FL SWITCH LM 8TX(-E)
FL SWITCH LM 4TX/2FX(-E)
FL SWITCH LM 4TX/2FX SM(-E)

Lean Managed Switches With Six or Eight Ports

AUTOMATIONWORX

Data Sheet
7199_en_01

Description

Lean Managed Switch

The lean managed switches enable the cost-effective creation of manageable Ethernet networks in industrial environments. The compact ME45 switches are available as a 10/100 twisted pair version with eight ports. Alternatively, Phoenix Contact offers two versions with two glass fiber interfaces (100Base-FX multi mode **or** 100Base-FX single mode) and four twisted pair ports. All twisted pair ports have an auto negotiation and auto crossing function. Redundant and manufacturer-independent network structures are possible via Rapid Spanning Tree IEEE 802.1w. Lean managed switches support complete network management via SNMP and have an integrated web server for comprehensive configuration and diagnostic mechanisms. The group of lean managed switches comprises three devices with a different port number or different transmission media:

– FL SWITCH LM 8TX with eight RJ45 ports
– FL SWITCH LM 4TX/2FX with four RJ45 ports and two **multi**-mode fiber optic SC ports
– FL SWITCH LM 4TX/2FX SM with four RJ45 ports and two **single**-mode fiber optic SC ports

Features

– 10/100 Mbps RJ45 ports with auto crossing and auto negotiation
– Glass fiber SC ports 100 Mbps (100BASE-FX, full duplex) in single mode or multi mode
– SNMP management (Simple Network Management Protocol)
– Integrated web server for configuration and diagnostics
– Easy-to-use status and diagnostic indicators
– Redundancy via Rapid Spanning Tree (IEEE 802.1w)
– 24 V DC supply voltage, redundant
– Floating alarm contact
– V.24/RS 232 Communication interface
– IGMP snooping

Application

– Establishing collision-free Ethernet networks (Switched Ethernet) in industrial environments
– Robust infrastructure for industrial applications (EMC, vibrations, temperature range)
– Management, protocols and functions are compatible to office standards - important for continuity in global company networks
– Simple startup, configuration, diagnostics using the "Factory Manager" software tool

☞ Make sure you always use the latest documentation.
It can be downloaded at www.download.phoenixcontact.com.

A conversion table is available on the Internet at www.download.phoenixcontact.com/general/7000_en_00.pdf.

☞ By default upon delivery the IGMP Snooping function is activated for the „E" versions. It can be activated in the WBM for the other versions, if necessary.

☞ This data sheet is valid for the products listed on the following page:

PHOENIX CONTACT

INSPIRING INNOVATIONS

Ordering Data

Products

Description	Type	Order No.	Pcs./Pkt.
Lean managed switch with eight RJ45 ports	FL SWITCH LM 8TX FL SWITCH LM 8TX-E	2832632 2891466	1
Lean managed switch with four RJ45 ports and two multi-mode SC ports	FL SWITCH LM 4TX/2FX FL SWITCH LM 4TX/2FX-E	2832658 2891660	1
Lean managed switch with four RJ45 ports and two single-mode SC ports	FL SWITCH LM 4TX/2FX SM FL SWITCH LM 4TX/2FX SM-E	2891916 2891864	1

