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User manual

**FL SWITCH MM HS UM E for
FL SWITCH MM HS
FL SWITCH MCS ...**

Modular Managed (Compact) Switch System

AUTOMATION

User manual

Description of the hardware and software functions of the Modular Managed Switch System (MMS) with firmware Version 4.70a and the Managed Compact Switch (MCS) with firmware Version 4.72

2012-01-23

Designation: FL SWITCH MM HS UM E

Revision: 15

Order No.: —

This user manual is valid for (see ordering date in chapter 12):

The MMS and the MCS with firmware Version 4.70a (MMS)/4.72 (MCS) in the Factory Line product range.

The Modular Managed Switch System includes:

- The FL SWITCH MM HS and FL SWITCH MM HS/M head stations
- The FL MXT and FL MXT/M extension modules
- The various FL IF ... interface modules

The Managed Compact Switch includes:

- The FL SWITCH MCS 16TX and FL SWITCH MCS 14TX/2FX MCS switches
- The FL MEM PLUG/FL MEM PLUG/MRM configuration memories

Please observe the following notes

User group of this manual

The use of products described in this manual is oriented exclusively to:

- Qualified electricians or persons instructed by them, who are familiar with applicable standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.
- Qualified application programmers and software engineers, who are familiar with the safety concepts of automation technology and applicable standards.

Explanation of symbols used and signal words



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety measures that follow this symbol to avoid possible injury or death.

There are three different categories of personal injury that are indicated with a signal word.

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WARNING This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

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This symbol together with the signal word **NOTE** and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware/software, or surrounding property.



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Table of contents

1	The Modular Managed Switch System (MMS) and the Managed Compact Switch (MCS)	1-1
1.1	Properties (MMS)	1-1
1.2	Future-proof networks for the highest possible requirements	1-1
1.2.1	System components (MMS)	1-3
1.2.2	MMS firmware versions and their functions	1-5
1.2.3	Firmware functions and the required hardware (MMS)	1-7
1.2.4	Device view (MMS)	1-7
1.2.5	Dimensions of the Modular Managed Switch System for normal operation	1-10
1.2.6	Dimensions of the Modular Managed Switch System for GL-certified operation	1-11
1.2.7	Assignment of ports to slots	1-11
1.3	Status and diagnostic indicators	1-12
1.3.1	LEDs on the switch and the MMS extension module	1-12
1.3.2	Meaning of the 7-segment display (MMS)	1-14
1.4	Properties (MCS)	1-18
1.4.1	Firmware versions and their functions (MCS)	1-18
1.4.2	Firmware functions and the required hardware (MCS)	1-21
1.4.3	Dimensions of the MCS	1-21
1.4.4	Device view (MCS)	1-22
2	Mounting and installation	2-1
2.1	Mounting and removing the MMS head station or MCS	2-1
2.2	Mounting and removing extension modules (MMS)	2-3
2.3	Mounting and removing interface modules (MMS)	2-5
2.4	Arrangement of the interface modules	2-7
2.5	Mounting and removing the FL M LABEL labeling field (accessories)	2-8
2.5.1	Mounting	2-8
2.5.2	Removal	2-9
2.5.3	Dimensions of the labeling field	2-9
2.6	FL MEM PLUG (accessories)	2-9
2.7	Installing the MMS or MCS	2-10
2.7.1	Connecting the supply voltage to the MMS/MCS	2-10
2.7.2	Connecting the supply voltage to the FL SWITCH MM HS/M for GL-certified operation	2-11
2.7.3	Alarm contact	2-12
2.7.4	V.24 (RS-232) interface for external management	2-13
2.8	Grounding	2-13
3	Startup and functions	3-1
3.1	Basic settings	3-1

3.1.1	Default upon delivery/default settings	3-1
3.2	Using Smart mode.....	3-2
3.2.1	Activating Smart mode	3-2
3.2.2	Assigning IP parameters	3-4
3.2.3	Flowchart after a restart	3-8
3.3	Starting up interface modules with the MMS	3-10
3.3.1	FL IF 2TX VS-RJ	3-10
3.3.2	FL IF 2POF 10/100	3-12
3.3.3	FL IF 2HCS 100	3-15
3.3.4	FL IF 2FX SC .../FL IF 2FX SM SC	3-17
3.3.5	FL IF 2FX ST-D	3-19
3.3.6	FL IF TX/POF 10/100	3-20
3.3.7	FL IF TX/HCS 100	3-21
3.3.8	FL IF MEM 2TX-D/FL IF MEM 2TX-D/MRM	3-23
3.3.9	FL IF 2PSE-F	3-24
3.3.10	FL IF 2POF SCRJ-D	3-28
3.4	Frame switching	3-31
3.4.1	Store-and-forward	3-31
3.4.2	Multi-address function	3-31
3.4.3	Learning addresses	3-31
3.4.4	Prioritization	3-32
4	Configuration and diagnostics	4-1
4.1	Factory Manager	4-1
4.1.1	General function	4-1
4.1.2	Assigning IP parameters	4-1
4.1.3	Configuration and diagnostics	4-3
4.2	Web-based management (WBM).....	4-10
4.2.1	General function	4-10
4.2.2	Requirements for the use of WBM	4-11
4.2.3	Functions/information in WBM	4-12
4.3	Simple Network Management Protocol (SNMP).....	4-44
4.3.1	General function	4-44
4.3.2	Diagram of SNMP management	4-47
4.3.3	RFC1213 MIB - MIB II	4-49
4.3.4	RMON MIB (1.3.6.1.2.1.16)	4-56
4.3.5	Bridge MIB (1.3.6.1.2.1.17)	4-62
4.3.6	pBridgeMIB (1.3.6.1.2.1.17.6)	4-64
4.3.7	qBridgeMIB (1.3.6.1.2.1.17.7)	4-65
4.3.8	rstp MIB (1.3.6.1.2.1.17.11)	4-68
4.3.9	IANAifType MIB (1.3.6.1.2.1.30)	4-69
4.3.10	IF MIB (1.3.6.1.2.1.31)	4-69
4.3.11	pnoRedundancy MIB 1.3.6.1.4.1.24686	4-72
4.3.12	Private MIBs	4-73

