WAGO-SPEEDWAY 767

Manual

767-5204

MOVILINK® Interface (RS-232, RS-485)
2 interfaces (2 x M12) + 4 digital inputs/outputs (2 x M12, two inputs/outputs per connector)

Version 1.1.0

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

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

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1 Notes about this Documentation

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

⚠ 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.

Note

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

1.1 Validity of these Operating Instructions

These operating instructions are only applicable to the WAGO *SPEEDWAY 767* Series module MOVILINK® Interface (RS-232, RS-485), 767-5204.

1.2 Copyright

1.3 Symbols

⚠ DANGER

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

NOTICE

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

Note

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

Information

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

1.4 Number Notation

Table 1: Number Notation

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

1.5 Font Conventions

Table 2: Font Conventions

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

2 Important Notes

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

2.1 Legal Bases

2.1.1 Subject to Changes

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

2.1.2 Personnel 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 Intended Use

The 767-5204 module has two serial interfaces for controlling drives using the MOVILINK® protocol and configurable digital inputs and outputs. These are suitable for the output of digital signals as well as for detecting digital field signals.

The module is supported by all series 767 fieldbus couplers of Release 5 or higher.

The module may not be used to control safety-related functions, i.e. it cannot be a functional part of a safety function.

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

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

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.)

- 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

3 Device Description

The 767-5204 module makes it possible to connect drives that support the MOVILINK® protocol to an RS-232 or RS-485 interface. In addition, two of the connections can each be parameterized with two signal channels as digital inputs or outputs. In this way, the module has space to connect up to four digital actuators or sensors to both control solenoid valves, contactors, etc., and to evaluate sensors, proximity switches, etc.

The properties (e.g. filter times) of all signal channels of the module can be parameterized independently, depending on fieldbus via the device description file (e.g. GSD, GSDML, etc.) of a fieldbus or independent of the fieldbus via an FDT/DTM frame application such as WAGOframe.

The module supports the MOVILINK® protocol from SEW-EURODRIVE GmbH & Co.KG. Support is limited to a subset of the protocol. Supported are PDU types 0x05 (cyclic) and 0x85 (acyclic) that send a telegram with 6 bytes of user data to the drive.

Data can be transferred in "Mailbox" or "Easy" mode.

In Mailbox mode, communication with the module is message-based, i.e. a set of MOVILINK® user data is transferred to the mailbox as a block and then transferred to the module. Received data also arrives at the control unit as a block. In Mailbox mode, both MOVILINK® interfaces are accessed simultaneously.

In Easy mode, the MOVILINK® data is written from the control unit to the process image and read from the process image directly. Only one serial interface can be used and only PDU type 0x05 (cyclic) is supported.

All data from the drive is transferred transparently to the connected fieldbus master. The module works independent of the fieldbus used half-duplex at up to 57600 baud depending on the configuration.

The default operating mode of the serial interfaces is RS-485 half-duplex. The default data transmission rate is 9600 baud. 1 start bit, 8 data bits and 1 stop bit are sent. There is even parity generation and dataflow control.

As required, the module can be reconfigured in wide ranges:

- Module operating mode: Mailbox mode or Easy mode (either interface 1 or 2)
- Operating mode of the serial interfaces: RS-232 or RS-485
- Baud rate of the serial interfaces: 9600 baud or 57600 baud

In RS-232 mode, the interface works in accordance with the TIA/EIA-232-F and CCITT V 28/DIN 66259-1 standards. In RS-485 mode, the interface works in accordance with the TIA/EIA-485-A, DIN 66259 standards.

The positive switching digital inputs have a characteristic in accordance with IEC61131-2, Type 2. They have extensive parameterization options channel-by-channel such as filter times or signal inversion.

The positive switching outputs are designed for 0.5 A (max. 0.6 A) and short circuit/overload protected. There are also parameterization options for the outputs channel-by-channel such as substitute value strategy.

3.1 Connectors

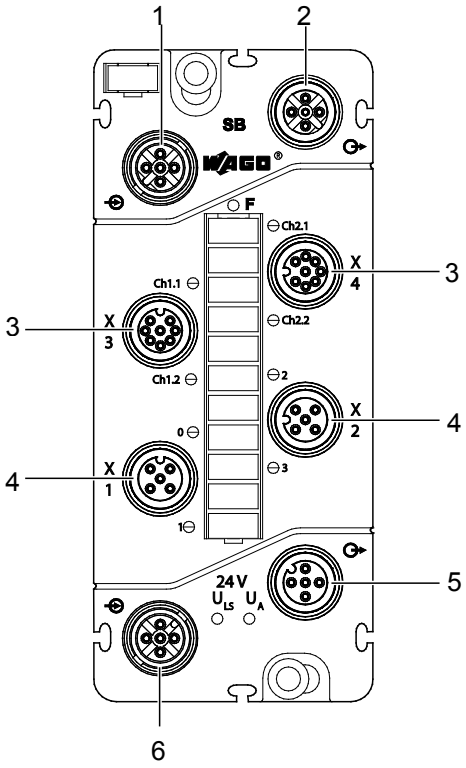


Figure 1: Connectors (exemplary)

Table 3: Legend for figure "Connectors"

Position	Description	Function
1	S-BUS input M12 plug, B-coded	For transmitting data from previous 767 Series components.
2	S-BUS output M12 socket, B-coded	For transmitting S-BUS data to the next 767 Series components or to the S-BUS terminator.
3	Serial interfaces 1 and 2 M12 socket, A coded	MOVILINK® devices with one of the following interfaces are supported: RS-232, RS-485.
4	Digital inputs and outputs X1 and X2, (double assignment) M12 socket, A coded	For connecting digital sensors or actuators.
5	Supply output M12 socket, A coded	For providing system and/or actuator power supply to adjacent I/O modules.
6	Supply input M12 plug, A coded	For infeed of system and actuator supply.

3.2 Marking Possibilities and Fastening

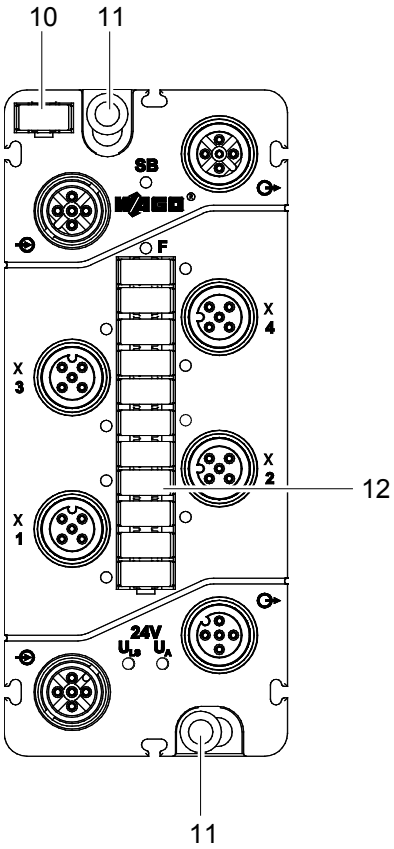


Figure 2: Marking possibilities and fastening (exemplary)

Table 4: Legend for figure "Marking possibilities and fastening"

Position	Description	Function
10	Module marker card	For identifying the module within a fieldbus node.
11	Mounting holes	With integrated function earth (FE) socket for fastening and grounding the module.
12	Marker strips	For identifying inputs.

3.3 Display Elements

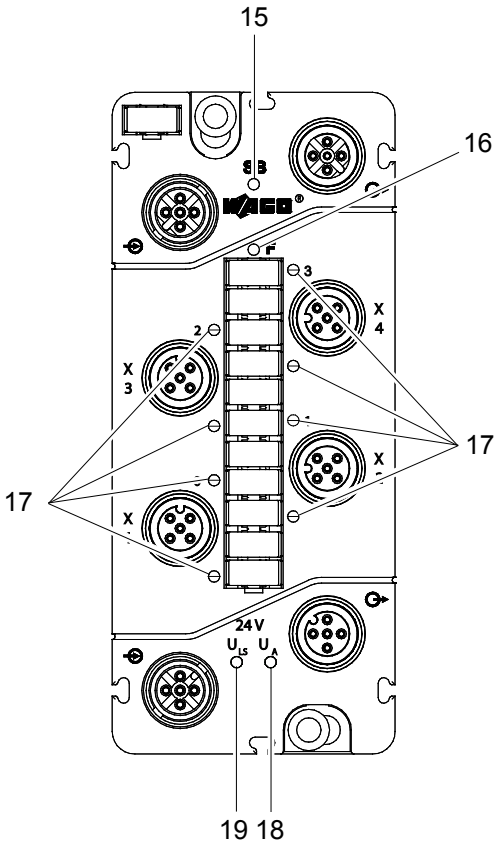


Figure 3: Display elements (exemplary)

Table 5: Legend for figure "Display elements"

Position	LED	Color	Meaning
15	SB	Green/red/orange	S-BUS status
16	F	Red	Diagnostic information
17	Ch1.1	Yellow	Status of the serial interfaces. Detailed information can be found in section "Diagnostics" > "LED Signaling".
	Ch1.2	Yellow, red	
	Ch2.1	Yellow	
	Ch2.2	Yellow, red	
	0 … 3	Yellow, red	Information about the inputs and outputs. Detailed information can be found in section "Diagnostics" > "LED Signaling".
18	U_A	Green	Actuator supply is present.
19	U_{LS}	Green	Logic supply and sensor supply are present.

Note

Detailed information
Detailed information can be found in section "Diagnostics" > "LED Signaling".

3.4 Labeling

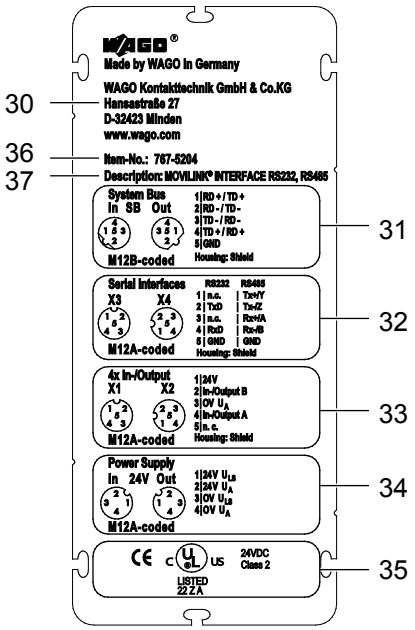


Figure 4: Labeling

Table 6: Legend for figure "Labeling"

Position	Description
30	Manufacturer's mailing address
31	Pin assignment of S-BUS
32	Pin assignment of the serial interfaces
33	Pin assignment of the inputs/outputs
34	Pin assignment of supply input and output
35	Information on approvals and CE marks
36	Item number
37	Clear labeling of the module

On the side of the module is a label, with information that would prove useful in the case of a complaint:

- BA: Work order number (40)
- SN: Serial number (40)
- Manufacturing number (41)

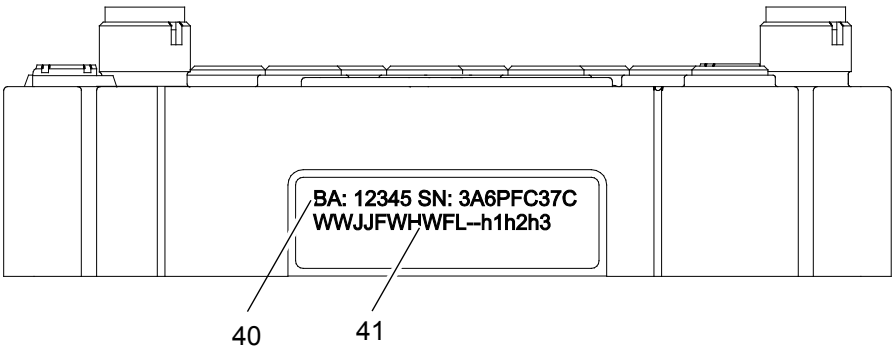


Figure 5: Label on the module

Table 7: 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

3.5 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 and outputs of the modules (see also sections "Connecting the Supply Cable" and "Connecting the Sensor/Actuator Cable").

Please note that the common power supply of the sensors and actuators is distributed to the module connections X1 and X2 (each pin 1).

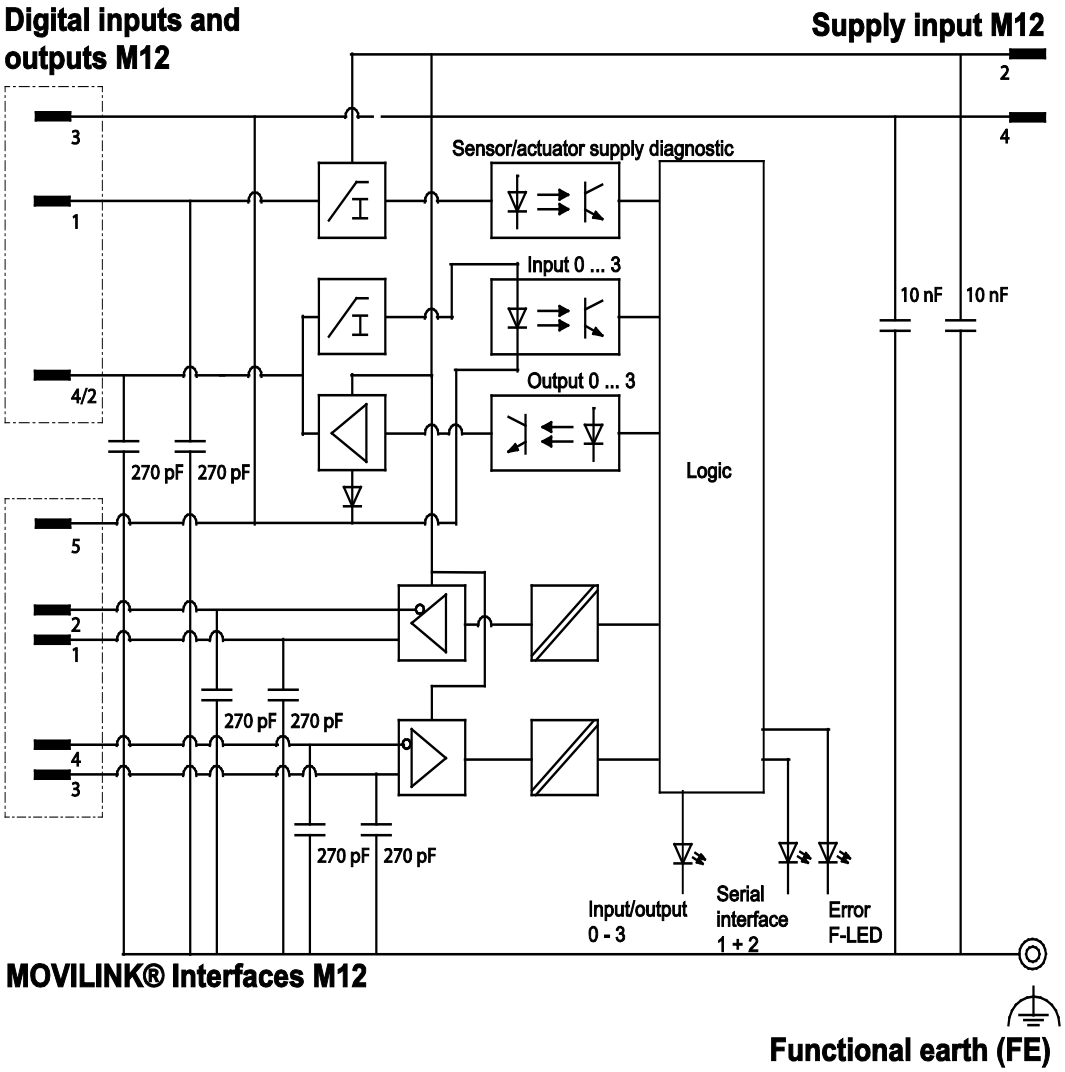


Figure 6: Schematic diagram

3.6 Dimensions

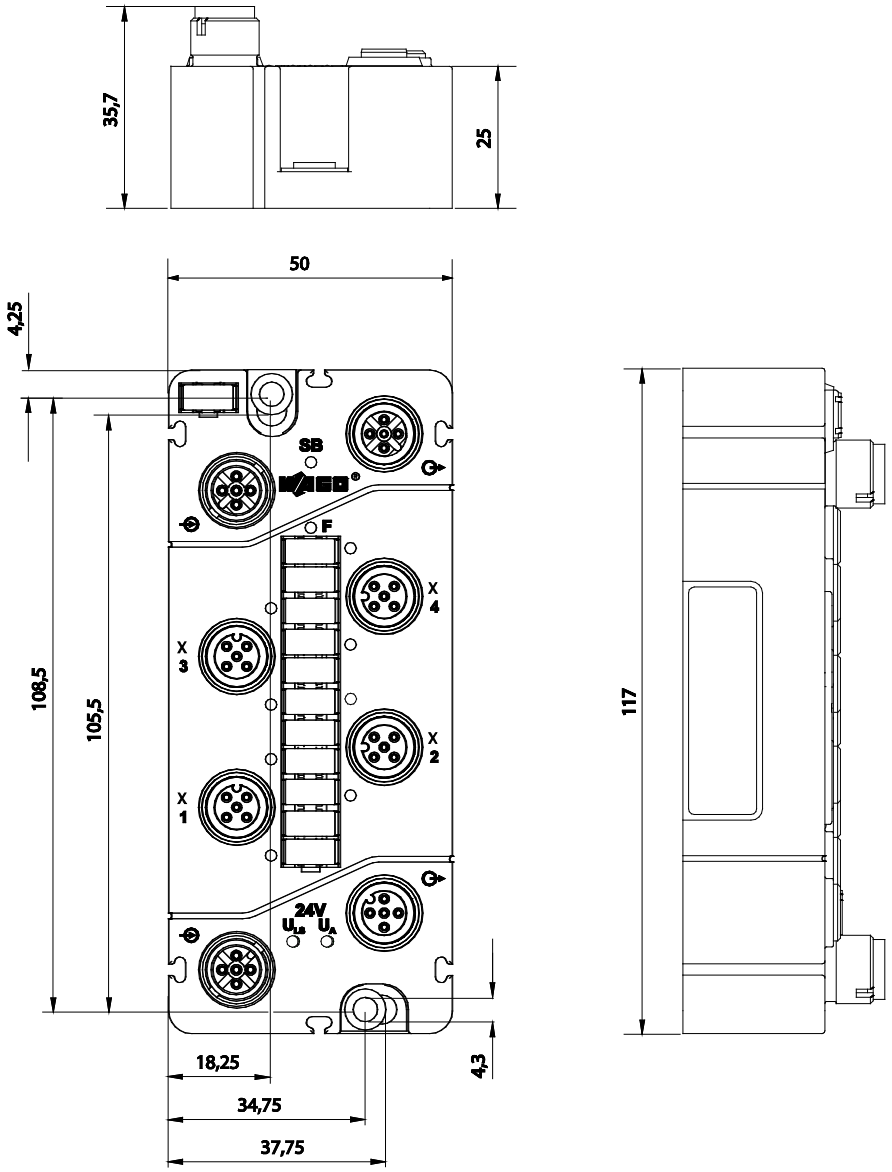


Figure 7: Dimensions of the module in millimeters (exemplary)

3.7 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!

