



WAGO-SPEEDWAY 767 System Description and Notes

767-xxxx

Version 1.0.0

Introduction

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Table of Contents

Introduction	2
1 Safety	4
1.1 Explanation of Symbols	4
1.2 Validity of this System Description	6
1.3 Proper Use	6
1.4 Personnel Qualification	6
1.5 Basic Safety Information	7
1.6 Safety Equipment	8
1.7 Technical Condition of Specified Devices	9
1.8 Notes on Operation	9
2 General information	10
2.1 Abbreviations and Symbols Used	10
2.2 Explanation of Item Numbers and Colors of WMBs	11
2.3 I/O Modules and Your Use	12
2.4 Scope of Delivery	13
3 System Description.....	14
3.1 Series 767 Components	15
3.2 Supply Layout	18
3.2.1 General Information	18
3.2.2 Supply Connections	19
3.2.3 Supply Voltages U_{LS} and U_A	20
3.2.4 Galvanic Isolation	21
3.2.5 Individual Supply and Supply Groups	25
3.2.6 Shielding	29
3.3 WAGOframe FDT/DTM Frame Application	30
3.4 CoDeSys	31
3.5 General Technical Data	32
List of Figures	34
List of Tables.....	35

1 Safety

1.1 Explanation of Symbols

 **DANGER**

Warning of physical injury

Indicates a direct hazard with a high level of risk which leads to death or serious physical injury if not avoided.

 **DANGER**



Warning of physical injury from electric current

Indicates a direct hazard with a high level of risk which leads to death or serious physical injury if not avoided.

 **WARNING**

Warning of physical injury

Indicates a possible hazard with a moderate level of risk, which may lead to death or (serious) physical injury if not avoided.

 **CAUTION**

Warning of physical injury

Indicates possible hazards with a low level of risk, which could lead to minor or moderate physical injuries if not avoided.

NOTICE

Warning of damage to equipment

Indicates a possible hazard that could lead to equipment damage if not avoided.

NOTICE



Warning of damage to equipment from electrostatic discharge

Indicates a possible hazard that could lead to equipment damage if not avoided.

Note

**Please note**

Indicates possible malfunction, which does not lead to equipment damage if it is not avoided.

Information

**Reference to additional information**

Indicates other sources of information which are not an integral part of this documentation, such as the Internet.

1.2 Validity of this System Description

This system description applies to all WAGO SPEEDWAY 767 Series devices.

1.3 Proper Use

The sole purpose of 767 series is to control applications. This consists of

- receiving field signals,
- processing field signals,
- emitting field signals,
- transmitting field signals to the higher-level controller, and
- receiving field signals from the higher-level controller.

The corresponding manuals contain instructions regarding the proper use of the individual devices.

The devices were developed for a work environment, which requires the IP 67 safety class (NEMA 6, 6P).

The fieldbus couplers can be expanded by up to 64 767 Series I/O modules, depending on the fieldbus used. The total expansion shall not exceed 500 m with a maximum distance of 50 m between I/O modules.

Uses other than those described here are not allowed.

1.4 Personnel Qualification

All sequences implemented on the fieldbus coupler may only be carried out by electrical specialists with sufficient knowledge in automation.

1.5 Basic Safety Information

This section includes an overall summary of the most important warning notices that are mentioned in each individual section of the manuals. They serve as a protection to your health and a protection from equipment damage on the 767 components (fieldbus coupler and the I/O modules connected to it). Read and adhere to the safety information described below before using the 767 components.



DANGER

Electric voltage!

Operate the 767 components exclusively with 24VDC 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 component has been in operation, allow it to cool before touching or use gloves.

NOTICE

The highest current carrying capacity of the M23 supply contacts is 24A!

The supply lines of the M23 supply input shall only be charged with a maximum of 8A for U_{LS} and 16A for U_A . If the maximum current carrying capacity is exceeded, both the connectors and components will be damaged. The module supply input is not automatically monitored for overload.

NOTICE

The highest current carrying capacity of the M12 supply contacts is 4A!

Supply lines U_{LS} and U_A of supply output M12 may each be charged with a maximum of 4A. If the maximum current carrying capacity is exceeded, both the connectors and components will be damaged. The module supply output is not automatically monitored for overload.

NOTICE

Exposed connections!

If connections have not been closed with protective covers, liquid or dirt can penetrate the fieldbus coupler and ruin it. Close all unneeded connections with protective caps to comply with the IP 67 safety class.

- Disconnect the power supply from the system on which you wish to mount the 767 components.

- For assembling, start-up, maintenance and trouble shooting, adhere to the specific accident prevention provisions which apply to your system (e.g., BGV A 3, "Electrical Installations and Equipment").
- The operating instructions of the 767 series components being used must be laid out ready at the workplace.
- Observe the exact positioning (coding) between plug and socket.
- The 767 components shall not come in contact with substances having seeping and insulating properties. Otherwise, additional measures shall be taken for the devices, such as installation of an enclosure that is resistant to the above-mentioned substance properties.
- Electronic components, which fulfill the ESD requirements according to the IEC 61000-6-2, are integrated in the 767 components. Because higher voltages can arise from charging under unfavorable circumstances in the field, discharge is to be ensured before carrying out work on the 767 system.
- Observe the correct layout of the potential equalization.
- Keep sufficient distance from electromagnetic sources of interference with all cables to achieve a high interference immunity of the 767 system against electromagnetic perturbing radiation. Use only shielded cables at the necessary locations, and always observe the appropriate standards for EMC-suitable installations.
- For retransmission of the power supply and for the S-BUS, use only pre-assembled WAGO system cables. This is the only means whereby the entered characteristics of the technical data can be achieved.
- Replace defective or damaged 767 components (e.g., deformed connections), since otherwise function disruptions can occur in the respective fieldbus stations or nodes.
- When laying all cable, ensure that you do not lay it in shear areas of moving devices.
- For each activity, observe the corresponding personnel qualification in Section 1.4.
- Observe the marking on the front and rear side of the 767 components.

1.6 Safety Equipment

All products of series 767 are designed according to the IP 67 safety class. This consists of, among other things, complete touch protection of electric voltages and currents – even when wet.

1.7 Technical Condition of Specified Devices

With each change to the 767 components, as well as to the software and firmware, all liability claims are terminated without written permission from WAGO Kontakttechnik GmbH & Co. KG. Parameterization shall only be carried out within the described scope (Section "Parameterization").

1.8 Notes on Operation

For the integration of the 767 components into your machine or system, the relevant valid and applicable standards, specifications and guidelines shall be observed in all activities (e.g., BGV A 3, "Electrical Systems and Equipment", DIN EN 418, EN 60204). The emergency-off apparatuses shall remain operative 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, sensor cable and actuator cable are correct (see the corresponding product manual for more information).