4.4	Management via local V.24 (RS-232) communication interface	4-125
4.4.1	General function	4-125
4.4.2	User interface functions	4-126
4.4.3	Starting with faulty software (firmware)	4-129
4.5	Management via Telnet	4-132
4.5.1	Configuring the Telnet terminal	4-132
4.5.2	Telnet interface functions	4-132
5	(Rapid) Spanning Tree	5-1
5.1	General function	5-1
5.2	(R)STP startup.....	5-2
5.2.1	Enabling (R)STP on all switches involved	5-2
5.2.2	Connection failure - Example	5-11
5.2.3	Mixed operation of RSTP and STP	5-13
5.2.4	Topology detection of a Rapid Spanning Tree network (RSTP)	5-13
5.2.5	Configuration notes for Rapid Spanning Tree	5-16
6	Media Redundancy Protocol (MRP)	6-1
6.1	General function	6-1
6.2	MRP manager	6-1
6.2.1	Network examples	6-2
6.3	Enabling web pages for using MRP in WBM	6-4
6.4	Configuration of MRP	6-4
6.4.1	MRP General	6-4
6.4.2	MRP Configuration	6-5
7	Multicast filtering	7-1
7.1	Basics.....	7-1
7.2	Enabling the web pages for multicast filtering in WBM	7-1
7.3	Static multicast groups	7-1
7.3.1	"Current Multicast Groups" web page	7-2
7.3.2	Creating static multicast groups	7-2
7.3.3	Procedure for creating a multicast group	7-4
7.4	Dynamic multicast groups	7-7
7.4.1	Internet Group Management Protocol (IGMP)	7-7
7.4.2	"General Multicast Configuration" web page	7-8
7.5	Multicast source detection.....	7-9
7.5.1	Properties of multicast source detection	7-9
8	Virtual Local Area Network (VLAN)	8-1
8.1	Basics.....	8-1
8.2	Enabling the VLAN web pages in web-based management	8-1

8.2.1	Management VLAN ID	8-2
8.2.2	Changing the management VLAN ID	8-2
8.3	General VLAN configuration	8-3
8.4	Current VLANs	8-4
8.4.1	Static VLANs	8-5
8.4.2	VLAN Port Configuration	8-6
8.4.3	VLAN Port Configuration Table	8-6
8.5	Creating static VLANs	8-7
8.5.1	Dynamic configuration	8-9
8.6	VLAN and (R)STP	8-9
9	Operating as a PROFINET device	9-1
9.1	Preparing the switch for PROFINET mode	9-1
9.2	Switch as a PROFINET IO device	9-2
9.2.1	Configuration in the engineering tool	9-2
9.2.2	Configuring the switch as a PROFINET IO device	9-4
9.2.3	Configuration via the engineering tool	9-5
9.2.4	PROFINET flashing function	9-5
9.2.5	Device naming	9-5
9.2.6	Operating in the PROFINET environment	9-5
9.3	PROFINET alarms.....	9-6
9.3.1	Alarms in WBM	9-7
9.4	Process data communication	9-7
9.4.1	Control word	9-8
9.5	PDEV - Function description.....	9-9
9.5.1	PROFINET stack and PDEV function	9-9
9.6	Conformance according to PROFINET conformance class B	9-10
10	LLDP (Link Layer Discovery Protocol)	10-1
10.1	Basics.....	10-1
10.2	Representation of the topology in an engineering tool	10-4
11	DHCP relay agent	11-1
11.1	Activating the DHCP relay agent	11-1
12	Technical data and ordering data	12-1
12.1	Technical data	12-1
12.1.1	Technical data (MMS)	12-1
12.1.2	Technical data (MCS)	12-5
12.1.3	Revision history of this manual	12-7
12.2	Typical current consumption (MMS) - (Example).....	12-8

12.3	Ordering data	12-9
12.3.1	Ordering data (MMS)	12-9
12.3.2	Ordering data for GL-certified components (GL Certificate No. 24 2750 4 HH)	12-9
12.3.3	Ordering data (MCS)	12-10
12.3.4	Accessories (MMS/MCS)	12-10

1 The Modular Managed Switch System (MMS) and the Managed Compact Switch (MCS)



Unless stated otherwise, all information in this manual is valid for the FL SWITCH MM HS and FL SWITCH MM HS/M modular devices, as well as for the FL MXT and FL MXT/M extension stations, and the FL SWITCH MCS 16TX and FL SWITCH MCS 14TX/2FX compact devices.