3.7.1 Device Data

Table 8: Technical data − Device

Width	50 mm
Height	35.7 mm
Lowness	117 mm
Weight	Approx. 260 g

3.7.2 Supply

Table 9: Technical data − Supply

Connection type	M12 connectors, A coded, 4 poles *
Current carrying capacity of 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	 DC 24 V (-25 % … +30 %) DC 24 V (-25 % … +30 %)
Supply current Logic and sensor current I_{LS} Actuator current I_A	 Typical 75 mA + sensors (max. 400 mA) Typical 25 mA + actuators 2.4 A (4*600 mA) **Note:** Please note the maximum aggregate current ≤ 4 A
Protection	Reverse voltage protection for U_{LS} + U_A Short-circuit protection for sensor/actuator supply

* Derating should be observed!

3.7.3 Communication

Table 10: Technical data − Communication

S-BUS connection	Shielded M12 connector, B coded, 5 poles

3.7.4 MOVILINK® Interfaces

Table 11: Technical data − MOVILINK® interfaces

Number of interfaces	2
Connection type	M12 connector, A coded, 5 poles, shielded
Transmission channels	1 RxD/1 TxD (half duplex)
Line length, max.	15 m (RS-232) or 200 m (RS-485)
Baud rate	9600 or 57600 Baud
Protocol MOVILINK® PDU types	0x05 (cyclic) and 0x85 (acyclic)
Data bits	8
Parity	Even
Stop bits	1

3.7.5 Digital Inputs

Table 12: Technical data − Digital inputs

Number of inputs	4
Connection type	M12 connectors, 5 poles, A coded, shielded
Connection technology	2 or 3 wire
Input filter	Hardware: ≤110 µs Software: configurable
Input characteristic	Type 2, acc. to IEC 61131-2
Signal voltage (0) Signal voltage (1)	DC -3 V … +5 V DC +11 V … U_A
Input wiring	high-side switching
Input voltage	24 V DC (-3 V DC < U_{IN} < +30 V DC) Supply from U_A strongly recommended, recover for voltages > U_A
Input current	Typ. 7.3 mA
Connection of 2-wire BEROs	Maximum of 1.5 mA standby current permissible
Cable length, unshielded	≤ 30 m

3.7.6 Input Characteristic

Table 13: Technical data − Input characteristic

Input voltage	**Typical input current**
-3 V < U_A < 0 V	0 mA
5 V	2.3 mA … 2.5 mA
11 V	6.4 mA … 6.7 mA
24 V < U_A <31.2 V	7.3 mA … 7.5 mA

3.7.7 Digital Outputs

Table 14: Technical data − Digital outputs

Number of outputs	4
Connection type	M12 connectors, 5 poles, A coded, shielded
Connection technology	2 or 3 wire
Output voltage	≤ U_A
Output current (per channel)	0.5 A (max. 0.6 A), short-circuit/overload protection (thermal shutdown)
Voltage drop against U_A at 500 mA	Maximum 0.2 V DC
Output current (module)	Maximum 2 A
Leakage current in OFF state	Typ. 5 µA
Output circuit	High-side switching

3.7.8 Information for Actuator Selection

Table 15: Technical data − Actuator selection

Delay time HW from 0 to 1 (0 – 90 %) from 1 to 0 (0 – 90 %)	 Typical 90 µs (resistive load) Typical 310 µs (resistive load)
Rise time from 0 to 1 from 1 to 0	 Typical 60 µs (resistive load) Typical 45 µs (resistive load)
Cable length, unshielded	≤ 30 m
Resistance to recovery	≤ 1.0 A (error: 1 channel)
Type of load	Inductive, resistive loads and lamps
Switching frequency	Inductive load approx. 20 Hz Resistive load approx. 500 Hz Lamp load approx. 500 Hz
Parallel switching of 2 outputs	For performance enhancement For redundant control of a load
Type of protective circuit	External protection (e.g., recovery diodes)
Output resistance	< 0.4 Ω

3.7.9 Effect of Operating State on Outputs

Table 16: Technical data − Operating states

CPU stop of PLC	Acc. to substitute value strategy
Interruption of field bus	Acc. to substitute value strategy
Interruption of S-BUS	0 V status
Supply voltage under rated voltage tolerance	0 V status
Interruption of supply voltage	0 V status
Output operation	Non-retentive
Overload behavior	Automatic restart

3.7.10 Configurable Functions of the MOVILINK® Interfaces

Table 17: Technical data − Configurable functions of the MOVILINK® interfaces

Operating mode (module)	Easy mode (channel 1) / easy mode (channel 2) / mailbox mode
Type (per channel)	RS-232 / RS-485 (half duplex)
Baud rate (per channel)	9600 Baud / 57600 Baud

3.7.11 Configurable Functions of the Digital Inputs/Outputs

Table 18: Technical data − Configurable functions of the digital inputs/outputs

Operating mode (per module)	DO / DI / DIO
Input filter (per channel)	0.1 / 0.5 / 3 / 15 / 20 ms / filter off
Inversion (per channel)	ON / OFF
Substitute value strategy (per channel)	Switch substitute value / keep last value
Substitute value (per channel)	0 / 1
Manual mode (per channel)	ON / OFF
Manual mode value (per channel)	0 / 1
Online simulation (by channel)	Lock / unlock, simulation value: 0 / 1
Online simulation (per channel/module)	Diagnostics

3.7.12 Diagnostics

Table 19: Technical data − Diagnostics

Per module	Short circuit/overload of field supply
Per channel	Overtemperature (DO)
Per module	Undervoltage (U_{LS} + U_A)

3.7.13 Process Image

Table 20: Technical data − Process image

Process data width (interfaces)	10 byte (data In/Out)
Process data width (DIO)	1 byte data In/Out + 1 byte status

3.7.14 Indicators

Table 21: Technical data − Indicators

SB: S-BUS status	LED (green/red/orange)
F: Error status	LED (red)
Ch1.1/Ch2.1: Transmission status	LED (yellow)
Ch1.2/Ch2.2: Reception status	LED (yellow/red)
0 … 3: Input and output signal status	LED (yellow)
0 … 3: Output diagnostics	LED (red)
U_{LS} + U_A: Supply status	LED (green)
LED indicators:	Non-retentive

3.7.15 Isolation

Table 22: Technical data − Isolation

Channel - Channel	No
U_{LS}, U_A, S-BUS	500 V DC each

3.8 Approvals

The following approvals have been granted to 767-5204 module:

CE	Conformity Marking	
cULus	cULus	UL508

The following Ex approvals are pending for 767-5204 module:

Ex	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

3.9 Standards and Guidelines

The module 767-5204 meets the following standards and guidelines:

EC EMC Directive	2004/108/EC
EMC CE-Immunity to interference	acc. to EN 61000-6-2
EMC CE-Emission of interference	acc. to EN 61000-6-4
Ex Directive	94/9/EC
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

4 Mounting

The module can be fastened directly to your system using screws. It can also be mounted on a carrier rail using an adapter or fastened to a profile rail using a surface mounting profile.

For mounting on a flat surface, WAGO offers spacers to assist in the mounting process that can be inserted between the 767 Series components. 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 or actuator cables.

4.1 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 module's mounting holes is not to exceed 4 mm. Otherwise, a full contact with function earth (FE) socket of the module not be guaranteed. This may lead to restrictions in the shielding.
- To protect the module from tensile forces that may arise, do not bridge spaces with it.
- Screw the module 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 module, 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 module to your system so all FE (function earth) 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 module and the possible source of the shock.

4.2 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 module 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 also be found in the 767 Series fieldbus manuals, in the "Accessories" section. Select the manual appropriate to the fieldbus you are using.

- Carrier rail adapter, including fixing screws and perforated or imperforated carrier rails (DIN rail 35 x 7.5 or DIN rail 35 x 15) according to EN 60715, also available from WAGO.

  or

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

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

Bore measurements

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

4.3 Direct Mounting on Your System

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

1. Disconnect the power supply from those devices on which you wish to mount the module.

2. Mark the drill holes using the hole drilling template printed on the packaging. You can also hold the module in the desired position and mark the drill holes. Ensure that there is sufficient space around the 767 Series components 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 module with two M4x12 screws via the two mounting holes.

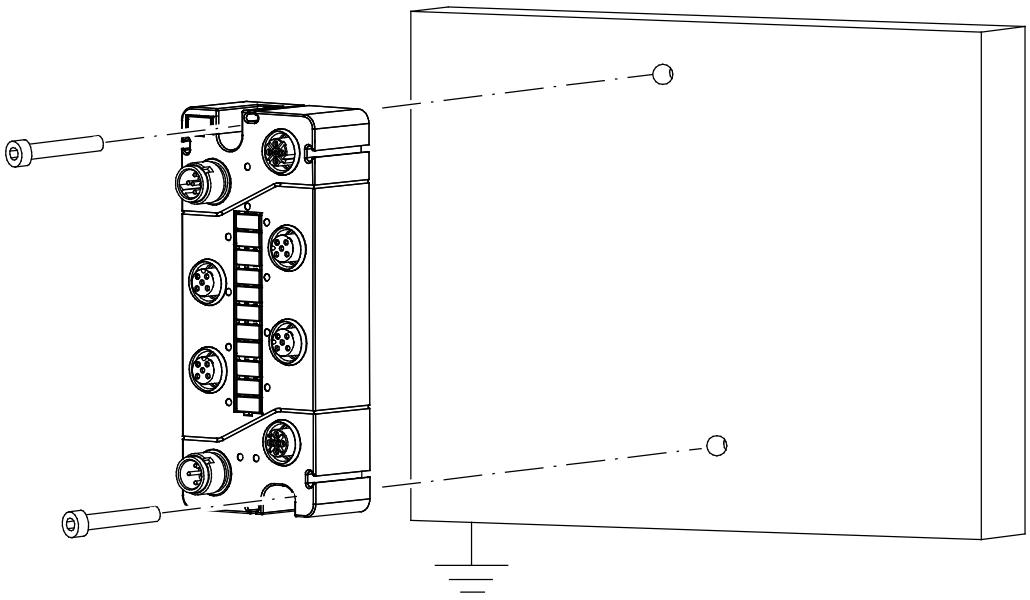


Figure 8: Mounting the module on a grounded frame or to another grounding point

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

4.4.1 Fastening the Carrier Rail Adapter to the Module

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

Screw together the module and carrier rail adapter using the M4 threaded screws provided, as shown in the figure below.

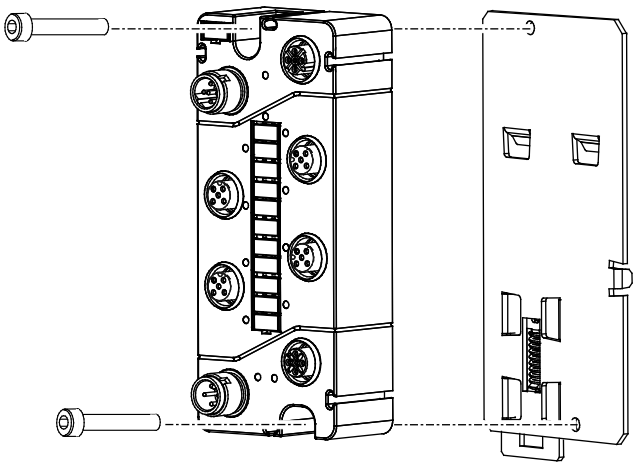


Figure 9: Fastening to the carrier rail adapter

4.4.2 Fastening the Module 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 module.

When mounting the module 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 module.
2. Set the module onto the edge of the carrier rail (51) with the two notches (50).
3. Press the undersurface against the lower carrier rail edge until the latch (52) 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.

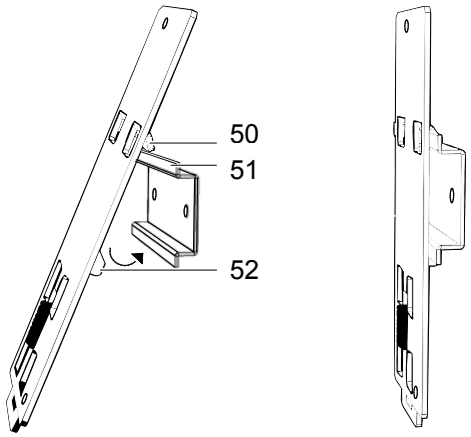


Figure 10: Mounting the carrier rail adapter (exemplary)

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

4.5.1 Fastening the Profile Adapter to the Module

Aside from using carrier rail adapters to fasten the module, 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 module and the profile adapter using the M4 threaded screws provided, as shown in the following figure.

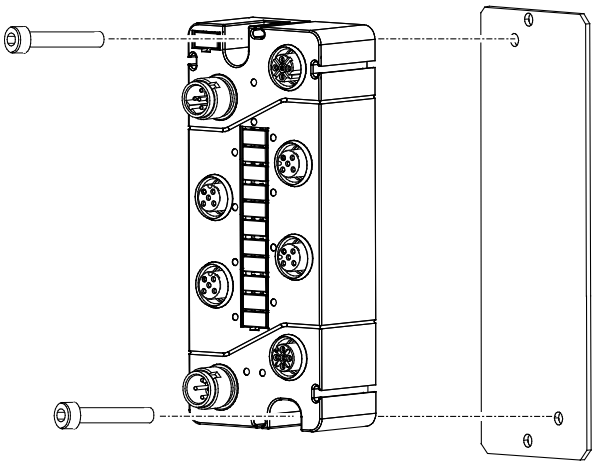


Figure 11: Fastening to the profile adapter

4.5.2 Fastening the Module with Profile Adapter to a Profile Rail

To fasten the module 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 module.

2. Insert the two screws into the holes above and beneath the fastened module on the profile adapter.

3. Fasten an appropriate nut on each of these screws.

4. Insert the profile adapter with the attached module into the profile rail of your system. Position it and tighten the screws.

4.6 Marking and Replacing the Marking Spaces

The module marker card (10) and marking strip (12) are attached when delivered. The protective cover is to be removed when labeling the marking strip. To do this, proceed as follows:

1. Press the slot screwdriver (maximum slot width: 3mm) into the small opening under the marking strip cover (12) and lever it up.

2. Remove the marking strip cover.

3. Mark the marking strip with a waterproof pen.

4. Reinsert the marking strip cover and press it firmly in place.

If the module's marker card (10) must be replaced, proceed in accordance with the step sequence described previously. New module marker cards can be obtained through WAGO.

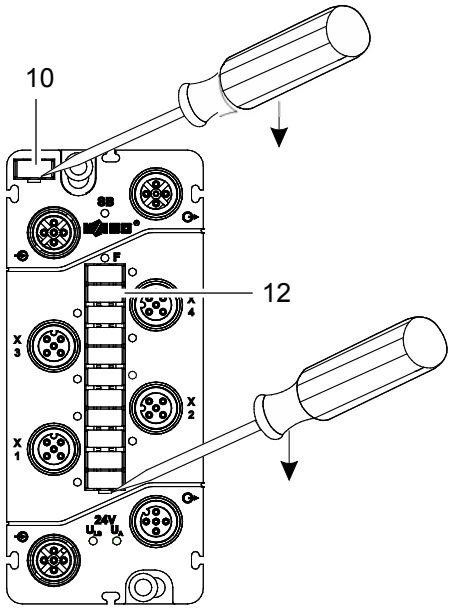


Figure 12: Replacing the marking spaces

4.7 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. 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 module.

2. The spacer can only be inserted into the appropriate openings of the module from the bottom. To bind both components, place the module on the spacer or push the spacer from the bottom into the module.

3. Fasten the attached components on a flat surface by fastening the module to the grounded frame of your system or to another grounding point with two M4 screws via the mounting holes.