Accessories

Description	Type	Order No.	Pcs./Pkt.
Security set for four RJ45 ports	FL SEC PAC 4TX	2832865	4
Gray RJ45 connector set for linear cable	FL PLUG RJ45 GR/2	2744856	2
Green RJ45 connector set for crossed cable	FL PLUG RJ45 GN/2	2744571	2
Universal end clamp	E/NS 35 N	0800886	50
Assembly tool for RJ45 connector	FL CRIMPTOOL	2744869	1
Startup/diagnostic software - Factory Manager	FL SWT	2831044	1
Network monitoring with HMI/SCADA systems	FL SNMP OPC SERVER	2832166	1
Patch box 8 x RJ45 CAT5e, pre-assembled, can be retrofitted	FL PBX 8TX	2832496	1
Patch cable, CAT 5, pre-assembled, 0.3 m long	FL CAT5 PATCH 0,3	2832250	10
Patch cable, CAT 5, pre-assembled, 0.5 m long	FL CAT5 PATCH 0,5	2832263	10
Patch cable, CAT 5, pre-assembled, 1.0 m long	FL CAT5 PATCH 1,0	2832276	10
Patch cable, CAT 5, pre-assembled, 1.5 m long	FL CAT5 PATCH 1,5	2832221	10
Patch cable, CAT 5, pre-assembled, 2.0 m long	FL CAT5 PATCH 2,0	2832289	10
Patch cable, CAT 5, pre-assembled, 3.0 m long	FL CAT5 PATCH 3,0	2832292	10
Patch cable, CAT 5, pre-assembled, 5.0 m long	FL CAT5 PATCH 5,0	2832580	10
Patch cable, CAT 5, pre-assembled, 7.5 m long	FL CAT5 PATCH 7,5	2832616	10
Patch cable, CAT 5, pre-assembled, 10.0 m long	FL CAT5 PATCH 10	2832629	10

Technical Data

General Data

Function	Lean managed Ethernet/Fast Ethernet switch; conforms to standard IEEE 802.3
Switch principle	Store and forward
Address table	For 1023 MAC addresses
SNMP	Version 1 and 2
Supported MIBs	SNMPv2 MIB, RSTP MIB, and private SNMP objects from Phoenix Contact
Housing dimensions (width x height x depth)	45 mm x 99 mm x 112 mm
Permissible operating temperature	-40°C to +70°C
Permitted storage temperature	-40°C to +85°C
Degree of protection	IP20, DIN 40050, IEC 60529
Class of protection	Class 3 VDE 0106; IEC 60536
Maximum humidity (operation)	30% to 95%, no condensation
Maximum humidity (storage/transport)	30% to 95%, no condensation
Air pressure (operation)	86 kPa to 108 kPa, 1500 m above sea level
Air pressure (operation)	66 kPa to 108 kPa, 3500 m above sea level
Preferred mounting position	Perpendicular to a standard DIN rail
Connection to protective earth ground	By snapping it on a grounded DIN rail / via COMBICON (optionally)
Weight	140 g, typical

Power Supply

Connection	Via COMBICON; maximum conductor cross section = 2.5 mm^2
Nominal value	24 V DC
Permissible ripple	3.6 V_{pp} within the permissible voltage range
Permissible voltage range	18.5 V DC to 30.5 V DC
Current consumption at U_S at a nominal value of	250 mA, typical (8TX...); 400 mA, typical (4TX/2FX...)
Test voltage	500 V DC for one minute
Protection against polarity reversal	Present
Power consumption	6 W, typical (8TX...); 9,6 W typical (4TX/2FX...)

Interfaces

Ethernet interface in RJ45 format	
Number	8 or 4
Connection format	8-pos. RJ45 socket on the switch
Connection medium	Twisted pair cable with a conductor cross section of 0.14 mm^2 to 0.22 mm^2
Cable impedance	100 Ohm
Transmission speed	10/100 Mbps
Ethernet interface (SC)	
Number	0 or 2
Connection format	SC duplex socket on the switch
Wavelength	1300 nm
Laser protection	Class 1 according to DIN EN 60825-1:2001-11
Minimum transmission length, including 3 dB system reserve, when using **multi**-mode	6,4 km glass fiber with F-G 50/125 0,7 dB/km F1200 2,8 km glass fiber with F-G 50/125 1,6 dB/km F800 11 km glass fiber with F-G 62,5/125 0,7 dB/km F100 3,0 km glass fiber with F-G 62,5/125 2,6 dB/km F
Maximum transmission power **multi**-mode	-14 dBm
Minimum transmission power **multi**-mode	-20 dBm with 62,5/125 µm, -23,5 with 50/125 µm
Minimum receiver sensitivity **multi**-mode	-31 dBm
Maximum overrange **multi**-mode	-14 dBm
Minimum transmission length, including 3 dB system reserve, when using **single**-mode	36 km glass fiber with F-G 9/125 0,36 dB/km 32 km glass fiber with F-G 9/125 0,4 dB/km 26 km glass fiber with F-G 9/125 0,5 dB/km
Maximum transmission power **single**-mode	-8 dBm
Minimum transmission power **single**-mode	-15 dBm
Minimum recierver sensitivity **single**-mode	-31 dBm
Maximum overrange **single**-mode	-7 dBm
Transmission speed	100 Mbps
V.24 (RS-232) communication interface	
Number	1
Connection format	Mini-DIN female connector on the switch
Floating alarm contact	
Voltage	24 V DC
Current carrying capacity	100 mA, maximum