1.1 Properties (MMS)

The **Modular Managed Switch (Modular Managed Switch System - MMS)** is an Ethernet switch, which is suitable for industrial use and consists of a head station, extension modules, and interface modules. The head station and extension modules contain the entire Ethernet switching technology. Interface modules provide the interface to the desired physical transmission method. An extension module can be used to extend the head station from eight ports to 16 ports, and the use of two extension modules gives a maximum of 24 ports. The desired transmission medium can be freely selected using the various interface modules.

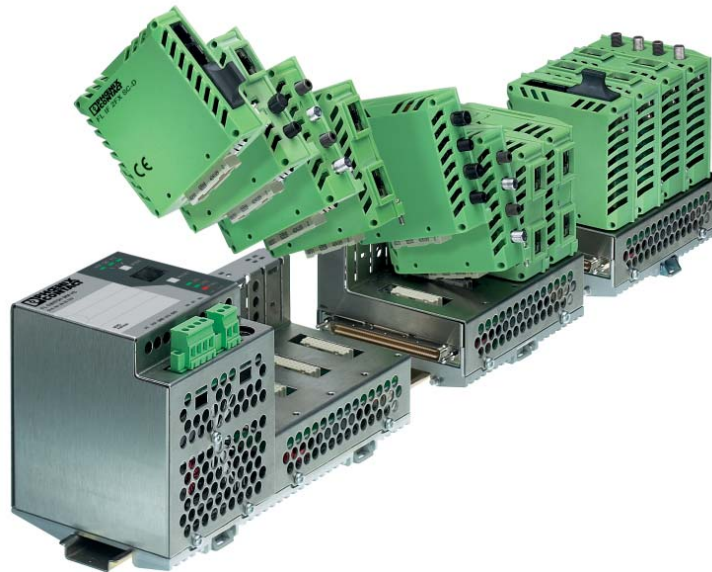


Figure 1-1 The Modular Managed Switch System

1.2 Future-proof networks for the highest possible requirements

Transmission method

10/100 Mbps polymer/HCS fibers on the MMS

Easy to assemble polymer fibers can now also be used for Ethernet. This cost-effective fiber optic technology can cover distances of up to 50 m. This provides cost savings both during installation and for maintenance when replacing mechanically damaged fiber optic cables. HCS fiber technology is available for distances of up to 300 m.

FL SWITCH MM HS

Maximum availability

Maximum network availability

A device design that does not use a fan, the redundant power supply, and conformance with all relevant industrial standards in terms of EMC, climate, mechanical load, etc. ensure the highest possible level of availability.

Redundancy can also be created with standards: the (Rapid) Spanning Tree Protocol or RRP (Media Redundancy Protocol) ensure the safe operation of the entire network regardless of topology, even in the event of a cable interrupt.

All information

Clear information

You can label your device clearly using the large labeling field, and read operating states and additional information from the two-digit 7-segment display. Two LEDs per port with switchable information ensure that you always have sufficient local information. A web server and an SNMP agent are provided for diagnostics, maintenance, and configuration via the network. A terminal access point can be used for local operation.

Port mirroring

Port mirroring can be used to monitor data traffic on the network connections.

Modularity

Modular structure of the MMS

Depending on your requirements, you can create a compact switch for the control cabinet (with convenient connections on the front) or a switch for the terminal box (with connections at the bottom). It is also possible to add a glass fiber interface or extend your existing station from 8/16 ports to a maximum of 24 ports.



Figure 1-2 Possible system hardware

PROFINET

The switches can be operated in PC WorX and Step 7 environments as conformance class B PROFINET IO devices. Connections to PLC systems can be easily implemented for diagnostic and communication applications.

The Modular Managed Switch System (MMS) and the Managed Compact Switch (MCS)

Ethernet/IP

In the Ethernet/IP environment the switches support the IGMP snooping function and multicast filtering.

Smart mode

For easy configuration, the switches support Smart mode in which the operating state can be changed without WBM.

