

# FL SWITCH SFN(T)...

## 16-Port Standard Function Ethernet Switches for Normal and Extreme Environments



### AUTOMATION

Data Sheet  
2806\_en\_C

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#### 1 Description

The FL SWITCH SFN(T)...16(15)(14)TX... range of Factory Line switches can be used for quick and cost-effective Ethernet network expansion to the field level. These unmanaged switches provide simple, robust networking in an industrial environment. Due to the narrow housing design, the switches are suitable for use in control cabinets and junction boxes.

The FL SWITCH SFNT... switches allow operation across a wider temperature range than most switches, allowing networks to expand into process industry environments, such as oil/gas, chemical, water/wastewater, wind energy, security, and monitoring.

The FL SWITCH SFN(T)...16(15)(14)TX... switches support the auto negotiation function on the RJ45 ports and offer transmission speeds of 10/100 Mbps. Mixed operation for the connection of segments with different data transmission speeds is also supported. The RJ45 ports offer an autocrossing function, which means it is not necessary to make a distinction between 1:1 and crossover cables.

Fiber optic ports are available in an SC format and offer speeds of 100 Mbps. The fiber optic ports extend the segment length to 2000 m or more, depending on the quality of the fiber optic cable.

#### 2 Features and Benefits

- -40 to 75°C operating range for SFNT switches
- 0 to 60°C operating range for SFN switches
- Auto-negotiation and autocross simplify cabling
- Couple copper network segments with different bit rates with automatic detection of the data transmission speed of 10 or 100 Mbps
- Individual LEDs at each port indicate communication activity and data rate
- Redundant power supply capable with local (LED) and remote (dry contact) alarms to indicate failure of one or both power supplies
- Available fiber optic options for extended distance and electrical noise immunity
- Fiber optic ports available in SC formats



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It can be downloaded at [www.phoenixcontact.net/catalog](http://www.phoenixcontact.net/catalog).

### 3 Ordering Data

Description	Type	Order No.	Pcs./Pkt.
<b>Ethernet switch</b> , with 16 RJ45 ports for 10/100 Mbps	FL SWITCH SFN 16TX	2891933	1
<b>Ethernet switch</b> , with 15 RJ45 ports, 1 fiber optic port in SC format for 10/100 Mbps	FL SWITCH SFN 15TX/FX	2891934	1
<b>Ethernet switch</b> , with 14 RJ45 ports, 2 fiber optic ports in SC format for 10/100 Mbps	FL SWITCH SFN 14TX/2FX	2891935	1
<b>Ethernet switch</b> , wide temperature, with 16 RJ45 ports for 10/100 Mbps	FL SWITCH SFNT 16TX	2891952	1
<b>Ethernet switch</b> , wide temperature, with 15 RJ45 ports, 1 fiber optic port in SC format for 10/100 Mbps	FL SWITCH SFNT 15TX/FX	2891953	1
<b>Ethernet switch</b> , wide temperature, with 14 RJ45 ports, 2 fiber optic ports in SC format for 10/100 Mbps	FL SWITCH SFNT 14TX/2FX	2891954	1

#### Accessories

Description	Type	Order No.	Pcs./Pkt.
Universal end clamp	E/NS 35 N	0800886	50
Patch angle with 2 ports in CAT 5e	FL PF 2TX CAT5E	2891165	1
Patch angle with 8 ports in CAT 5e	FL PF 8TX CAT5E	2891178	1
Patch angle with 2 ports in CAT 6	FL PF 2TX CAT6	2891068	1
Patch angle with 8 ports in CAT 6	FL PF 8TX CAT6	2891071	1
Patch angle with security elements for 2 ports in CAT 5e	FL PF SEC 2TX	2832687	1
Patch angle with security elements for 8 ports in CAT 5e	FL PF SEC 8TX	2832690	1
Patchbox 8 x RJ45 CAT 5e, 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
Security element for FL CAT patch	FL PATCH SAFE CLIP	2891246	20
Color marker for FL PATCH GUARD, black	FL PATCH GUARD CCODE BK	2891136	12
Color marker for FL PATCH GUARD, blue	FL PATCH GUARD CCODE BU	2891233	12
Color marker for FL PATCH GUARD, orange	FL PATCH GUARD CCODE OG	2891330	12
Color marker for FL PATCH GUARD, yellow	FL PATCH GUARD CCODE YE	2891437	12
Color marker for FL PATCH GUARD, turquoise	FL PATCH GUARD CCODE TQ	2891534	12
Color marker for FL PATCH GUARD, green	FL PATCH GUARD CCODE GN	2891631	12
Color marker for FL PATCH GUARD, red	FL PATCH GUARD CCODE RD	2891738	12
Color marker for FL PATCH GUARD, violet	FL PATCH GUARD CCODE VT	2891835	12
Security element for FL PATCH	FL PATCH GUARD	2891424	20
FL PATCH GUARD, key	FL PATCH GUARD KEY	2891521	1
Dust protection cap	FL RJ45 PROTECT CAP	2832991	10