Mechanical Tests

Shock test according to IEC 60068-2-27	Operation: 25g, 11 ms period, half-sine shock pulse Storage/transport: 50g, 11 ms period, half-sine shock pulse
Vibration resistance according to IEC 60068-2-6	Operation/storage/transport: 5g, 150 Hz, criterion 3
Free fall according to IEC 60068-2-32	1 m

Conformance With EMC Directives

Developed according to IEC 61000-6.2	
Emitted interference acc. to EN55022: 1998 + A1: 2000 + A2: 2003 (interference voltage)	Class A (industrial applications)
Emitted interference acc. to EN55011: 1998 + A1: 1999 + A2: 2002 (electromagnetic interference)	Class A (industrial applications)
Noise immunity acc. to EN61000-4-2 (IEC1000-4-2) (ESD)	Requirements acc. to DIN EN 61000-6-2
Contact discharge:	Test intensity 2, criterion B
Air discharge:	Test intensity 3, criterion B
Indirect discharge:	Test intensity 2, criterion B
Noise immunity acc. to EN61000-4-3 (IEC1000-4-3) (electromagnetic fields)	Requirements acc. to DIN EN 61000-6-2
	Test intensity 3, criterion A
Noise immunity acc. to EN61000-4-4 (IEC1000-4-4) (burst)	Requirements acc. to DIN EN 61000-6-2
Data lines:	Test intensity 2, criterion B
Voltage supply:	Test intensity 3, criterion B
Noise immunity acc. to EN61000-4-5 (IEC1000-4-5) (surge)	Requirements acc. to DIN EN 61000-6-2
Data lines:	Test intensity 2, criterion B
Voltage supply:	Test intensity 1, criterion B
Noise immunity acc. to EN61000-4-6 (IEC1000-4-6) (conducted)	Requirements acc. to DIN EN 61000-6-2
	Test intensity 3, criterion A

General Information

⚠️ **Warning**
Disregarding this warning may result in damage to equipment and/or serious personal injury. Only qualified personnel may start up and operate this device. According to the safety instructions in this text, qualified personnel are persons who are authorized to start up, to ground, and to mark devices, systems, and equipment according to the standards of safety technology. In addition, these persons must be familiar with all warning instructions and maintenance measures in this text.

⚠️ **Warning**
The FL SWITCH LM ... module is designed exclusively for SELV operation according to IEC 950/EN 60950/VDE 0805.

Installation and Mounting/Removal

Install the lean managed switch on a clean DIN rail according to EN 60715. To avoid contact resistance only use clean, corrosion-free DIN rails. End clamps can be mounted on both sides of the module to stop the modules from slipping on the DIN rail.

Mounting

1   Place the module onto the DIN rail from above. The upper holding keyway of the module must be hooked onto the top edge of the DIN rail.
2   Push the module from the front towards the mounting surface.
3   Once the module has been snapped on properly, check that it is fixed securely on the DIN rail.

Removal

1   Pull the locking latch down using a screwdriver, needle-nose pliers or similar.
2   Pull the bottom edge of the module away from the mounting surface.
3   Pull the module diagonally upwards away from the DIN rail.