Features and fields of application of the MMS and MCS

- Increased network performance by filtering data traffic:
 - Local data traffic remains local.
 - The data volume in the network segments is reduced.
- Easy network expansion and network configuration.
- Coupling segments with different transmission speeds.
Automatic detection of 10 Mbps or 100 Mbps data transmission rate with auto crossing.
- Increased availability through the use of redundant transmission paths with Rapid Spanning Tree. Support of various topologies and meshed structures as well as ring topologies with special ring detection. Fast switch-over times with RSTP fast ring detection.
- Configuration of switches using web-based management, SNMP, Telnet or locally via a V.24 (RS-232) interface.
- Multicast filtering (static and dynamic).
- IGMP snooping, optional querier function.
- VLAN support according to 802.1Q (32 VLANs).
- Port security functions.
- Access control for web-based management (WBM).
- Optimum support of the PROFINET RT and Ethernet/IP automation protocols.
- Integration in PROFINET environments.
- Topology detection using LLDP (Link Layer Discovery Protocol).
- Address assignment via BootP, DHCP, DCP or statically.
- Address assignment using DHCP option 82 relay agent.
- MMS: Support of Power over Ethernet (PoE).
- MMS: Support of POF-SCRJ
- Support of the Media Redundancy Protocol (MRP), both as a client and as the manager (in conjunction with the "FL IF MEM 2TX-D/MRM" interface module for the MMS or the "FL MEM PLUG/MRM" interface module for the MCS). The MRP ring can thus be created using any MMS/MCS ports, they simply have to be defined.

1.2.1 System components (MMS)

Central element FL SWITCH MM HS

The head station is the central element of the Modular Managed Switch System. It contains all the management functions, and the interface modules provide it with the desired interfaces to the network. Up to two extension modules can be connected to a head station, which means that the maximum system configuration comprises 24 Ethernet ports.

FL SWITCH MM HS

FL SWITCH MM HS/M

Thanks to certification according to Germanischer Lloyd (GL Certificate No. 2427504 HH), the FL SWITCH MM HS/M head station, the FL MXT/M extension module, and some of the available interface modules have been approved for shipbuilding and off/onshore applications. Please observe the list of GL-certified components on page 12-9. Please also observe the notes for supply voltage connection on page 2-11.



NOTE: Always switch off the supply voltage before inserting or removing extension modules (FL MXT).



Do not connect more than two extension modules (FL MXT) to one head station.

Extension module FL MXT

An extension module provides another 8 ports, which can be individually equipped with interface modules. A maximum of 2 extension modules can be connected to the head station. The maximum system configuration therefore comprises 24 ports.



It is not possible to operate the extension modules without the head station.

FL MXT/M

The FL MXT/M extension module is approved for shipbuilding and off/onshore applications thanks to its certification according to GL (Certificate No. 2427504 HH).

Interface modules FL IF ...



Please observe the list of GL-certified components on page 12-9.

Interface modules provide the desired interface to the network. The two outlet directions, the various types of media supported, and the port density of two ports per interface module provide a high degree of flexibility in terms of the system configuration.

1.2.2 MMS firmware versions and their functions

Firmware Version 1.03 provides the standard switch functions.

In addition, firmware Version 1.11 supports the Spanning Tree redundancy mechanism.

Firmware 2.03 offers the following additional functions:

- Multicast filter mechanisms (maximum of 20 multicast groups)
- IGMP snooping and querier function
- Memory module support

Firmware 2.10 offers the following additional functions:

- Auto-refresh of various WBM pages
- POF and FX interface module support
- Extensive support and improved configuration handling of the memory module
- Extended multicast filtering (multicast transmitters are detected and added to multicast groups)
- Extended IGMP snooping and IGMP query function (switch passively reads IGMP membership reports, creates corresponding multicast groups, and sends IGMP queries to multicast groups)
- Visualization of port capacity
- Port prioritization

Firmware 3.04 offers the following additional functions:

- VLAN support
- Rapid Spanning Tree support
- Security options (port-based security and access control for WBM)
- Optimization of the password concept
- Event table (logging of important events)
- Representation of MAC address table in WBM

Firmware 4.03 offers the following additional functions:

- Optimized Rapid Spanning Tree Protocol (RSTP) (improved switch-over times)
- Fast ring detection
- Large tree support
- Support of LLDP topology detection
- DHCP support
- DHCP with option 82 relay agent
- PROFINET device function and DCP
- Support of Power over Ethernet (IEEE 802.3af)
- Simplified port configuration
- IGMP query Version 1 and 2

Firmware 4.50 offers the following additional functions:

- Support of the POF-SCRJ interface module and corresponding diagnostics
- SNMP traps can be disabled individually
- The VLAN for management can be set: VLAN ID to manage (web, SNMP, ping, IGMP query) the switch in "VLAN Tagging" mode
- DHCP relay agent can be disabled according to the port
- PROFINET alarms and configuration comparison
- Fast aging on link down

- Extended LED diagnostics (identification of the switch in the PROFINET environment and detection of the "Missing IP parameter following restart" status)
- PoE traps (when the PoE status changes)
- Test traps to check communication
- Deletion of the MAC address table from WBM and SNMP

Firmware 4.60 offers the following additional functions:

- Support of the Media Redundancy Protocol, both as a client and as the manager
- Extended PROFINET IO device function
- Support of up to 128 multicast groups, of which up to 20 are static groups

Firmware 4.70a offers the following additional functions:

- Support of time synchronization using SNTP
- Support of the PDEV function for the PROFINET environment
- Support of Smart mode for easily selecting the operating mode

