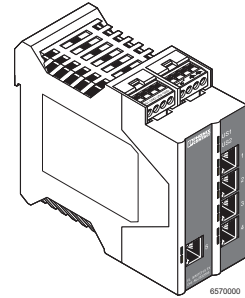# FL SWITCH 5TX (-ZF)

10/100 Mbit/s Five Port Ethernet Switch with screw terminals or spring cage terminals

<u>Data Sheet 6570C</u>   12/2002

Product Description

The FL SWITCH 5TX (-ZF) enables quick and cost-effective Ethernet network extension. It has five twisted pair ports, which can be connected to additional network segments or terminal devices. The switch supports Ethernet with a transmission rate of 10 Mbit/s as well as Fast Ethernet with a transmission rate of 100 Mbit/s.

The switch regenerates received data telegrams and sends them to the port to which the device with the corresponding target address is connected.

Features and field of application

– Increasing the network performance by filtering the data traffic.
   - Local data traffic remains local.
   - The data volume in the network segments is reduced.
– Simple network extension without configuration of the switches.
– Coupling the network segments with different bit rates.
   - Automatic detection of the data transmission rate of 10 or 100 Mbit/s.
– Auto negotiation: Every port establishes a half or full duplex connection with 10 Mbit/s or 100 Mbit/s.
– Auto crossing: It is not necessary to make a distinction between 1:1- or crossover Ethernet cables.

– Electrically isolated alarm output: It is possible to monitor the redundant voltage supply via the alarm output.
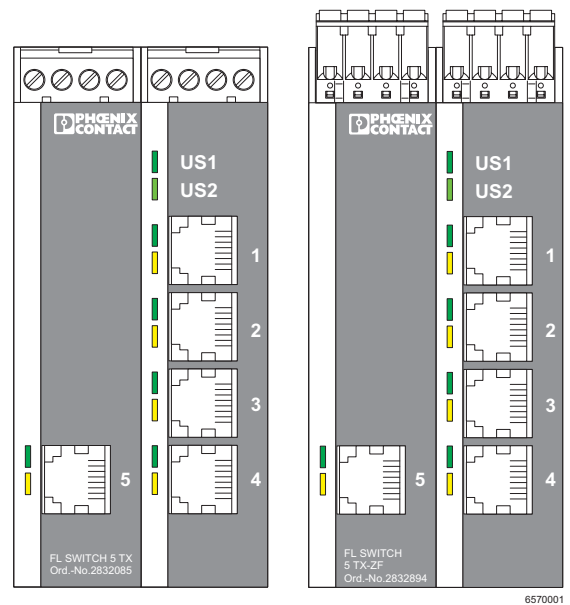

Figure 1   FL SWITCH 5TX (-ZF)

Local Diagnostic and Status Indicators

Des.	Color	Meaning
US1	Green	Supply voltage US1
US2	Green	Supply voltage US2
One LED per port		
	Green	Link active
	Yellow	Receiving telegrams

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General Information

⚠️ **Warning**
If these instructions are not followed there is a danger of 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 5TX (-ZF) module is designed exclusively for SELV operation according to IEC 950/EN 60950/VDE 0805.
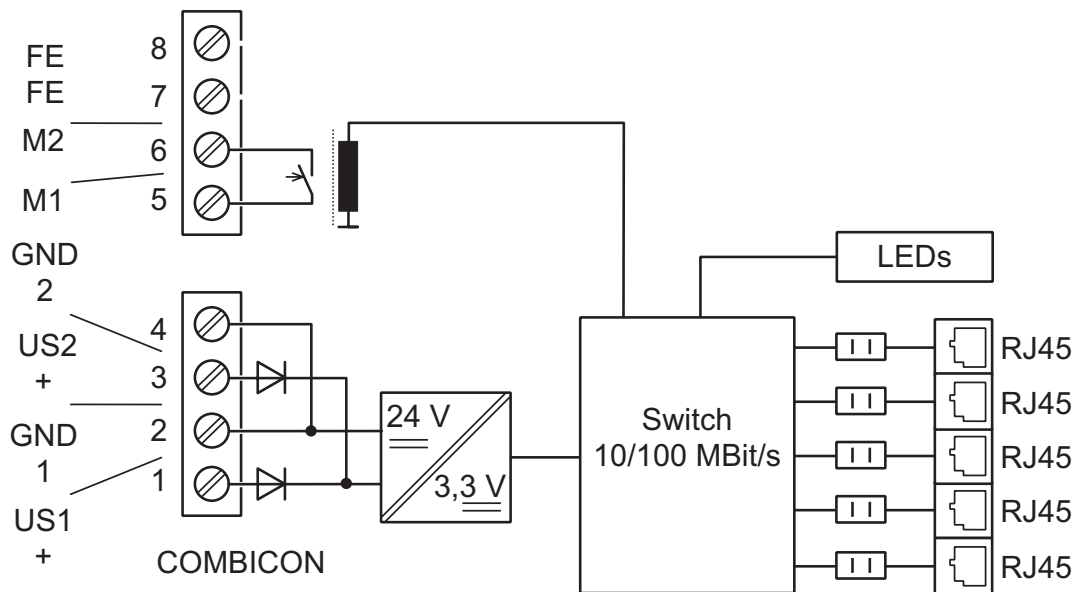
Internal Circuit Diagram

Figure 2   Internal circuit diagram of the FL SWITCH 5TX (-ZF)

Installation and Mounting/Removal

Install the FL SWITCH 5TX (-ZF) 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 terminal modules from slipping on the DIN rail.