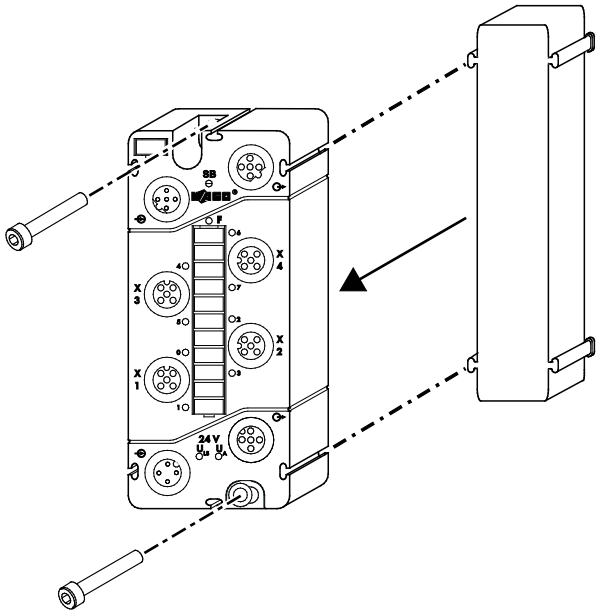


Figure 13: Attaching a spacer to a module

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.

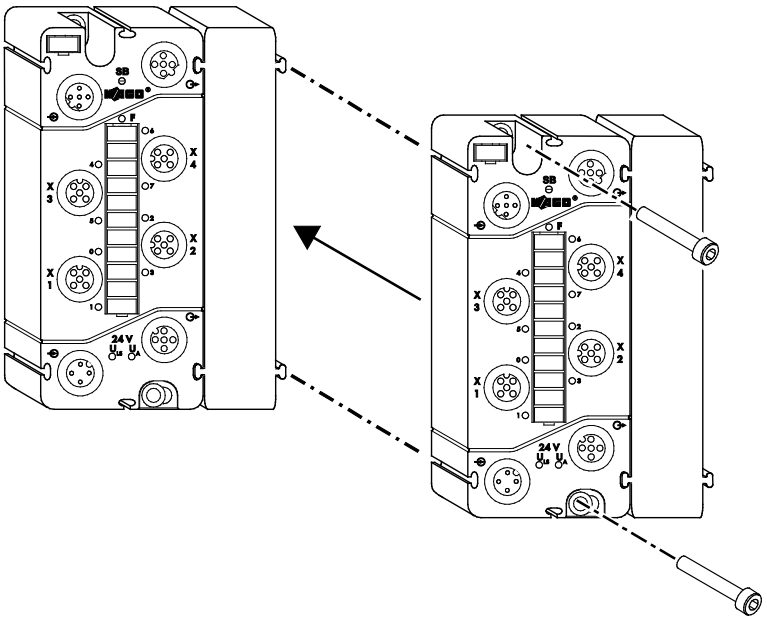


Figure 14: Attaching another module with a spacer

5 Connecting Data and Supply Cables

5.1 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!

- For both power supply and S-BUS, use only pre-assembled WAGO system cables so the specified characteristics of the technical data can be achieved.

- Do not use drop lines under any circumstances. This can lead to amplified line reflections and signal distortions, which greatly impair the transmission quality.
- Observe the exact positioning (coding) between plug and socket.
- 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.
- Observe the correct layout of the potential equalization.

5.2 Required Accessories

The WAGO accessories listed below are required for connecting the data and supply cable. The associated item numbers can also be found in the fieldbus manuals for 767 Series, in the "Accessories" section. Select the manual appropriate to the 767 Series fieldbus you are using.

- S-BUS M12 terminator, IP 67
- S-BUS and supply cables, pre-assembled on both ends, IP 67
- Torque wrench
- Protective caps

5.3 Connecting the S-BUS Cables

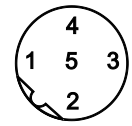
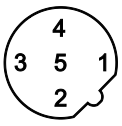
The S-BUS is used for communication between a fieldbus coupler and the connected 767 Series components.

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 connections:

Table 23: S-BUS connection assignment

Connection		Contact	Description	
			IN	OUT
IN 	OUT 	1	RD +	TD +
		2	RD −	TD −
		3	TD −	RD −
		4	TD +	RD +
		5	GND	
		Connecting thread	Shield	

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

1. Disconnect the power supply from those devices on which you have mounted the module.

2. Connect the S-BUS cable (S1) with the OUT connection (3) of the fieldbus coupler and the IN connection (1) of the 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.

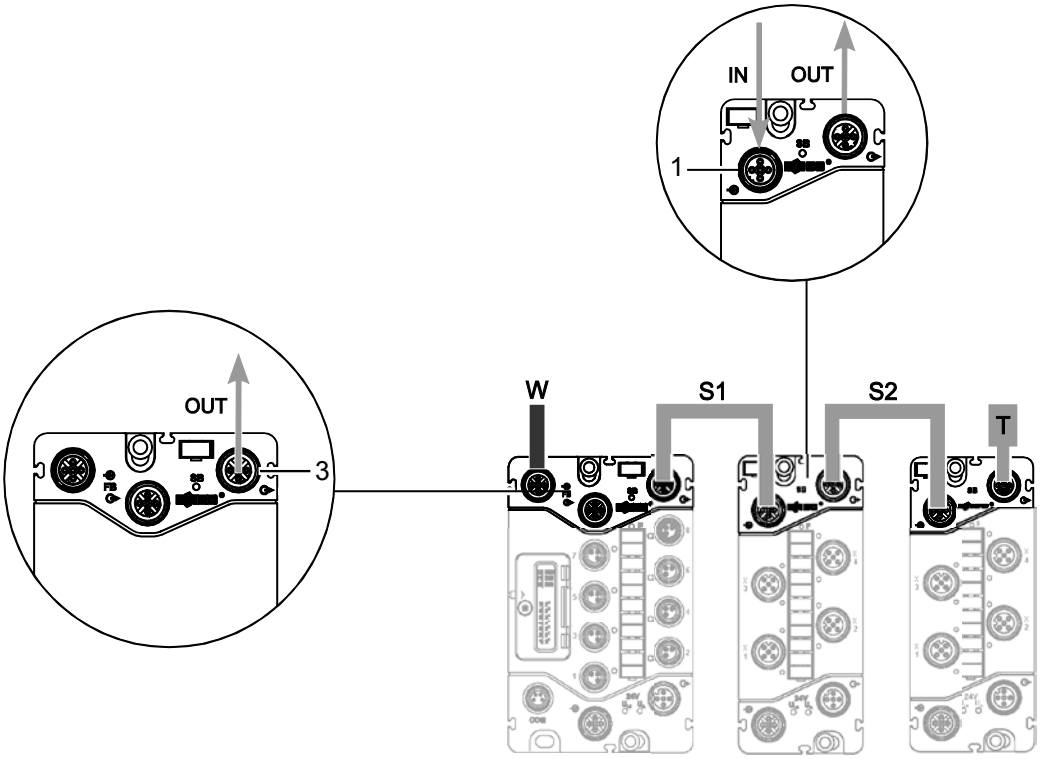


Figure 15: S-BUS connected to a fieldbus coupler and modules

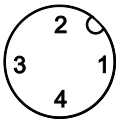
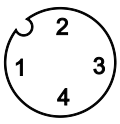
5.4 Connecting the Supply Cable

The supply cable provides power to the module.

Requirement:
The WAGO supply cables K1 and K2, which are pre-assembled on both ends, must be available (see figure on next page).

The following table outlines the assignment of the supply connections:

Table 24: 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 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.

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

1. Disconnect the power supply from those devices on which you have mounted the module.

2. Connect the power supply cable (K1) to the OUT connection (9) of the fieldbus coupler and the IN connection (5) of the module.
   For example, if two modules have been connected to the fieldbus coupler, connect the power supply transmission cable (K1, K2) with the associated IN and OUT connections, as shown in the following figure.

3. Tighten the plugs and sockets using the knurled-head screws.

4. Screw a protective cap on all unused ports to ensure that IP 67 degree of protection is provided

Information on connecting the power supply cable (K0) to the "IN" port (6) of a fieldbus coupler can be found in the appropriate manuals.

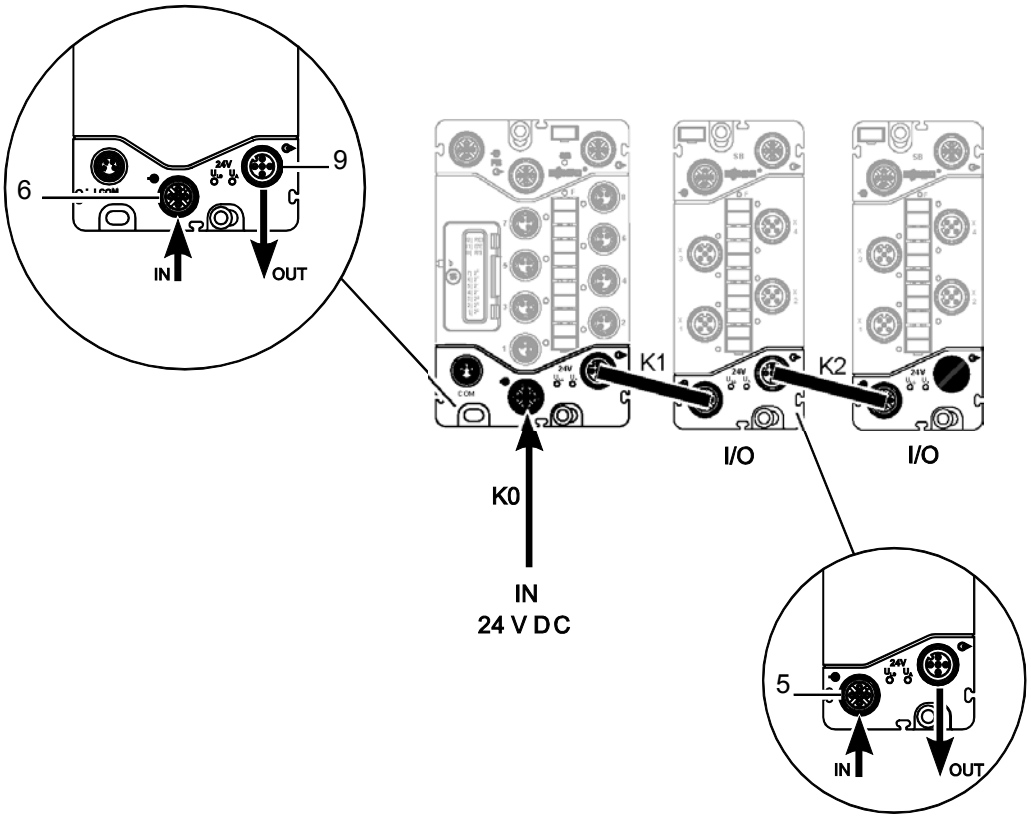


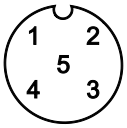
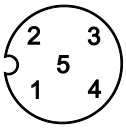
Figure 16: Supply cable connected to a fieldbus coupler and modules

5.5 Connecting Interface Cables

The interface cables are used to connect external devices with a serial interface.

When using cables that have not been pre-assembled, make sure that these cables are equipped with M12 plugs rated to IP67. The following table outlines connection assignments:

Table 25: Serial interfaces: Pin assignment

Connection		Pin assignment		
IN/OUT  X3	IN/OUT  X4	**Pin**	**RS-232**	**RS-485**
		1	n.c.	TX+ / Y
		2	TxD	TX– / Z
		3	n.c.	RX+ / A
		4	RxD	RX– / B
		5	GND	GND
		Housing	Shield (screen)	Shield (screen)

Note

Use twisted-pair cable and terminating resistor!
In the RS-485 (bus connection) operating mode, use a twisted-pair cable for longer cable lengths (more than 50 m) or higher transmission rates. Use a terminating resistor to terminate the end of the cable on MOVILINK® module 767-5204. Use WAGO item No. 756-9218/0050-0000 "M12, RS-422/RS-485 TERMINATOR".

To connect the external devices to the serial interfaces (X3 or X4), process as follows:

1. Disconnect the power supply from those devices on which you have mounted the module.

2. Insert the plug of the connection cable to the socket of a serial interface (3) of the module and tighten using the knurled-head screw.

3. Screw a protective cap on all unused connections to ensure that the IP67 degree of protection is adhered to.

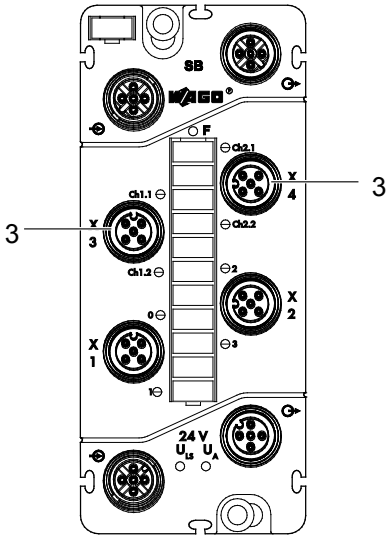


Figure 17: Connectors of interfaces

5.5.1 Connection Example

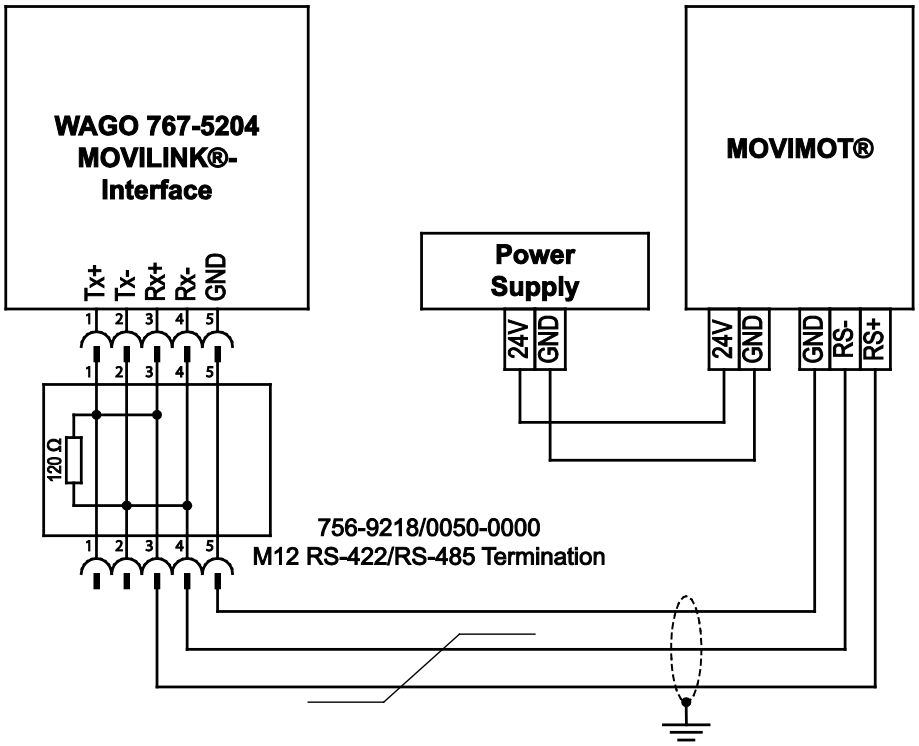


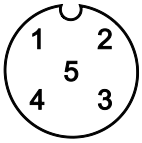
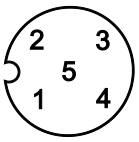
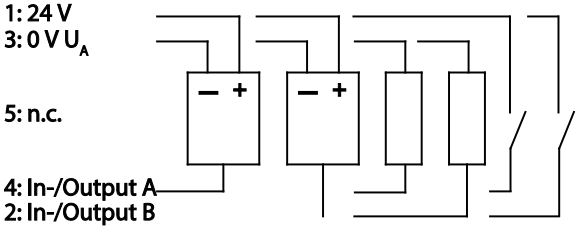
Figure 18: Connection example 1 x MOVIMOT®, RS-485 mode

5.6 Connecting Sensor/Actuator Cables

The sensor/actuator cable provides power to the connected sensors and actuators.

When using cables that have not been pre-assembled, make sure that these cables are equipped with M12 plugs rated to IP67. The following table outlines the assignment of the sensor/actuator connections:

Table 26: Digital inputs and outputs: Pin assignment

Connection		Connection Scheme
IN/OUT  X1	IN/OUT  X2	

NOTICE

The highest current carrying capacity of the supply contacts is 4A!
Ensure that the actuators from the U_A supply line are supplied with power. The actuator's power consumption must be taken into consideration when determining the current power demand for the V_A supply line.

NOTICE

Inputs/outputs have limited feedback protection!
Please note the maximum feedback current of 1A per input/output pin. It is strongly recommended to feed input signals from U_A.

To connect the sensors/actuators to the digital inputs and outputs, proceed as follows:

1. Disconnect the power supply from those devices on which you have mounted the module.

2. Insert the plug of the sensor or actuator cable into the socket of a digital input/output (4) of the module and tighten it using the knurled-head screw.

3. Screw a protective cap on all unused connections to ensure that the IP67 degree of protection is adhered to.

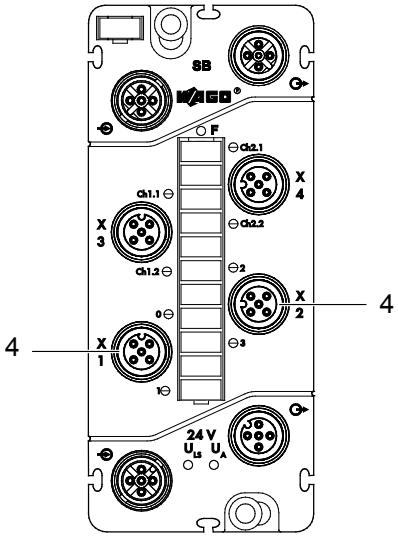


Figure 19: Connectors of sensors/actuators

6 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:

- Both 767 Series Fieldbus Coupler and Module 767-5204 have been properly mounted (See also fieldbus coupler manuals Series 767).
- The fieldbus, all necessary supply and sensor lines, and the S-BUS bus terminator are all securely fastened onto the appropriate connections (see section "Connecting Data and Supply Cables").
- An appropriate potential equalization is implemented in your system.
- Shielding is carried out properly.