1.2.3 Firmware functions and the required hardware (MMS)

Table 1-1 Functions and the required hardware

Function	Required hardware for the head station	Required hardware for the extension modules
Standard switch functions	Hardware Version ≥ 3 (includes system bus Version 4.1)	Hardware Version ≥ 2 (includes system bus Version 3.1)
Memory module support	Hardware Version ≥ 4 (includes system bus Version 4.2)	Hardware Version ≥ 2 (includes system bus Version 3.1)
PoE module support	Hardware Version ≥ 6 (includes system bus Version 5.0)	Hardware Version ≥ 4 (includes system bus Version 4.0)
POF-SCRJ module support	Hardware Version ≥ 6 (includes system bus Version 5.0)	Hardware Version ≥ 4 (includes system bus Version 4.0)
MRP module support	Hardware Version ≥ 6 (includes system bus Version 5.0)	Hardware Version ≥ 4 (includes system bus Version 4.0)

1.2.4 Device view (MMS)

1.2.4.1 Front view of the head station

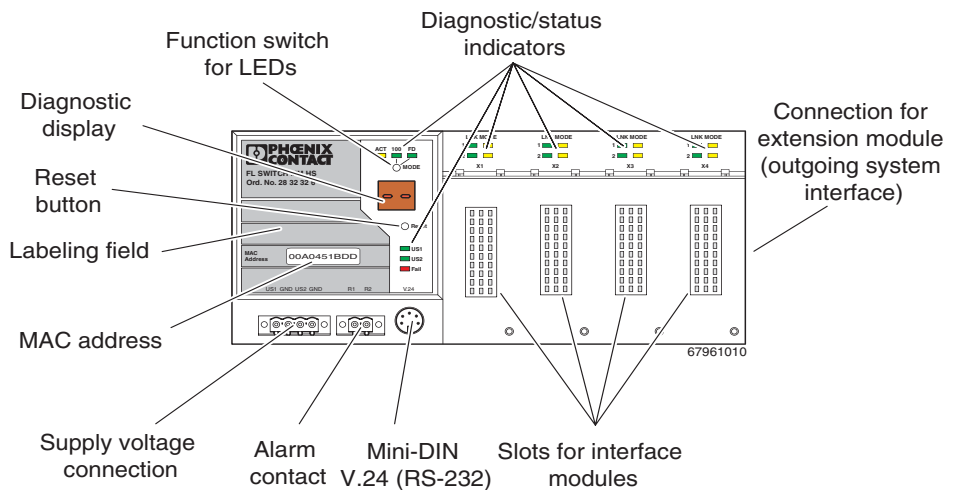


Figure 1-3 Front view of the head station

- **Diagnostic/status indicators**
Important information is displayed directly on the device. Each port has two LEDs. The left-hand LED always indicates the "LINK", while the right-hand LED display is set with the function switch.
- **Function switch for LEDs**
The MODE function switch can be used to specify which information is displayed by the second port-specific LED. The three LEDs above the switch indicate the selected mode. This information is then displayed by all port-specific LEDs (see also example on page 1-13).
- **Connection for extension module (FL MXT)**
Connect the first of a maximum of two extension modules here.

- Slots for interface modules
This is where the various interface modules (each with two ports) are inserted and locked in place.
- Mini-DIN V.24 (RS-232)
V.24 (RS-232) interface in Mini-DIN format for local configuration via the serial interface.
- Alarm contact
The floating alarm contact can be connected here via a 2-pos. COMBICON connector.
- Supply voltage connection
The supply voltage can be connected via the 4-pos. COMBICON connector (redundancy is optional).
- Reset button



In order to prevent an accidental MMS reset, the reset button must be held down for a few seconds before it triggers a reset.

- Diagnostic display
Various operating states or error states can be displayed here. For a list of possible codes, please refer to page 1-14.

1.2.4.2 Front view of the extension module

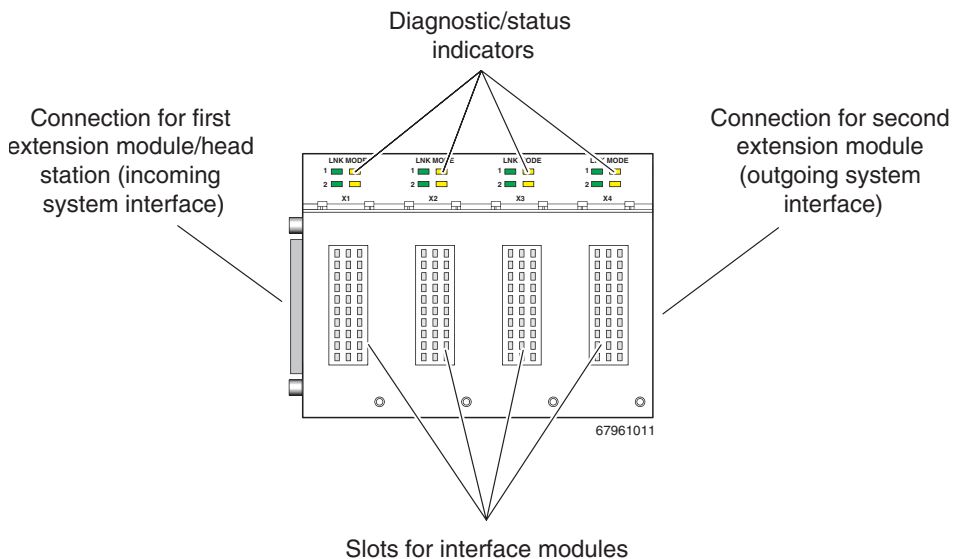


Figure 1-4 Front view of the extension module

- Diagnostic/status indicators
Important information is displayed directly on the device.
- Connection for second extension module
Connect the second extension module here.
- Connection for interface modules
This is where the various interface modules are inserted and locked in place.