The following measures for the 24V supply shall exist:

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

2 General information



2.1 Abbreviations and Symbols Used

Following is a list of explanations of the most important abbreviations and symbols used in the operating instructions:

Table 1: Abbreviations and symbols used

Abbreviation	Description
DI (Digital Input)	Digital input
DO (Digital Output)	Digital output
AI (Analog Input)	Analog input
AO (Analog Output)	Analog output
RTD (Resistance Temperature Device)	Resistance temperature device
I/O (Input/Output)	Input/output
I/O module	All S-BUS devices are defined as I/O modules
767 component	All Series 767 products
S-BUS	The S-BUS (system bus) is the transmission system used for data exchange between a fieldbus coupler and I/O modules
U_{LS}	Power supply for logic and sensors
U_A	Power supply for actuators
DTM (Device Type Manager)	A device-specific software component used to configure a 767 component
FDT/DTM	FDT/DTM is a manufacturer-independent concept that enables configuration of field devices from different manufacturers using only a single program.
PFC (programmable fieldbus controller)	Programmable fieldbus coupler
FC (fieldbus controller)	Fieldbus coupler
DIP switch	Switch used to set the fieldbus address
WMB	WAGO multi marking system
Profibus-specific: class 1 master (PROFIBUS)	The automation system (PLC) that processes cyclical process data is defined as a class 1 master. This is used to configure the 767 components and perform diagnostics.

Table 1: Abbreviations and symbols used

Abbreviation	Description
	This symbol denotes the inputs (IN) of the 24V power supply and of the S-BUS of all components
	This symbol denotes the outputs (OUT) of the 24V power supply and of the S-BUS of all components
1010 _B	The _B after the binary value denotes the binary representation
1010 _D	The _D after the decimal value denotes the decimal representation
1010 _H	The _H after the hexadecimal value denotes the hexadecimal representation

2.2 Explanation of Item Numbers and Colors of WMBs

Information on the properties of a 767 component can be extracted from the various colors of the multi marking system, WMB (11), the item number (40) and the back side of the module. Information regarding the back side of the module can be found in the corresponding product instructions.

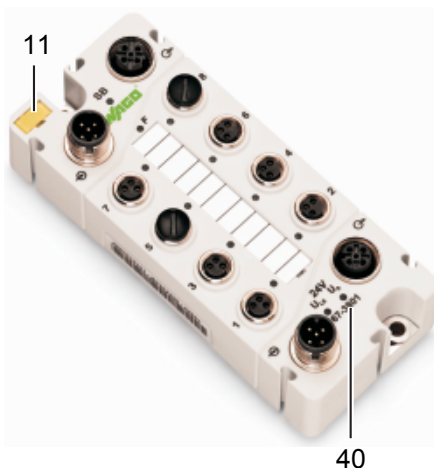


Fig. 1: Position of the item number and the WMB on the 767 components; in this example, on an I/O module

Table 2: Explanation of various colors of WMB

WMB Colors	Meaning
Yellow	Digital inputs
Red	Digital outputs
Green	Analog inputs
Blue	Analog outputs
Gray	Power distributor

2.3 I/O Modules and Your Use

The following tables gives an overview of which Series 767 I/O modules are suitable for your use:

Table 3: I/O modules and its functions

Use	Item No.	Type	Information
Analyzing sensors, encoders, switches and proximity switches	767-3801	8DI, 24VDC (8 x M8)	Eight digital inputs with M8 connectors
	767-3802	8DI, 24VDC (4 x M12)	Eight digital inputs with M12 connectors, two outputs per connector
Switching DC contactors, solenoid valves and indicator lights	767-4801	8DO, 24VDC, 0.5A (8 x M8)	Eight digital outputs with M8 connectors
	767-4802	8DO, 24VDC 0.5A (4xM12)	Eight digital inputs with M12 connectors, two outputs per connector
Switching DC contactors, solenoid valves and indicator lights	767-4803	8DO, 24VDC 2.0A (8xM8)	Eight digital outputs with M8 connectors
	767-4804	8DO, 24VDC 2.0A (4xM12)	Eight digital inputs with M12 connectors, two outputs per connector

Table 3: I/O modules and its functions

Use	Item No.	Type	Information
Measuring voltages and currents	767-6401	4AI U/I (4 x M12)	Measuring Ranges ± 10V 0 – 10V 0 – 20mA ±20mA 4 – 20mA
Measuring temperatures	767-6402	4AI RTD (4 x M12)	Measuring Ranges Resistance thermometer: Pt 100, Pt 200, Pt 500, Pt 1000 Ni 100, Ni 120, Ni 1000 Resistances: 1.25 kΩ, 5 kΩ Potentiometer: Lead angle 0 – 100 %
Releasing voltages and currents	767-7401	4AO U/I (4xM12)	Output Signals ± 10V 0 – 10V 0 – 20mA ±20mA 4 – 20mA
Supply power to modules over large distances	767-9101	Power distributor	Distributing supply voltages U_{LS} and U_A via six M12 connectors

2.4 Scope of Delivery

The scope of delivery consists of the following components:

- A device (fieldbus coupler, programmable fieldbus coupler, I/O module or power distributor) equipped with a labeling plate for module identification and a labeling strip for identification of inputs and outputs.
- Two M8 or M12 protective caps for unused connectors to comply with IP 67 degree of protection.

3 System Description

The trend toward decentralization of automation systems requires increasingly powerful IP-67 solutions. First, the components must be mounted directly onto the system or machine; this saves costs associated with switchboards, wiring and mounting. In addition, it is advantageous to segment automation systems into functional units in order to operate, develop, test, produce and expand them.

The modular SPEEDWAY 767 I/O system fulfills this requirement. It consists of (programmable) fieldbus couplers, I/O modules and power distributors. You can connect up to 64 additional I/O modules with up to eight channels on a fieldbus coupler.

A total expansion of up to 500 meters is possible for each 767 node if the maximum distance between individual 767 components is 50 meters (see Section 3.2.5 for more information). In this case, the fieldbus coupler and I/O modules are only connected to each other via the S-BUS cable for communication and the supply cable for the power supply.