7 Parameterizing

All parameters listed here can be set using WAGOframe (or another FDT/DTM frame application) for the module.
If you use a fieldbus for the parameterization, only certain parameters are configurable, depending on the type of fieldbus.

⚠ DANGER

Changing parameters!
When parameters are incorrectly modified via FDT/DTM frame 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.

For the parameterization of the module, an appropriate DTM is available. Via this DTM, you can parameterize the module either online or offline. The offline mode enables the parameterization of a module that is not yet present. In the offline mode, first store the parameters in a project and later transfer them to the module.

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

Note

Detailed informations.
Detailed information on handling WAGOframe can be found in the fieldbus coupler manuals.

The following sections provide information on the parameters and their descriptions.

To open the parameterization user interface (DTM) of the module, double-click on the module in the "Network View" of WAGOframe. The parameterization user interface can also be opened by right-clicking on **Offline Parameter** or **Online Parameter** in the context menu.

If several DTMs are open, select one via the corresponding tabs.
Depending on the DTM you have selected, different buttons are provided:

Table 27: DTM buttons

Buttons	Description
[Read] *(Online mode only)*	Reads and displays the parameters found in the module.
[Write] *(Online mode only)*	Writes the modified values to the module.
[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.

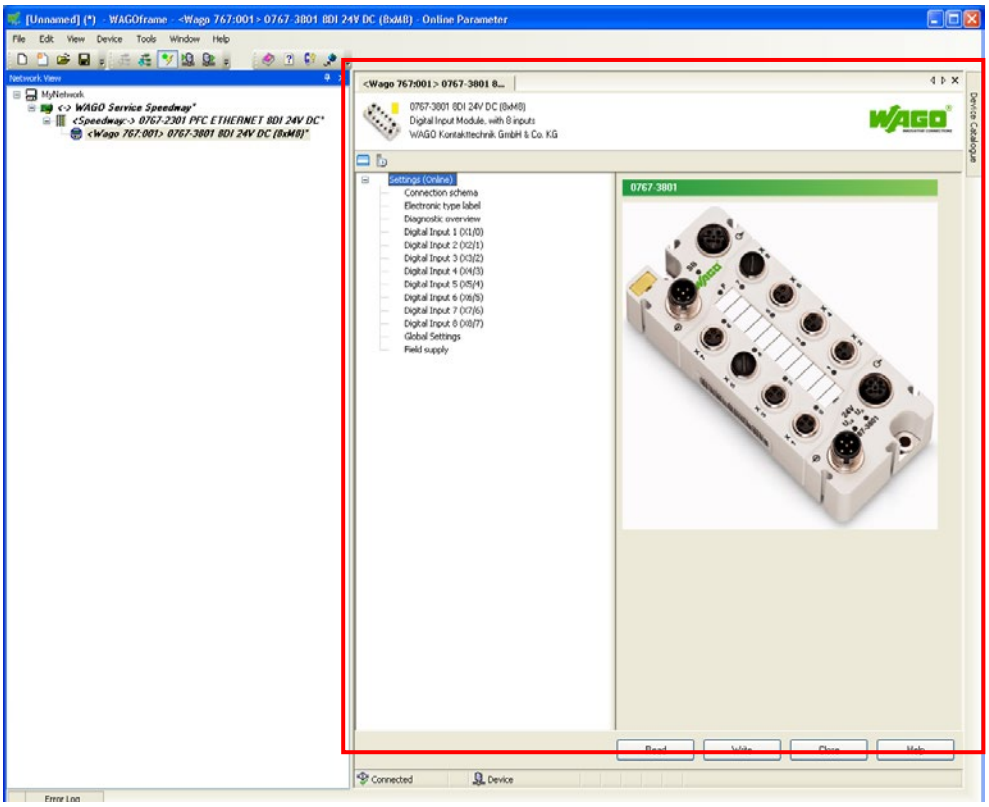


Figure 20: Example of an open DTM, including parameters

7.1 Electronic Type Label

Table 28: Information on the module

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:** Firmware loader release index
Firmware revision	General information on the module
Order number	
Description	
Serial number	
Date of production	
Designation	Electronic marking field

7.2 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 "Diagnostics" > "LED Signaling"). The diagnostic overview is only available in online mode.

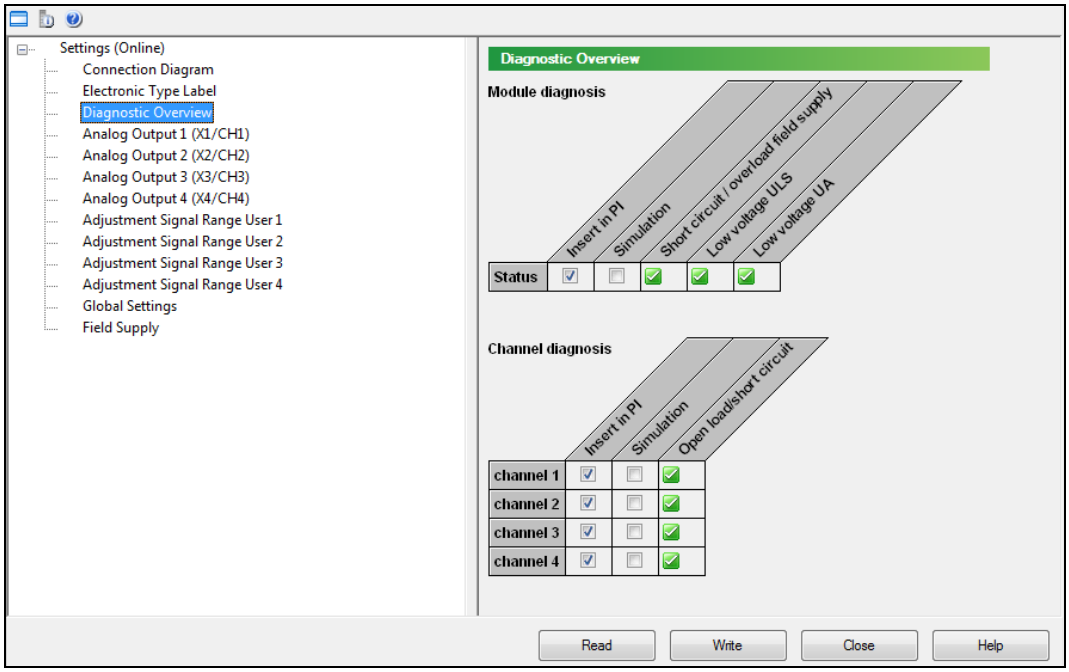


Figure 21: Example of the diagnostic overview of a module (information may differ from the actual module)

Table 29: Diagnostics setup

Parameter	Description
Insert in PI	By unselecting the checkbox, you specifically suppress evaluation and transmission of individual diagnostics. Doing so has no effect on the size of the process image. Even if a diagnostics has occurred, the diagnostic value "0" (no error) is transmitted to the higher-level controller.
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 30: Information about existing module diagnostics

Global Diagnostics	
Diagnostics	**Description**
Low voltage U_{LS}	⚠ WARNING **Disabling the outputs** If there is an undervoltage of U_A and/or U_{LS}, the module outputs are disabled. Machine components can be placed in a dangerous condition, as well as personnel and machine put in danger. If an undervoltage of the logic and sensor supply (U_{LS}) of < 18 V occurs on the module, the outputs are disabled and a corresponding diagnostic is transmitted to the fieldbus coupler. The serial interfaces are disabled. The F-LED of the module illuminates.
Low voltage U_A	⚠ WARNING **Disabling the outputs** If there is an undervoltage of U_A and/or U_{LS}, the module outputs are disabled. Machine components can be placed in a dangerous condition, as well as personnel and machine put in danger. If an undervoltage of the actuator supply (U_A) of < 18 V occurs on the module, the outputs are disabled and a corresponding diagnostic is transmitted to the fieldbus coupler. The serial interfaces are disabled. The F-LED of the module illuminates.
Short circuit/ overload encoder supply	The module has detected a short circuit or overload of the encoder supply (only possible when field supply is switched on).

Table 31: Information about existing channel diagnostics

Channel Diagnostics	
Diagnostics	**Description**
Overtemperature	The module has identified overheating on the corresponding channel (1 – 8) (only enabled when the actuator output is switched on).

Note

Interruption of the S-BUS

If there is an interruption of the S-BUS, the module is automatically put in STOP mode. The module outputs are disabled.

7.3 Input and Output Parameters

Selecting the Connection Mode

Specify in which operating mode the connection should be operated. Each connection can be configured individually as a digital input or output.

Table 32: Overview of the connection mode

Parameter	Description
Connection mode	Digital output Operation of the respective connection as a digital output.
	Digital input Operation of the respective connection as a digital input.

7.3.1 Connection Mode "Digital Output"

Table 33: Overview of adjustable parameters for the digital outputs

Parameter	Description
Connection mode	Mode display
Designation	Electronic marking field (max. 40 characters)
Output value	The output state is indicated in this field.
Process image value	This field indicates the value of the output process image for this output. When manual operation is activated, the field becomes a checkbox. Activate the checkbox to output the state "1" on the output independent of the control unit.
Signal Inversion	Here you can release the current process value as an inverted output value. **Checkbox deactivated*:** Output signal is output as shown in the process image **Checkbox activated:** Output signal is output inverted as shown in the process image
Substitute value strategy	This releases the substitute value or the last output value in cases such as a fieldbus interruption. You have the following options: - Switch to substitute value* - Keep last value**
Substitute value	Enter the process value that is output in case of error. In case of error (e.g., fieldbus interruption), the value is used with the "Switch to substitute value" substitute value strategy. **Checkbox deactivated:** 0* **Checkbox activated:** 1
Manual Operation	Activate the checkbox to define the output value independent of the control unit. When manual operation is activated, the field for the process image value becomes a checkbox for the manual operation value.
Diagnostic Simulation	Activate the checkbox to switch diagnostic simulation on. When the simulation is switched on, the fields for the diagnoses become checkboxes.
Restart mode Actuator	Set the restart behavior of an enabled output if the output has been disabled due to the "Overtemperature" diagnosis. You have the following options: - Delayed* After the time set has elapsed ("Restart delay, actuator"), the output is switched on again automatically. - Diagnosis acknowledgement The output is only switched on after acknowledging the diagnostic message. Acknowledge the diagnostic message from the higher-level control unit or PLC. The respective coupler manual specifies which fieldbus couplers this functionality supports. **Information about diagnostic acknowledgement:** When using fieldbus couplers that do not support the diagnostic acknowledgement, disabled outputs may remain OFF.

Table 33: Overview of adjustable parameters for the digital outputs

Parameter	Description
Restart delay, actuator	Time in 100 ms intervals, after which a disabled output is switched on again in case of error. You must deactivate the checkbox under "Restart mode, actuator" (0). *Default setting: 10 * 100 ms = 1000 ms* **Note**: If you set the time of the "Restart delay, actuator" parameter to 0 ms, the I/O LED appears yellow instead of red if a short circuit or overload appears due to the short restart interval (see section "Diagnostics").
Overtemperature	When the checkbox is activated, there is an overtemperature on the respective channel (only enabled when the actuator output is switched on).

* Default
** The last value is the value output to the contact before occurrence of the respective interruption. For example, this can be a process value or "manual operation value".

7.3.2 Connection Mode "Digital Input"

Table 34: Overview of adjustable parameters for the digital inputs

Parameter	Description
Connection mode	Mode display
Designation	Electronic marking field (max. 40 characters)
Input value	The input state is indicated in this field. When simulation is activated, the field becomes a checkbox. Activate the checkbox to simulate the state "1" in the process image independent of the input.
Signal Inversion	You can invert the currently pending input signal here. **Checkbox deactivated*:** Input signal is mapped in the process image as attached to the input **Checkbox activated:** Input signal is mapped inverted in the process image
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
Substitute value strategy	This is used, for example, to transfer the substitute value or the last input value in the event of a low voltage U_A. You have the following options: - Switch to substitute value* - Keep last value**
Substitute value	Here you can enter the process value that is transmitted in the case of an error. In case of error (e.g. low voltage U_A), the value is used with the "Switch to substitute value" substitute value strategy. **Checkbox deactivated:** 0* **Checkbox activated:** 1
Simulation input value	Activate this checkbox to switch input simulation on. The field for the input value then becomes a checkbox for the simulation value.

* Default

** The last value is the value output to the contact before occurrence of the respective interruption. This can be, for example, an input value or a "simulation value".

7.4 Parameters of the Interfaces

7.4.1 Operating Mode

Table 35: Operating mode

Parameter	Description
Operating type	In this box, select the operating mode. The following options are available: - Mailbox mode - Easy mode, serial interface 1* - Easy mode, serial interface 2

* Factory default setting

Note

System reset after switching the operating mode
Perform a system reset after switching the operating mode!

7.4.2 Parameters of the serial Interfaces

Table 36: Parameters of the serial interfaces

Parameter	Description
Designation	Enter a designation for the connection. Max. 40 characters can be entered.
Function mode	In this box, select the operating mode. You have the following options: - RS-232 - RS-485 half-duplex*
Baud rate	In this box, select the baud rate. You have the following options: - 9600* - 57600

* Factory default setting

7.4.3 Parameters of the MOVILINK® Interfaces

Table 37: Parameters of the MOVILINK® interfaces

Parameter	Description
Manual operation	Select this checkbox to define the output data independent of the control unit. When manual operation is on, the input fields “Slave address”, “PD1 down word”, “PD2 down word” and “PD3 down word” are displayed. In addition, the display fields “PD1 up word”, “PD2 up word” and “PD3 up word” are displayed.

7.5 Global Settings

Table 38: Overview of parameters for the entire module

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. *Default setting: unselected*
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	

7.6 Parameters of Field Supply

Table 39: Overview of adjustable parameters for the field supply

Parameter	Description
Enable field supply	Switch on the field supply (24VDC) here. *Default setting: selected*
Autorestart delay	In the event of a short circuit, the sensor supply is switched off for a certain time. Here, enter this delay time (in 100 ms increments) after which 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. *Default setting: unselected*
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.

7.7 Automatic Storage of System Parameters

Some fieldbus couplers provide the "System Parameter Handling" feature. This serves to identify changes to the configuration of a 767 Series node and to the automatic configuration of the I/O modules. When an I/O module must be replaced due to a defect, you do not need to reconfigure the new I/O module. The stored parameters are automatically transferred to the new I/O module. Detailed information on this procedure can be found in the fieldbus coupler manuals in the "Parameter Setting via FDT/DTM" section.

7.8 Updating the Firmware

When updating the module firmware, the saved module parameters can be overwritten. Therefore, check your existing configuration after updating the firmware.

8 Process Image

The process images for the module listed in the following sections describe the data length on the S-BUS (system bus). The implementation of the S-BUS process images onto the respective fieldbus process images can be found in the fieldbus coupler manuals.

The process image is divided into two areas: an output data area and an input data area. The process image can contain process data with and without diagnostic information, independently of whether the transmission of synchronous diagnostic information has been selected.

Note

Synchronous diagnostic information
Synchronous diagnostic information designates the cyclical transmission of diagnostic information in the process image. This is not selected in the original factory settings for the module.

This is only possible when using a fieldbus coupler that supports the synchronous diagnostic function (e.g. 767-1101 or 767-2301). Detailed information about enabling the transmission of diagnostic information can be found in the manual for the fieldbus coupler being used: see the section about the device description file.

In addition, you can also switch on synchronous diagnostic information in fieldbus couplers that support this function by using an FDT/DTM frame application (e.g. WAGOframe) in the corresponding DTM. For more information, see the Section "Parameterization via FDT/DTM" > "Diagnostics setting" in the fieldbus coupler manuals.

Note

Activate module diagnostics
You can enable or suppress the individual module diagnostics. For more information, see the Section "Diagnostics Overview".

Note

Diagnostic Actuator short circuit/overload
The "Actuator short circuit/overload" diagnostic is dependent on the switching status of the outputs (see section "Diagnostics" > "Diagnostic overview".

8.1 Process Image in Easy Mode

The input and output data in Easy mode is displayed in Intel format.

8.1.1 Input Data in Easy Mode

The process image for the process data sent to the fieldbus coupler from the module is:

Table 40: Fieldbus-dependent PI size

Item No.	Fieldbus	PI Size	Remark
767-1101	PROFIBUS	10 bytes	With synchronous diagnostics, cannot be parameterized
767-1201	PROFINET IO	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1301	MODBUS	9 bytes	Without synchronous diagnostics, cannot be parameterized
	Ethernet/IP	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1311	sercos	9 bytes	Without synchronous diagnostics
		10 bytes	With synchronous diagnostics (configurable via SSDML)
767-1401	DeviceNet	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1501	CANopen	10 bytes	Including diagnostics (10 bytes are available on the fieldbus including one byte for diagnostics. Depending on the parameterization, asynchronous or synchronous diagnostics. On the fieldbus, the difference is only in the response time.)
767-2301	MODBUS	9 bytes	Without synchronous diagnostics, cannot be parameterized
	Ethernet/IP	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-2501	CANopen	10 bytes	Including diagnostics (10 bytes are available on the fieldbus including one byte for diagnostics. Depending on the parameterization, asynchronous or synchronous diagnostics. On the fieldbus, the difference is only in the response time.)

