

FL SWITCH SF ...

Factory Line Switches With Standard Functions



AUTOMATIONWORX

Data Sheet

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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 provided in the SC or ST format. 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.

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.
- Electrical isolation of network segments using up to two fiber optic ports.
- Increasing the maximum cable length to 10,000 m (62.5/125 μm) or to 6400 m (50/125 μm) using a fiber optic port.
- Floating alarm output: The alarm output can be used to monitor the redundant voltage supply.



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



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.



This data sheet is valid for the products listed on page 12 under "Ordering Data".

Housing Versions and Position of the Fiber Optic Connections

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

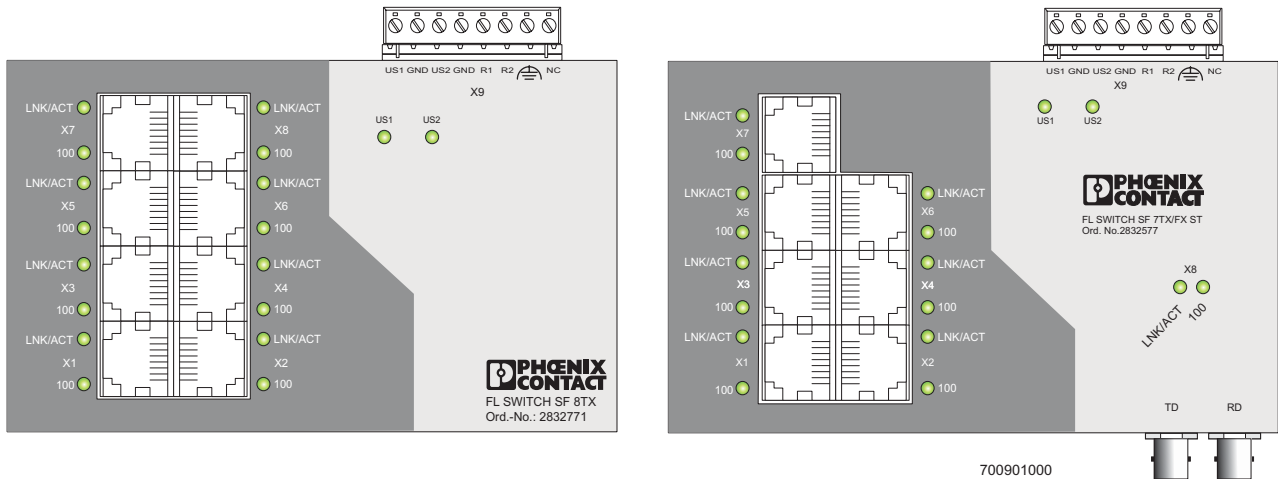


Figure 1 Housing examples for 8-port switches - FL SWITCH SF 8TX (left) / FL SWITCH 7TX/FX ST (right)