## 4 Technical Data

### General Data

Function	Switch/repeater; conforms to standard IEEE 802.3
Latency of the communication processor	8 $\mu$ s plus frame time
Housing dimensions (width x height x depth)	70 x 135 x 110 mm
Weight, without connectors	870 g
Operating temperature	
FL SWITCH SFN...	0°C to 60°C
FL SWITCH SFNT...	-40°C to 75°C
Storage temperature	-40°C to 85°C
Degree of protection	IP20, DIN 40050, IEC 60529
Protection class	Class 3 VDE 0106; IEC 60536
Humidity (operation and storage)	5% to 95%, no condensation
Air pressure (operation)	
FL SWITCH SFN...	86 kPa to 108 kPa, 1500 m above sea level
FL SWITCH SFNT...	62 kPa to 108 kPa, 4160 m above sea level
Air pressure (storage)	
FL SWITCH SFN...	66 kPa to 108 kPa, 3500 m above sea level
FL SWITCH SFNT...	62 kPa to 108 kPa, 4160 m above sea level
Mounting	NS35 (EN 60715)
Preferred mounting position	Perpendicular to a standard mounting rail
Connection to protective earth ground	Snapped onto a grounded mounting rail

### Supply Voltage (U<sub>S</sub>)

Connection type	Removable, screw-clamp connector
Wire size (solid/stranded/AWG)	0.2 to 2.5 mm <sup>2</sup> / 0.2 to 2.5 mm <sup>2</sup> / 30 - 12 AWG
Torque	0.6 - 0.8 Nm (5 - 7 lb <sub>f</sub> -in.)
Recommended PE wire size	2.5 mm <sup>2</sup>
Nominal power supply	24 V DC
Permissible ripple	3.6 V <sub>pp</sub> within the permissible voltage range
Permissible voltage range	12 V DC to 48 V DC
Test voltage	500 V DC for one minute
Protection against polarity reversal	Present

### Current Consumption and Inrush Current

	Current Consumption (max)		Inrush Current
FL SWITCH SFN(T) 16TX	550 mA @ 12 V DC	275 mA @ 24 V DC	9.85 A @ 30 $\mu$ s
FL SWITCH SFN(T) 15TX/FX	630 mA @ 12 V DC	315 mA @ 24 V DC	9.7 A @ 30 $\mu$ s
FL SWITCH SFN(T) 14TX/2FX	715 mA @ 12 V DC	350 mA @ 24 V DC	10.0 A @ 30 $\mu$ s

### Interfaces

Total number of RJ45 Ethernet interfaces	14/15/16
MAC Address Table Size (Entries)	4 K
<b>Properties of RJ45 Ports</b>	
Connection format	8-pos. RJ45 female connector on the switch
Connection medium	Twisted-pair cable with a conductor cross section of 0.14 mm <sup>2</sup> to 0.22 mm <sup>2</sup>
Cable impedance	100 $\Omega$
Transmission speed	10/100 Mbps
Maximum network segment length	100 m
<b>Properties of Fiber Optic Ports</b>	
Connection format	SC duplex female connector
Fiber type	Multimode
Laser protection	Class 1 according to DIN EN 60825-1:2001-11

### Interfaces (Continued)

Transmission rate	100 Mbps full duplex
Wavelength	1300/1310 nm
Fiber optic segment length	12.1 km glass fiber with F-G 62.5/125 0.7 dB/km F1000 3.3 km glass fiber with F-G 62.5/125 2.6 dB/km F600 7.1 km glass fiber with F-G 50/125 0.7 dB/km F1200 3.1 km glass fiber with F-G 50/125 1.6 dB/km F800
Transmission power (medium type) dynamic (average)	
Minimum	-23.5 dBm (50/125 μm) / -20 dBm (62.5/125 μm)
Maximum	-14 dBm (50/125 μm) / -14 dBm (62.5/125 μm)
Transmission power (medium type) static	
Minimum	-22.5 dBm (50/125 μm) / -19 dBm (62.5/125 μm)
Maximum	-14 dBm (50/125 μm) / -14 dBm (62.5/125 μm)
Receiver sensitivity	
Minimum	-31 dBm (dynamic) / -31 dBm (static)
Maximum	-14 dBm (dynamic) / -14 dBm (static)
<b>Alarm Contacts</b>	
Voltage	24 V DC
Current carrying capacity	1 A maximum including inrush





