WAGO-SPEEDWAY 767

Manual

767-5201

TTL Incremental/SSI Encoder

2 encoder interfaces (2 x M12) + 4 digital inputs/outputs (2 x M12, 2 inputs/outputs per connector)

Version 1.1.0

WAGO Kontakttechnik GmbH & Co. KG

Hansastraße 27
D-32423 Minden

Phone: +49 (0) 571/8 87 – 0
Fax: +49 (0) 571/8 87 – 1 69

E-Mail: info@wago.com

Web: http://www.wago.com

Technical Support

Phone: +49 (0) 571/8 87 – 5 55
Fax: +49 (0) 571/8 87 – 85 55

E-Mail: support@wago.com

Every conceivable measure has been taken to ensure the 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.

E-Mail: documentation@wago.com

We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally 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 TTL Incremental/SSI Encoder, 767-5201.

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 767-5201 Module evaluates both incremental and absolute encoders with RS-422 signal levels. Integrated DIOs allow outputs to be directly set and inputs to be read depending on counter states. Two of the four DIO channels can also be used as PWM outputs.

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 767-5201 module is a hybrid module, which is designed to connect 2 incremental encoders or SSI encoders. Each input can be individually configured to one of the encoder types.

In addition, two of the connections can each be parameterized with two signal channels as digital inputs or outputs.
Thus, the module offers space for connecting up to four digital sensors or actuators. These can be configured as sub-signals to the counter channels, e.g. as gate, latch, preset, or cam signals.

The following connections are possible:

- 2 x M12, A-coded, 8 poles, either for connecting TTL incremental encoders or SSI encoders
- 2 x M12, A-coded, 5 poles, usable either for fast DIOs (or optionally as a PWM output)

Counter function

- **Incremental encoder interface function**
  When functioning as an incremental encoder interface, the module detects the pulses from a connected incremental encoder. In this case, the rotational direction of the encoder is recognized automatically due to the functionality of the two clock signals.
  Another option allows for the connection of a C track, by means of which a zero set pulse or a preset pulse can be triggered.
- **SSI encoder interface function**
  When functioning as an SSI encoder interface, the current counter reading of the encoder is read in binary using an SSI interface (Synchronous Serial Interface). The counter reading is stored in the module and output as a process value.

Counter mode

- **Event counter:**
  In the basic "counter" function, the module counts the pulses arriving at the pulse input, whereby it automatically detects the counting direction.
- **Gate time/frequency measurement:**
  The pulses are counted that occur within the gate time (a gate time of 1 s results in the frequency in Hz).
- **Gate time/cycle duration measurement:**
  The cycle duration is determined in µs.

A series of control functions have been implemented in the module, which can be used to control the behavior of the counter.

- **Gate function**
  The gate function can be coupled to one of the 6 inputs on the device. If the gate function is selected, the counter counts.
  If the gate function is not selected, the current counter reading remains unchanged ("frozen").

- **Latch function**
  The latch function can be coupled to one of the 6 inputs on the device.
  If the latch input is selected, then the current counter reading is saved. The saved value can be displayed in the process image by means of a corresponding command.
  The latch function can be locked or unlocked by means of the process image (control byte).

- **Preset function**
  The preset function can be coupled to one of the 6 inputs on the device.
  If the preset input is selected, the current counter reading is set to a previously-defined preset value. This function is used, for example, to detect the C track of the incremental encoders and set the counter value to zero.
  The preset function can be locked or unlocked by means of the process image (control byte).

- **Cam function**
  You can use the cam function to set one of the device outputs when the current counter reading is in a predefined value range.
  Up to 4 cams can be defined for each counter channel. The lower and upper limiting values and the output channel to be used can be parameterized for each cam.

The encoder supply for the counter channels can be switched between 5 V and 24 V.

The positive switching digital inputs have a characteristic in accordance with IEC61131-2, Type 3. They have extensive parameterization options such as filter times or signal inversion.

The positive switching outputs are designed for 0.1 A (max. 0.2 A) and short circuit/overload protected. Extensive parameterization options are also available for the outputs, such as signal inversion, substitute value strategy or restart behavior.

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.

There are significantly more parameterization options when using the WAGOframe FDT/DTM frame application than when parameterizing by means of the device description files (GSD, GSDML, etc.).
In fact, some options are not available, or only available in a limited scope, when parameterizing using the DD files (GSD, GSDML, etc.).
An invalid configuration, such as assigning different functions to one input, can therefore generate error messages.

Detailed information about assignment of module parameters using a fieldbus is provided in the corresponding manual (e.g., PROFIBUS Fieldbus Coupler 767-1101).

Detailed information regarding the properties of the module is available in the Section "Device description" > "Technical data".

3.1 Connectors

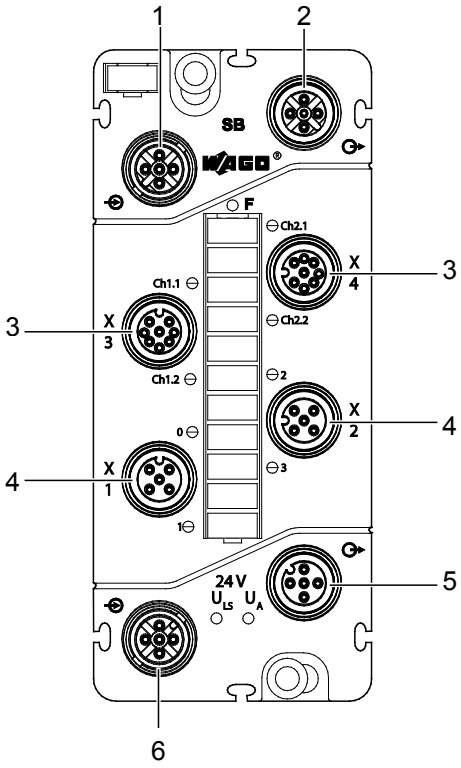


Figure 1: Connectors

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	Incremental encoder/SSI encoder X3 and X4 M12 socket, A coded	For connecting an incremental/SSI encoder.
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

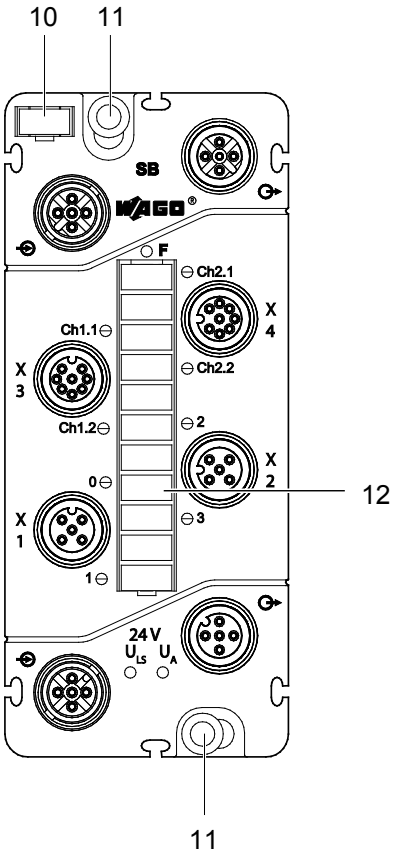


Figure 2: Marking possibilities and fastening

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

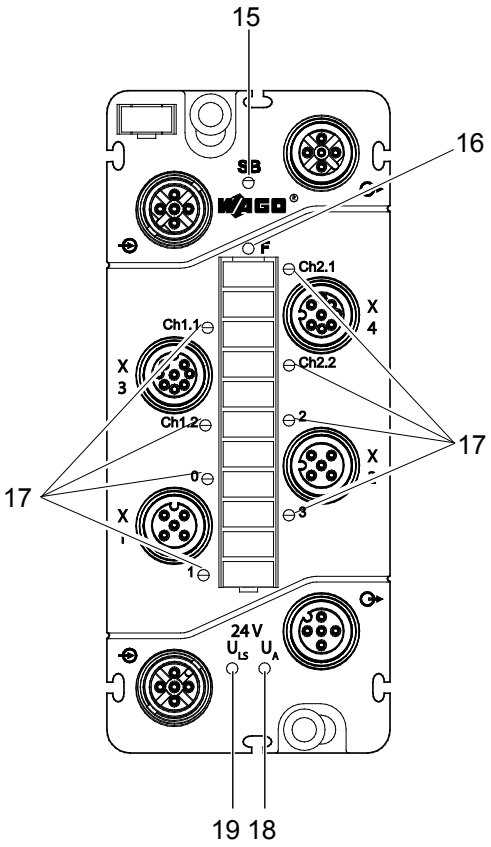


Figure 3: Display Elements

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	Green, yellow	Status of the TTL Incremental/SSI Encoder Interfaces. Detailed information can be found in section "Diagnostics" > "LED Signaling".
	Ch1.2	Green, yellow, red	
	Ch2.1	Green, yellow	
	Ch2.2	Green, 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

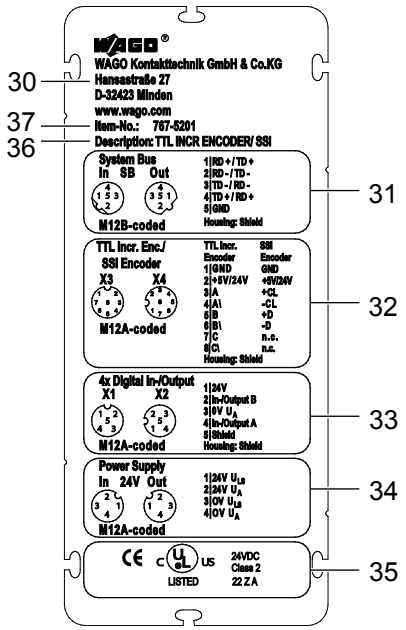


Figure 4: Labeling

Table 6: Legend for figure "Labeling"

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

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)

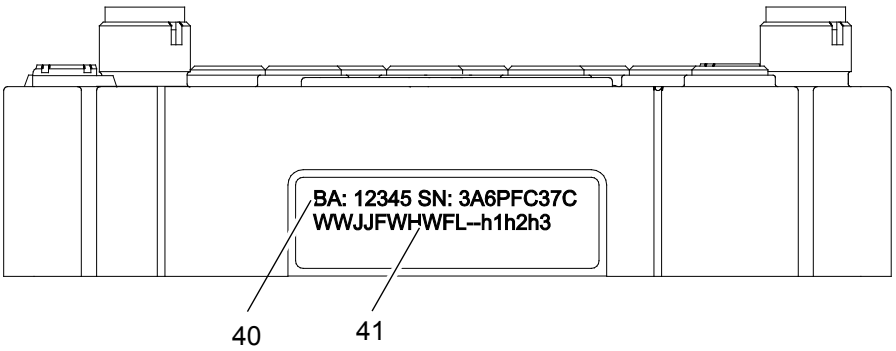


Figure 5: Label on the module

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 power supply of the sensors and actuators together from U_A is done and is distributed to all module ports.