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

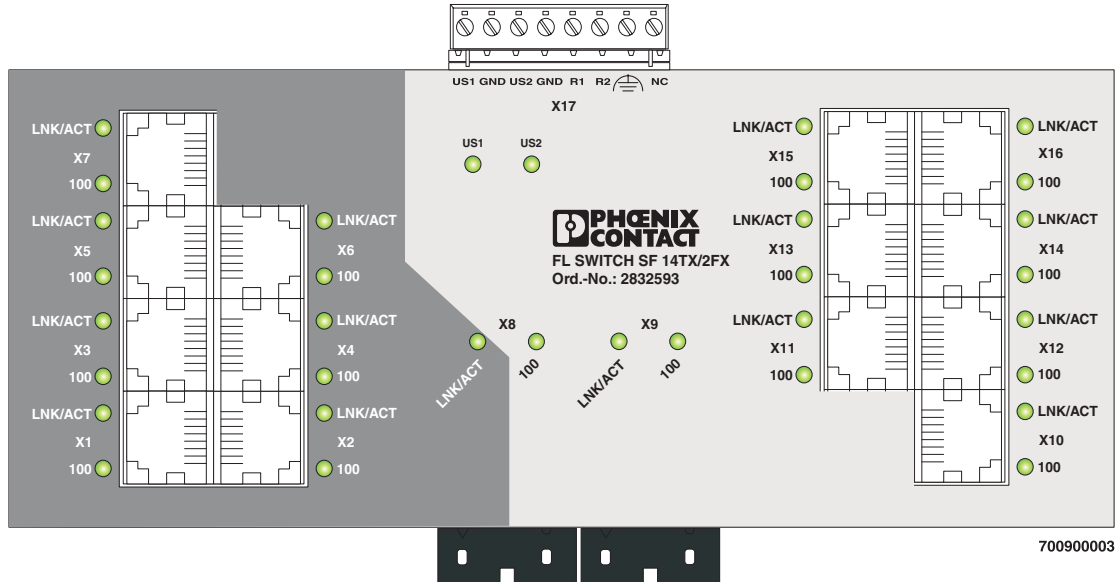


Figure 2 Housing example for 16-port switches (FL SWITCH 14TX/2FX)

Local 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 active
		Flashing	Active telegram
		OFF	Link not active
100	Yellow	ON	Data transmission speed 100 Mbps
		OFF	Data transmission speed not 100 Mbps

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 SF ... module is designed exclusively for SELV operation according to IEC 950 / EN 60950 / VDE 0805.

**Warning**

- A.) THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, ZONE 2, GROUPS A,B,C, AND D OR NON- HAZARDOUS LOCATIONS ONLY.
- B.) WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, ZONE 2.
- C.) WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

Installation and Mounting/Removal

Install the FL SWITCH SF ... module 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 modules 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.

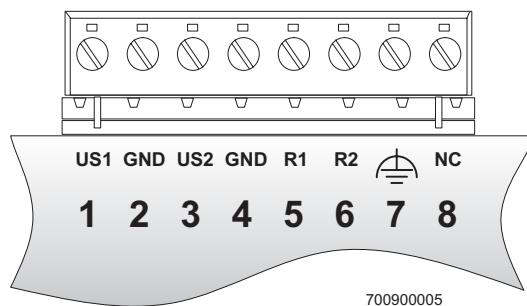
Mounting:

1. Place the module onto the DIN rail from above. The upper holding keyway 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. 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.

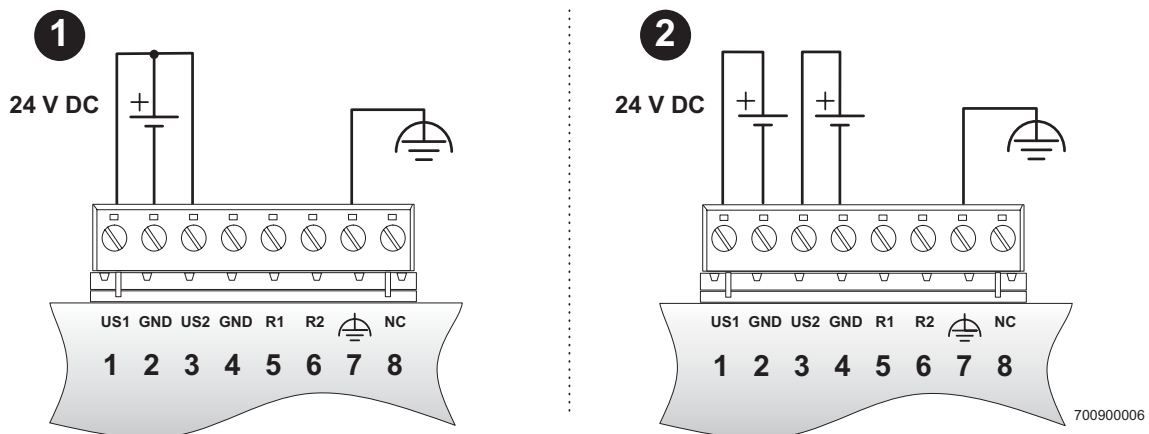


Figure 4 Typical supply of the module from one or two voltage sources

Supplying the Module From One Voltage Source



The alarm contact is open 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 closed. If the voltage is not supplied redundantly, terminal blocks US1 and US2 must be jumpered (see Figure 4, version 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 ... module has up to 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 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.