The structure of the bytes is shown in the following table:

Table 41: Process image – Input data in Easy mode

Byte 0	7 … 0	Drive data, PD 1, high byte Interface 1 or 2
Byte 1	7 … 0	Drive data, PD 1, low byte Interface 1 or 2
Byte 2	7 … 0	Drive data, PD 2, high byte Interface 1 or 2
Byte 3	7 … 0	Drive data, PD 2, low byte Interface 1 or 2
Byte 4	7 … 0	Drive data, PD 3, high byte Interface 1 or 2
Byte 5	7 … 0	Drive data, PD 3, low byte Interface 1 or 2
Byte 6	7 … 0	Status Interface 1 or 2
	1 No error 2 Timeout (no response received within 50 ms after a request.) 3 Parity error/checksum is wrong (The MOVILINK® telegram received from the module is faulty.) 4 Reserved 5 Response is not expected (The response for a group (address 100 - 253) or broadcast (address 255) was sent.) 6 - 62 reserved 63 Module is initializing. 64 - 255 reserved	
Byte 7	7 … 0	MOVILINK® address Interface 1 or 2
Byte 8	7 … 0	Digital inputs (process data)
	1_B: Input value = True	

Table 41: Process image – Input data in Easy mode

Byte 9	7 … 0	Diagnostic message
	| | | | | | | |	
	| | | | | | | 1_B: Short circuit/overload of the field supply on one or more channels (X1 - X2)	
	| | | | | | Reserved	
	| | | | | 1_B: Low voltage U_{LS}	
	| | | | 1_B: Low voltage U_A	
	| | | 1_B: Overtemperature on channel 1	
	| | 1_B: Overtemperature on channel 2	
	| 1_B: Overtemperature on channel 3	
	1_B: Overtemperature on channel 4	

8.1.2 Output Data in Easy Mode

The process image for the process data sent to the module coupler from the fieldbus coupler is:

Table 42: Fieldbus-dependent PI size

Item No.	Fieldbus	PI Size	Remark
767-1101	PROFIBUS	10 bytes	With synchronous diagnostics, cannot be parameterized
767-1201	PROFINET IO	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1301	MODBUS	9 bytes	Without synchronous diagnostics, cannot be parameterized
	Ethernet/IP	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1311	sercos	9 bytes	Without synchronous diagnostics
		10 bytes	With synchronous diagnostics (configurable via SSDML)
767-1401	DeviceNet	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1501	CANopen	10 bytes	Including diagnostics (10 bytes are available on the fieldbus including one byte for diagnostics. Depending on the parameterization, asynchronous or synchronous diagnostics. On the fieldbus, the difference is only in the response time.)
767-2301	MODBUS	9 bytes	Without synchronous diagnostics, cannot be parameterized
	Ethernet/IP	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-2501	CANopen	10 bytes	Including diagnostics (10 bytes are available on the fieldbus including one byte for diagnostics. Depending on the parameterization, asynchronous or synchronous diagnostics. On the fieldbus, the difference is only in the response time.)

The structure of the bytes is shown in the following table:

Table 43: Process image – Output data in Easy mode

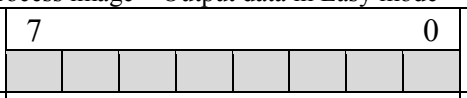
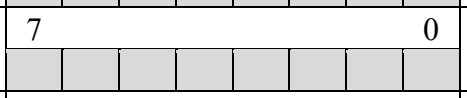
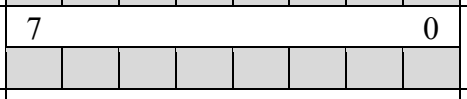
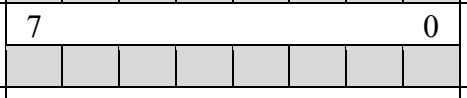
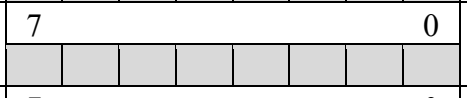
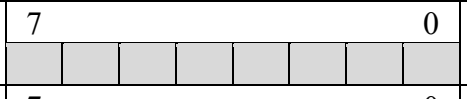
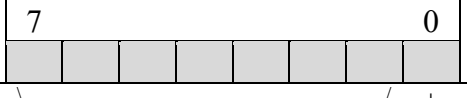
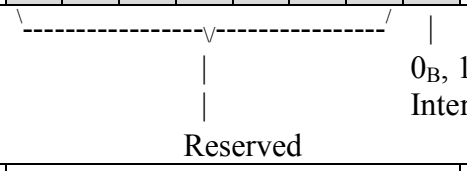
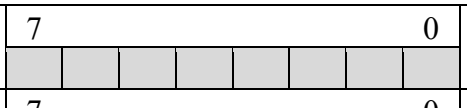
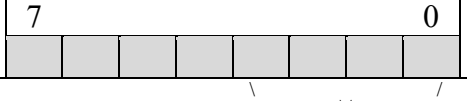
Byte 0		Drive data, PD 1, high byte Interface 1 or 2
Byte 1		Drive data, PD 1, low byte Interface 1 or 2
Byte 2		Drive data, PD 2, high byte Interface 1 or 2
Byte 3		Drive data, PD 2, low byte Interface 1 or 2
Byte 4		Drive data, PD 3, high byte Interface 1 or 2
Byte 5		Drive data, PD 3, low byte Interface 1 or 2
Byte 6		Flow control Interface 1 or 2
		
Byte 7		MOVILINK® address Interface 1 or 2
Byte 8		Digital outputs (process data)
	1_B: Output value = True	

Table 43: Process image – Output data in Easy mode

Byte 9	7							0	Diagnostics confirmation
								1_B: Short circuit/overload of the field supply on one or more channels (X1 - X2) confirmed	
							Reserved		
						1_B: Low voltage U_{LS} confirmed			
					1_B: Low voltage U_A confirmed				
				1_B: Overtemperature on channel 1 confirmed					
			1_B: Overtemperature on channel 2 confirmed						
		1_B: Overtemperature on channel 3 confirmed							
	1_B: Overtemperature on channel 4 confirmed								

8.2 Process Image in Mailbox 2.0 Mode

8.2.1 Input Data in Mailbox 2.0 Mode

The process image for the process data sent to the fieldbus coupler from the module is:

Table 44: Fieldbus-dependent PI size

Item No.	Fieldbus	PI Size	Remark
767-1101	PROFIBUS	10 bytes	With synchronous diagnostics, cannot be parameterized
767-1201	PROFINET IO	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1301	MODBUS	9 bytes	Without synchronous diagnostics, cannot be parameterized
	Ethernet/IP	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1311	sercos	9 bytes	Without synchronous diagnostics
		10 bytes	With synchronous diagnostics (configurable via SSDML)
767-1401	DeviceNet	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1501	CANopen	10 bytes	Including diagnostics (10 bytes are available on the fieldbus including one byte for diagnostics. Depending on the parameterization, asynchronous or synchronous diagnostics. On the fieldbus, the difference is only in the response time.)
767-2301	MODBUS	9 bytes	Without synchronous diagnostics, cannot be parameterized
	Ethernet/IP	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-2501	CANopen	10 bytes	Including diagnostics (10 bytes are available on the fieldbus including one byte for diagnostics. Depending on the parameterization, asynchronous or synchronous diagnostics. On the fieldbus, the difference is only in the response time.)

The structure of the bytes is shown in the following table:

Table 45: Process image – Input data in Mailbox 2.0 mode

Byte 0	7 … 0	Data of serial interfaces 1 and 2 (Mailbox 2.0 protocol)
. . .		
Byte 7	7 … 0	
Byte 8	7 … 0	Digital inputs (process data)
	\--------\/--------/ 1_B: Input value = True	
Byte 9	7 … 0	Diagnostic message
	| | | | | | | | | | | | | | | 1_B: Short circuit/overload of the field supply on one or more channels (X1 - X2) | | | | | | Reserved | | | | | 1_B: Low voltage U_{LS} | | | | 1_B: Low voltage U_A | | | 1_B: Overtemperature on channel 1 | | 1_B: Overtemperature on channel 2 | 1_B: Overtemperature on channel 3 1_B: Overtemperature on channel 4	

8.2.2 Output Data in Mailbox 2.0 Mode

The process image for the process data sent to the module coupler from the fieldbus coupler is:

Table 46: Fieldbus-dependent PI size

Item No.	Fieldbus	PI Size	Remark
767-1101	PROFIBUS	10 bytes	With synchronous diagnostics, cannot be parameterized
767-1201	PROFINET IO	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1301	MODBUS	9 bytes	Without synchronous diagnostics, cannot be parameterized
	Ethernet/IP	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1311	sercos	9 bytes	Without synchronous diagnostics
		10 bytes	With synchronous diagnostics (configurable via SSDML)
767-1401	DeviceNet	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-1501	CANopen	10 bytes	Including diagnostics (10 bytes are available on the fieldbus including one byte for diagnostics. Depending on the parameterization, asynchronous or synchronous diagnostics. On the fieldbus, the difference is only in the response time.)
767-2301	MODBUS	9 bytes	Without synchronous diagnostics, cannot be parameterized
	Ethernet/IP	9 bytes	Without synchronous diagnostics, cannot be parameterized
767-2501	CANopen	10 bytes	Including diagnostics (10 bytes are available on the fieldbus including one byte for diagnostics. Depending on the parameterization, asynchronous or synchronous diagnostics. On the fieldbus, the difference is only in the response time.)

The structure of the bytes is shown in the following table:

Table 47: Process image – Output data in Mailbox 2.0 mode

Byte 0	7 … 0	Data of serial interfaces 1 and 2 (Mailbox 2.0 protocol)
Byte 7	7 … 0	
Byte 8	7 … 0	Digital outputs (process data)
	\--------\/--------/ 1_B: Output value = True	
Byte 9	7 … 0	Diagnostics confirmation
	| | | | | | | | | | | | | | | 1_B: Short circuit/overload of the field supply on one or more channels (X1 - X2) confirmed | | | | | | Reserved | | | | | 1_B: Low voltage U_{LS} confirmed | | | | 1_B: Low voltage U_A confirmed | | | 1_B: Overtemperature on channel 1 confirmed | | 1_B: Overtemperature on channel 2 confirmed | 1_B: Overtemperature on channel 3 confirmed 1_B: Overtemperature on channel 4 confirmed	

9 MOVILINK® Interfaces

The module has two MOVILINK® interfaces accessible from a uniform programming interface.

9.1 Function Block Simatic S7

To obtain the current version of this function block, please contact WAGO Support.

9.2 Data Transfer

The data of the serial interface is transferred via the MOVILINK® protocol. A description of the protocol is available in the appendix.

9.2.1 Data Transfer in Easy Mode

In Easy mode, the MOVILINK® data is written from the control unit to the output process image and the MOVILINK® data of an attached converter read from the input process image.

The module generates MOVILINK® telegrams that are sent cyclically via the set interface. The lag between two sent telegrams correspond to the idle times defined in the MOVILINK® protocol.

Cyclic transmission is enabled via the serial interface by setting bit 0 in byte 6 (flow control).

The telegrams from the attached converters are evaluated in the module.

MOVILINK® addresses 0 … 255 are supported. Assignment of the MOVILINK® addresses is taken into account during data transfer.

For all single slave addresses (0 … 99) and the universal address for point-to-point communication (254), there is error control:

- After converter response timeout
- By parity
- By checksum

The status last determined for an individual converter or the status of the interface is displayed together with the single address or the group address in byte 6 (status byte) of the output process image.

The following examples show the progress of the data transfer for an interface with several attached converters.

Example 1:

Interface 1 is connected to 3 MOVILINK® converters, where the converters are configured as slaves with addresses 1, 2 and 3.

Output status:

Output data				
PD1	PD2	PD3	Flow control = 0 locked	Slave address = 1
Input data				
PD1 (invalid)	PD2 (invalid)	PD3 (invalid)	Status = 63 initialization	Slave address invalid

The PLC writes user data PD1 … PD3 and slave address 1 to the output process image. The interface is in initialization status (status byte = 63).

Step 1:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Slave address = 1
Input data				
PD1 (invalid)	PD2 (invalid)	PD3 (invalid)	Status = 63 initialization	Slave address invalid

By setting the flow control, cyclic transmission of the MOVILINK® telegrams is permitted.

Step 2:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Slave address = 1
Input data				
PD1 (valid)	PD2 (valid)	PD3 (valid)	Status = 1 no error	Slave address = 1

Slave 1 has responded correctly. The slave address is written from the module to byte 7 of the input process image. Setting the status byte (return code 1, "No error") shows that there is valid MOVILINK® user data in bytes 0 … 3 of the input process image.

Step 3:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Slave address = 2
Input data				
PD1 (valid)	PD2 (valid)	PD3 (valid)	Status = 1 no error	Slave address = 1

The module transmits a MOVILINK® telegram for slave 2 via interface 1.

Step 4:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Slave address = 2
Input data				
PD1 (valid)	PD2 (valid)	PD3 (valid)	Status = 1 no error	Slave address = 2

Slave 2 has responded correctly. The slave address is written from the module to byte 7 of the input process image. Setting the status (return code 1, "No error") shows that there is valid MOVILINK® user data in bytes 0 … 5 of the input process image.

Step 5:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Slave address = 3
Input data				
PD1 (valid)	PD2 (valid)	PD3 (valid)	Status = 1 no error	Slave address = 2

The PLC writes user data PD1 … PD3 and slave address 3 to the output process image. The module transmits a MOVILINK® telegram for slave 3 via interface 1.

Step 6:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Slave address = 3
Input data				
PD1 (valid)	PD2 (valid)	PD3 (valid)	Status = 1 no error	Slave address = 3

Slave 3 has responded correctly. The slave address is written from the module to byte 7 of the input process image. Setting the status byte (return code 1, "No error") shows that there is valid MOVILINK® user data in bytes 0 … 5 of the input process image.

Example 2:

Interface 1 is connected to several MOVILINK® converters, where the converters are configured as slaves with addresses 1 and 2 and as a group with address 101.

Output status:

Output data				
PD1	PD2	PD3	Flow control = 0 locked	Slave address = 1
Input data				
PD1 (invalid)	PD2 (invalid)	PD3 (invalid)	Status = 63 initialization	Slave address invalid

The PLC writes user data PD1 … PD3 and slave address 1 to the output process image. The interface is in initialization status (status byte = 63).

Step 1:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Slave address = 1
Input data				
PD1 (invalid)	PD2 (invalid)	PD3 (invalid)	Status = 63 initialization	Slave address invalid

By setting the flow control, cyclic transmission of the MOVILINK® telegrams is permitted.

Step 2:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Slave address = 1
Input data				
PD1 (valid)	PD2 (valid)	PD3 (valid)	Status = 1 no error	Slave address = 1

Slave 1 has responded correctly. The slave address is written from the module to byte 7 of the input process image. Setting the status byte (return code 1, "No error") shows that there is valid MOVILINK® user data in bytes 0 … 3 of the input process image.

Step 3:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Slave address = 2
Input data				
PD1 (valid)	PD2 (valid)	PD3 (valid)	Status = 1 no error	Slave address = 1

The PLC writes user data PD1 … PD3 and slave address 2 to the output process image. The module transmits a MOVILINK® telegram for slave 2 via interface 1.

Step 4:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Slave address = 2
Input data				
PD1 (invalid)	PD2 (invalid)	PD3 (invalid)	Status = 2 Timeout	Slave address = 2

Slave 2 has not responded. The slave address is written from the module to byte 7 of the input process image. Setting the status byte (return code 2, "Timeout") shows that the MOVILINK® user data in bytes 0 … 5 of the input process image is invalid.

Step 5:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Group = 101
Input data				
PD1 (invalid)	PD2 (invalid)	PD3 (invalid)	Status = 2 Timeout	Slave address = 2

The PLC writes user data PD1 … PD3 and group address 101 to the output process image. The module transmits a MOVILINK® telegram for group 101 via interface 1.

Step 6:

Output data				
PD1	PD2	PD3	Flow control = 1 enable	Group = 101
Input data				
PD1 (invalid)	PD2 (invalid)	PD3 (invalid)	Status = 5 Response not expected	Group = 101

The group address is written from the module to byte 7 of the input process image. Setting the status byte (return code 5, "Response is not expected") shows that the MOVILINK® user data in bytes 0 … 5 of the input process image is invalid.

9.2.2 Data Transfer in Mailbox Mode

In Mailbox mode, the MOVILINK® data is transmitted from the control unit to the module and the MOVILINK® data of an attached converter to the PLC as Mailbox messages.

After receipt of a Mailbox message from the PLC, a MOVILINK® telegram is generated and transmitted to the RS-485 (RS-232) network via the respective interface. In contrast to Easy mode, transmission is not cyclic, but controlled by a higher-level master system completely.

Three message types are defined. Types 6 and 8 are used exclusively for data exchange and type 8 exclusively for status error messages.

9.2.2.1 MOVILINK® Mailbox 2.0 Message Types

Protocol ID 0 is used to transmit MOVILINK® user data via Mailbox 2.0.

Only Mailbox 2.0 message types with simple header are supported.

The following message types are supported:

Table 48: Supported message types

Message type	Related MOVILINK® PDU type	Message length*	Remark
6	0x05, 0x85	8	The data for one drive is transmitted.
8	0x05	14	The data for two drives is transmitted. (optimal throughput / data freshness)
9	0x05, 0x85	3	Return error code
* Length including header			

9.2.2.1.1 Message Type 6

Message type 6 is used to control individual drives or groups via interface 1 or 2.

The address of the MOVILINK® device or group and special service addresses are coded within the address byte.