Terminal Assignment

Connect the DIN rail to protective earth ground using a grounding terminal block. The modules are grounded when they are snapped onto the DIN rail. Connect protective earth ground with low impedance.
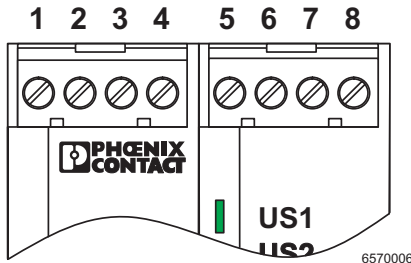
Terminal	Meaning
1	Supply voltage +US1
2	GND US1
3	Supply voltage +US2
4	GND US2
5 and 6	Floating alarm contact
7	Functional earth ground (optional)
8	Not connected

Figure 1   Terminal Assignment

Connection of the Supply Voltage

⚠ **Warning**
The product designation/brief product designation (-PAC) module is designed exclusively for SELV operation according to IEC 950/EN 60950/VDE 0805.

Example Voltage Supply of the Module From One or Two Voltage Sources and Connection of the Alarm Contact
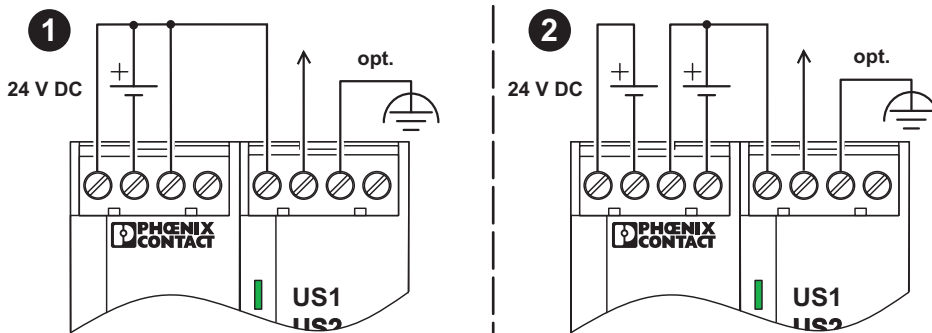

Figure 2   Example voltage supply of the module from one or two voltage sources and connection of the alarm contact

Supplying the Module From One Voltage Source

The 24 V supply voltage can be connected redundantly. Both voltage inputs are electrically isolated from one another and the housing. In the event of redundant voltage supplies the higher of the two voltages supplies the switch. The load is not distributed. The module is fully operational even with only one supply voltage (without jumpering it to other supply voltage terminal blocks).

⚠ In the event of a non-redundant voltage supply the switch indicates a voltage supply failure by opening the alarm contact. This error message can be avoided by connecting the supply voltage to both terminals in parallel, as shown in Figure 2, or by deactivating redundant supply voltage monitoring in the web-based management.

Monitoring the Voltage Supply

A message is generated via an SNMP trap if voltage is not present at the two supply voltage terminal blocks US1 and US2. The target address can be set in the web-based management. If the voltage is not supplied redundantly, terminal blocks US1 and US2 must be jumpered (see Figure 2, version 1) in order for the voltage to be monitored via the SNMP trap. Option: In addition, noise immunity can be increased in environments subject to high EMI by a low-impedance connection to functional earth ground via terminal block 7.