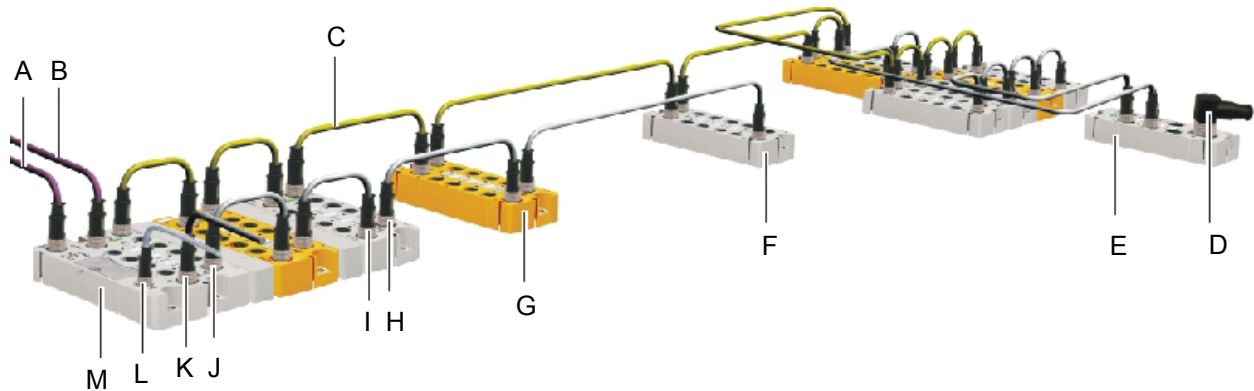


Fig. 2: Sample setup of fieldbus node using Series 767

A, B	Fieldbus (input, output)	H, I	Power supply of I/O module (input, output)
C	S-BUS	J, K	Output for power supply of fieldbus coupler (input, output)
D	Additional supply	L	USB interface
E	Power distributor	M	Fieldbus coupler
F	I/O module		
G	Safety module		

3.1 Series 767 Components

Series 767 consists of (programmable) fieldbus couplers, I/O modules and power distributors:

- **(Programmable) fieldbus coupler**
The fieldbus couplers represent the link to the fieldbus and thus to data exchange with the higher-level controller. In this regard, all of the most important fieldbuses are supported. In addition to the preprocessing of signals, the programmable fieldbus couplers possess an integrated PLC functionality and extend this to intelligent slaves. A sealing cover is used to protect the existing operating elements from abuse.

Configuration and programming are performed via either a USB interface (service interface) or the fieldbus, insofar as this supports noncyclical services. All fieldbus couplers come equipped with eight digital inputs and can be expanded via an interface to include additional inputs and outputs for signal processing. The fieldbus-specific LED indicators can be used to display diagnostic messages.



Fig. 3: View of PFC PROFIBUS DP 8DI 24VDC (programmable fieldbus coupler)

- **I/O modules**

Digital and analog I/O modules help to expand the 767 system and are connected to the fieldbus coupler via the S-BUS. Signals are either acquired or emitted. Each I/O module has many configuration options that allow its functions to be adjusted precisely. Configuration is carried out via a fieldbus coupler. Furthermore, the I/O modules provide the option of module- and channel-specific diagnostics. This can be achieved with 8 x M8 or 4 x M12 connectors regardless of the function of an I/O module.



Fig. 4: View of 8DI 24VDC module with an 8 x M8 layout

- **Power distributor**

Power distributors make it possible to supply power to the 767 components across large distances. This is accomplished using an M23 connector with a maximum cable cross section of 2.5 mm² for the power supply. Thus, larger distances can be bridged before being branched to their M12 connectors to supply power to the 767 components. The power distributors do not possess S-BUS connections.



Fig. 5: View of power distributor with six outputs

3.2 Supply Layout

3.2.1 General Information

Follow the instructions below to prevent damage to the Series 767 components.

NOTICE

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

Supply lines U_{LS} and U_A may each be charged with a maximum of 4A. If the maximum current carrying capacity is exceeded, both the connectors and components will be damaged. The module supply output is not automatically monitored for overload.

NOTICE

The highest current carrying capacity of the M23 supply contacts is 24A!

The supply lines of the M23 supply input shall only be charged with a maximum of 8A for U_{LS} and 16A for U_A . If the maximum current carrying capacity is exceeded, both the connectors and components will be damaged. The module supply input is not automatically monitored for overload.

- Observe the power demand of the components when laying out Series 767. Electronic, sensor and actuator ratios are to be taken into account to prevent module and system overload. Detailed information on power demand can be found in the technical data sheets corresponding to the respective 767 components.
- Connecting supply voltages U_{LS} and U_A using only one 0VDC contact is not allowed, since this would cause the current carrying capacity of the contacts to be exceeded.
- If you form a new supply group by using a power distributor, you must externally protect the cable between the power distributor and the I/O modules. Attaching a line protector is sufficient. Be sure to act in accordance with DIN VDE 0100.

3.2.2 Supply Connections

The 24V supply voltages are provided via the IN connection (A) on the fieldbus coupler. Inside the 767 components, the IN/OUT connections are always jumpered. A subsequent I/O module (B) can thus obtain its supply voltage via the OUT connection on the upstream fieldbus coupler. You can connect additional I/O modules until the highest permissible current load of 4A for one supply line (U_{LS} and/or U_A) is reached. To connect additional 767 components, you must then create a new infeed (see Section 3.2.5).

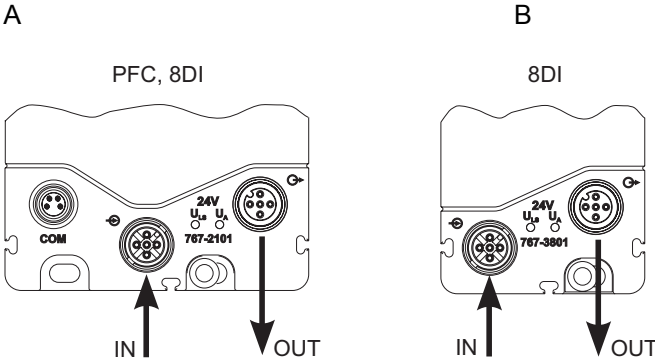


Fig. 6: Supply connections on a fieldbus coupler and I/O/ module

One exception to this is the 2A output modules (see figure below). These have two IN connections due to the increased power demand. Retransmission of the power supply is thus not possible. For the subsequent I/O modules (individual supply or supply groups), the power must be resupplied.

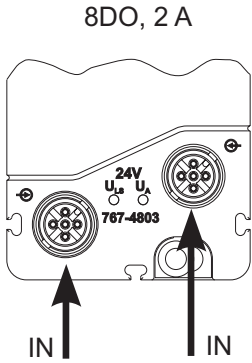


Fig. 7: 2A output module

NOTICE

Highest current carrying capacity: 8A

For the 2A output modules, note that the module's aggregate actuator current shall not exceed 8A ($2 \times U_A$).

