FL SWITCH SF ...

Factory Line Switches With Standard Functions

Data Sheet 05/2004

This data sheet is valid for the following products:

- FL SWITCH SF 8TX
- FL SWITCH SF 7TX/FX
- FL SWITCH SF 6TX/2FX
- FL SWITCH SF 16TX
- FL SWITCH SF 15TX/FX
- FL SWITCH SF 14TX/2FX

Product Description

The FL SWITCH SF ... range of Factory Line switches with standard functions in numerous versions can be used for quick and cost-effective Ethernet network expansion The switches have 8 or 16 ports, up to two of which are multi-mode glass fiber ports. The twisted pair ports of the switches support both Ethernet with a transmission speed of 10 Mbps and Fast Ethernet with a transmission speed of 100 Mbps. The glass fiber ports only support 100 Mbps.

Please note the different connection directions of the transmission media: Copper cables are connected at the **front**, glass fiber cables at the **bottom**.

The switches regenerate received data telegrams and send them to the port to which the device is connected with the corresponding target address.

Features and Fields of Application

- Increased network performance by filtering the data traffic.
  - Local data traffic remains local.
  - The data volume in the network segments is reduced.
- Easy network expansion without configuration of the switch.
- Coupling copper network segments with different bit rates.
  - Automatic detection of the data transmission speed of 10 or 100 Mbps.
- Auto negotiation: Each copper port establishes a half or full duplex connection with 10 or 100 Mbps.
- Auto crossing: It is not necessary to make a distinction between 1:1 or crossover Ethernet copper cables.
- Easy network expansion without configuration of the switches.
- Electrical isolation of network segments using up to two fiber optic ports.
- Maximum cable length increased up to 2 km (1.24 mi.) glass fiber with F-G 62.5/125 1.4 dB/km via the fiber optic port.
- Floating alarm output: The alarm output can be used to monitor the redundant voltage supply.

Housing Versions and Position of the Fiber Optic Connections

The housing of the three 8-port versions is identical. On the fiber optic versions, the connections for the fiber optic ports are at the **bottom** (see also Figure 2).

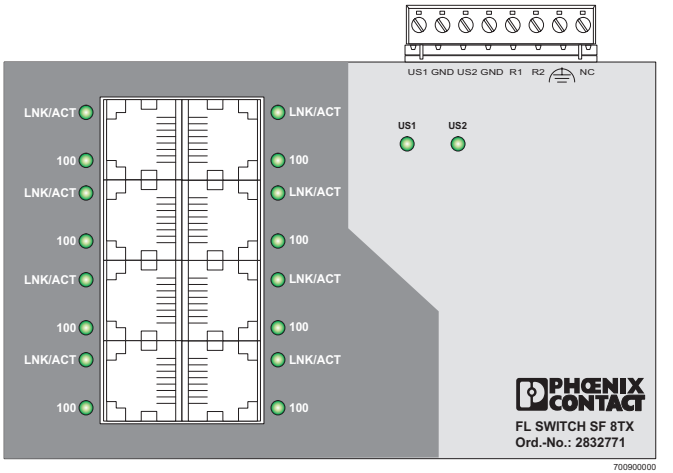


Figure 1 Housing example for 8-port switches

The housing of the three 16-port versions is identical. On the fiber optic versions, the connections for the fiber optic ports are at the **bottom**.