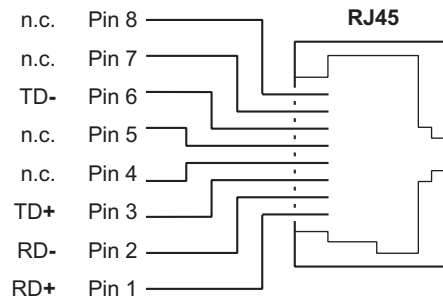


Figure 5 Pin assignment of the Ethernet ports in RJ45 format

Switching Features of the FL SWITCH SF ... Module

– Store and Forward

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 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 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 2k (8-port version) or 8k (16-port version) 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

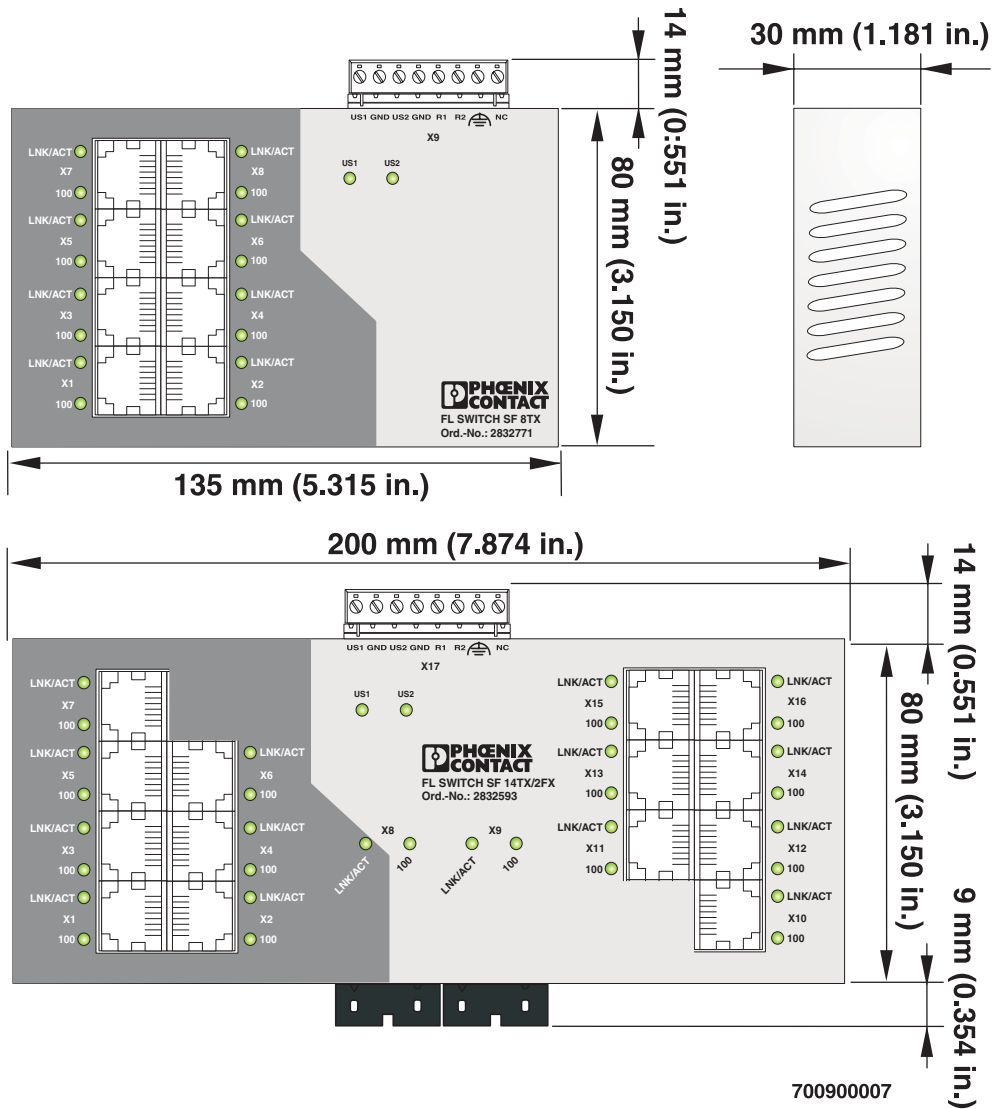


Figure 6 Housing dimensions of the FL SWITCH SF ... module



The housing depth and housing height is identical for all six housing versions.

Mounting Option

Using the FL RA SF8 rail adapter the 8-port SF switches can also be mounted on the DIN rail at an angle of 90°. In addition, the switch can be fixed on the DIN rail using the E/NS 35 universal end clamp.