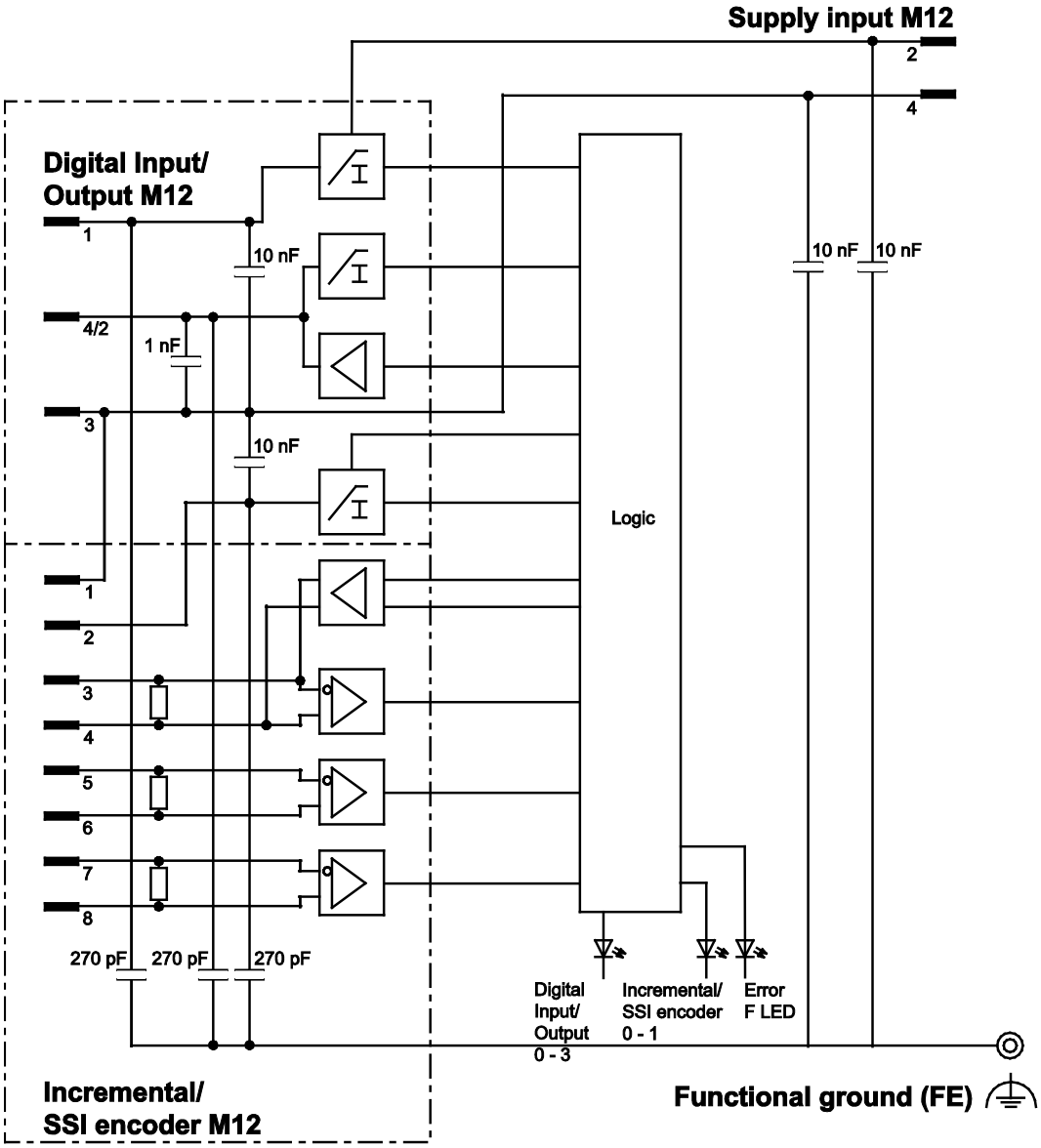


Figure 6: Schematic diagram

3.6 Dimensions

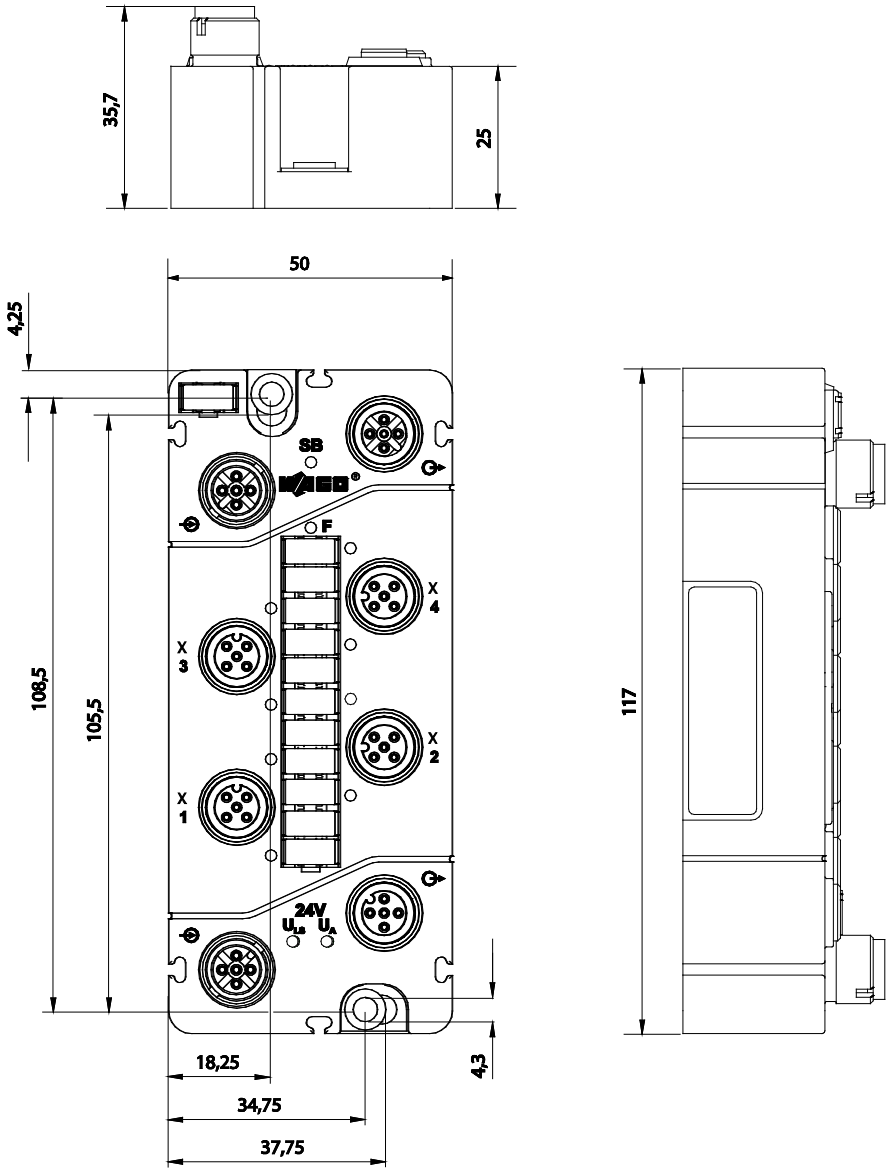


Figure 7: Dimensions of the module in millimeters (exemplary)

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 General Information

Table 8: Technical data – General information

Width	50 mm
Height	35.7 mm
Lowness	117 mm
Weight	Approx. 270 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	 24 VDC (-25 % … +30 %) 24 VDC (-25 % … +30 %)
Supply current Logic and sensor current I_{LS} Actuator current I_A	 Typical 50 mA Typical 25 mA + actuators (max. 800 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 (System bus) connection	Shielded M12 connector, B-coded, 5 poles

3.7.4 Incremental Encoder Interface

Table 11: Technical data − Incremental encoder interface

Number of inputs	2 (X3, X4)
Connection type	M12 connectors, A-coded, 8 poles, shielded
Transmitter supply	5 V/24 V, max. 300 mA
Transmitter connection	A, A\, B, B\, C, C\
Signal input	RS-422 differential signal
Counter	32 bits
Max. Operating Frequency	1 MHz
Zero impulse latch	32 bits
Cable length, shielded	≤ 30 m