Message type 6 is structured as follows:

Table 49: Message type 6

Byte 0	7 … 0 0 0 0 0 0 1 1 1	Header
	Simple header Data element length (7 bytes)	
Byte 1	7 … 0	Address byte
	Interface (0 = Interface 1, 1 = Interface 2) PDU type (0 = Cyclic (0x05), 1 = Acyclic (0x85)) Address (0 … 63) 0 … 31: Slave address (MOVILINK® slave addresses 0 … 31) 32 … 47: Group address (MOVILINK® group addresses 100 … 115) 48 … 61: Reserved (services) 62: Service address (MOVILINK® service address 254) 63: Broadcast (MOVILINK® broadcast address 255)	
Byte 2	7 … 0	PD1, high byte
Byte 3	7 … 0	PD1, low byte
Byte 4	7 … 0	PD2, high byte
Byte 5	7 … 0	PD2, low byte
Byte 6	7 … 0	PD3, high byte
Byte 7	7 … 0	PD3, low byte

9.2.2.1.2 Message Type 8

Message type 8 is used to control several drives via interface 1 and 2.

The data for two drives (or groups of drives) connected to different interfaces is transmitted.

Only PDU type 0x05 is used.

The address of a MOVILINK® device or group and special service addresses are coded within the address byte.

Message type 8 is structured as follows:

Table 50: Message type 8

Byte 0	7 … 0 0 0 0 0 1 1 0 1	Header
	Simple header: Data element length (13 bytes)	
Byte 1	7 … 0	Address byte
	Address (0 … 15) (interface 1) 0 … 9: Slave address (MOVILINK® slave addresses 0 … 9) 10 … 13: Group address (MOVILINK® group addresses 100 … 103) 14: Service address (MOVILINK® service address 254) 15: Broadcast (MOVILINK® broadcast address 255) Address (0 … 15) (interface 2) 0 … 9: Slave address (MOVILINK® slave addresses 0 … 9) 10 … 13: Group address (MOVILINK® group addresses 100 … 103) 14: Service address (MOVILINK® service address 254) 15: Broadcast (MOVILINK® broadcast address 255)	
Byte 2	7 … 0	PD1, high byte (interface 1)
Byte 3	7 … 0	PD1, low byte (interface 1)
Byte 4	7 … 0	PD2, high byte (interface 1)
Byte 5	7 … 0	PD2, low byte (interface 1)
Byte 6	7 … 0	PD3, high byte (interface 1)
Byte 7	7 … 0	PD3, low byte (interface 1)
Byte 8	7 … 0	PD1, high byte (interface 2)

Table 50: Message type 8

Byte 9	7 0	PD1, low byte (interface 2)
Byte 10	7 0	PD2, high byte (interface 2)
Byte 11	7 0	PD2, low byte (interface 2)
Byte 12	7 0	PD3, high byte (interface 2)
Byte 13	7 0	PD3, low byte (interface 2)

9.2.2.1.3 Message Type 9

Return message of type 9 is used to transfer the status from the interface.

The address of a MOVILINK® device or group and special service addresses are coded within the address byte.

Message type 9 is structured as follows:

Table 51: Message type 9

Byte 0	7 … 0 0 0 0 0 0 0 1 0	Header
	Simple header Data element length (2 bytes)	
Byte 1	7 … 0	Address byte
	Address (0 … 63) 0 … 31: Slave address (MOVILINK® slave address 0 … 31) 32 … 47: Group address (MOVILINK® group addresses 100 … 115) 48 … 61: Reserved (services) 62: Service address (MOVILINK® service address 254) 63: Broadcast (MOVILINK® broadcast address 255) PDU type (0 = Cyclic (0x05), 1 = Acyclic (0x85)) Interface (0 = Interface 1, 1 = Interface 2)	
Byte 2	7 … 0	Return code
	1 Reserved 2 Timeout (no response received within 50 ms after a request.) 3 Parity error/checksum is wrong (The MOVILINK® telegram received from the module is faulty.) 4 Unknown message (The format of the message is not supported.) 5 Response is not expected (The response for a group (address 100 … 253) or broadcast (address 255) was sent.) 6 … 255 reserved	

9.2.2.1.4 Using Message Type 6

This message type can be used to access up to 31 individual converters or up to 16 converter groups per interface.

The individual converters can be configured with MOVILINK® slave addresses 0 … 31.

In addition, several converters can be grouped using MOVILINK® group addresses 100 … 115.

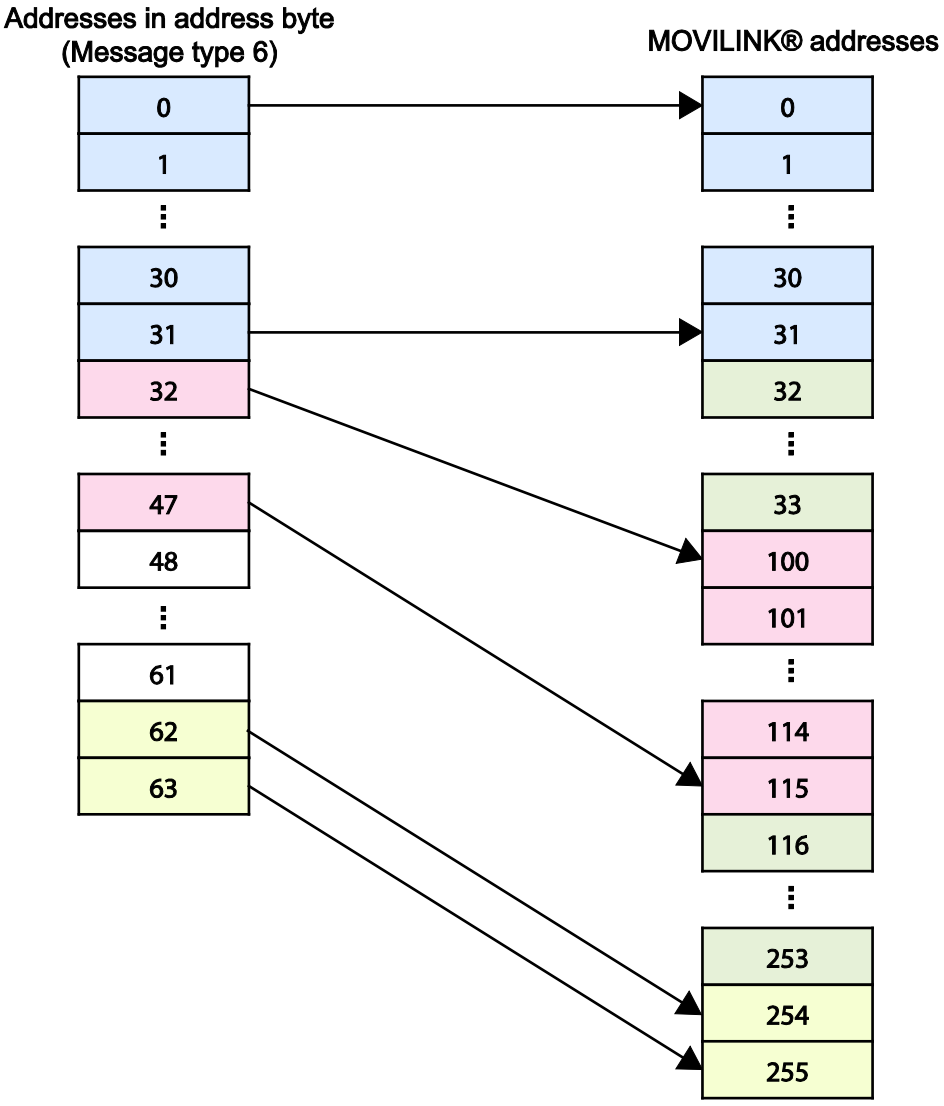


Figure 22: Compilation of MOVILINK® addresses for type 6 messages

Note

Please note the max. number of converters that can be connected!
Up to max. 31 converters can be connected to an interface, e.g. 21 individual converters and 10 converters configured as a group.

Example 1:

Interface 1 is connected to 2 MOVILINK® converters, where the converters are configured as individual slaves with addresses 1 and 2.

The following sequence diagram shows the data flow between the PLC and MOVILINK® module.

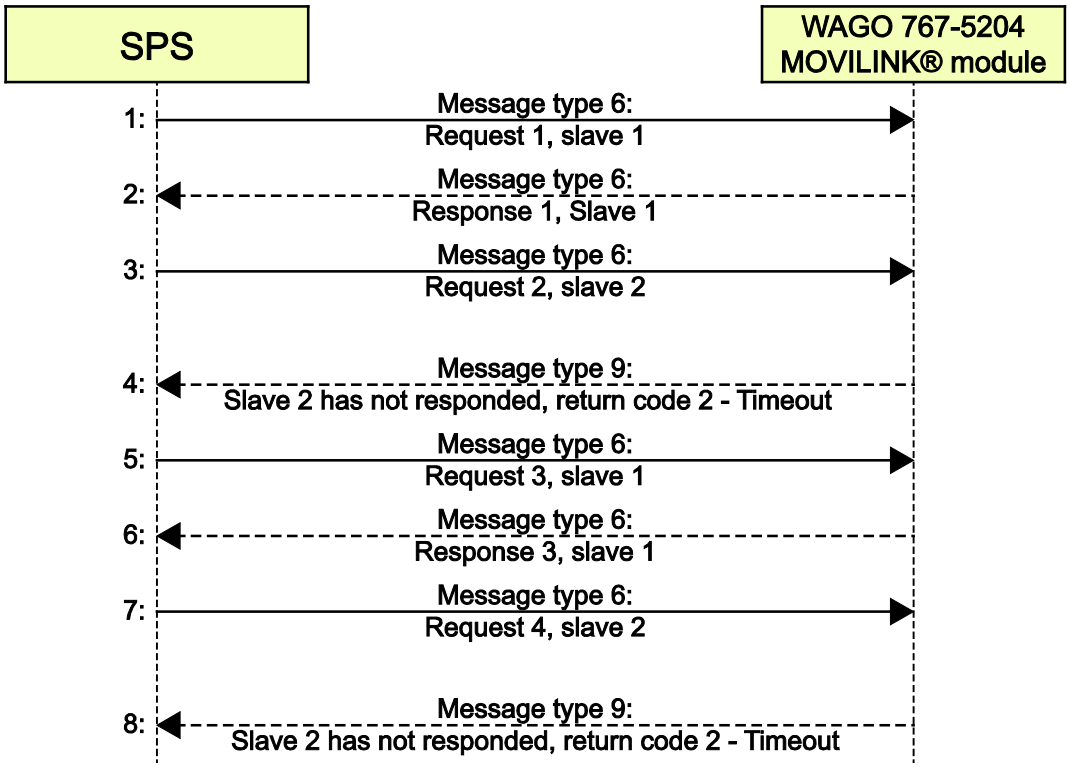


Figure 23: Data exchange between the PLC and individual slaves

Table 52: Data exchange between the PLC and individual slaves

Sequence number	Description
1	The PLC transmits request 1 for the converter with slave address 1 to the MOVILINK® module. The module transmits a corresponding MOVILINK® telegram via interface 1.
2	Slave 1 has responded correctly. The module transmits response 1 to the PLC.
3	The PLC transmits request 2 for the converter with slave address 2 to the module. The module transmits a corresponding MOVILINK® telegram via interface 1.
4	Slave 2 has not responded. The module transmits return code 2 (timeout) with a message of type 9 to the PLC.
5	The PLC transmits request 3 for the converter with slave address 1 to the module. The module transmits a corresponding MOVILINK® telegram to slave 1.
6	Slave 1 has responded correctly. The module transmits response 3 to the PLC.
7	The PLC transmits request 4 for the converter with slave address 2 to the module. The module transmits a corresponding MOVILINK® telegram via interface 1.
8	Slave 2 has not responded. The module transmits return code 2 (timeout) with a message of type 9 to the PLC.

Example 2

Interface 1 is connected to several MOVILINK® converters, where the converters are configured as an individual slave with addresses 1 and as a group with address 101.

The following sequence diagram shows the data flow between the PLC and MOVILINK® module.

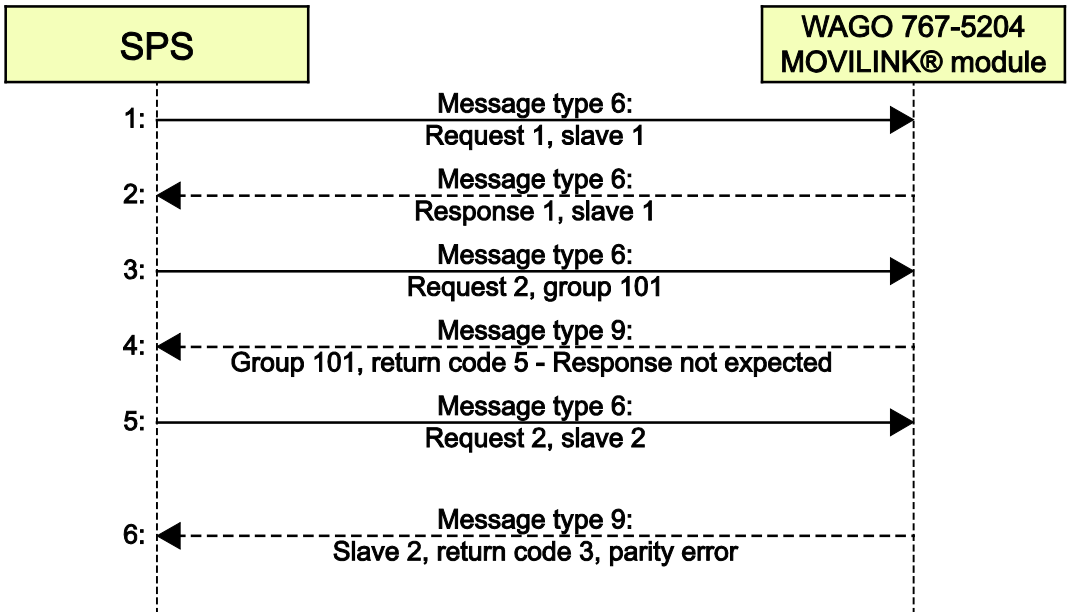


Figure 24: Data exchange between the PLC and a slave and group

Table 53: Data exchange between the PLC and a slave and group

Sequence number	Description
1	The PLC transmits request 1 for the converter with slave address 1 to the module. The module transmits a corresponding MOVILINK® telegram via interface 1.
2	Slave 1 has responded correctly. The module transmits response 1 to the PLC.
3	The PLC transmits request 2 for the converter group with group address 101 to the module. The module transmits a corresponding MOVILINK® telegram via interface 1.
4	The module acknowledges transmission with a message of type 9, return code 5 "Response is not expected".
5	The PLC transmits request 2 for the converter with slave address 2 to the module. The module transmits a corresponding MOVILINK® telegram via interface 1.
6	Slave 2 has not responded. The module transmits return code 2 (timeout) with a message of type 9 to the PLC.

9.2.2.1.5 Using Message Type 8 in Mailbox Mode

This message type can be used to access up to 10 individual converters or up to 4 converter groups per interface. This message type contains MOVILINK® user data for two converters that is transmitted simultaneously via the fieldbus of the higher-level master system. Control of the individual converters or converter groups connected to both interfaces is optimized in terms of time.

The individual converters can be configured with MOVILINK® slave addresses 0 … 9.

In addition, several converters can be grouped using MOVILINK® group addresses 100 … 103.

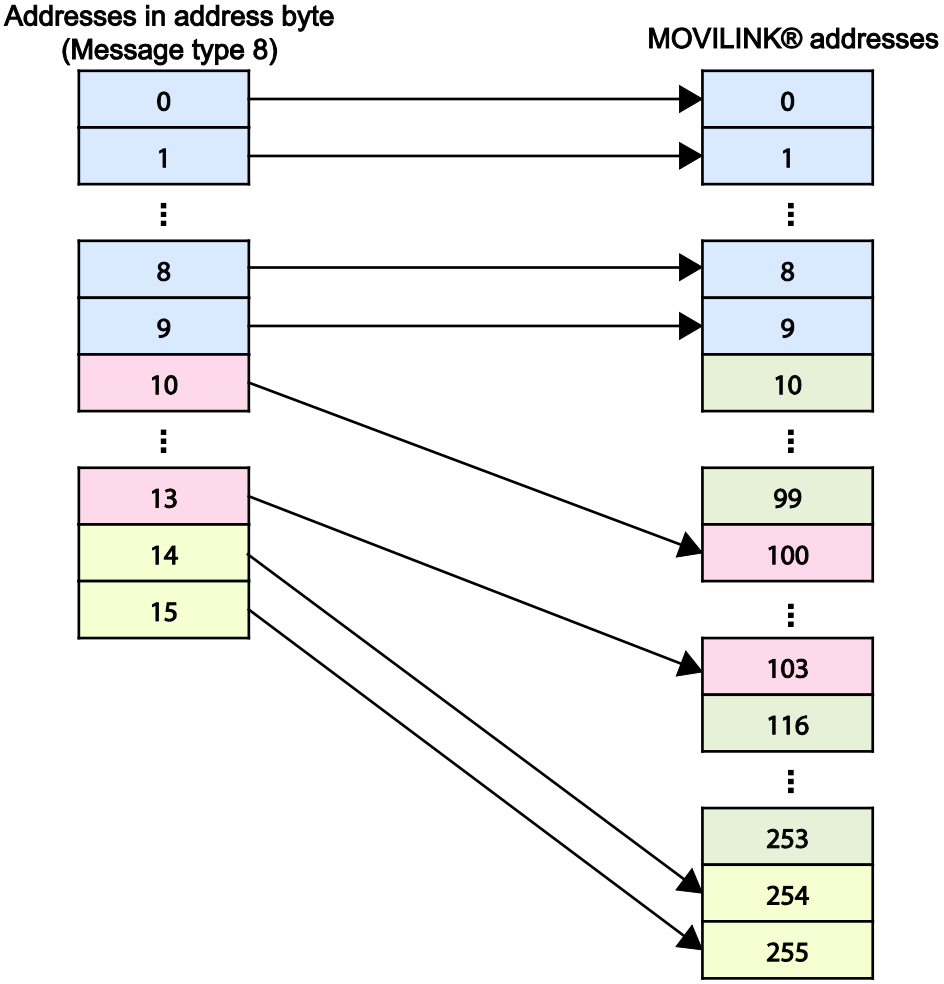


Figure 25: Compilation of MOVILINK® address for type 8 messages

Example 1:

Interfaces 1 and 2 are connected to two MOVILINK® converters, where the "Slave 1" converter is connected to interface 1 and "Slave 2" converter to interface 2.