Connection to Functional Earth Ground

Snapping the switch onto a grounded DIN rail connects it to the ground potential. The switch is designed for SELV operation according to IEC 950/EN 60950/VDE 0805. Only SELV according to the defined standards may be used for supply purposes. In case of a non-redundant voltage supply the switch indicates the voltage supply failure via the SNMP trap. This error message can be avoided by connecting the supply voltage to both terminals in parallel, as shown in Figure 2, version 1, or by deactivating redundant supply voltage monitoring in the web-based management.
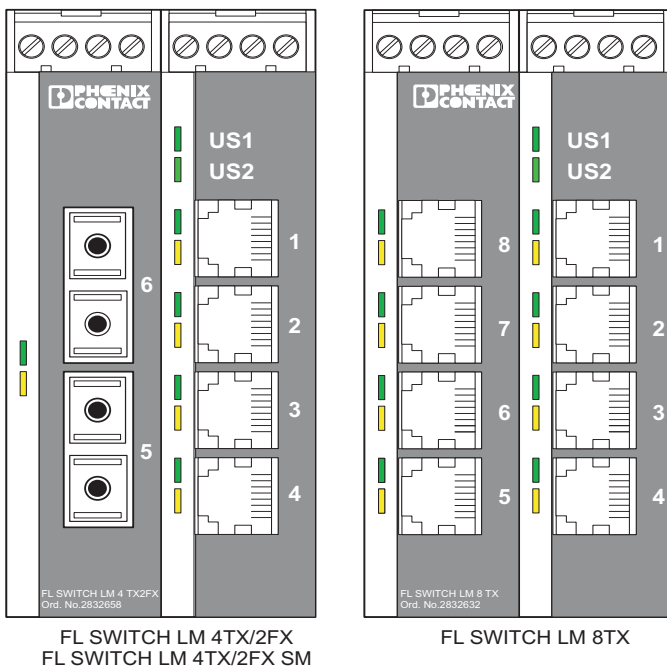
Local Diagnostic and Status Indicators

FL SWITCH LM 4TX/2FX
FL SWITCH LM 4TX/2FX SM

FL SWITCH LM 8TX

Figure 3   Front view

Local Status and Diagnostic Indicators

Des.	Color	Status	Meaning
US1	Green	ON	Supply voltage US1 in the tolerance zone
		OFF	Supply voltage US1 less than 18 V DC
US2	Green	ON	Supply voltage US2 in the tolerance zone
		OFF	Supply voltage US2 less than 18 V DC
RJ45 ports			
LNK	Green	ON	Link active
		OFF	Link not active
		Blink	Sending/receiving telegrams
100	Yellow	ON	Full duplex mode
		OFF	Half duplex mode
		Blink	Collision detect
FX ports			
LNK	Green or yellow	ON	Link active
		OFF	Link not active
		Blink	Sending/receiving telegrams

Assigning the IP address

Two mechanisms are available for the assignment of the IP address: BootP or via the RS232 interface. By default upon delivery, the IP address is assigned via BootP. The Factory Manager configuration software has been optimized for use with the LMS and enables easiest IP address assignment. The assignment mechanism can be modified via the web-based management or via the RS232 interface.

Hardware Functions

– "Store and forward" Ethernet switching

All data telegrams that are received by the switch are saved and checked for validity. Invalid or faulty data packets (>1522 bytes or CRC errors) and fragments (<64 bytes) are rejected. Valid data telegrams are forwarded by the switch. The switch always forwards the data using the data transmission rate that is used in the target network segment.

– Multi-address function

The switch automatically learns the addresses of the termination devices that are connected via a port by evaluating the source address in the data telegrams. Only packets with unknown addresses, with a source address of this port or with a multicast/broadcast address in the target address field are forwarded via the corresponding port. The switch can store up to 8000 addresses in its address table with an aging time of approximately 300 seconds. This is important when more than one termination device is connected to one or more ports. In this way, several independent subnetworks can be connected to one switch.

– Diagnostics via alarm contact

Is one or both supply voltages missing, opens the alarm contact. On a restart, the switch executes a hardware selftest. In the event of an error during the selftest, an SNMP trap is transmitted. During operation, an integrated watchdog monitors the cyclic execution of the software program. If the watchdog is not cyclically triggered by the software, an SNMP trap is transmitted.

– Status and diagnostic indicators

These indicators will always keep you informed about the LMS status. Local diagnostics without additional tools is possible thanks to numerous LEDs.

– Auto crossing

Thanks to auto crossing of the transmit and receive cables of a twisted pair interface, it is no longer necessary to differentiate between a 1:1 cable or a cross-over Ethernet cable.

– Auto negotiation

Auto negotiation is a function whereby the switch automatically detects the operating parameters for the connected network and sets the corresponding parameters (10 Mbps/100 Mbps data transmission rate and half/full duplex transmission mode) for its RJ45 ports. Automatic port setting eliminates the need for manual intervention by the user. The auto negotiation function can be activated/deactivated via the web interface.