3.7.5 SSI Encoder Interface

Table 12: Technical data − SSI encoder interface

Number of inputs	2 (X3, X4)
Connection type	M12 connectors, A-coded, 8 poles, shielded
Transmitter supply	5 V/24 V, max. 300 mA
Transmitter connection	D+, D-, CL+, CL-
Signal input	+D, -D: RS-422 differential signal
Signal output	CL+, CL-: RS-422 differential signal
Data width	8 bits … 32 bits
Baud rate	62.5 kHz … 2 MHz
Cable length, shielded	≤ 30 m

3.7.6 Digital Inputs

Table 13: Technical data − Digital inputs

Number of inputs	4 (X1, X2)
Connection type	M12 connectors, A-coded, 5 poles, shielded
Connection technology	2- or 3-wire
Front end cycle time (hardware)	Max. 3 µs
Front end jitter/skew	< 2 µs
Input characteristic	Type 3, acc. to IEC 61131-2
Signal voltage (0) Signal voltage (1)	-3 V … +5 VDC +15 V … +30 VDC
Input wiring	High-side switching
Input voltage U_{IN}	24 VDC (-3 VDC < U_{IN} < +30 VDC); Supply from U_A strongly recommended.
Connection of 2-wire BEROs	Maximum of 1.5 mA standby current permissible
Cable length, shielded	≤ 30 m

3.7.7 Input Characteristic

Table 14: Technical data − Input characteristic

Input current at U_{IN} = 0 V	Typ. 0 mA
at U_{IN} = 5 V	Typ. 2.0 mA
at U_{IN} = 15 V	Typ. 2.5 mA
at U_{IN} = 24 V	Typ. 2.9 mA
at U_{IN} = 30 V	Typ. 3.2 mA

3.7.8 Digital Outputs

Table 15: Technical data − Digital outputs

No. of outputs	4 (X1, X2)
Connection type	M12 connectors, A-coded, 5 poles, shielded
Connection technology	2- or 3-wire
Output voltage	≤ U_A
Output current (channel/module)	0.1 A/0.4 A
Output current, short time, 1 s (channel)	0.2 A
Response time	approx. 10 µs (output, 90 %)
Pulse width modulation (PWM) Pulse frequency Pulse duty factor Resolution	 100 Hz … 10 kHz 0 … 100 % 16 bits (≤ 1 kHz), 12 bits (>1 kHz)
Output protection	Short-circuit/overload protection (thermal shutdown)
Voltage drop against U_A at 100 mA	maximum 1.7 VDC
Leakage current in OFF state	Typ.150 µA
Output circuit	Push/pull

3.7.9 Information for Actuator Selection

Table 16: Technical data − Actuator selection

Delay time HW from 0 to 1 (0 – 90 %) from 1 to 0 (0 – 90 %)	 < 10 µs (resistive load) < 10 µs (resistive load)
Rise time from 0 to 1 from 1 to 0	 Typical 10 µs (resistive load) Typical 10 µs (resistive load)
Cable length, shielded	≤ 30 m
Resistance to recovery	≤ 0.2 A (error: 1 channel)
Type of load	Inductive, resistive loads and lamps
Switching frequency	Inductive load, approx. 20 Hz Resistive load, approx. 10 kHz Lamp load, approx. 500 Hz
Parallel switching of 2 outputs	not permitted as push/pull is the final stage
Type of protective circuit	External protection (e.g., recovery diodes)
Output resistance	< 6 Ω

3.7.10 Effect of Operating States

Table 17: 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

3.7.11 Configurable Functions of the Incremental Encoder Interfaces

Table 18: Technical data − Configurable functions of the incremental encoder interfaces

Multiple edge detection	1-fold 4-fold
Noise filter	1 / 2 / 4 µs / OFF

3.7.12 Configurable Functions of the SSI Encoder Interfaces

Table 19: Technical data − Configurable functions of the SSI encoder interfaces

Length data range	8 bits … 24 bits (default 13)
Data length of the speed	0 bits … 24 bits (default 12)
Speed suppression by the encoder	Off / On
Bus speed of the SSI bus	62.5 / 125 / 250 / 500 kHz / 1 / 2 MHz
Parity	None / odd / even
Coding	Binary / Gray
Alarm bit evaluation	Off / On

3.7.13 Configurable Functions of the Cam Output

Table 20: Technical data − Configurable functions of the cam outputs

Cam lower value	Value (INT32)
Cam upper value	Value (INT32)
Cam output	Deactivated / DO 1 … 4
Cam active	Off / On

3.7.14 Configurable Functions of the PWM Outputs

Table 21: Technical data − Configurable functions of the PWM outputs

Duty cycle	0 … 100 % (default 50 %)
Frequency	100 / 200 / 500 Hz / 1 / 2 / 5 / 10 kHz
Substitute value	0 … 100 % (default 50 %)
Substitute value strategy	Switch substitute value/keep last value

3.7.15 Configurable Functions of the Digital Inputs/Outputs

Table 22: Technical data − Configurable functions of the digital inputs/outputs

Operating mode (per module)	DO / DI / DIO
Input filter (per channel)	16 / 65 / 250 µs / 1 ms / Out
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

3.7.16 Diagnostics

Table 23: Technical data − Diagnostics

Encoder (channel by channel)	Over-/underflow, wire break, limit value violation (min./max.)
DIOs (channel by channel)	Overtemperature actuators
Supply (per module)	Short-circuit of the sensor/actuator supply Undervoltage (U_{LS} + U_A)

3.7.17 Process Image

Table 24: Technical data − Process image

Process data width	2 x 4-byte encoder value 2 x 2-byte control data 1-byte status DI/control DO
Synchronous diagnostics (optional)	2 bytes

3.7.18 Indicators

Table 25: Technical data − Indicators

SB: S-Bus status	LED (green/red/orange)
F: Error status	LED (red)
Ch1 + Ch2: Encoder status	LED (green/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

3.7.19 Isolation

Table 26: Technical data − Isolation

Channel - Channel	No
U_{LS}, U_A, S-bus	500 VDC each

3.8 Approvals

The following approvals have been granted to 767-5201 module:

CE	Conformity Marking	
cULus	cULus	UL508

The following Ex approvals are pending for 767-5201 module:

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 767-5201 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.

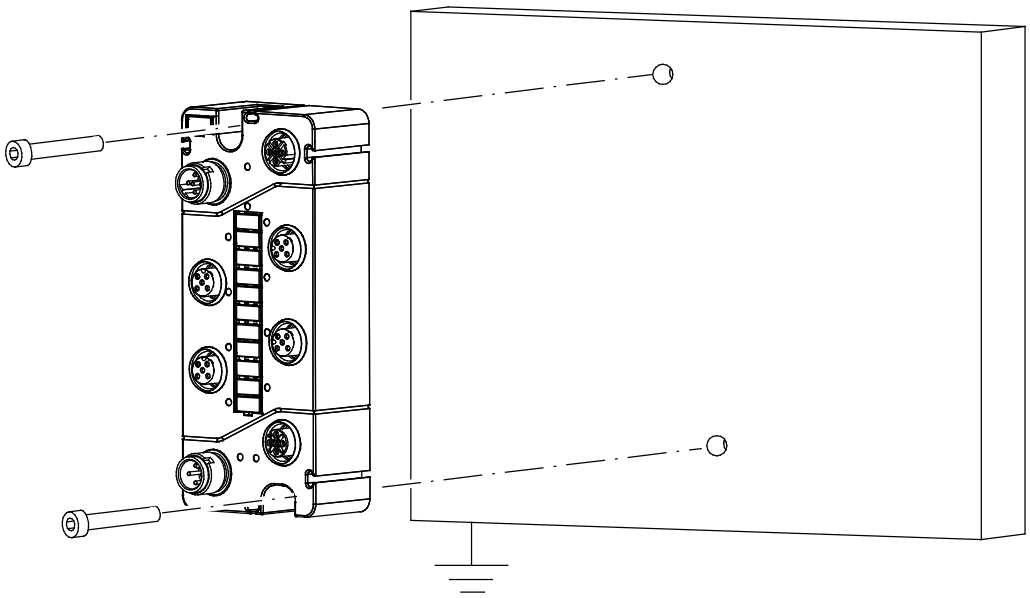


Figure 8: Mounting the module on a grounded frame or to another grounding point

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.

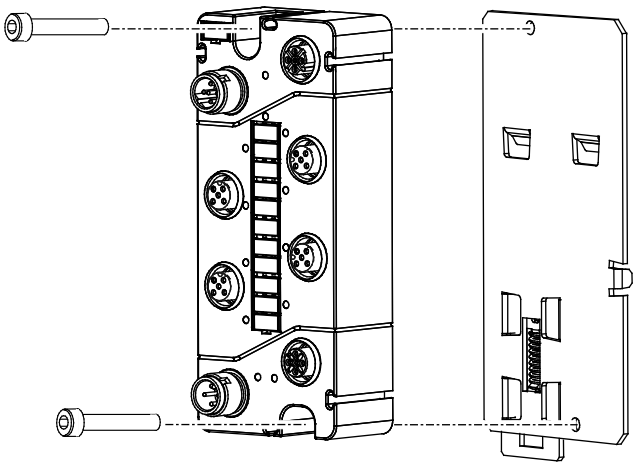


Figure 9: Fastening to the carrier rail adapter

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.

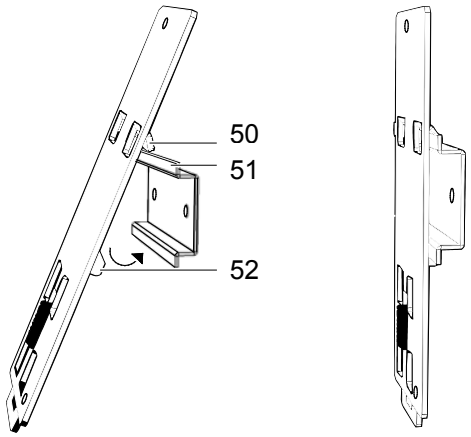


Figure 10: Mounting the carrier rail adapter (exemplary)

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.

