10 hex	No	Yes	Set_Attribute_Single	Modifies an attribute value

19.1.8 Node Information Class (82_{hex})

This class provides information about an individual I/O module. Among the more important information is the item number. Additional information about the I/O module can be found in instance attributes 2. From this instance attribute, you can identify whether the I/O module is physical or virtual and whether the MODBUS process image, EtherNet/IP or an IEC 61131 application has been assigned.

Class Attributes

Table 253: "Node information" class: class attributes

Attribute ID	Access	Name	Data Type	Description	Default Value
1	Get	Revision	UINT	Version of object	1 (0x0001)
2	Get	Max Instance	UINT	Maximum number of instances: 65	-

Instance attributes of instances 1 through 255 (I/O modules 1 through 65)

Table 254: "Node information" class: instance attribute

Attribute ID	Access	NV	Name	Data Type	Description	Default Value
1	Get	V	Order number	SHORT_STRING	Item number	-
2	Get	V	Additional info	UDINT	*	-

* Bit 0: Additional module information

0 = Physical I/O module,

1 = Virtual I/O module

Bit 1: The process image is assigned to EtherNet/IP

0 = No,

1 = Yes

Overview of Services

Table 255: "Node information" class: services

Service Code	Service Available		Service Name	Description
	Class	Instance		
0E hex	Yes	Yes	Get_Attribute_Single	Delivers content of respective attribute

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