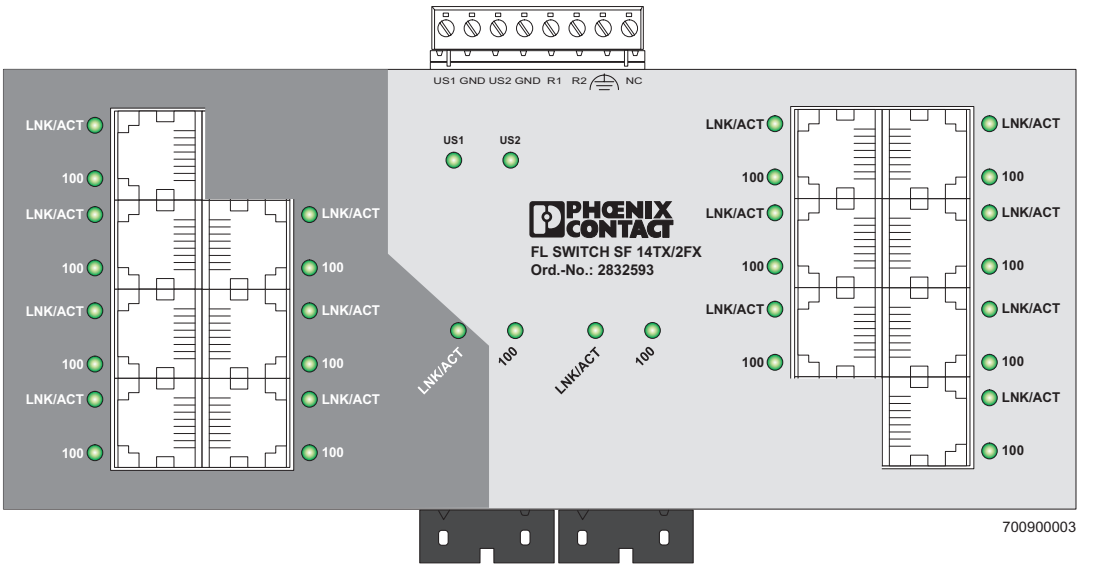


Figure 2 Housing example for 16-port switches

Local LED Diagnostic and Status Indicators

Des.	Color	Status	Meaning
US1	Green	ON	Supply voltage US1 in the tolerance zone
		OFF	Supply voltage US1 too low
US2	Green	ON	Supply voltage US2 in the tolerance zone
		OFF	Supply voltage US2 too low
One LED per port			
LNK/ ACT	Green	ON	Link
		Flashing	Active
		OFF	No Link
100	Yellow	ON	Data transmission speed 100 Mbps
		OFF	Data transmission speed not 100 Mbps

General Notes

Warning
Disregarding this warning may result in damage to equipment and/or serious personal injury. Only qualified personnel may start up and operate these devices. 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 SF ... module is designed exclusively for SELV operation according to IEC 950/EN 60950/VDE 0805.

Installation and Mounting/Removal

Install the FL SWITCH SF ... on a clean DIN rail. 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 terminals from slipping on the DIN rail.

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.

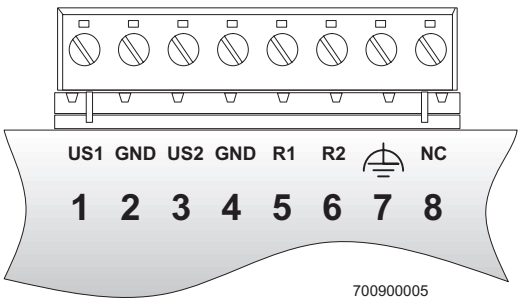
Mounting:

1. Place the module onto the DIN rail from above. The upper holding keyway 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. Insert a suitable tool (e.g., needle-nose pliers) into the arresting latch and pull it down.
2. Pull the module slightly away from the mounting surface.
3. Lift the module from the DIN rail.

Terminal Assignment



Terminal	Meaning
1	Supply voltage +US1
2	GND US1
3	Supply voltage +US2
4	GND US2
5	Alarm contact 1 (R1)
6	Alarm contact 2 (R2)
7	Functional earth ground
8	n. c.

Figure 3 Terminal assignment

Connecting the Supply Voltage

The module is operated using a +24 V DC SELV. The module is fully operational even with only one supply voltage (without jumpering it to other supply voltage terminal blocks) and/or without wiring the alarm contact.