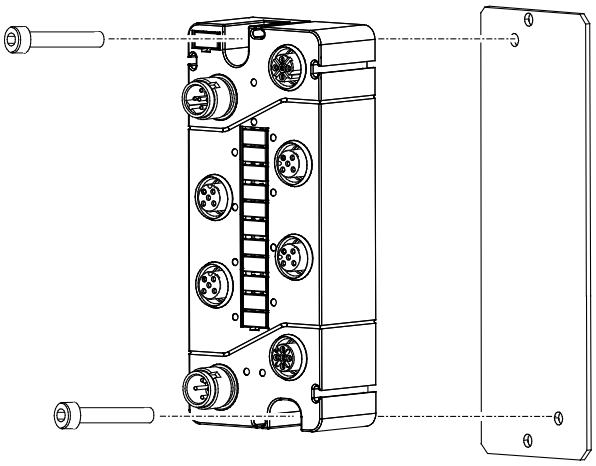


Figure 11: Fastening to the profile adapter

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.

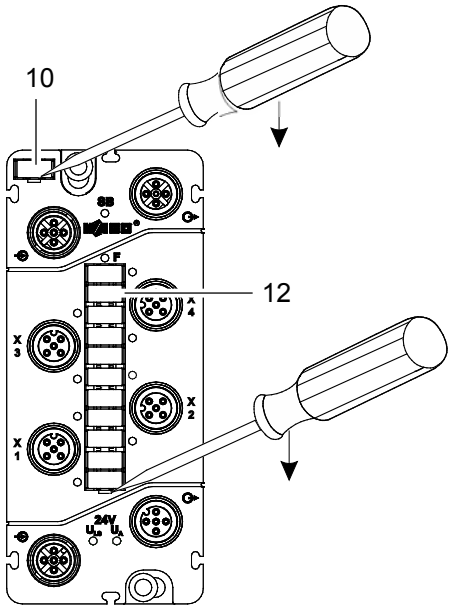


Figure 12: Replacing the marking spaces

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.

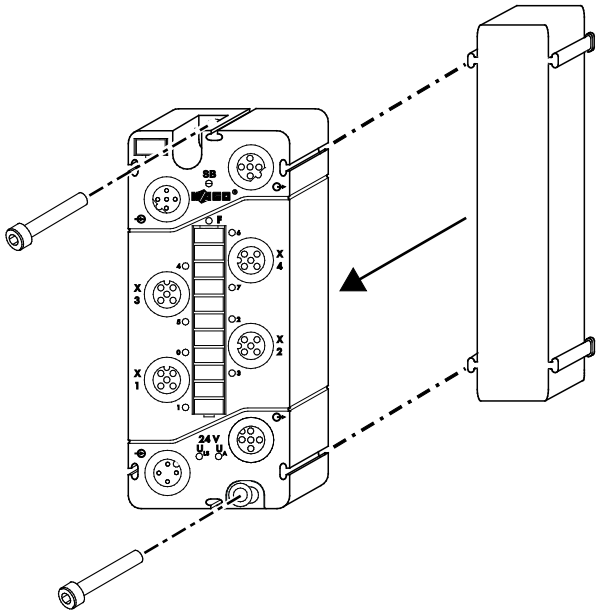


Figure 13: Attaching a spacer to a module

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.

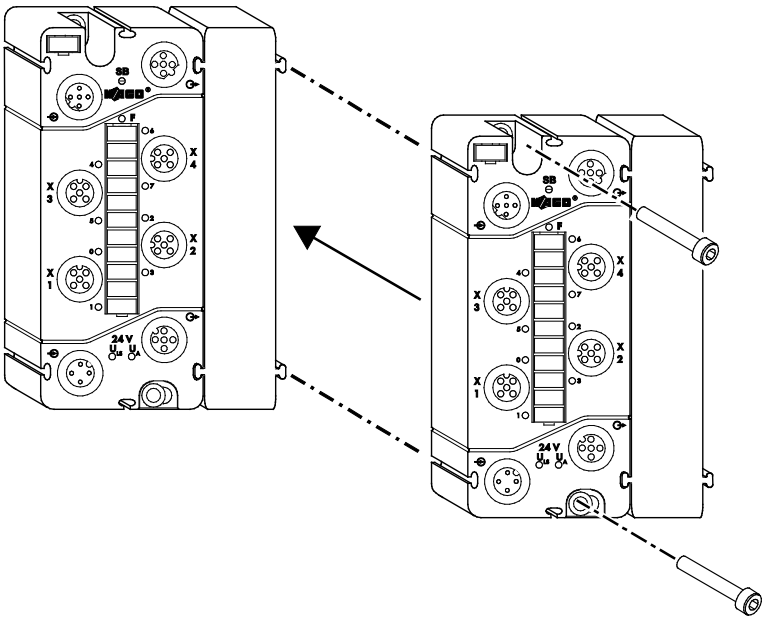


Figure 14: Attaching another module with a spacer

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

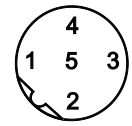
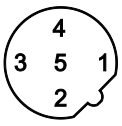
The S-BUS is used for communication between a fieldbus coupler and the connected 767 Series components.

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 27: 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.

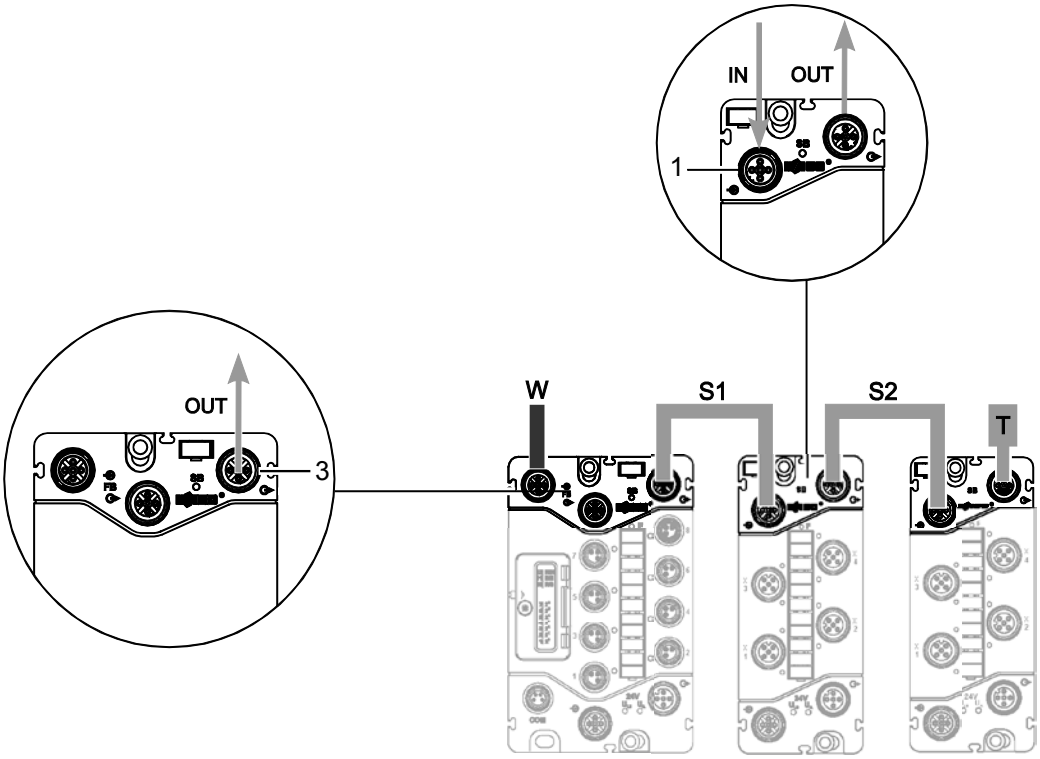


Figure 15: S-BUS connected to a fieldbus coupler and modules

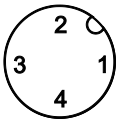
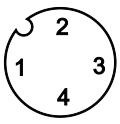
5.4 Connecting the Supply Cable

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 28: 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.