### 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	
IEC 61000-4-2 (ESD)	Contact: ±4 kV, Criterion B Air: ±8 kV, Criterion B
IEC 61000-4-3 (radiated-noise immunity)	10 V/m, Criterion A
IEC 61000-4-4 (burst)	Ports: ±1 kV, Criterion B DC power: ±2 kV, Criterion B
IEC 61000-4-5 (surge)	Ports: ±1 kV, Criterion B DC power: ±500 V, Criterion B
IEC 61000-4-6 (conducted noise immunity)	10 V <sub>rms</sub> , Criterion A
IEC 61000-4-8 (noise immunity against magnetic fields)	30 A/m, Criterion A
EN 55022 (noise emission)	Class A

### Approvals

General	  ROHS EEE 2002/95/EC, WEEE 2002/96/EC
Hazardous location	 Class I, Zone 2 AEx nC IIC T4, EX nC nL IIC T4 X  Class I, Division 2 Groups A, B, C, D, T4

## 5 Overview

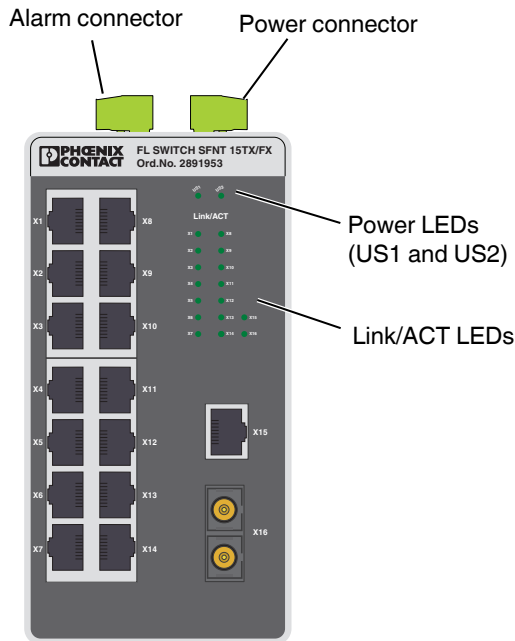


Figure 1 Connectors and LEDs (...15TX/FX shown)

### 5.1 Diagnostic and Status Indicators

Des.	Color	Status	Meaning
US1 and US2	green	ON	Supply voltage (US) in the tolerance range
		OFF	Supply voltage (US) too low
Link/ACT	green	ON	Valid network connection
		Flashing	Transmitting or receiving data



At high data rates the Link/ACT LED blinking may appear to be a constant rate.

## 6 Requirements for Operation in Hazardous Locations



### WARNING:

These instructions must be followed for proper use in hazardous locations.

The device must be installed within an enclosure rated at least IP54.

Do not open the enclosure unless power has been switched off or the area is known to be non-hazardous.

Provisions shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40%.

## 7 Installation



### CAUTION:

Only qualified personnel may start up and operate this device. Qualified personnel are persons authorized to start up, ground and mark devices, systems, and equipment according to the standards of safety technology.



### NOTE:

The FL SWITCH SFN(T)... module is designed for SELV and PELV operation according to IEC 61140/EN 61140.

Install the FL SWITCH SFN(T)... on a clean NS 35 rail. To avoid contact resistance, use only clean, corrosion-free rails that meet the EN 60715 standard. End clamps can be mounted on both sides of the module to stop the modules from slipping on the rail.



### NOTE:

Connect the mounting rail to protective earth ground using a grounding terminal block. The modules are grounded when they are snapped onto the rail. Connect protective earth ground with low impedance.

### 7.1 Assembly

1. Place the module onto the rail from above. The upper holding keyway must be hooked onto the top edge of the 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 rail.

### 7.2 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 rail.

### 7.3 Power Connection

The switch is designed for SELV and PELV operation at +24 V DC according to IEC 61140/EN 61140. Only SELV and PELV according to the defined standards may be used for supply purposes.