- Slot for first extension module/head station
Connect this extension module either to a head station or to the first extension module here.

1.2.4.3 View of the interface modules (example)

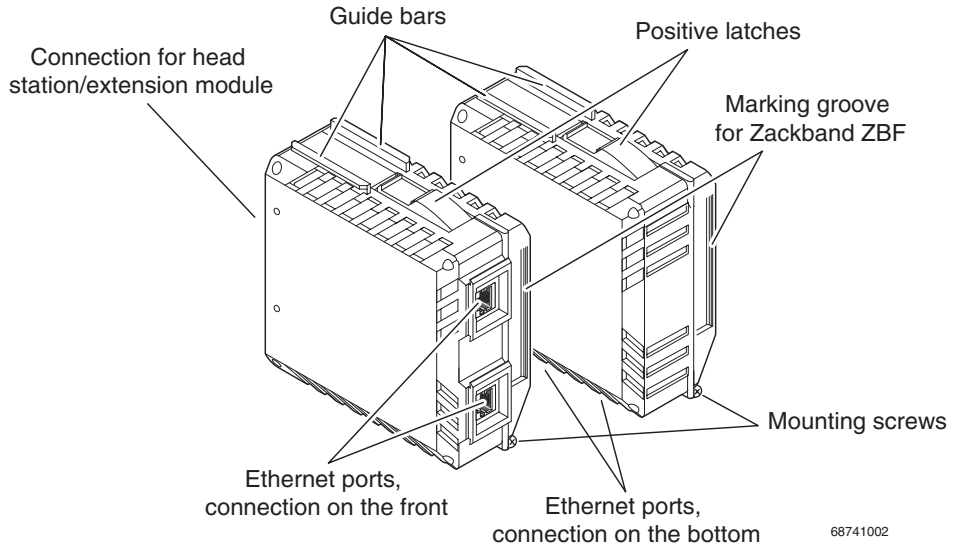
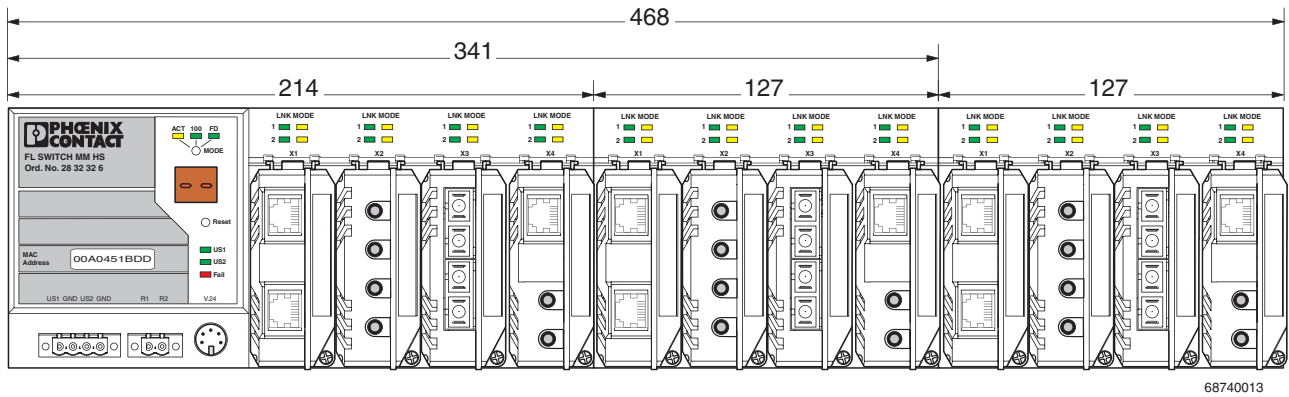


Figure 1-5 View of the interface modules (example)

- Connection for extension module/head station
This connector is used to connect the interface module and the extension module or the head station.
- Guide bars
These bars aid installation and hold the interface modules securely in place.
- Positive latches
These latches must be pressed in order to remove the interface module (previous versions used mounting screws).
- Ethernet ports
These are the ports for the various interfaces and connection directions.
- Marking groove for Zackband ZBF ...
- Mounting screws to lock the interface modules in place.