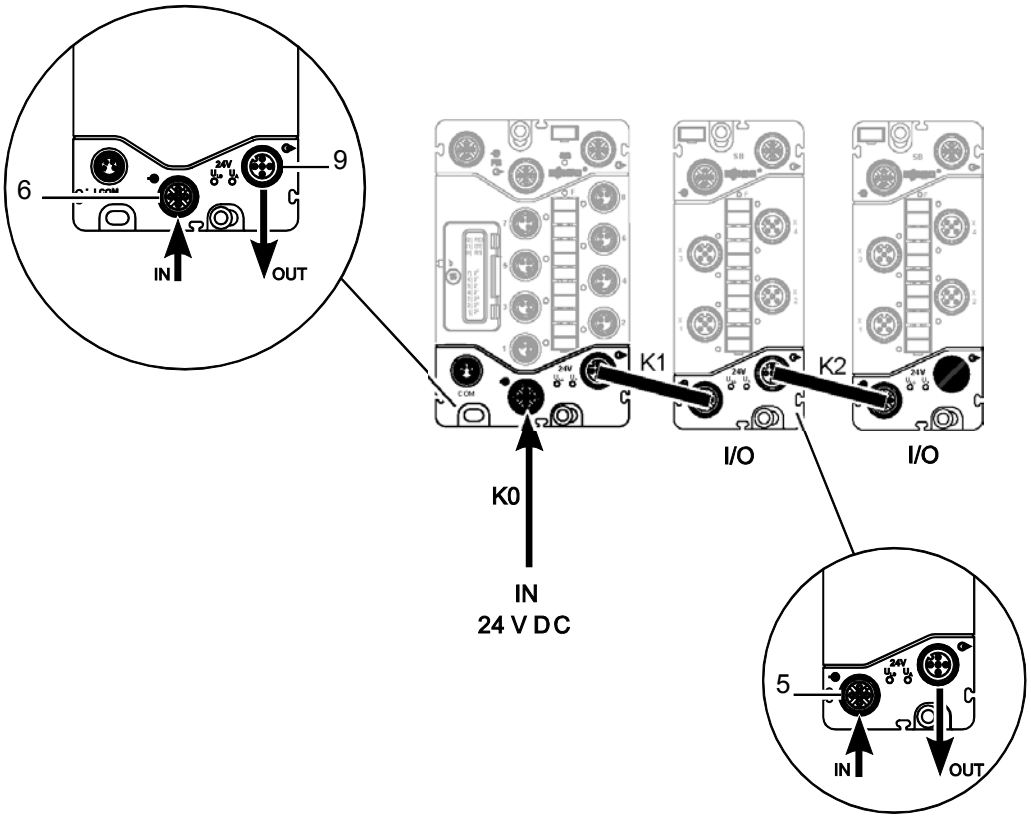


Figure 16: Supply cable connected to a fieldbus coupler and modules

5.5 Connecting Interface Cables

The interface cables are used to connect external devices with a TTL Incremental/ SSI Encoder Interface.

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

Table 29: Digital in- and -outputs: Connection assignment

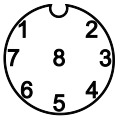
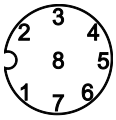
Connection		**Pin assignment**		
IN/OUT  X3	IN/OUT  X4	**Pin**	**TTL Incr.-Encoder**	**SSI Encoder**
		1	GND	GND
		2	+5 V/24 V	+5 V/24 V
		3	A	+CL
		4	A\	-CL
		5	B	+D
		6	B\	-D
		7	C	n.c.
		8	C\	n.c.
		Housing	Shield (screen)	Shield (screen)

Table 30: Digital in- and -outputs: Connection assignment

Pin	**X3**	**X4**
7	Input 6 (DI 6)	Input 8 (DI 8)
8	Input 6\ (DI 6)	Input 8\ (DI 8)

To connect the external devices to the TTL Incremental/ SSI Encoder 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 TTL Incremental/ SSI Encoder 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.

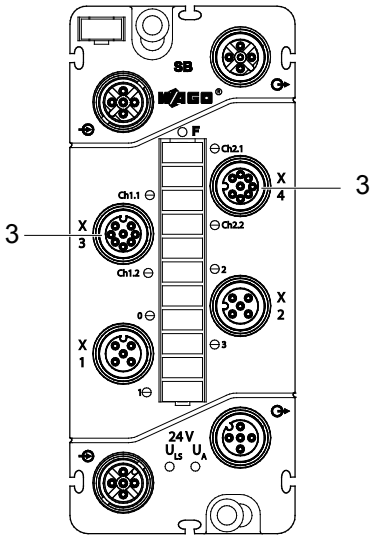


Figure 17: Connectors of interfaces

5.6 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 31: Digital inputs and outputs: Pin assignment

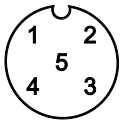
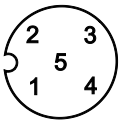
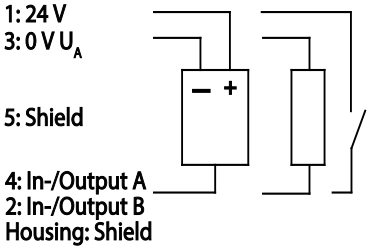
Connection		Connection Scheme
IN/OUT  X1	IN/OUT  X2	

Table 32: Digital in- and -outputs: Connection assignment

Pin	X1	X2
2	In-/Output 2 (DIO2)	In-/Output 4 (DIO4)
4	In-/Output 1 (DIO1) or PWM1	In-/Output 3 (DIO3) or PWM2

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.

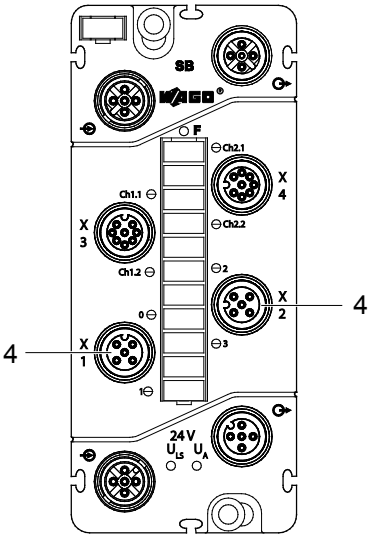


Figure 18: Connectors of sensors/actuators

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 767-5201 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 33: 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.

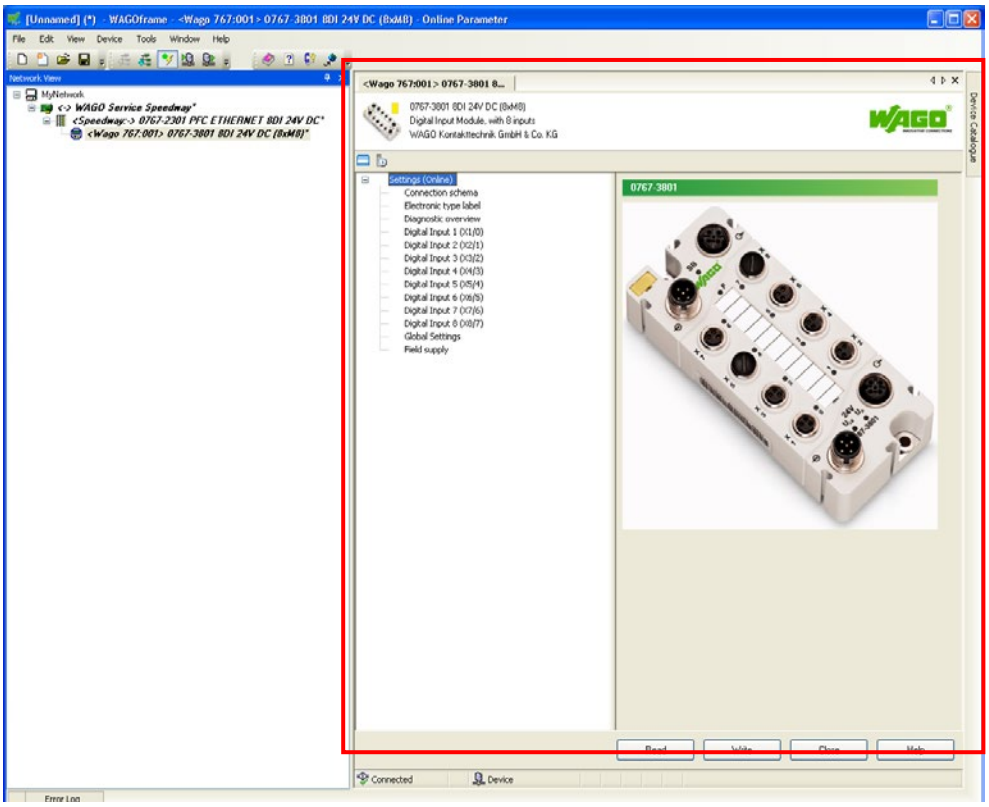


Figure 19: Example of an open DTM, including parameters

7.1 Electronic Type Label

Table 34: 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.

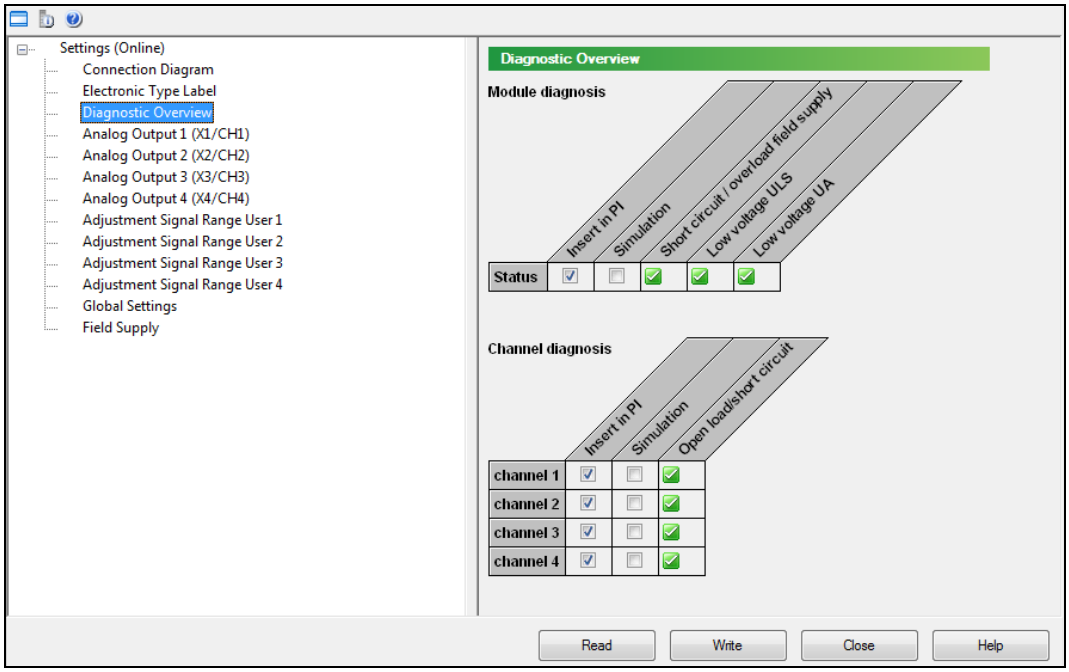


Figure 20: Example of the diagnostic overview of a module (information may differ from the actual module)