The following sequence diagram shows the data flow between the PLC and MOVILINK® module.

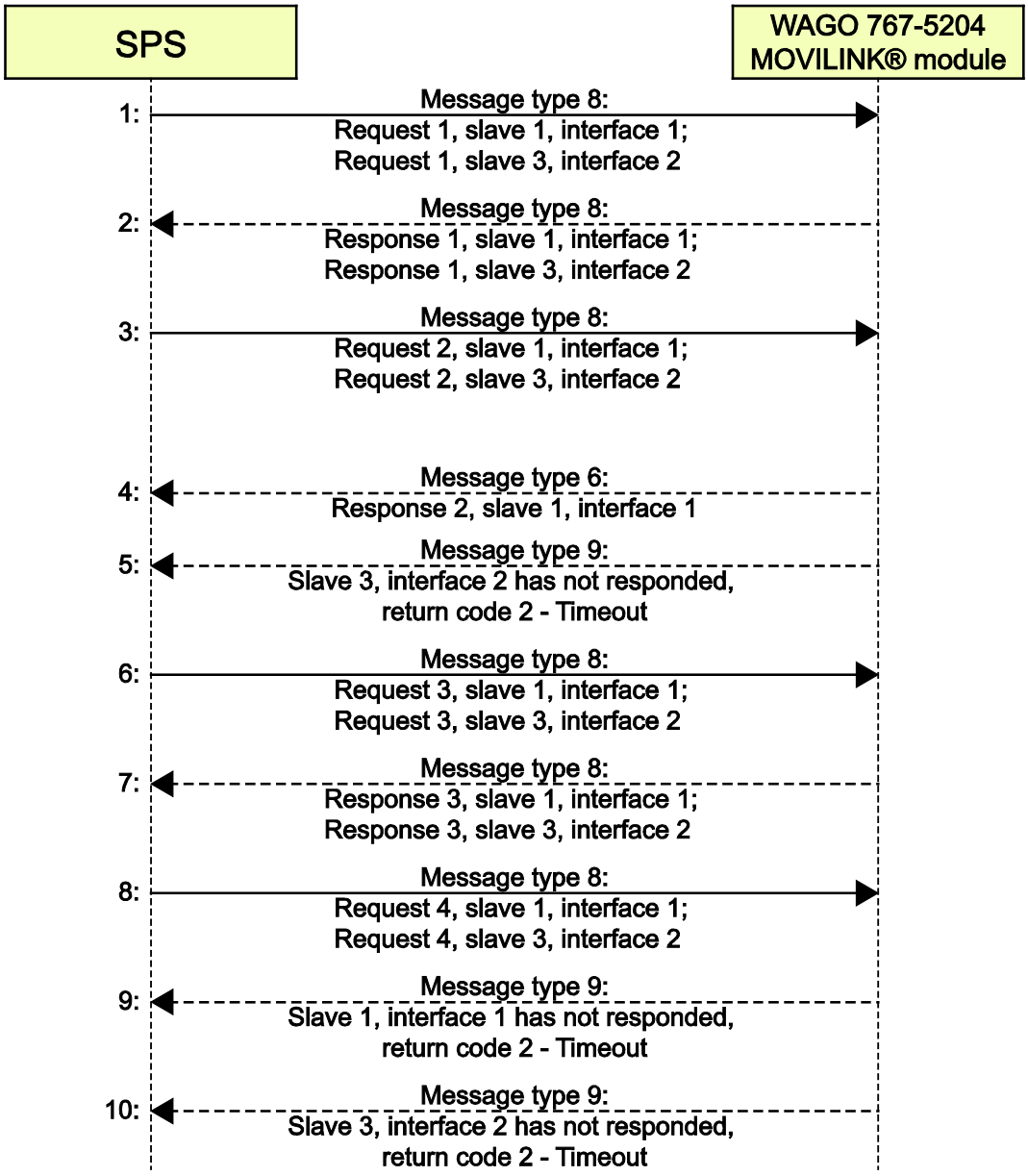


Figure 26: Data exchange between the PLC and individual slaves

Table 54: Data exchange between the PLC and individual slaves

Sequence number	Description
1	The PLC transmits request 1 for the converter with slave address 1, interface 1 and for the converter with slave address 3, interface 2 to the MOVILINK® module. The module transmits corresponding MOVILINK® telegrams via interfaces 1 and 2.
2	Slave 1 and slave 3 have responded correctly. The MOVILINK® module transmits response 1 to the PLC.
3	The PLC transmits request 1 for the converter with slave address 1, interface 1 and for the converter with slave address 3, interface 2 to the MOVILINK® module. The module transmits the corresponding MOVILINK® telegrams via interfaces 1 and 2.
4	Slave 1 has responded correctly (however, slave 3 has not responded). The module now transmits response 2 from slave 2 with a message of type 6 to the PLC.
5	Because slave 3 has not responded, the module transmits return code 2 (timeout) with a message of type 9 to the PLC.
6	The PLC transmits request 3 for the converter with slave address 1, interface 1 and for the drive with slave address 3, interface 2 to the MOVILINK® module. The module transmits the corresponding MOVILINK® telegrams via interfaces 1 and 2.
7	Slave 1 and slave 3 have responded correctly. The MOVILINK® module transmits response 3 to the PLC.
8	The PLC transmits request 4 for the converter with slave address 1, interface 1 and for the converter with slave address 3, interface 2 to the MOVILINK® module. The module transmits the corresponding MOVILINK® telegrams via interfaces 1 and 2.
9	Slave 1 has not responded. The module transmits return code 2 (timeout) with a message of type 9 to the PLC.
10	Slave 3 has not responded. The module transmits return code 2 (timeout) with a message of type 9 to the PLC.

Example 2

Interfaces 1 and 2 are connected to two MOVILINK® converters, where the "Slave 1" converter is connected to interface 1 and "Slave 2" converter to interface 2.

For throughput optimization, the internal buffer of the MOVILINK® module designed for up to two messages can be used. While processing a message, the other message is transmitted by the PLC to the module to increase throughput, thus reducing the cycle time for cyclic data exchange.

The cycle time for cyclic data exchange is defined as the lag between two MOVILINK® telegrams received from one converter that are addressed for this converter.

The cycle time T_{Cycle} can be calculated as follows:

$$T_{Cycle} = N * T_{Converter},$$

N = Number of individual converters (slaves) connected to the interface
$T_{Converter}$ = Lag between transmission of the request and receipt of the response for a converter (slave)

This time depends on several factors:

- The PLC cycle time
- The transmission time via the fieldbus of the higher-level master system
- The set transmission rate of the RS-485 bus
- The maximum response delay time
- The character delay time of a converter

The typical lag ($T_{converter}$) for example 2 is approx. 35 ms when using a SIEMENS Simatic S7 PLC, WAGO fieldbus coupler PROFIBUS DP/V1 (767-1101), converter of the MOVIMOT® series and a set transmission rate of 9600 baud.

The following sequence diagram illustrates the data exchange between the PLC and MOVILINK® module.

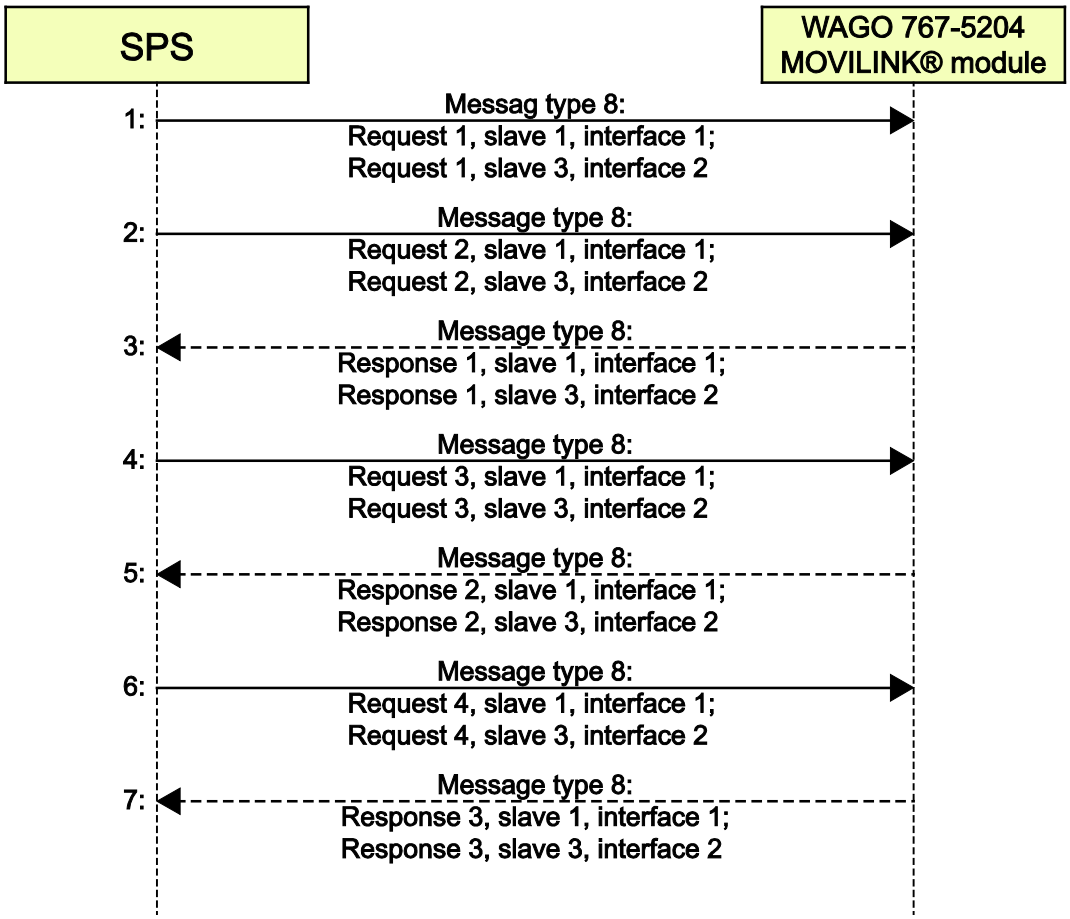


Figure 27: Data exchange between the PLC and individual slaves with throughput optimization

Table 55: Data exchange between the PLC and individual slaves with throughput optimization

Sequence number	Description
1	The PLC transmits request 1 for the converter with slave address 1, interface 1 and for the converter with slave address 3, interface 2 to the MOVILINK® module. The module transmits corresponding MOVILINK® telegrams via interfaces 1 and 2.
2	While processing request 1, request 2 for the converter with slave address 1, interface 1 and for the converter with slave address 3, interface 2 is transmitted from the PLC to the MOVILINK® module. The module transmits corresponding MOVILINK® telegrams via interfaces 1 and 2.
3	Slave 1 and slave 3 have responded correctly to request 1. The MOVILINK® module transmits response 1 to the PLC.
4	While processing request 2, request 3 for the converter with slave address 1, interface 1 and for the converter with slave address 3, interface 2 is transmitted from the PLC to the MOVILINK® module. The module transmits corresponding MOVILINK® telegrams via interfaces 1 and 2.
5	Slave 1 and slave 3 have responded correctly to request 2. The MOVILINK® module transmits response 2 to the PLC.
6	While processing request 3, request 4 for the converter with slave address 1, interface 1 and for the converter with slave address 3, interface 2 is transmitted from the PLC to the MOVILINK® module. The module transmits corresponding MOVILINK® telegrams via interfaces 1 and 2.
7	Slave 1 and slave 3 have responded correctly to request 2. The MOVILINK® module transmits response 2 to the PLC.

10 Diagnostics

10.1 LED Signaling

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

Note

Disabling specific diagnostics
Use the diagnostic overview (section "Parameterizing" > "Diagnostic Overview") to disable specific diagnostics (see F- and I/O-LED). In this case, the corresponding LED is disabled (off).

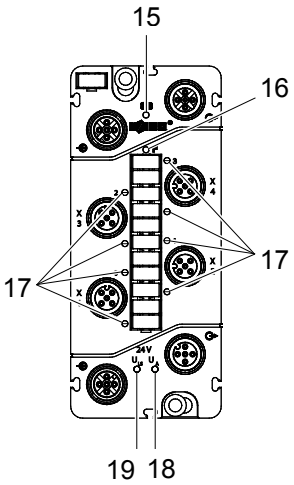


Figure 28: LEDs indicating operational messages (exemplary)

Table 56: Operating messages 1

Pos.	LED	Color/Status	Cause	Remedy/information
15	SB	Off	Low voltage; U_{LS} not available.	Check the power supply.
		Red, flashing, 4 Hz	S-BUS error on module.	Check whether the S-BUS cable is connected. Check the S-BUS cable for damages. Check whether the fieldbus coupler firmware is compatible with the module.
		Red, flashing, 1 or 2 Hz	The module is being restarted via the fieldbus coupler.	If the flashing frequency is 1Hz, please contact WAGO Support.
		Green	Data exchange is in process; process data values are valid. The module is in RUN mode.	-

Table 56: Operating messages 1

Pos.	LED	Color/Status	Cause	Remedy/information
15	SB	Green and orange, flashing, 1 Hz	The set substitute value is applied to the module.	Can be set by the fieldbus coupler if fieldbus is missing. Check the fieldbus connection and the status of the higher-level controller.
		Orange, flashing, 2 Hz	The module has detected the S-BUS.	-
		Orange and green, flashing, 4 Hz	The last module is being detected in the 767 node.	Check the S-BUS terminator and/or the S-BUS cables.
		Orange, flashing, 1 Hz	The fieldbus coupler is addressing the module in the 767 node.	-
		Orange and green, flashing, 2 Hz	The S-BUS parameters are being stored by the fieldbus coupler.	-
		Orange	The firmware is being updated.	All 767 Series components are being updated by the fieldbus coupler within the node.
		Orange, flashing, 4 Hz	The module is attempting to establish communication with the fieldbus coupler.	Check the power supply to upstream 767 Series component and/or check the S-BUS cable for damages.
15	SB	Green, flashing, 1 Hz	The module is in HOLD mode.	Is initiated by the fieldbus coupler. In DI mode, the last input values transferred to the fieldbus coupler are kept in the process image. In DO mode, the last output values are retained.
		Green, flashing, 2 Hz	The module is in STOP mode.	Is initiated by the fieldbus coupler. In DI mode, the input values are set to 0 in the process image. In DO mode, the output value is output as 0.

Table 57: Operational messages 2

No.	LED	Color/status	Cause	Remedy/information
16	F	Red	There is at least one global diagnostic message on the module.	Check the supply voltages U_{LS} and U_A of the upstream 767 Series components. For more information, see the section "Parameterizing"> "Diagnostic Overview".
17	Ch 1.1 Ch 2.1	Off	No data to send	Check the connection of the external device and that the transmission parameters match.
		Yellow flashing	Channel sends data	---
	Ch 1.2 Ch 2.2	Off	No data receipt	Check the connection of the external device and that the transmission parameters match.
		Yellow flashing	Channel receives data	---
17	0 ... 3	Yellow	Input: Signal active and is recognized as '1'.	---
			Output: Output signal is active.	Check the actuator connection for short circuit/overload. A short circuit or overload can only occur when the output is switched on.
		Red*	Error on output	Check the actuator connection for short circuit/overload.
		* If you set the time of the parameter "Restart delay, actuator" (section "Parameterizing"> "Output Parameters") to 0 ms, the I/O LED appears yellow rather than red in case of a short circuit or overload due to the short restart interval.		
18	U_A	Green	Actuator supply U_A is present.	-
		Off	Actuator supply U_A is not present.	Connect the power supply and check the voltage level, if applicable.
19	U_{LS}	Green	Logic supply and sensor supply U_{LS} are present.	-
		Off	Logic supply and sensor supply U_{LS} are not present.	Connect the power supply and check the voltage level, if applicable.

11 Service

This section contains information on maintenance and service.

11.1 Updating the Firmware

The firmware for the module can be updated. This takes place via the USB connection of a fieldbus coupler. Additional information can be found in the fieldbus manuals in section "Updating the Firmware".

11.2 Replacing the Module

To replace a module, e.g., to change variants, proceed as described follow.

11.2.1 Disconnecting the Cables

Before removing the connectors, clean the module 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 module.

⚠ 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.

11.2.2 Removing the Module from Your System

To remove the module from your system's framework, proceed as follows:

1. Disconnect the power supply from those devices on which you have mounted the module.

2. Release the module from your system by unscrewing the M4 screws.

11.2.3 Removing the Module from the Carrier Rail

In order to keep the representation unambiguous, the carrier rail adapter in the following figure (B, C) is shown without module.

If the module is mounted on a carrier rail, proceed with the removal as follows:

1. Disconnect the power supply from those devices on which you have mounted the module.

2. To remove the module, press down the release actuator of the carrier rail adapter using a slot screwdriver (B) and remove it from the carrier rail (C).