1.2.5 Dimensions of the Modular Managed Switch System for normal operation



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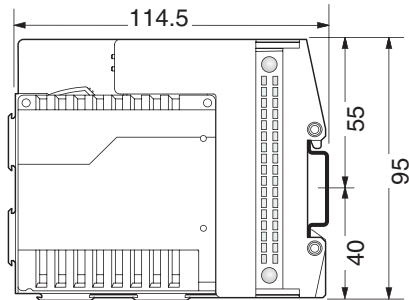
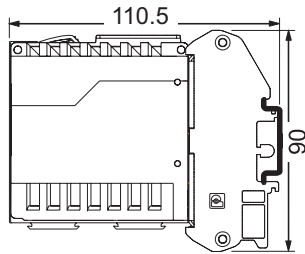


Figure 1-6 MMS housing dimensions in millimeters

Housing dimensions of the converter board with interface module

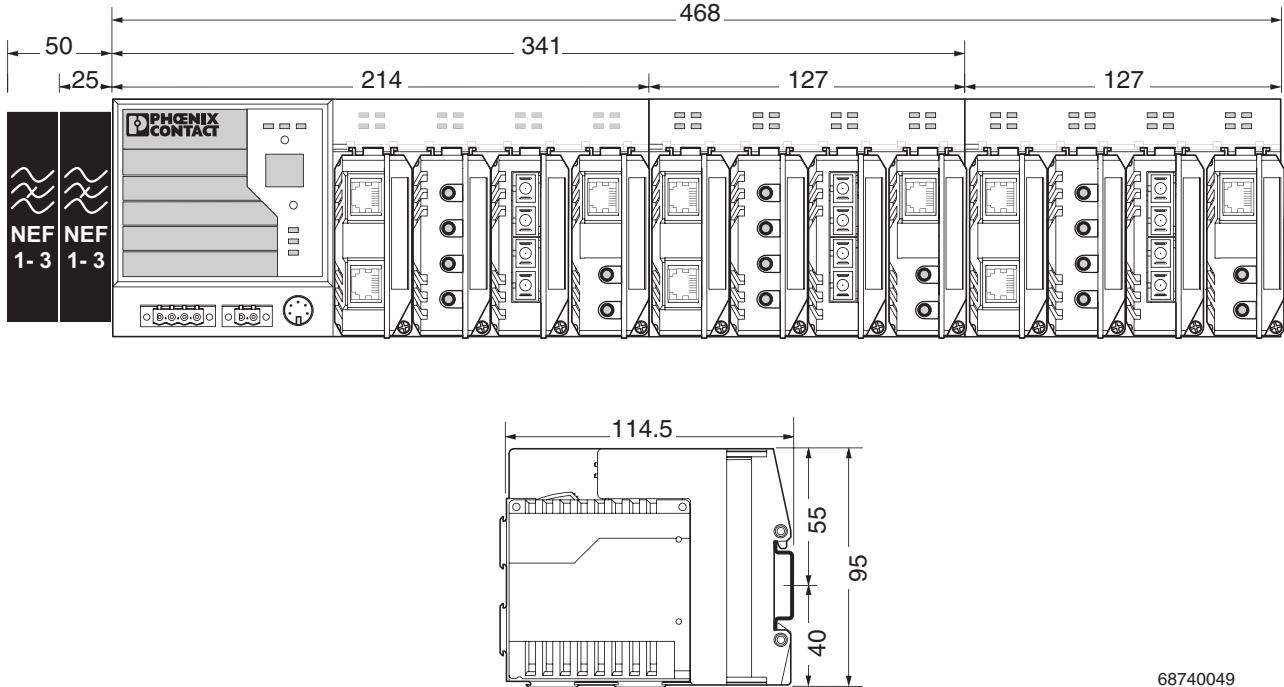


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Housing width: 67 mm

Figure 1-7 Housing dimensions of the FL CB IF converter board

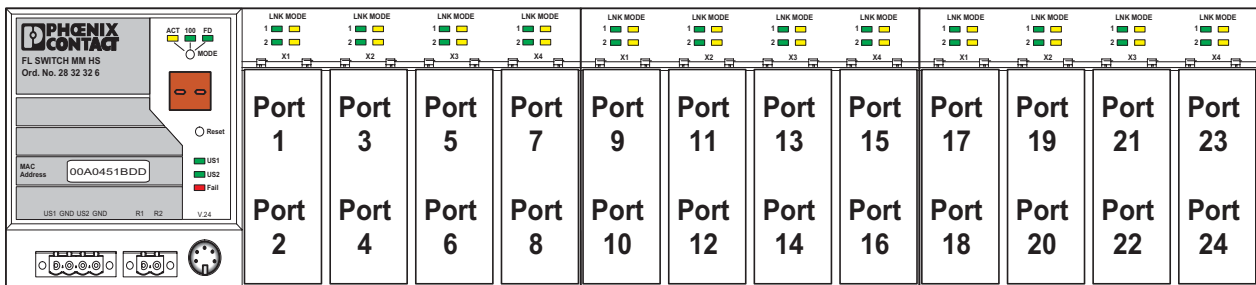
1.2.6 Dimensions of the Modular Managed Switch System for GL-certified operation



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Figure 1-8 MMS housing dimensions in millimeters

1.2.7 Assignment of ports to slots



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Figure 1-9 Assignment of ports to slots