3.2.3 Supply Voltages U_{LS} and U_A

Two 24VDC supply lines are carried through each IN/OUT connection of the 767 components:

- U_{LS} for logic and sensor supply
The logic and sensor supply provides power to the fieldbus (only applicable to CAN and PROFIBUS), the S-BUS, the logic and the sensor technology. The fieldbus and S-BUS are galvanically isolated from the sensor technology unit. This prevents on-site malfunctions of the functional capability of the 767 system.
- U_A for actuator supply.
The actuator supply is galvanically isolated from the logic and sensor supply. This prevents on-site malfunctions of the electronics and/or sensor technology.

Both supply lines can be charged with a current of no more than 4A. Always feed in U_{LS} and U_A separately (do not jumper) and secure both supply voltages independent from each other with one sufficiently designed fuse each. This prevents the components and system parts from being ruined in the case of an error.

The following tables outline the assignment of the supply connections:

Table 4: Connection assignment of IN/OUT









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

Table 5: Connection assignment of IN/IN of 2A output module

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

3.2.4 Galvanic Isolation

The following are schematic representations of the potential groups of the 767 components.

Block Diagrams of Fieldbus Couplers

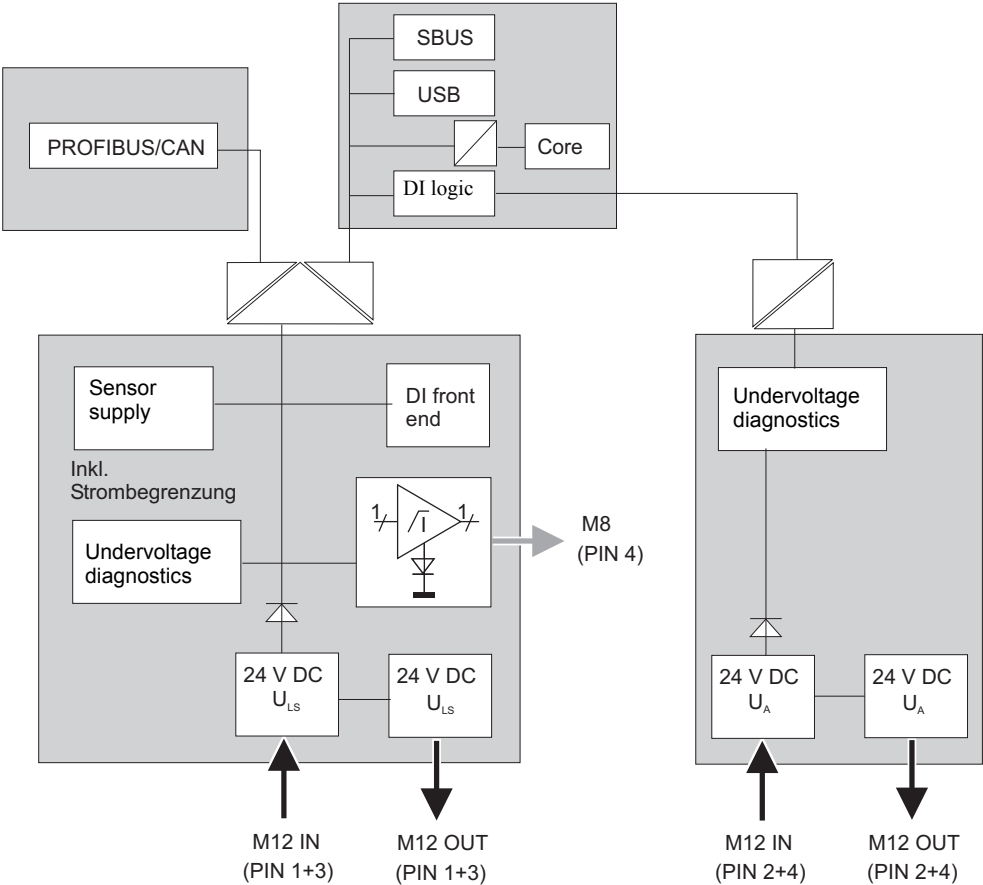


Fig. 8: Block diagram of fieldbus couplers

Block Diagram of DI Modules

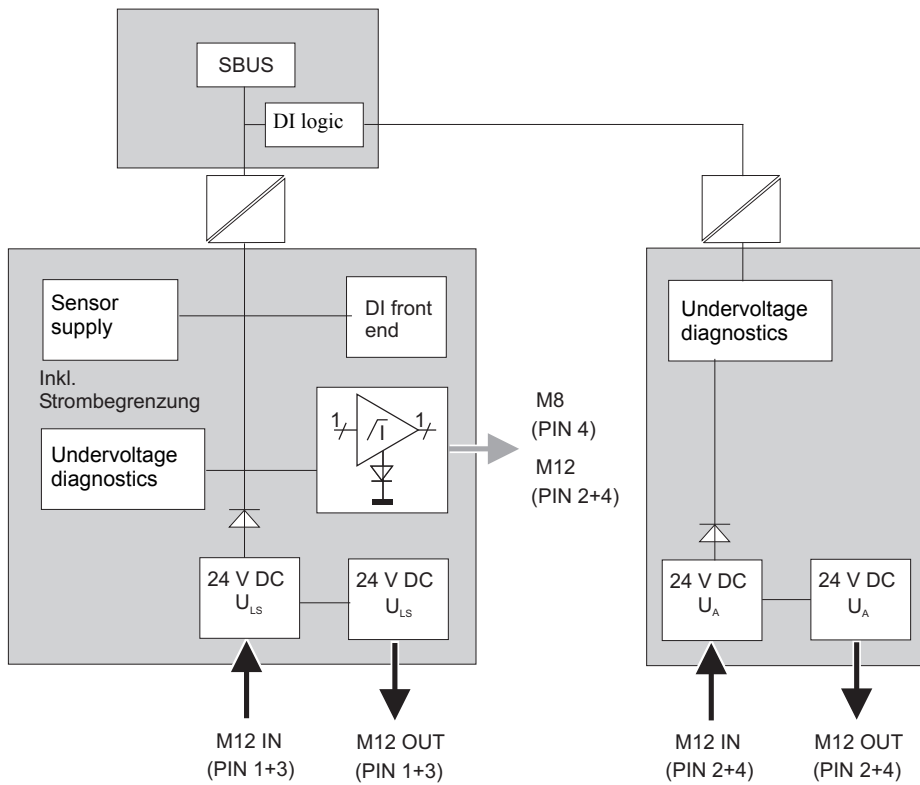


Fig. 9: Block diagram of DI modules

Block Diagram of DO Modules, 0.5A

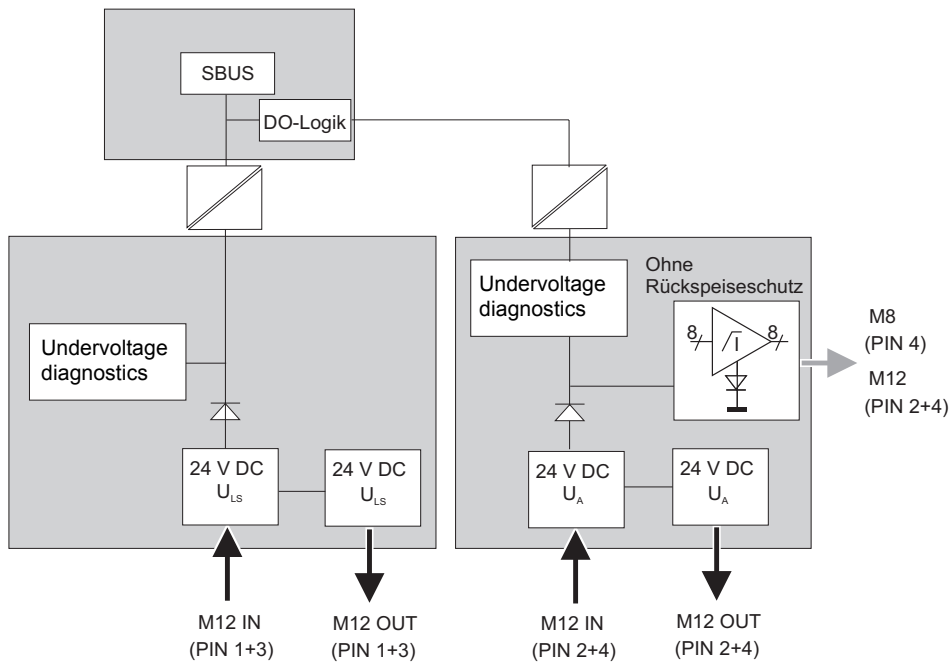


Fig. 10: Block diagram of DO modules, 0.5A

Block Diagram of DO Modules, 2.0A

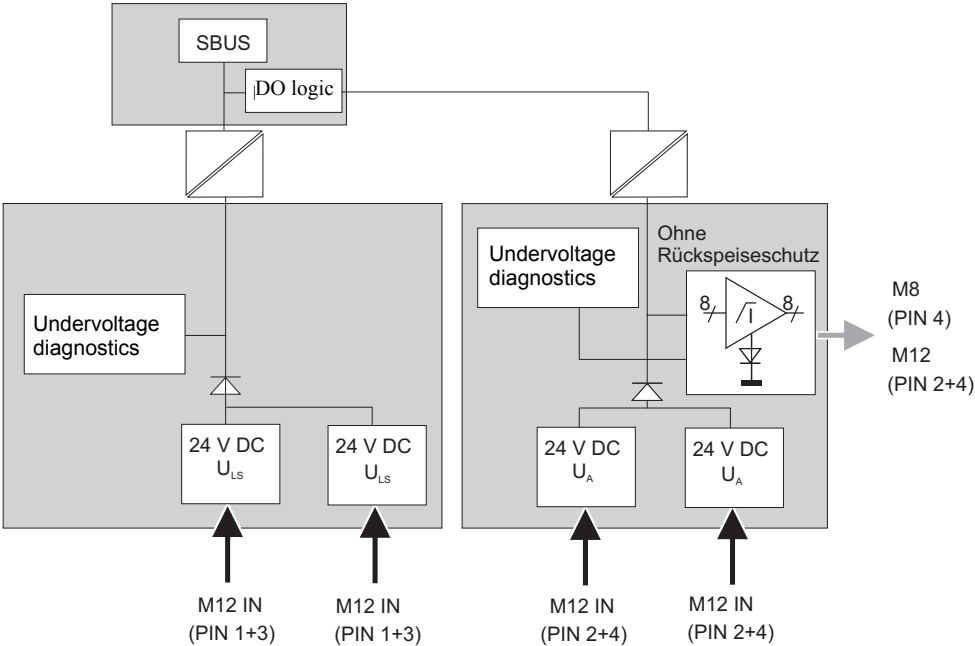


Fig. 11: Block diagram of DO modules, 2A

Block Diagram of AI Modules

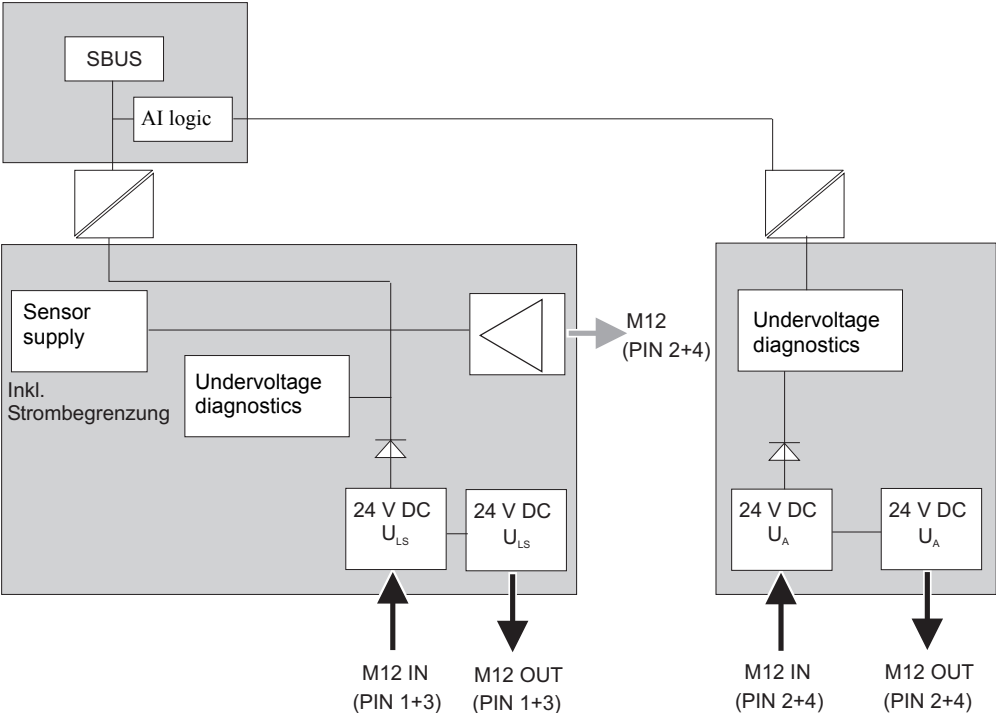


Fig. 12: Block diagram of AI modules

Block Diagram of AO Modules

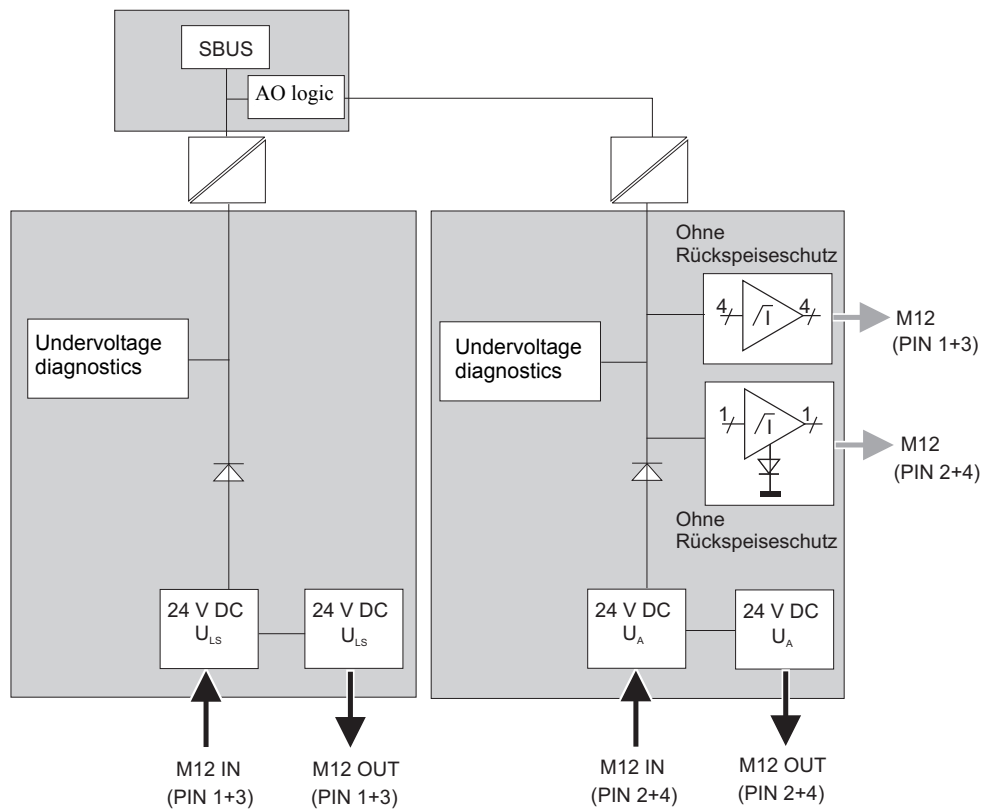


Fig. 13: Block diagram of AO modules