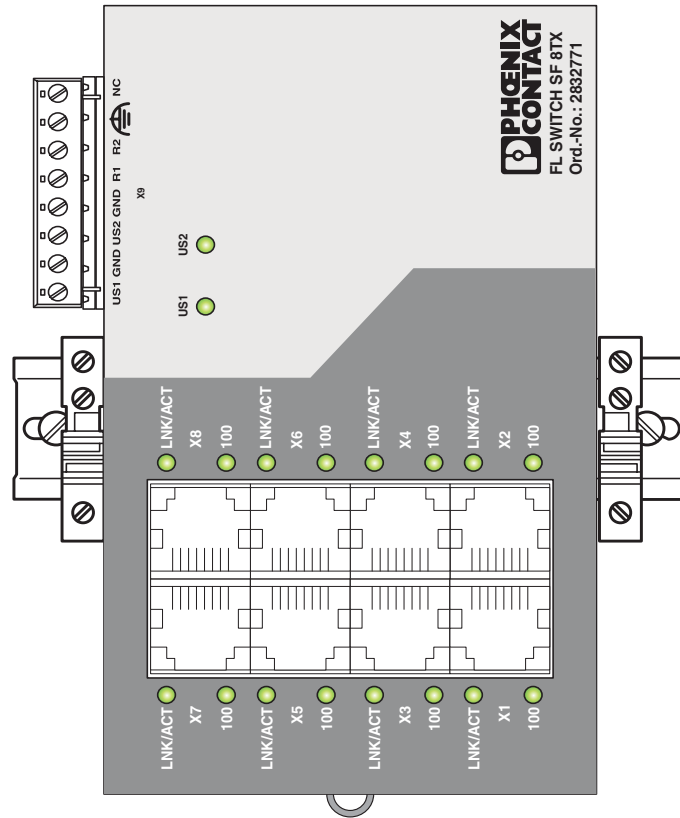


Figure 7 Mounting of the FL SWITCH SF 8TX turned by 90°

Technical Data

General Data	
Function	Switch/repeater; conforms to standard IEEE 802.3
Latency of the communication processor	6 μ s plus frame time (16-port version) 8 μ s plus frame time (8-port version)
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 optics)	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 optics)	200 x 80 x 30 (without COMBICON) 200 x 103 x 30 (with COMBICON)
Permissible operating temperature	0°C to 55°C
Permitted storage temperature	-20°C to 70°C
Degree of protection	IP20, DIN 40050, IEC 60529
Class of protection	Class 3 VDE 0106; IEC 60536
Humidity (operation)	5% to 95%, no condensation
Humidity (storage)	5% 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	Snapped onto a grounded DIN rail
Weight	
8-port switch	260 g, typical
16-port switch	380 g, typical
Supply Voltage (US)	
Connection	Via COMBICON; conductor cross-section 2.5 mm ² , maximum
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	Depends on the device - see the following table
Inrush current	9 A
Protection against polarity reversal	None
Test voltage	500 V DC for 1 minute
Power consumption	Depends on the device - see the following table

Module	Current Consumption	Power Consumption
FL SWITCH SF 8TX	200 mA	4.8 W
FL SWITCH SF 7TX/FX (ST)	220 mA	5.28 W
FL SWITCH SF 6TX/2FX (ST)	240 mA	5.76 W
FL SWITCH SF 16TX	300 mA	7.2 W
FL SWITCH SF 15TX/FX	330 mA	7.92 W
FL SWITCH SF 14TX/2FX	360 mA	8.64 W

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. RJ45 socket on the switch

Connection medium Twisted pair cable with a conductor cross-section of 0.14 mm² to 0.22 mm²

Cable impedance 100 Ω

Transmission speed 10/100 Mbps

Maximum network segment expansion 100 m

Properties of Fiber Optic Ports

Number 0, 1 or 2 depending on the device version

Connection format SC duplex socket or ST 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
 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
 10 km glass fiber with F-G 62.5/125 0.7 dB/km F1000
 3 km glass fiber with F-G 62.5/125 2.6 dB/km F600

Dynamic (average) transmission power (fiber type) in link mode

Minimum -24 dBm (50/125 μm) / -19 dBm (62.5/125 μm)