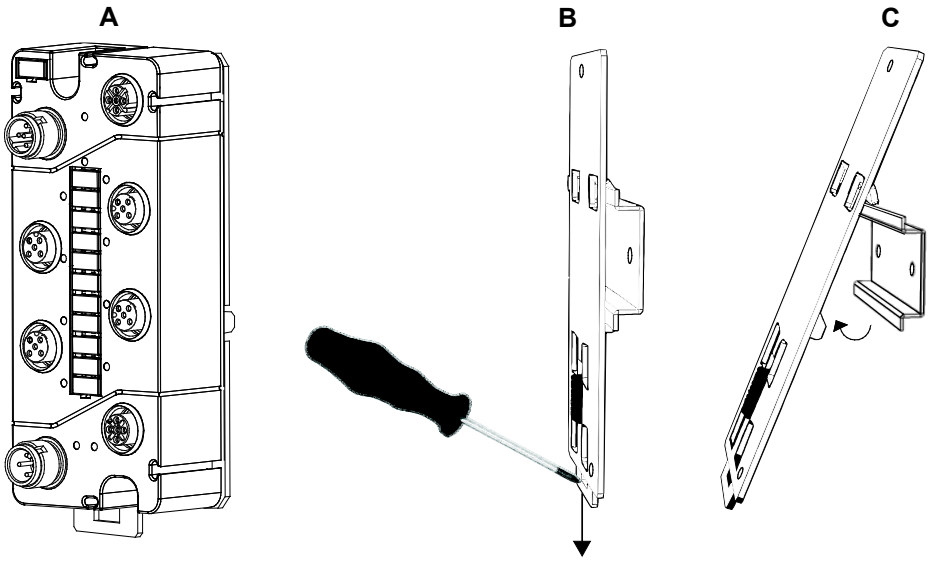


Figure 29: Removing the module (with the carrier rail adapter) from the carrier rail

11.2.4 Removing the Module from the Profile Adapter

If the module is mounted on a profile adapter, proceed with the removal as follows:

1. Disconnect the power supply from that part of the system on which you have mounted the module before attempting to remove it.

2. Unscrew the screws on which the nuts are fastened and remove the module from the profile rail of your system.

3. Unscrew the screws that connect the module with the profile adapter.

11.2.5 Connecting the Module

To connect the module, proceed as described in Sections 4 through 6. If necessary, the parameters of the previous module are transferred to the new module, depending on the type of fieldbus coupler being used. For more information, see section "Parameterizing" > "Automatic Storage of System Parameters".

11.3 Disposal

Do not dispose of the 767 Series components in the household waste; observe the laws which apply to them. You can also contact a certified waste management company.

12 Appendix

12.1 Diagnostic Information

Some fieldbus couplers display the error code in the form of an attribute path (CIA), through which diagnostics are clearly assigned. Other fieldbus couplers (e.g., PROFINET I/O or PROFIBUS DP) convert the attribute path into a fieldbus-specific message.

The following diagnostic codes can be generated by the module:

Table 58: Diagnostics of the module

Diagnostic Message	Attribute Path			Classification
	C	I	A	
Short circuit/overload of field supply The function is only enabled when the field supply is switched on.	16	1	128	Diagnostic alarm
Low voltage U_{LS} (sensor supply)	50	1	128	Diagnostic alarm
Low voltage U_A (actuator supply)	50	1	129	Diagnostic alarm

Table 59: Diagnostics of the individual channels of the module

Diagnostic Message	Attribute Path			Classification
	C	I	A	
Overtemperature This function is only enabled when the actuator output is switched on.	9	Chanel (1 - 4)	130	Diagnostic alarm

Use the diagnostics overview of the section of the same name to disable specific diagnostics.

12.2 Mailbox 2.0 Transmission Method

Mailbox 2.0 defines a service to transfer data full-duplex via a defined channel.

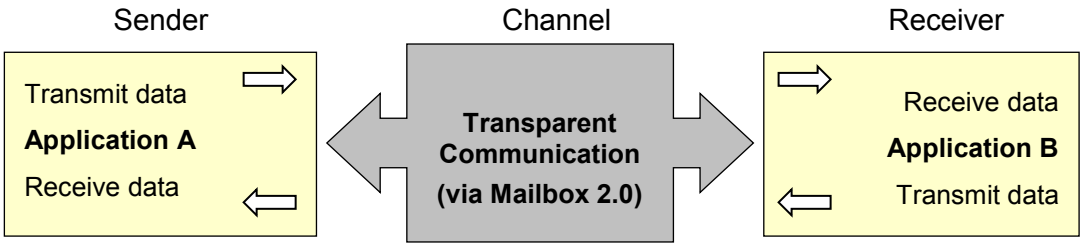


Figure 30: Communication via Mailbox 2.0

Example:
A sender wants to transfer 10 bytes (the character string "Hello Wago") to a receiver via a 4-byte wide channel.

12.2.1 Message

The Mailbox 2.0 method packages the data in messages. A message contains a header and user data.

There are two message types.

Message with simple header:

xx	"H"	"a"	"l"	"l"	"o"	" "	"W"	"a"	"g"	"o"

Message with extended header:

xx	xx	xx	"H"	"a"	"l"	"l"	"o"	" "	"W"	"a"	"g"	"o"

Structure of the simple header:

Table 60: Structure of the Simple Header

Simple header							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Length						

Data element length max. 127 bytes
0: Simple header

Structure of the extended header:

Table 61: Structure of the Extended Header

Extended header				
Bit 7	**Bit 6**	**Bit 5 … 0**	**Bit 7 … 0**	**Bit 7 … 0**
1	0	Length High	Length Low	Protocol ID

Protocoll_ID 0..255
Data element length max. 16383 bytes
10: Extended header

A message that uses this header can contain 16383 bytes of user data. In addition, the message can have a protocol ID. This protocol ID allows the message to include a logical meaning.

12.2.2 Transmission Channel

To transfer a message over a narrow channel, synchronization between sender and receiver is required. Therefore, the transmission channel is divided into a synchronization part and a data part.

For synchronization, a so-called handshake byte (HB) is defined.

The handshake byte occupies the first byte of the transmission channel while part of the message is always delivered in the remaining bytes.

HB	Part of the message

There is always one transmission channel from the sender to the receiver and one transmission channel from the receiver to the sender. Both channels do not have to be the same size. However, the minimum size is 1 byte.

12.2.2.1 The Handshake Byte

In general, a distinction is made between Control(C) and Toggle(T) mode (bit 7). The Control mode is used to synchronize the subscribers. The Toggle mode is used to exchange data.

Structure of the handshake byte:

Table 62: Structure of the Handshake Byte

Handshake byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Status				Control			
C/T	Response			C/T	Command		
	T	0x0			T	0x0	

The following figure shows the basic use of the handshake byte.

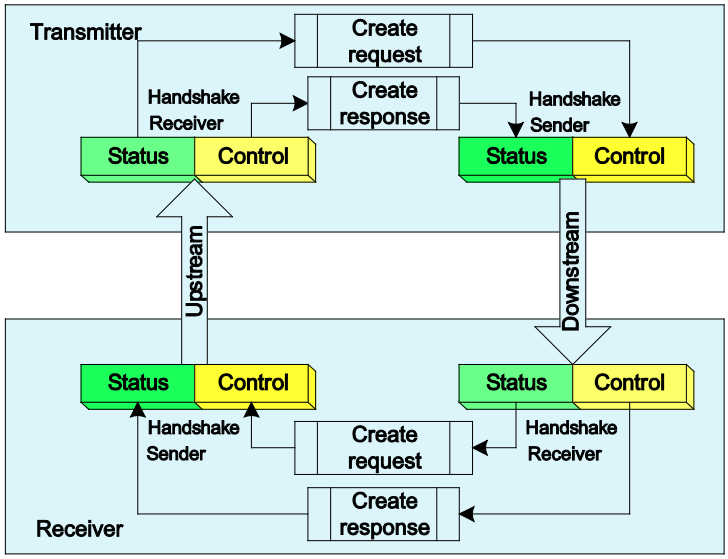


Figure 31: Use of the Handshake Byte

12.2.3 Communication Phases

The Mailbox 2.0 mechanism defines two communication phases:

- Synchronization
- Data exchange

Only after successful synchronization from sender to receiver the actual user data can be exchanged.

12.2.3.1 Synchronization

In the synchronization phase, the handshake byte is used in Control mode.

A distinction is made between interpretation as signaling mode and interpretation as command acknowledgement mode.

In command acknowledgement mode, the handshake byte appears as follows:

Status Nibble			
Bit 3	Bit 2	Bit 1	Bit 0
0	Acknowledgement		

Control Nibble			
Bit 3	Bit 2	Bit 1	Bit 0
0	Acknowledgement		

The Control nibble is used to transfer a request while the Status nibble contains the response to the request.

12.2.3.1.1 Mailbox Commands

The following commands are defined:

Table 63: Commands

Value	Explanation	Description
0	INVALID	Signals that the sender has not started operations again after a reset.
1	HOLD REQUEST	Notice that the channel is ready, but data is not currently being transferred (e.g. because the output buffer is still empty)
2	RESET REQUEST	Prompt to reset
3 ... 7	-	(not supported, ignore)

12.2.3.1.2 Acknowledgement

The following acknowledgements are defined:

Table 64: Acknowledgement

Value	Explanation	Description
0	INVALID	Signals that the receiver has not started operations again after a reset.
1	HOLD ACKNOWLEDGE	Signal or confirmation that the channel is ready, but data is not currently being transferred (e.g. because there is not any data yet).
2	RESET ACKNOWLEDGE	Response to "RESET REQUEST" when Mailbox in reset.
3 ... 7	-	(not supported, ignore)

12.2.3.1.3 Signaling

In signal mode, the handshake byte appears as follows:

Table 65: Structure of the Handshake Byte

Handshake byte							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	0	Signal					

Table 66: Signaling

Value	Explanation	Description
0x00	INVALID SIGNAL	State of the process image with no effect by Mailbox 2.0
0x32	RESET SIGNAL	Shows that the local Mailbox is in the process of restarting
0x33	ERROR SIGNAL	Shows that the local Mailbox is in the fault condition
(other)	-	Other values are not considered as signals and are processed separately in the Status or Control nibble.

12.2.3.1.4 Finite Automation

Synchronization follows the chart below.

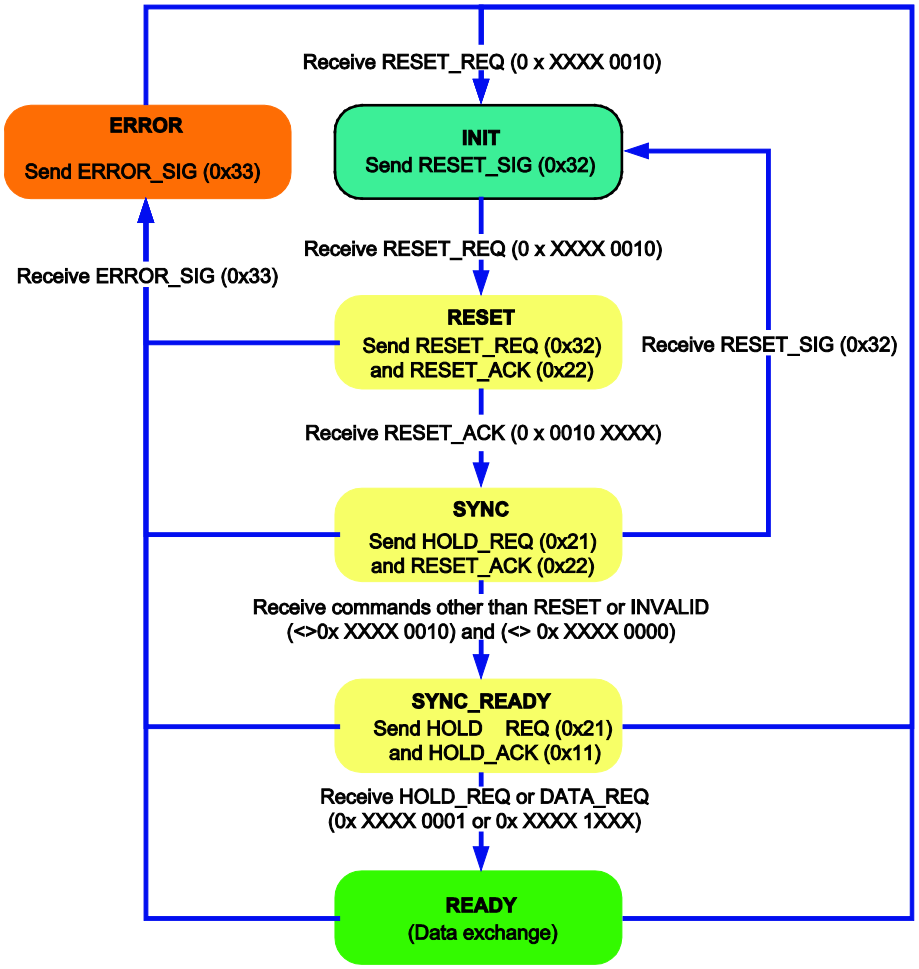


Figure 32: Finite Automation

12.2.3.2 Data Exchange

In the data exchange phase, the handshake byte is used in Toggle mode. Because a message is normally larger than the data part of the transmission channel, the message must be transferred in several cycles (fragmentation).

Status Nibble			
Bit 3	**Bit 2**	**Bit 1**	**Bit 0**
1	T	0x00	

Control Nibble			
Bit 3	**Bit 2**	**Bit 1**	**Bit 0**
1	T	0x00	

Send fragment:

The first toggle bit expected by the receiver after synchronization has the value 0. The toggle bit in the second fragment receives a 1, the toggle bit in the third fragment again a 0, etc. Only when the status of the toggle bit matches in the received status nibble is receipt of the fragment confirmed by the receiver. Only then can a new fragment be sent. As long as there is no confirmation, the fragment remains unchanged in the process image.

For the special case that the content of the send buffer is no longer sufficient to fill the transmission channel completely, the transmission channel is filled with zeros to the end.

Receive fragment:

The control now has to confirm receipt of this fragment. Receipt is confirmed by inverting the toggle bit of the status nibble to be sent.

Because the Mailbox 2.0 mechanism is full-duplex capable, data can be sent and received at the same time.

12.2.3.2.1 Example

The following example shows use of the transmission channel during a send operation (no full-duplex transmission):

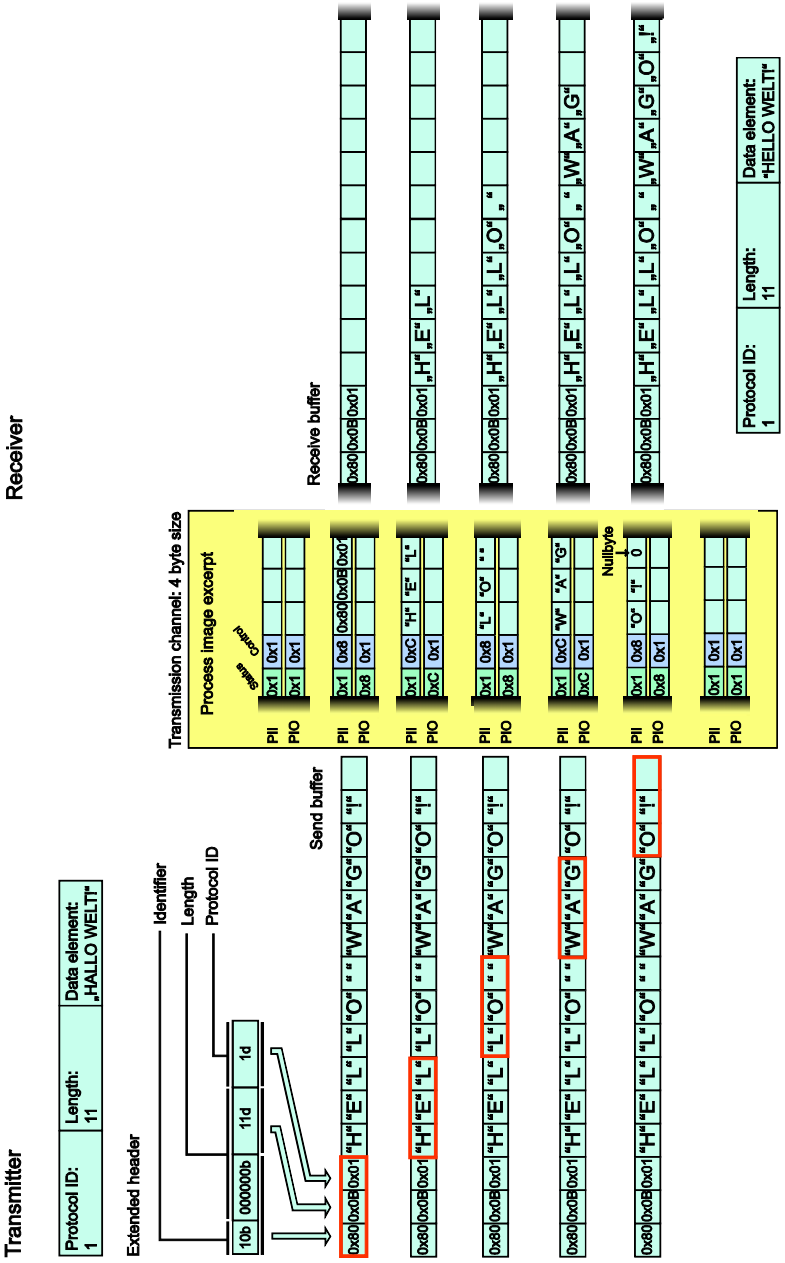


Figure 33: Example of Send Operation

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