– Twisted pair

The switch uses link test pulses according to standard IEEE 802.3 at regular intervals to monitor the connected TP/TX cable segments for short circuits and interrupts.

Software Functions

SNMP

SNMP (Simple Network Management Protocol) enables Ethernet communication monitoring also via network management systems. Management systems, such as a PC with Factory Manager, can read and modify configuration and diagnostic data from network devices via SNMP. Supported MIBs: SNMP (MIB II, Bridge, IF MIB), Phoenix MIB, RSTP MIB.

IEEE 802.1w - Rapid Reconfiguration Spanning Tree Protocol (RSTP)

Rapid Spanning Tree is a procedure enabling the use of redundant Ethernet structures. Via RSTP, the meshed topologies of the redundant structures are suppressed logically and acyclic converted to tree structures. In meshed networks, two nodes may be connected in two or more ways (loop). Due to these loops, data packets would circle endlessly in the network. For this reason these loops are replaced by a logical deterministic path using an RSTP algorithm. The loops are eliminated by temporarily switching off the individual switch ports in a controlled way. All active ports as well as deactivated ports receive data packets. However, the data packets are only forwarded by active ports. The deactivated ports operating in hot standby mode are reintegrated into the network, if required, by modifying the network topology.

Web-Based Management

Apart from the management via SNMP, the switch also supports integrated web-based management. This enables detailed ways for diagnostics and configuration during startup, operation and in the event of an error, as well as comprehensive network and device information.

IGMP Snooping

In IGMP snooping, the switch passively listens in on the IGMP messages that are sent over the network and dynamically creates the appropriate groups. The groups are not saved and will be lost on every power down or when switching off the snooping function.

> By default upon delivery the IGMP Snooping function is activated for the „E" versions. It can be activated in the WBM for the other versions, if necessary.

Functions/Information in Web-Based Management

General Instructions

General description of the web pages

Device Information

– General

Information about the device and manufacturer

– Technical data

The most important technical data

– Hardware installation

Figure showing how to connect the component

– Local diagnostics

Explanations regarding the local status and diagnostic indicators

– Serial port

List of transmission parameters for serial communication

General Configuration

– IP configuration

Indication or modification of the current IP parameters as well as of the addressing mechanism

– SNMP configuration

Indication/modification of the customer-specific device description and the trap configuration

– Software update

Indication or modification of the parameters for the TFTP software update

– Configuration management

Specifications for saving the active configuration as well as the option to reset the switch to the default settings

– Change password

Modification of the current password

Switch Station

– Remote diagnostics

Status of the alarm contact and the voltage supply

– MIB2 traps

Configuration of the states that are to be reported via a trap

– Other services

Activation/deactivation of the SNMP agent, the web server or RSTP

Ports

– Port table

Activation/deactivation of individual ports

– Port configuration

Individual configuration for every individual port

– Port statistics

Detailed statistic information on the data volume of every individual port

– RSTP configuration and information

RS232 Communication Interface for External Management

General function

A local communication connection for configuration purposes can be established between the LMS and a PC using the RS232 interface in Mini-DIN format.

You can implement the following settings in the terminal interface:

– Assigning the IP address
– Assigning the subnet mask
– Determining the default gateway
– Activating/deactivating BootP
– "Save Parameters" request
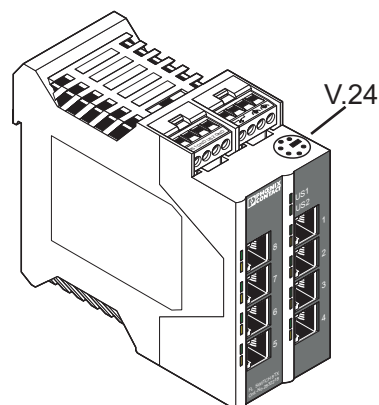– "Restart" request
– "Reset to Factory Defaults" request

Figure 4   Position of the RS232 interface