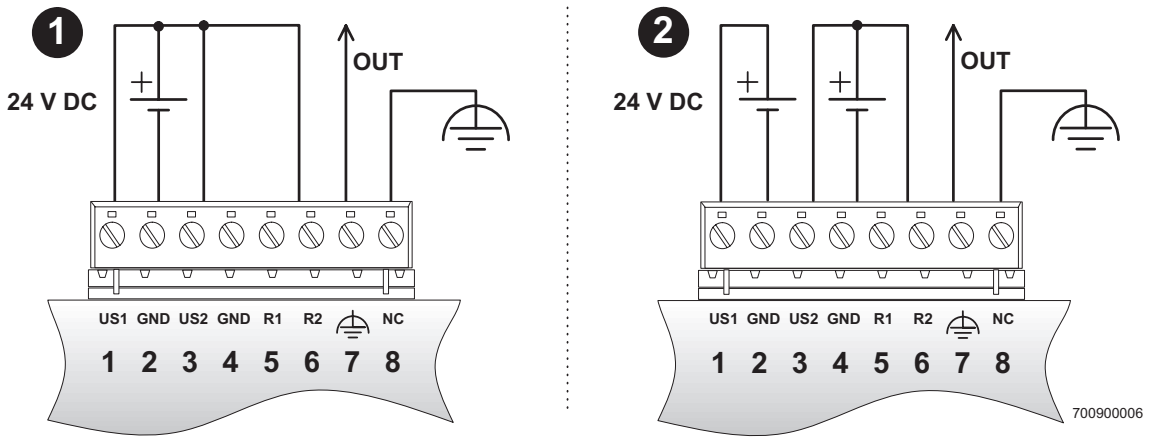


Figure 4 Typical supply of the module from one or two voltage sources

Supplying the Module From One Voltage Source

The alarm contact is closed if voltage is present at both supply voltage terminal blocks US1 and US2. In the event of an error at one of the two voltage sources, the contact is opened.
If the voltage is not supplied redundantly, terminal blocks US1 and US2 must be jumpered (see Figure 4, 1), so that the voltage can be monitored via the alarm contact.

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.

Ethernet Interface

The FL SWITCH SF ... has up to 16 Ethernet ports on the front in RJ-45 format, to which only twisted pair cables with an impedance of 100 Ω can be connected. The data transmission speed is 10 Mbps or 100 Mbps. In addition, each port has an auto crossing function: It is not necessary to make a distinction between 1:1 or crossover Ethernet cables.

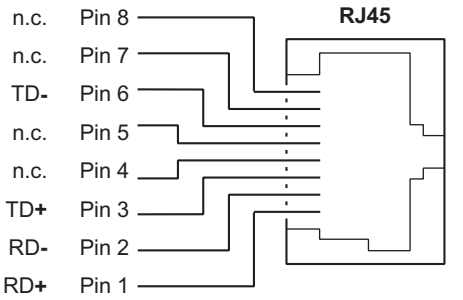


Figure 5 Pin assignment of the Ethernet ports in RJ-45 format

Switching Features of the FL SWITCH SF ...

– **Storing and Forwarding**
All data telegrams received by the switch are stored 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 speed that is used in the target network segment.

– **Multi-Address Function**
The switch automatically learns the addresses of termination devices, which are connected via the port, by evaluating the source addresses in the data telegram. 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 2048 addresses in its address table with an aging time of 5 minutes. 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.

A restart deletes the entire address table.