Maximum -14 dBm (50/125 μm) / -14 dBm (62.5/125 μm)

Minimum receiver responsivity -32 dBm (dynamic)

Maximum overrange -14 dBm (dynamic)

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 shockpulse
 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)	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

Approvals

CE, cURus (File: E140324), cULus (Class I Div 2 File: E199827)

ROHS EEE 2002/95/EC, WEEE 2002/96/EC

Differences to Previous Versions

Rev. 00 - First version

Rev. 01 - Technical data modified and module marking updated

Rev. 02 - Fiber optic technical data and alarm contact wiring modified

Rev. 03 - Approvals added

Rev. 04 - Port numbering and rail adapter added

Rev. 05 - ST versions added

Rev. 06 - Values for humidity changed, approval added

Ordering Data

Description	Type	Order No.	Pcs./Pkt.
Ethernet switch with 8 RJ45 ports	FL SWITCH SF 8TX	28 32 77 1	1
Ethernet switch with 7 RJ45 ports and 1 fiber optic port in SC format	FL SWITCH SF 7TX/FX	28 32 72 6	1
Ethernet switch with 6 RJ45 ports and 2 fiber optic ports in SC format	FL SWITCH SF 6TX/2FX	28 32 93 3	1
Ethernet switch with 16 RJ-45 ports	FL SWITCH SF 16TX	28 32 84 9	1
Ethernet switch with 15 RJ45 ports and 1 fiber optic port in SC format	FL SWITCH SF 15TX/FX	28 32 66 1	1
Ethernet switch with 14 RJ45 ports and 2 fiber optic ports in SC format	FL SWITCH SF 14TX/2FX	28 32 59 3	1
Ethernet switch with 7 RJ45 ports and 1 fiber optic port in ST format	FL SWITCH SF 7TX/FX ST	28 32 57 7	1
Ethernet switch with 6 RJ45 ports and 2 fiber optic ports in ST format	FL SWITCH SF 6TX/2FX ST	28 32 67 4	1
Rail adapter for mounting the 8-port switch at an angle of 90°	FL RA SF8	28 32 51 9	1
Universal end clamp	E/NS 35 N	08 00 88 6	50
RJ45 connector set gray for 1:1 cables (pack of 2)	FL PLUG RJ45 GR/2	27 44 85 6	1
RJ45 connector set green for crossover cables (pack of 2)	FL PLUG RJ45 GN/2	27 44 57 1	1
Double sheathed Ethernet cable	FL CAT5 HEAVY	27 44 81 4	-
Flexible Ethernet cable	FL CAT5 FLEX	27 44 83 0	-
Assembly tool for RJ45 connector	FL CRIMPTOOL	27 44 86 9	1
Patchbox 8 x RJ45 CAT5e, pre-assembled, can be retrofitted	FL PBX 8TX	28 32 49 6	1
Patchbox 6 x RJ45 CAT5e and 4 SC-RJ, glass pre-assembled, can be retrofitted	FL PBX 6TX/4FX	28 32 50 6	1
Patch cable, CAT 5, pre-assembled, 0.3 m long	FL CAT5 PATCH 0,3	28 32 25 0	10
Patch cable, CAT 5, pre-assembled, 0.5 m long	FL CAT5 PATCH 0,5	28 32 26 3	10
Patch cable, CAT 5, pre-assembled, 1.0 m long	FL CAT5 PATCH 1,0	28 32 27 6	10
Patch cable, CAT 5, pre-assembled, 1.5 m long	FL CAT5 PATCH 1,5	28 32 22 1	10
Patch cable, CAT 5, pre-assembled, 2.0 m long	FL CAT5 PATCH 2,0	28 32 28 9	10
Patch cable, CAT 5, pre-assembled, 3.0 m long	FL CAT5 PATCH 3,0	28 32 29 2	10
Patch cable, CAT 5, pre-assembled, 5.0 m long	FL CAT5 PATCH 5,0	28 32 58 0	10
Patch cable, CAT 5, pre-assembled, 7.5 m long	FL CAT5 PATCH 7,5	28 32 61 6	10
Patch cable, CAT 5, pre-assembled, 10.0 m long	FL CAT5 PATCH 10	28 32 62 9	10
Dust protection caps for RJ45 sockets	FL RJ45 PROTECT CAP	28 32 99 1	10