Table 35: 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 36: 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. This can place machine components in a dangerous condition, and personnel and machine may be 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 F-LED of the module illuminates. If the logic and sensor supply (U_{LS}) is redirected, it can lead to malfunctions in downstream modules. **Note** **Switching Threshold** The switching threshold is typically 17 V.
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. This can place machine components in a dangerous condition, and personnel and machine may be 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 F-LED of the module illuminates. If the actuator supply (U_A) is redirected, it can lead to malfunctions in the downstream modules. **Note** **Switching Threshold** The switching threshold is typically 17 V.
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 37: 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 Counter Parameters

Table 38: Overview of adjustable parameters for the counter

Parameter	Description:
Designation	Enter a designation for the connection. Max. 40 characters can be entered.
Simulation	Select this checkbox to switch on the simulation. *Default setting: unselected*
Counter function	Select the counter function in this field. You can select the following settings: - Incremental position encoder * - SSI encoder
Counter mode	Select the counter mode in this field. You have the following options: **- Event counter*** The counter counts the pulses detected at the counter input. **- Peak time/frequency** The counter counts the pulses that are detected within an adjustable gate time at the counter input. **- Peak time/duration** The counter determines the pulse duration of the applied pulses in µs.
Substitute 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: - Set substitute value* - Hold last value**
Substitute value	Enter the process value here that should be transmitted in case of error. In case of error (e.g. low voltage U_A), this value is used during the "Switch to substitute value" substitute value strategy. 0* 1
Counter direction	The current counting direction of the counter is indicated in this field. This is due to the encoder connected (incremental encoder or SSI encoder). - Up (0)* - Down (1)
Counter reading	This field indicates the current counter reading
Factor	Enter a factor here, by which the counter value should be multiplied. The counter value is the value that the module has actually detected (counted). The product is output as a process value. The process value is the value that is transmitted to a controller (e.g. the PLC). By using a factor, you can carry out a predefined conversion, e.g. a standardization of the counter value to degrees.
Process value	The process value is displayed in this field.
Speed	The speed is indicated in this field.

Table 38: Overview of adjustable parameters for the counter

Parameter	Description:
Lower limit	The lower limit value can be defined here. If the counter reading lies outside of the defined range, a limiting value signal is generated – this is available as a status bit in the process image. Enter a value (-2147483648 … 2147483647) here to serve as the starting value or the reference value for controlling the switching output. *Default setting: -2147483648*
Upper limit	The upper limit value can be defined here. If the counter reading lies outside of the defined range, a limiting value signal is generated – this is available as a status bit in the process image. Enter a value (-2147483648 … 2147483647) here to serve as the starting value or the reference value for controlling the switching output. *Default setting: 2147483647*
Lower limit value status	The status of the lower limit value is indicated in this field. *Default setting: inactive*
Upper limit value status	The status of the upper limit value is indicated in this field. *Default setting: active*
Wire break	The wire break detection status is indicated in this field. *Default setting: active*
Cam detected	The cam detection status is indicated in this field. *Default setting: inactive*
Gate time	Enter a value for the gate time here: 1 ms 10 ms 100 ms 1000 ms* 10000 ms
Preset value	Define a preset value here that should be used as the current counter value when an assigned input signal is detected. 0* This field is only displayed if you have selected "Incremental encoder" as the encoder in the **Counter function** field.

Table 38: Overview of adjustable parameters for the counter

Parameter	Description:
Preset input	Use this field to select the input that will be used as the trigger for the preset function. You can select the following settings: - deactivated* - Connector 1 (X1,CH0) DI1 - Connector 2 (X1,CH1) DI2 - Connector 3 (X2,CH2) DI3 - Connector 4 (X2,CH3) DI4 - Connector 6/8 (X3,CH5/X4,CH7) DI6/DI8 **Note** **Counter channel** Connector 6 is indicated for counter channel 1, and connector 8 for counter channel 2. This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.
Preset status	The status of the preset input is indicated in this field. *Default setting: inactive* This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.
Apply preset value	Check this control box in order to apply the preset value as the counter value. *Default setting: unselected* This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.
Latch input	Use this field to select the input that should be used as the trigger for saving (latching). You can select the following settings: - deactivated* - Connector 1 (X1,CH0) DI1 - Connector 2 (X1,CH1) DI2 - Connector 3 (X2,CH2) DI3 - Connector 4 (X2,CH3) DI4 - Connector 6/8 (X3,CH5/X4,CH7) DI6/DI8 **Note** **Counter channel** Connector 6 is indicated for counter channel 1, and connector 8 for counter channel 2. This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.
Latch unlocked	Select this checkbox to apply the latch value. *Default setting: unselected* This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.

Table 38: Overview of adjustable parameters for the counter

Parameter	Description:
Latch value	The current latch value is indicated in this field. This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.
Latch status	The status of the latch input is indicated in this field. *Default setting: inactive* This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.
State gate	This field indicates the gate status. This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.
Gate input	Use this field to select the input that will be used as the gate input. You can select the following settings: - deactivated* - Connector 1 (X1,CH0) DI1 - Connector 2 (X1,CH1) DI2 - Connector 3 (X2,CH2) DI3 - Connector 4 (X2,CH3) DI4 - Connector 6/8 (X3,CH5/X4,CH7) DI6/DI8 **Note** **Counter channel** Connector 6 is indicated for counter channel 1, and connector 8 for counter channel 2. This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.
Multiturn count	Enter the number of revolutions here, after which the preset function should be triggered. If a value N greater than 1 is entered, the preset signal is only evaluated every n^{th} time. *Default setting: 1* This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.
Counter overrun status	This field indicates whether a counter overrun has occurred. The indicator becomes inactive again as soon as the counter reading reaches half of the total counting range. This field is only displayed when you have selected "Incremental encoder" as the encoder in the **Counter function** field.

Table 38: Overview of adjustable parameters for the counter

Parameter	Description:
Multiple slope detect	Set the type of encoder evaluation here: **Single (1-fold) (positive edge)*** Only detects rising edges of the signal at the A track of the square wave signal. **Quadruplicate (4-fold)** Detects both edges of the two square wave signals. (Cycle quadruplication). This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.
Noise filter	Select the time for the noise filter here. When the noise filter is selected, interference with the incremental encoder signal is filtered. You have the following setting options: Off* 1 µs 2 µs 4 µs This field is only displayed when you have selected "Incremental position encoder" as the encoder in the **Counter function** field.

* Factory default setting
** The last value is the value that is read on the contact prior to the occurrence of the corresponding error. This can be, for example, an input value or a "simulation value".

7.3.1 Cam Parameters

The cam function switches an output whenever the current counter reading appears in a selectable value range (minimum/maximum value).

You can configure 4 cams per counter, whereby the cams are respectively assigned to one of the counter channels. Each cam can be mapped onto separate or common DO channels. If overlaps occur, the outputs are logically connected using an OR function.

Table 39: Overview of adjustable cam parameters

Parameter	Description:
Cam enable	Activate or deactivate the cam function here. - Off* - On
Cam lower limit	Select the lower switching value for the cam. -2147483648 … 2147483647 *Default setting: 0*
Cam upper limit	Select the upper switching value for the cam. -2147483648 … 2147483647 *Default setting: 0*
Cam output	Select the output that should be switched when the cam is detected. You can select any output DO1 … DO4 that is not assigned to another function (e.g. PWM): - deactivated* - Connector 1 (X1,CH0) DO1 - Connector 2 (X1,CH1) DO2 - Connector 3 (X2,CH2) DO3 - Connector 4 (X2,CH3) DO4

* Factory default setting

7.3.2 SSI Encoder Parameters

If you have selected the SSI encoder as the counter function, you can parameterize as follows:

Table 40: Overview of adjustable parameters for the SSI encoder

Parameter	Description:
Data length (single-turn data length)	Enter the number of the single-turn bits for the connected encoder here. 8 … 24 bits *Default setting: 13*
Multiturn data length (multi-turn data length)	Enter the data length of the speed of the multi-turn bit for the connected encoder here. 0 … 24 bits *Default setting: 12*
Single turn examination	Select here, if only the rotational angle of the encoder should be output. The speed will be thereby hidden. **Checkbox unselected:*** Speed is output **Checkbox selected:** Speed is not output
Clock rates	Select the bus speed for the SSI bus here. You have the following options: 6.25 kHz* 125 kHz 250 kHz 500 kHz 1 MHz 2 MHz
Parity	In this box, select the parity setting. You have the following options: - No* - Even - Odd
Encoding format	Select the code that corresponds to the connected SSI encoder: - Binary* - Gray

Table 40: Overview of adjustable parameters for the SSI encoder

Parameter	Description:
Alarmbit evaluation	Select whether the SSI encoder outputs an alarm bit. This alarm bit is evaluated by the module and forwarded as a diagnostic message: **Checkbox unselected:*** No alarm bit is output. **Checkbox selected:** An alarm bit is output.
Alarm bit	This field indicates the status of the alarm bit detected, if alarm bit evaluation has been selected. *Default setting: inactive*

* Factory default setting

7.4 Pulse Width Modulation Parameters

You can configure two outputs as pulse width modulation (PWM) channels.