Housing Dimensions

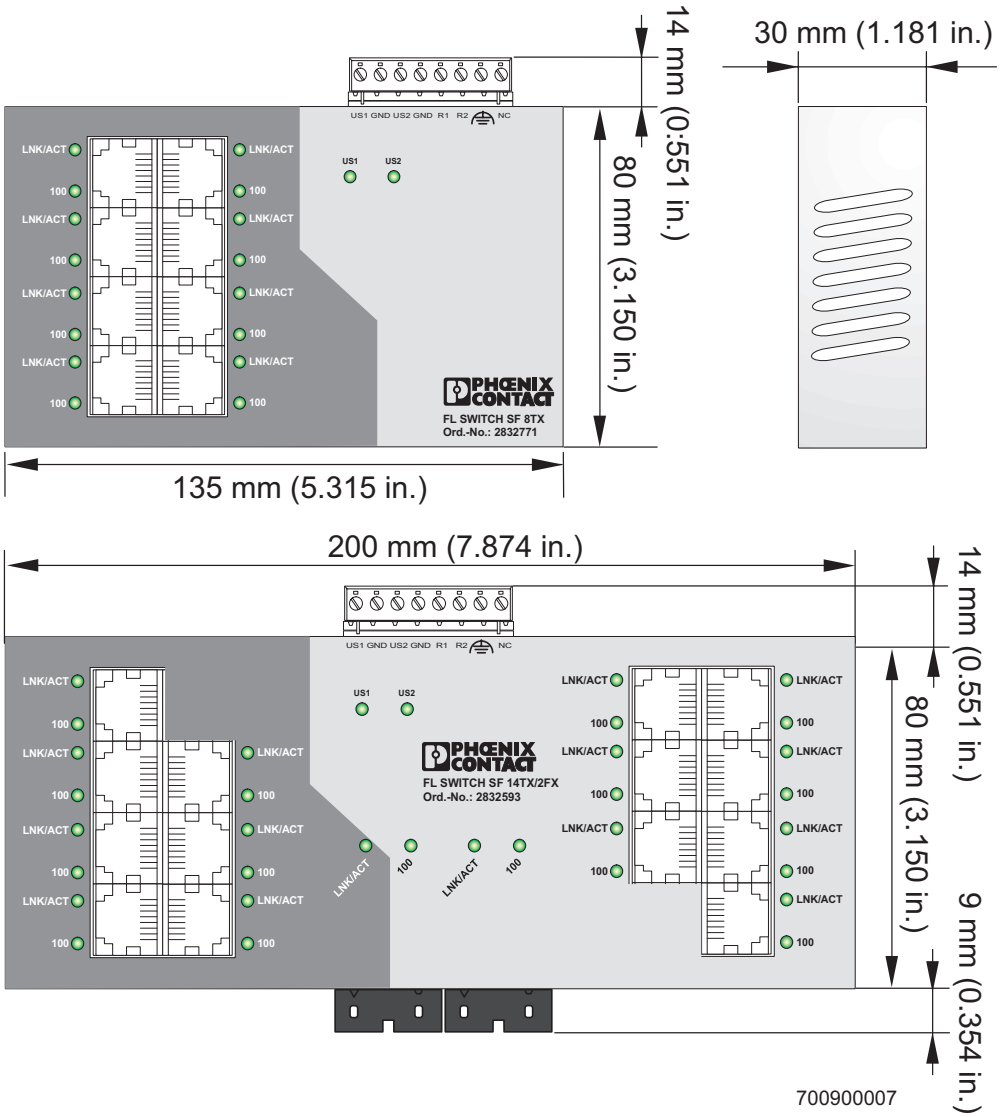


Figure 6 Housing dimensions for the FL SWITCH SF ...

The housing depth and high are identical for all six housing versions.

Technical Data

General Data	
Function	Switch; conforms to standard IEEE 802.3
Housing dimensions (width x height x depth) in mm	
8-port switch (RJ45)	135 x 80 x 30 (without COMBICON) 135 x 94 x 30 (with COMBICON)
8-port switch (Fiber Optic)	135 x 89 x 30 (without COMBICON) 135 x 103 x 30 (with COMBICON)
16-port switch (RJ45)	200 x 80 x 30 (without COMBICON) 200 x 94 x 30 (with COMBICON)
16-port switch (Fiber Optic)	200 x 89 x 30 (without COMBICON) 200 x 103 x 30 (with COMBICON)
Permissible operating temperature	0°C to +55°C (+32°F to +131°F)
Permissible storage temperature	-20°C to +70°C (-4°F to +158°F)
Degree of protection	IP20, DIN 40050, IEC 60529
Class of protection	Class 3 VDE 0106; IEC 60536
Humidity (operation)	30% to 95%, no condensation
Humidity (storage)	30% to 95%, no condensation
Air pressure (operation)	86 kPa to 108 kPa, 1500 m (4921 ft.) above sea level
Air pressure (storage)	66 kPa to 108 kPa, 3500 m (11483 ft.) above sea level
Preferred mounting position	Perpendicular to a standard DIN rail
Connection to protective earth ground	Snapped onto a grounded DIN rail
Weight 8-port switch	260 g
Weight 16-port switch	380 g