1.3 Status and diagnostic indicators

1.3.1 LEDs on the switch and the MMS extension module

Des.	Color	Status	Meaning
US1	Green	ON	Supply voltage 1 in the tolerance range
		OFF	Supply voltage 1 too low
US2	Green	ON	Supply voltage 2 in the tolerance range
		OFF	Supply voltage 2 too low
FAIL	Red	ON	Alarm contact open, i.e., an error has occurred
		OFF	Alarm contact closed, i.e., an error has not occurred
A Link LED is located above the interface module slot for each port			
LNK (Link)	Green	ON	Link active
		OFF	Link inactive
A second LED is provided above the interface module slot for each port on the MMS and on the front of the housing on the MCS. The function of the second LED (MODE) for each port can be set using a switch on the device, which controls all ports (see also example below). There are three options:			
ACT (Activity)	Green	ON	Sending/receiving telegrams
		OFF	Not sending/receiving telegrams
100	Green	ON	100 Mbps
		OFF	10 Mbps if Link LED is active
FD (Duplex)	Green	ON	Full duplex
		OFF	Half duplex if Link LED is active
ACT and 100 and FD simultaneously	Green	Flashing	PROFINET device identification
ACT or 100 or FD (selected by mode switch)	Green	Flashing	No IP parameter present following restart

Example:

In Figure 1-10, the LED indicators have the following meaning (see also "Assignment of ports to slots" on page 1-11):

A: The switch has been set to display the duplex mode; the mode LEDs now indicate that port 1 and port 3 are in full duplex mode and port 2 and port 4 are in half duplex mode.

B: The switch has been set to display the data transmission rate; the mode LEDs now indicate that port 1 and port 2 are operating at 10 Mbps, port 3 is operating at 100 Mbps, and port 4 is not operating at all.

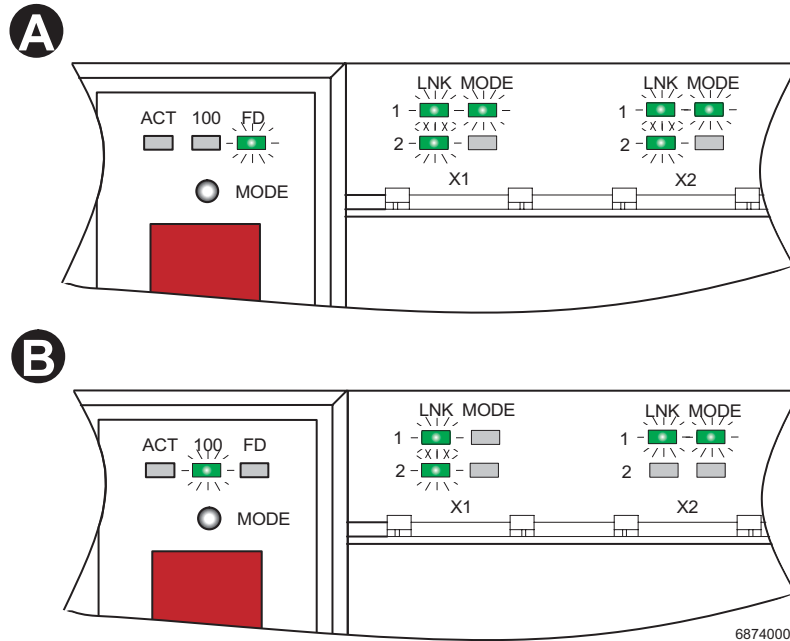


Figure 1-10 Example for status indicators

1.3.2 Meaning of the 7-segment display (MMS)



If the MMS has established a PROFINET connection, a dot appears in the bottom-right corner of the display.

During error-free operation:

Display	Meaning
xx.	PROFINET connection established between controller and MMS
bo	Extracting/starting firmware (boot)
01	Sending BootP requests
SC	Parameterization data being saved to the plug-in memory and the head station.
03	Downloading firmware via TFTP
04	Loading firmware in the Flash memory that was loaded via the network
05	The recently loaded firmware was successfully saved in the Flash memory
--	Initializing firmware
--	Firmware running
rb	A reset has been triggered via SNMP, WBM or V.24 (RS-232), the device is preparing to restart (reboot)
rC	After a device configuration update, "rC" (reconfiguration) may appear in the display after a restart. This means that the firmware automatically adapts the new configuration and then restarts the switch again.
Pb	A port blocked by the port security function is indicated with "Pb".
dP	The device is operated as a PROFINET IO device and is waiting for startup using a PROFINET controller. The device cannot be accessed via an IP address.
"00" alternates with another display	In PROFINET mode, the engineering tool called the "flashing" function.
SP	Spanning Tree initialization active

Messages during operation with the memory module:

Display	Meaning
0P	Parameterization data being read from the plug-in memory
EC	Equal configuration - the configurations on the memory module and in the head station are the same
dC	Different configuration - the configurations on the memory module and in the head station are different
0C	The memory module is empty

Messages during operation with the MRP memory module:

Display	Meaning
LF	Loop Failure - the MRP manager has detected an error in the redundant ring