Table 41: Overview of adjustable parameters for pulse width modulation

Parameter	Description:
PWM enable	Activate the PWM channel here. The assigned connection is parameterized as an output and outputs the PWM signal The DO1 connection is permanently assigned to channel 1, connection DO3 to channel 2. **Checkbox unselected:*** PWM channel unselected. **Checkbox selected:** PWM channel selected.
Ratio	The duty cycle of the PWM channel is indicated in this field. 0 … 100% *Default setting: 50%*
Frequency	Select the frequency for the pulse width modulation (PWM) in this field. You have the following options: 100 Hz 200 Hz 500 Hz 1 kHz* 2 kHz 5 kHz 10 kHz
Substitute strategy	This is used, e.g. to output the substitute value or the last output value in the event of a fieldbus interruption. You have the following options: - Set substitute value* - Hold last value**
Substitute value	Enter the process value here that is output in case of error. In the case of an error (e.g. fieldbus interruption), this value is used with the "Switch to substitute value" strategy. 0 … 100% *Default setting: 50%*

* Factory default setting
** The last value is the value output at the contact prior to the occurrence of the corresponding error. For example, this can be a process value or "manual operation value".

7.5 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 42: Overview of the connection mode

Parameter	Description:
Function mode	- Digital Output Operation of the respective connection as a digital output. - Digital Input Operation of the respective connection as a digital input.

7.5.1 Connection Mode "Digital Output"

Table 43: Overview of adjustable parameters for the digital outputs

Parameter	Description:
Function mode	Mode display
Designation	Enter a designation for the connection. Max. 40 characters can be entered.
Output value	The output status 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 selected, the field becomes a checkbox. Activate the checkbox to output the status "1" on the output independent of the control unit.
Signal inverting	Select here whether the current process value should be released as an inverted output value. **Checkbox unselected:*** Output signal is output as shown in the process image. **Checkbox selected:** Output signal is output as an inversion of that shown in the process image.
Substitute strategy	This is used, e.g. to output the substitute value or the last output value in the event of a fieldbus interruption. You have the following options: - Set to substitute value* - Hold last value**
Substitute value	Enter the process value that is output in case of error. In the case of an error (fieldbus interruption), this value is used with the "Switch to Substitute Value" strategy. **Checkbox unselected:** 0* **Checkbox selected:** 1
Manual operation	Activate this checkbox to define the output value independently from the control unit. When manual operation is selected, 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 display fields for the diagnoses become checkboxes.

Table 43: Overview of adjustable parameters for the digital outputs

Parameter	Description:
Actuator restart mode	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. - Diagnostic acknowledge 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. **Note** **Note about diagnostic acknowledgement** When using fieldbus couplers that do not support diagnostic acknowledgement, disabled outputs may remain OFF.
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* **Note** **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 selected, there is an overtemperature on the respective channel (only enabled when the actuator output is switched on).

* Factory default setting
** The last value is the value output at the contact prior to the occurrence of the corresponding error. For example, this can be a process value or "manual operation value".

7.5.2 Connection Mode "Digital Input"

Table 44: Overview of adjustable parameters for the digital inputs

Parameter	Description:
Function mode	Mode display
Designation	Enter a designation for the connection. Max. 40 characters can be entered.
Input value	The input status is indicated in this field. When simulation is selected, the field becomes a checkbox. Activate the checkbox to simulate the status "1" in the process image independent of the input.
Signal inverting	You can invert the currently pending signal input here. **Checkbox unselected*:** Input signal is shown in the process image as pending at the input. **Checkbox selected:** Input signal is shown as inverted in the process image.
Filter time	Set the input filter for the measured signals here. You have the following options: - Off - 16 µs - 65 µs - 250 µs - 1 ms
Substitute strategy	This is used, e.g. to output the substitute value or the last output value in the event of a fieldbus interruption. You have the following options: - Set to substitute value* - Hold last value**
Substitute value	Enter the process value that is output in case of error. In the case of an error (fieldbus interruption), this value is used with the "Switch to Substitute Value" strategy. **Checkbox unselected:** 0* **Checkbox selected:** 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.

* Factory default setting
** The last value is the value output to the contact prior to the occurrence of the corresponding error. For example, this can be a process value or "manual operation value".

7.6 Global Settings

Table 45: 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	

7.7 Field Supply Parameters

Table 46: Parameters for the field supply

Parameter	Description:
Enable field supply	Switch on the field supply here. *Default setting: selected*
Autorestart delay	In the event of a short circuit, the field supply is switched off for a parameterizable amount of time. Use this field to enter the time delay (in intervals of 100 ms), after which the field supply is to be restarted.. If the short circuit condition persists, the process is repeated. *Default setting: 10*
Supply voltage	Select the supply voltage here. You have the following options: Field supply X1 and X2 24 V* Field supply X3 and X4 5 V 24 V*
Diagnostic Simulation	The simulation can be used to simulate a short circuit. *Default setting: unselected*
Short circuit/Overload	"Simulation diagnosis" unselected: If a short circuit/open load occurs, the appropriate diagnosis is displayed here. If the "Simulation diagnosis" parameter has been selected, you can simulate the associated error by selecting the appropriate parameter.

* Factory default setting

7.8 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.

7.9 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 Input Data

The process image for the process data sent to the fieldbus coupler from the module is 13 bytes long.
If you parameterize synchronous diagnostic data for the module, the process image increases to 15 bytes.
The structure of the bytes is shown in the following figure:

Table 47: Process image of input data

Byte 0	7 … 0	Counter 1 process value
Byte 1	15 … 8	
Byte 2	23 … 16	
Byte 3	31 … 24	
Byte 4	7 … 0	Counter 1 status
Byte 5	15 … 8	
Byte 6	7 … 0	Counter 2 process value
Byte 7	15 … 8	
Byte 8	23 … 16	
Byte 9	31 … 24	
Byte 10	7 … 0	Counter 2 status
Byte 11	15 … 8	

Table 47: Process image of input data

Byte 12	7 … 0	Digital inputs status
		Displays the status of the digital inputs 1_B: DI1 1_B: DI2 1_B: DI3 1_B: DI4 1_B: Always 0 1_B: DI6 1_B: Always 0 1_B: DI8
Byte 13	7 … 0	Diagnostics: Byte 0
		1_B: Short circuit DO1 1_B: Short circuit DO2 1_B: Short circuit DO3 1_B: Short circuit DO4 1_B: Short circuit supply to channel X1, X2 1_B: Short circuit supply to channel X3, X4 1_B: Low voltage U_{LS} 1_B: Low voltage U_A
Byte 14	7 … 0	Diagnostics: Byte 1
		1_B: Wire break X3 1_B: Wire break X4 1_B: Channel 1 alarm bit set in the SSI data stream 1_B: Channel 2 alarm bit set in the SSI data stream 1_B: Not used, always 0

The byte meaning is identical for input and output data – in this case, the output data serve to confirm the diagnosis.

8.2 Output Data

The process image for the process data sent from the fieldbus coupler to the module is 13 bytes long.
If you parameterize synchronous diagnosis confirmation for the module, the process image increases to 15 bytes.
The structure of the bytes is shown in the following figure:

Table 48: Process image of output data

Byte 0	7 … 0	Set value counter 1
Byte 1	15 … 8	
Byte 2	23 … 16	
Byte 3	31 … 24	
Byte 4	7 … 0	Control byte counter 1
Byte 5	15 … 8	
Byte 6	7 … 0	Set value counter 2
Byte 7	15 … 8	
Byte 8	23 … 16	
Byte 9	31 … 24	
Byte 10	7 … 0	Control byte counter 2
Byte 11	15 … 8	

Table 48: Process image of output data

Byte 12	7 … 0	Digital outputs
		1_B: DO1 1_B: DO2 1_B: DO3 1_B: DO4 1_B: Not used, always 0
Byte 13	7 … 0	Diagnostics confirmation: Byte 0
		1_B: Short circuit DO1 1_B: Short circuit DO2 1_B: Short circuit DO3 1_B: Short circuit DO4 1_B: Short circuit supply to channel X1, X2 1_B: Short circuit supply to channel X3, X4 1_B: Low voltage U_{LS} 1_B: Low voltage U_A
Byte 14	7 … 0	Diagnostics confirmation: Byte 1
		1_B: Wire break X3 1_B: Wire break X4 1_B: Channel 1 alarm bit set in the SSI data stream 1_B: Channel 2 alarm bit set in the SSI data stream 1_B: Not used, always 0

9 Counter Function

The module also has available two mutually independent counter channels, which are functionally identical and can be parameterized independently from each other.

Each channel can be operated as an incremental encoder input or as an SSI encoder input.

Parameterization Limitations

There are a few limitations for the parameterization of functions, which depend on the mode selected and on the parameters themselves:

- If one of the DI1 … DI8 inputs is assigned a function (Gate, Preset, Latch), then it is no longer available for other functions.
- The DI1 … DI4 or DI6 input channels can be selected for counter channel 1, inputs DI1 … DI4 or DI8 for counter channel 2.
- If one of the channels is parameterized as a DO1 … DO4 output, then it can no longer be assigned to one of the above-mentioned functions.
- Channels DO1 or DO3 can be used as PWM outputs. They must first be parameterized as outputs for this purpose.
- A channel can only be used for the cam function if it was previously set as an output.

9.1 Operating Modes

There are three operating modes available for the counter:

- **Event counter**
  This counts the pulses detected on the counter input.
  If a gate has been defined, then the counter function can also be selected and unselected.

- **Gate time counter/Frequency counter**
  This counts the pulses within a definable gate time (time window in which the measurement takes place).
  The gate time can be defined in a range from 1 ms to 10,000 ms.
  A gate time of 1 s results in the frequency of the input signal in Hz.
  The gate time counter can be parameterized using the process data.