3.2.5 Individual Supply and Supply Groups

The modular structure permits both individual supply of I/O modules and aggregation to supply groups. Thus, each supply group and each individual supply can be operated using different infeeds at the same potential.

Always feed in U_{LS} and U_A separately (do not jumper) and secure both supply voltages independent from each other with one sufficiently designed fuse each.

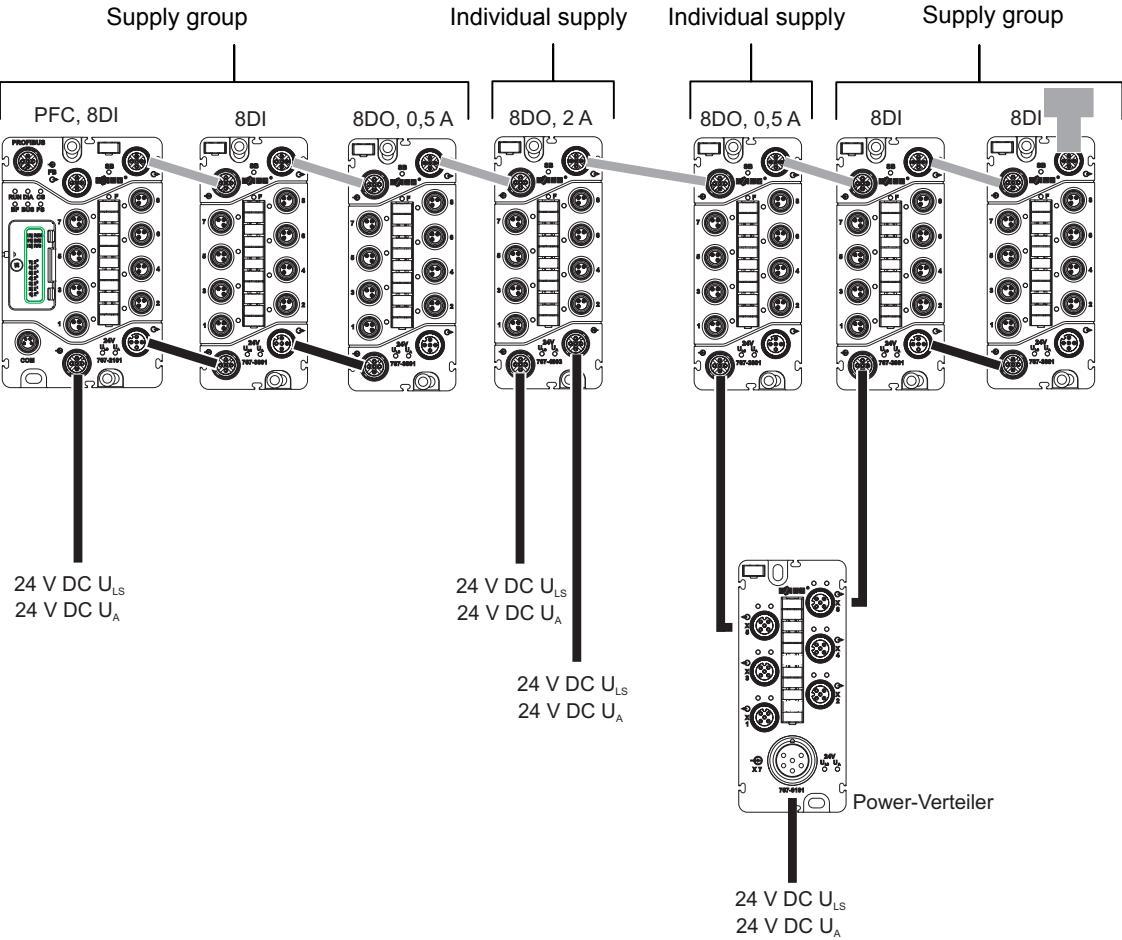


Fig. 14: Example of supplying a 767 node

Layout Example

The current carrying capacity of supply lines U_{LS} and U_A shall not exceed 4A each in a supply group. For this reason, the power demand of the fieldbus couplers, the I/O modules, the sensor technology and the actuators shall be examined precisely. To help in understanding, the following example illustrates the power demand of 767 components in conjunction with connected actuators or sensors. The structure in the example consists of a node that obtains its power supply from two infeed points (U_{LS} , U_A 1 and U_{LS} , U_A 2).