The FL SWITCH SFN(T)...16(15)(14)TX... switches provide the ability to connect redundant power supplies (see Figure 2). If redundant power supply is not required, a single power supply can be used (see Figure 3).

Snapping the switch onto a grounded rail connects it to the ground potential. In an environment particularly prone to EMI, noise immunity can be increased by an additional low-impedance connection to protective earth (see Figure 2 and Figure 3).

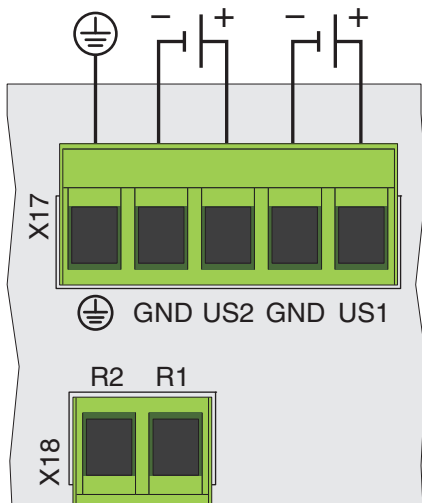


Figure 2 Power connections for redundant power supply

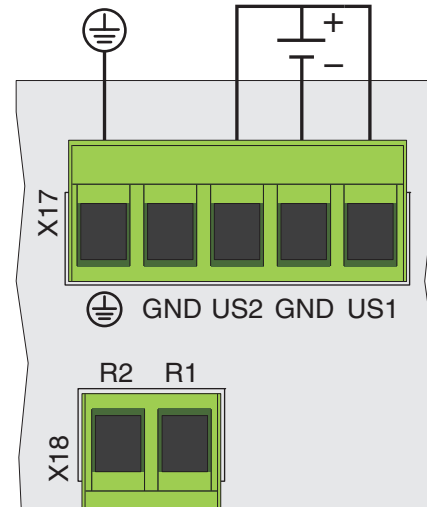


Figure 3 Power connections for single power supply

### 7.4 Alarm Contact

The FL SWITCH SFN(T)...16(15)(14)TX... switch provides contacts (R1, R2) for remote monitoring if a power failure is detected. Alarms are triggered if one or both power supplies fail.

The alarm relay is a normally closed type. When there are no faults, the contact is held open. When a fault occurs, the relay is de-energized to close the contact.

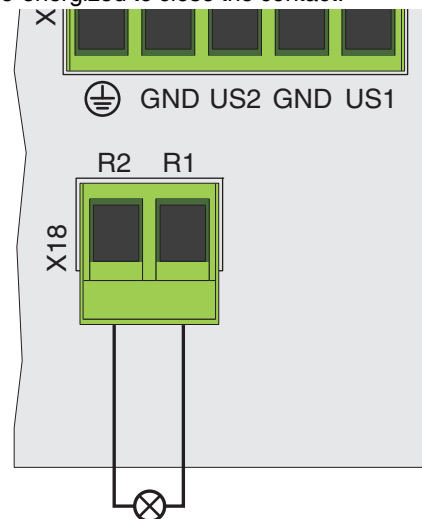


Figure 4 Remote monitoring connection

### 7.5 Ethernet Interface

The FL SWITCH SFN(T)... has 14, 15, or 16 Ethernet ports on the front in RJ45 format to which only twisted-pair cables with an impedance of 100 Ω can be connected. The data transmission speed is 10/100 Mbps. In addition, every port has an autocrossing function: it is not necessary to make a distinction between 1:1 or crossover Ethernet cables.

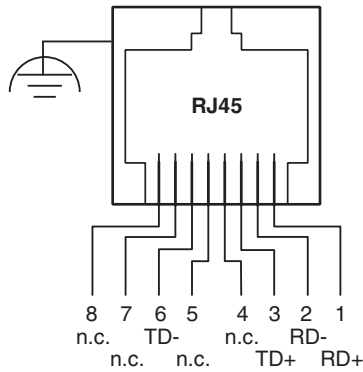


Figure 5 RJ45 pin assignment

## 8 Switching Characteristics

### Store and Forward

All data telegrams received by the switch are saved and their validity checked. 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 destination network segment.

### Multi-Address Function

The switch independently learns the addresses for termination devices, which are connected via a port, by

evaluating the source addresses in the data telegrams. Only packets with unknown addresses, with a source address of this port or with a multicast/broadcast address in the destination address field are forwarded via the corresponding port. The switch can store 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.

## 9 Dimensions