- **Gate time counter/Cycle duration**
  The cycle duration of the signal is determined within the configurable gate time (averaging) and output as a process value (in µs).
  The process value results from the reciprocal value of the Frequency * 1 million.

9.2 Controlling and Monitoring the Counter via the Process Data

The status and control bytes that can be used to monitor and control the counter will be subsequently explained:

9.2.1 Status Bytes

The counter reading is output via the status bytes in the process image, which are defined as follows:

Table 49: Status byte S0

Status byte S0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Upper limit value	Lower limit value	Over/ underrun	Cam status	Preset status	Counting direction status	Gate status	Latch status

Latch status	Current status of the latch signal.	
	0	Waiting for external latch event.
	1	External latch event has occurred.
Gate status	Current status of the gate counter.	
	0	Gate is locked.
	1	Gate is unlocked.
Counting direction status	0	Counting direction forwards.
	1	Counting direction backwards.
Preset status	0	Waiting for preset input.
	1	Preset has been triggered.
Cam status	0	No cam is switched.
	1	At least one cam is switched.
Over/underrun	1	Counter over/underrun detected.
Lower limit value	1	Value has fallen below lower limit value
Upper limit value	1	Upper limit value exceeded

Table 50: Status byte S1

Status byte S1							
Bit 15	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
X	Select value for process image		Set ACK register	Selected register for set value			

Selected register for set value	0	Limit_lower
	1	Limit_upper
	2	Counter value
	3	Preset value
	4	PWM value
	5	Reserved
	6	Reserved
	7	Reserved
	8	Cam1_lower
	9	Cam1_upper
	10	Cam2_lower
	11	Cam2_upper
	12	Cam3_lower
	13	Cam3_upper
	14	Cam4_lower
	15	Cam4_upper
Set ACK register	1	Apply set value for selected register
Select value for process image	0	Process image counter value
	1	Process image latch value
	2	Process image speed
	3	A+B/A-B
X	No function, always 0.	

9.2.2 Control Bytes

The control bytes enable configuration of the counter using process data. The following functions are available:

Table 51: Control byte C0

Control byte C0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	0	0	Cam locked	Preset unlocked	Counting direction	Gate inhibit	Latch unlocked

Latch unlocked	The latch function is selected when this bit is set. During the next latch pulse at the assigned input, the current counter reading is stored as the latch value. At the same moment, the latch bit is set in the status byte. Additional latch pulses do not lead to a further update of the latch value. In order to repeat execution of the latch function, the bit 0 must have been previously reset.	
	0	Latch function is locked.
	1	Latch function is unlocked.
Gate inhibit	Control of the counter gate (only in cases where this is not controlled via inputs). The bit serves as the gate control when the gate function is not assigned to an input. The counter is selected when the bit is reset, and locked when the bit is set.	
	0	Gate is unlocked.
	1	Gate is locked.
Count Direction	The counter direction bit enables selection of the counter direction for "Counter" encoders, if this function has not been assigned to an input.	
	0	Counting direction forwards.
	1	Counting direction backwards.
Preset unlocked	This bit serves to unlock the preset function. If a preset signal is detected at the assigned input, the counter is set to the value defined as the preset value. At the same moment, the preset bit is set in the status byte. An additional signal at the input does not lead to a repeated execution of the function, so long as the preset bit has not been reset in the meantime.	
	0	Preset function locked.
	1	Preset function is unlocked.
Cam locked	This bit unlocks the cam function for the module. As long as the bit is not set, no cam outputs are switched.	
	0	Cam is unlocked.
	1	Cam is locked.
0	This value is always 0 and may not be changed.	

Table 52: Control byte C1

Control byte C1							
Bit 15	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
0	Select value for process image		Set register	Select register for set value			

Select register for set value	These bits enable the selection of the internal register, which is set to a new value using the set value written into the output data.		
	0	Limit_lower	
	1	Limit_upper	
	2	Counter value	
	3	Preset value	
	4	PWM value	
	5	Reserved	
	6	Reserved	
	7	Reserved	
	8	Cam1_lower	
	9	Cam1_upper	
	10	Cam2_lower	
	11	Cam2_upper	
	12	Cam3_lower	
	13	Cam3_upper	
	14	Cam4_lower	
	15	Cam4_upper	
Set register	This bit controls the application of the value into the selected register – it takes place during the transition from bit 0 to bit 1. The selection of the register and setting this bit may take place in the same cycle.		
	0 ->1: Set value		
Select value for process image	These bits enable the selection of the value that should be represented as the process value in the input data:		
	0	Process image counter value	Output of the internal counter reading or the last counter value read when using SSI.
	1	Process image latch value	Output of the counter reading read during the last latch pulse.
	2	Process image speed	Output of the current speed (based on the difference between the last two samples relative to the gate-time parameter.
	3	A+B/A-B	Output of the sum (Channel 1) or difference (Channel 2) of the two counter readings from channel 1 and channel 2.
0	This value is always 0 and may not be changed.		

9.2.3 Example for Controlling Two Counters via Process Data

Example 1: Preparation for the Latch Signal

Table 53: Example: Preparation for the latch signal

Binary [bit 15…0]	Hexadecimal	Description:
0xxx xxxx xxxx xxx1		Latch unlocked

Read cyclic status register until bit 0 = 1, then

001x xxxx xxxx xxxx		Select latch value for the process image

Example 2: Set Counter Value as Default

Table 54: Example: Set counter value as default

Binary [bit 15…0]	Hexadecimal	Description:
00xx xxxx xxxx xxxx		Output status

xxx1 0010 xxxx xxxx		Apply default value as counter value
00xx xxxx xxxx xxxx		Output status

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).

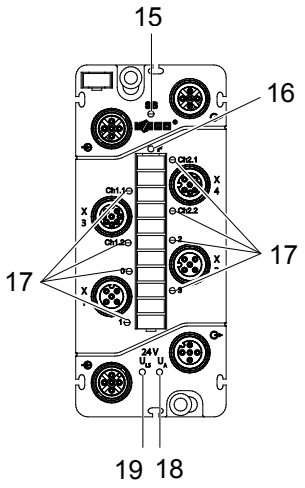


Figure 21: LEDs indicating operational messages

Table 55: 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 55: 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.

Note

Indicator Functions

The indicator functions for inputs Ch1.1 … Ch2.2 (LED 17) depend on the operating mode selected for the interface (incremental encoder interface or SSI encoder interface).

Table 56: Operational messages 2

Pos.	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 components upstream of the 767 Series module. For more information, see the Section "Parameterization" > "Diagnostics Overview".
17	Ch 1.1 Ch 2.1	Green	Counter channel 1/2 detects pulses in the forwards direction.	
		Red	Short circuit or wire break at an input.	Repair the short circuit or wire break
	Ch 1.2 Ch 2.2	Green	Counter channel 1/2 detects pulses in the backwards direction.	
		Yellow (Not for SSI encoder interfaces)	A signal is detected at input DI6 or DI8 (e.g. Z track).	
	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 "Restart delay, actuator" parameter (Section "Parameterization" > "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.		

Table 57: Operational messages 3

No.	LED	Color/status	Cause	Remedy/information
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.

Note

Flashing behavior of LED 17
Regarding the LEDs that signal a pulse: The indicator was increased to 200 ms to improve perception.
The red LED is dominant in contrast to the green LED.
The green LED is dominant in contrast to the yellow LED.

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).

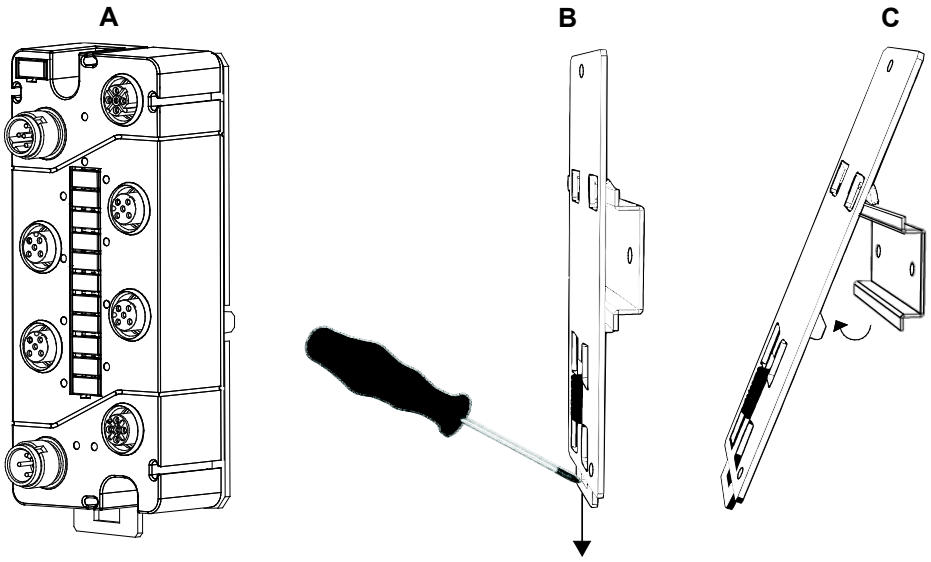


Figure 22: Removing the module (with the carrier rail adapter) from the carrier rail

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 for X1, X2 The function is only enabled when the field supply is switched on.	16	1	128	Diagnostic alarm
Short circuit/overload of field supply for X3, X4	16	2	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	Channel (1 … 4)	130	Diagnostic alarm
Wire break counter channel 1/2	31	1 … 2	133	Diagnostic alarm
Transmission error SSI channel 1/2	32	1 … 2	134	Diagnostic alarm

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

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