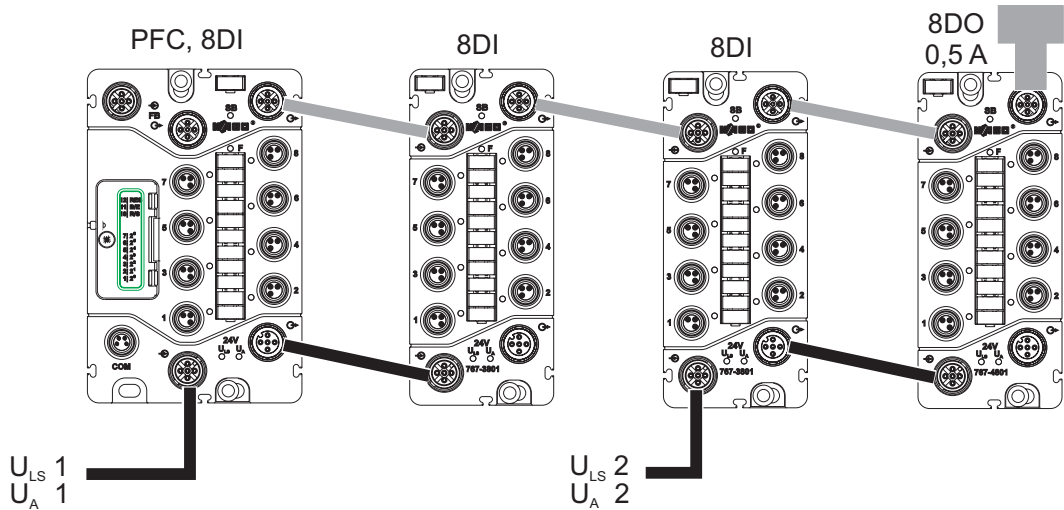


Fig. 15: Example of a 767 node

Information on the power demand of the inputs and of the I_L logic supply for each 767 component can be found on the device's data sheet.

Supply Line U_{LS} , U_A 1

Table 6: Electricity balance of a programmable fieldbus coupler with eight connected sensors

	Single Current	Aggregate Current
Power demand of sensor technology (capacitive)	6 x 10mA	60mA
Power demand of sensor technology (inductive)	2 x 20mA	+ 40mA
Power demand of sensor technology		= 100mA
Power demand of digital inputs	8 x 7.3mA	+ 58.4mA
Power demand I_S 1		= 158.4mA
Power demand I_L 1		+ 110.0mA
Current load U_{LS} 1		= 268.4mA
Current load U_A 1		= 5.0mA

Table 7: Electricity balance of an 8DI module with eight connected sensors

	Single Current	Aggregate Current
Power demand of sensor technology (capacitive)	4 x 10mA	40mA
Power demand of sensor technology (inductive)	4 x 20mA	+ 80mA
Power demand of sensor technology		= 120mA
Power demand of digital inputs	8 x 7.3mA	+ 58.4mA
Power demand I _S 1		= 178.4mA
Power demand I _L 1		+ 40.0mA
Current load U_{LS} 1		= 218.4mA
Current load U_A 1		= 5.0mA

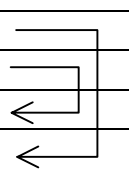
Supply Line U_{LS}, U_A 2

Table 8: Electricity balance of an 8DI module with eight connected sensors

	Single Current	Aggregate Current
Power demand of sensor technology (capacitive)	5 x 10mA	50.0mA
Power demand of sensor technology (inductive)	3 x 20mA	+ 60.0mA
Power demand of sensor technology		= 110.0mA
Power demand of digital inputs	8 x 7.3mA	+ 58.4mA
Power demand I _S 2		= 168.4mA
Power demand I _L 2		+ 40.0mA
Current load U_{LS} 2		= 208.4mA
Current load U_A 2		= 5.0mA

Table 9: Electricity balance of an 8DO module (0.5A) with six connected actuators

	Single Current	Aggregate Current
Power demand of solenoid valve	4 x 75mA	300.0mA
Power demand of solenoid valve	2 x 100mA	+ 200.0mA
Power demand of actuators		= 500.0mA
Power demand of outputs		+ 25.0mA
Power demand I _A 2		= 525.0mA
Power demand I _L 2		= 45.0mA
Current load U_{LS} 2		= 45.0mA
Current load U_A 2		= 525.0mA



Conclusion:

Table 10: Overview of results

	PFC	8DI	8DI	8DO	Power Need	Maximum Current
Current load U _{LS} 1	+ 268.4mA	+ 218.4mA			= 486.8mA	<= 4.0 A
Current load U _A 1	+ 5.0mA	+ 5.0mA			= 10.0mA	<= 4.0 A
Current load U _{LS} 2			+ 208.4mA	+ 45.0mA	= 253.4mA	<= 4.0 A
Current load U _A 2			+ 5.0mA	+ 525.0mA	= 530.0mA	<= 4.0 A

U_{LS} 1, U_A 1, U_{LS} 2 and U_A 2 are each charged with less than 4A. The highest current carrying capacity of the connectors is not exceeded. Therefore, retransmission of the power supply to other 767 components is not possible.

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

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

Note

You can also calculate the aggregate currents automatically using the smartDesigner program. This program is included in the ProServe software beginning in Version 5.2.

3.2.6 Shielding

The cable shield is connected using the threads of the corresponding cable connections. The shielding system diverts electromagnetic interspersion and interferences to the grounded system borders or to the mounting rail via the mounting points (connections for functional earth. This enables continuous shielding.

Use screws to connect the 767 components to the machine/system via mounting points. For more information, see the "Mounting" section in the 767 manuals.