Supply Voltage (US)	
Connection	Via COMBICON; maximum conductor cross section = 2.5 mm^2 (14 AWG)
Nominal value	24 V DC
Permissible ripple	3.6 V_{pp} within the permissible voltage range
Permissible voltage range	18.5 V DC to 30.2 V DC
Current consumption at US	240 mA (8-Ports) / 510 mA (16-Ports), maximum
Test voltage	500 V DC for 1 minute
Protection against polarity reversal	Present
Power consumption	4.8 W (8-Ports) / 8.9 W (16-Ports), maximum

Interfaces	
Total number of Ethernet interfaces	8/16
Properties of RJ-45 Ports	
Number	6, 7, 8, 14, 15 or 16 depending on the device version
Connection format	8-pos. RJ-45 female connector on the switch
Connection medium	Twisted pair cable with a conductor cross section of 0.14 mm^2 to 0.22 mm^2 (26 AWG to 25 AWG)
Cable impedance	100 Ω
Transmission speed	10/100 Mbps
Maximum network segment expansion	100 m (328.08 ft.)
Properties of Fiber Optic Ports	
Number	0, 1 or 2 depending on the device version
Connection format	SC duplex female connector 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	2 km (1.24 mi.) glass fiber with F-G 62.5/125 1.4 dB/km
Dynamic (average) transmission power (fiber type) in link mode	
Minimum	-19 dBm (62.5 / 125 um)
Maximum	-14 dBm (50/125 µm)/-14 dBm (62.5/125 µm)
Minimum receiver responsivity	-32 dBm (dynamic)
Maximum overrange	-14 dBm (dynamic)/-11 dBm (static)
Transmission speed	100 Mbps
Alarm contact	
Voltage	24 V DC, typical
Current carrying capacity	100 mA, typical

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 (3.281 ft.)

Conformance With EMC Directives	
Developed according to IEC 61000-6-2	
IEC 61000-4-2 (ESD)	Criterion B
IEC 61000-4-3 (radiated-noise immunity)	Criterion A
IEC 61000-4-4 (burst)	Criterion A
IEC 61000-4-5 (surge)	Criterion B
IEC 61000-4-6 (conducted noise immunity)	Criterion A
IEC 61000-4-8 (noise immunity against magnetic fields)	Criterion A
EN 55022 (noise emission)	Class A

Differences Compared to Previous Versions
Rev. 00 - first version
Rev. 01 - technical data and marking of the modules updated

Ordering Data

Description	Order Designation	Order No.
Ethernet switch with 8 RJ-45 ports	FL SWITCH SF 8TX	28 32 77 1
Ethernet switch with 7 RJ-45 ports and 1 fiber optic port	FL SWITCH SF 7TX/FX	28 32 72 6
Ethernet switch with 6 RJ-45 ports and 2 fiber optic ports	FL SWITCH SF 6TX/2FX	28 32 93 3
Ethernet switch with 16 RJ-45 ports	FL SWITCH SF 16TX	28 32 84 9
Ethernet switch with 15 RJ-45 ports and 1 fiber optic port	FL SWITCH SF 15TX/FX	28 32 66 1
Ethernet Switch with 14 RJ-45 ports and 2 fiber optic ports	FL SWITCH SF 14TX/2FX	28 32 59 3
RJ-45 connector set **gray** for 1:1 cables (pack of 2)	FL PLUG RJ45 GR/2	27 44 85 6
RJ-45 connector set **green** for crossover cables (pack of 2)	FL PLUG RJ45 GN/2	27 44 57 1
Double sheathed Ethernet cable	FL CAT5 HEAVY	27 44 81 4
Ethernet flex	FL CAT5 FLEX	27 44 83 0
Assembly tool for RJ-45 connector	FL CRIMPTOOL	27 44 86 9

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