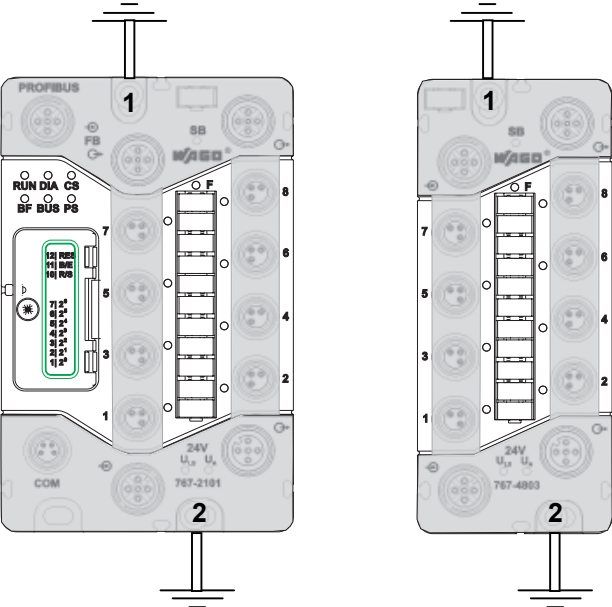


Fig. 16: Designation of mounting points

3.3 WAGOframe FDT/DTM Frame Application

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

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

For the parameterization of a 767 node, an appropriate DTM is available for each 767 component. Use this DTM to parameterize the 767 components. The 767 components can be parameterized either online or offline. The offline mode enables the parameterization of a 767 component that is not yet present.

3.4 CoDeSys

CoDeSys is a development environment for programmable logic controllers (PLC), per standard IEC 61131-3, for application development in the automation and building technology industries. In the CoDeSys automation alliance, a multitude of manufacturers--whose devices can be programmed with CoDeSys--have united.

For both manufacturers and end customers, this is advantageous since not every manufacturer must support every device class in order to obtain a universal CoDeSys solution through the alliance. All five of the languages specified by IEC 61131-3 ("International Electrotechnical Commission") are available in CoDeSys:

- STL (statement list)
- ST (structured text)
- LD (ladder diagram)
- CFC (continuous function chart).
- SFC (sequential function chart)

In addition to the languages in the IEC standard, CoDeSys also has the "CFC" (continuous function chart).

The following are significant advantages of CoDeSys 3 over its predecessor, Version 2.3:

Object-oriented programming

CoDeSys can be used to program your controller in an object-oriented manner; in other words, with comfort and constructs that are familiar from high-level languages such as JAVA or C++: classes, interfaces, methods, inheritance and polymorphy/dynamic linking. In this case, the IEC function blocks are seamlessly expanded and can also be used in other engineering aspects (e.g., visualization or fieldbus configuration). Object-oriented programming provides you with vast application benefits; for example, when reusing existing application parts or in the case of simultaneous development by several programmers.

Of course, you are also free to program in a "classical" manner as before. The object orientation is simply one programming option.

3.5 General Technical Data

Table 11: General technical data

Materials		
Housing	Polyamide (PA6.6) Polycarbonate (PC), switch cover Flammability per UL94-V0 Halogen and silicon-free	Light gray (~RAL7035) Transparent
Potting	Polyurethane (PUR) Flammability per UL94-V0 Halogen and silicon-free	
M8 and M12 connectors	M8x1, brass-plated bushing M12x1, brass-plated bushing, contacts from CUSn6 50 mating cycles Viton seal	Ni/Au refined
Transportation and Storage Requirements		
Free fall	≤1 m	IEC/EN 60068-2-32
Temperature	-40 ... +85 °C	
Relative humidity	5 ... 95 %	without condensation
Air pressure	1.080 ... 660 hPa	-1.000 ... 3.500 m
Operating Conditions		
Operating temperature	-25 ... +60 °C	Any fitting position
Temperature change	3 K/ s	
Air pressure	1.080 ... 795 hPa	-1.000 ... 2.000 m
Pollutant concentration	SO ₂ : <0.5 ppm H ₂ S: <0.1 ppm	
Degree of pollution	3	IEC60664 (IEC61131)
Protection class	III	IEC60536 (VDE0106, Part1)
Degree of protection	IP 67 (NEMA type 6,6P)	DIN40050 (EN60529)
Mechanical Capacities		
Vibration resistance Frequency range/limit value	10 Hz ≤ f < 59 Hz/0.35 mm amplitude (permanent) 59 Hz ≤ f < 500 Hz/5 g (permanent)	Per IEC 60068- 2-6
Shock resistance (temporary)	50 g	Per IEC 60068- 2-27
Continuous shock resistance	30 g	Per IEC 60068- 2-29
Impact resistance	-	Per IEC 60068- 2-32

Mechanical Capacities of the 767 Components in Conjunction with Mounting Rail Adapters*		
Vibration resistance Frequency range/limit value	5 Hz ≤ f < 9 Hz/3.5 mm amplitude (permanent) 9 Hz ≤ f < 150 Hz /1 g (permanent)	Per IEC 60068-2-6
Shock resistance (temporary)	15 g	Per IEC 60068-2-27
Electromagnetic Compatibility		
Immunity to interference	Per EN 61000-6-2	
Emission of interference	Per EN 61000-6-4	
Standards and Approvals		
UL 508		
Conformity marking		CE

* For information on this, please see the "Mounting" section from the individual manuals of the 767 components.

List of Figures

Fig. 1: Position of the item number and the WMB on the 767 components; in this example, on an I/O module	11
Fig. 2: Sample setup of fieldbus node using Series 767.....	14
Fig. 3: View of PFC PROFIBUS DP 8DI 24VDC (programmable fieldbus coupler).....	15
Fig. 4: View of 8DI 24VDC module with an 8 x M8 layout	16
Fig. 5: View of power distributor with six outputs	17
Fig. 6: Supply connections on a fieldbus coupler and I/O/ module	19
Fig. 7: 2A output module	19
Fig. 8: Block diagram of fieldbus couplers	21
Fig. 9: Block diagram of DI modules.....	22
Fig. 10: Block diagram of DO modules, 0.5A	22
Fig. 11: Block diagram of DO modules, 2A	23
Fig. 12: Block diagram of AI modules.....	23
Fig. 13: Block diagram of AO modules	24
Fig. 14: Example of supplying a 767 node.....	25
Fig. 15: Example of a 767 node	26
Fig. 16: Designation of mounting points.....	29

List of Tables

Table 1: Abbreviations and symbols used.....	10
Table 2: Explanation of various colors of WMB	11
Table 3: I/O modules and its functions	12
Table 4: Connection assignment of IN/OUT	20
Table 5: Connection assignment of IN/IN of 2A output module	20
Table 6: Electricity balance of a programmable fieldbus coupler with eight connected sensors.....	26
Table 7: Electricity balance of an 8DI module with eight connected sensors	27
Table 8: Electricity balance of an 8DI module with eight connected sensors	27
Table 9: Electricity balance of an 8DO module (0.5A) with six connected actuators.....	27
Table 10: Overview of results	28
Table 11: General technical data.....	32

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