> Connect the DIN rail to protective earth ground with 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. Slightly pull the module away from the mounting surface.
3. Lift the module from the DIN rail.

Terminal Point Assignment

Figure 3   Terminal point assignment
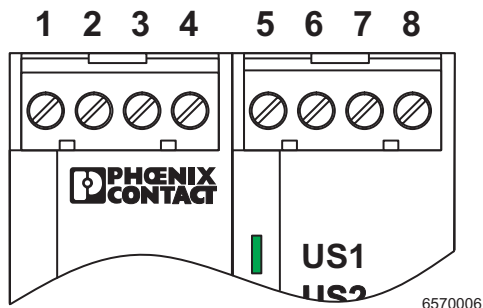
Terminal point	Meaning
1	Supply voltage +US1
2	GND US1
3	Supply voltage +US2
4	GND US2
5	Alarm contact 1 (M1)
6	Alarm contact 2 (M2)
7	Functional earth ground
8	Functional earth ground

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 connecting it to the other voltage supply terminal modules) and/or without wiring of the alarm contact.
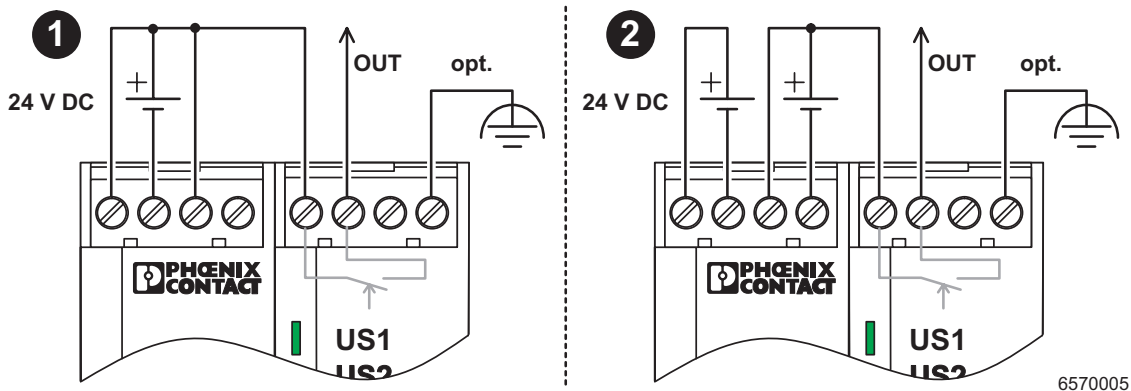
Figure 4   Example supply of the module from one or two voltage sources

Supplying the Module From one Voltage Supply

☞ In case of a non-redundant voltage supply the switch indicates the voltage supply failure via the alarm contact. You can prevent this error message by connecting the supply voltage in parallel to both terminal modules as shown in Figure 4, type 1.

☞ **Option:** In addition, noise immunity in an environment particularly prone to EMC can be increased by a connection with a low level of impedance to functional earth ground via terminal module 7 or 8.

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Ethernet Interface

The FL SWITCH 5TX (-ZF) has five Ethernet interfaces on the front in RJ45 format, to which only twisted pair cables with an impedance of 100 Ω can be connected. The data transmission rate is 10 Mbit/s or 100 Mbit/s. Every Ethernet port of the FL SWITCH 5TX (-ZF) can detect a pair of incorrectly connected receiving cables (RD+/RD-) and correct them using the auto polarity correction function. In addition, every port has an auto crossing function: It is not necessary to make a distinction between 1:1- or crossover Ethernet cables.
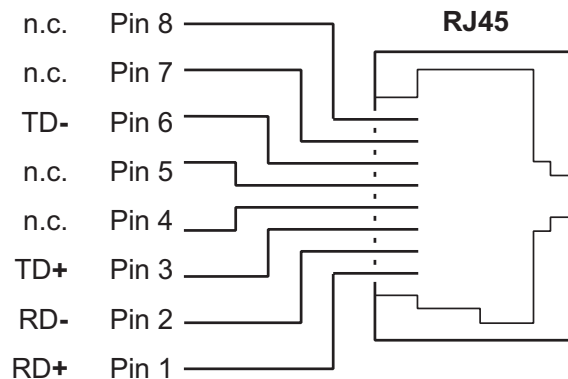

Figure 5   Pin assignment of the Ethernet ports in RJ45 format

Switching Features of FL SWITCH 5TX (-ZF)

– **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 error) as well as fragments (< 64 bytes) are rejected. Valid data telegrams are forwarded by the switch. The switch always forwards data using the data transmission rate that is used in the target network segment.

– **Multi Address Capability**
The switch automatically learns the addresses of the terminal devices that are connected via the 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 multi/broadcast address in the target address field are forwarded via the corresponding port. The switch can store up to 4096 addresses in its address table with an aging time of 5 minutes. This is possible if more than one terminal 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.

**Connecting Cables Between Ethernet Components**

☞ Auto crossing function: For the FL SWITCH 5TX (-ZF), it is not necessary to make a distinction between 1:1- or crossover Ethernet cables.

To connect Ethernet components (structure components or terminal devices) with one another, crossover cables (C/O) or 1:1 wired cables (1:1) are required. In general, 1:1 wired cables are required between structure components and terminal devices, whereas crossover cables are used for connections between two structure components and for connections between two terminal devices. To distinguish between the two cable types, **green** bending protection sleeves should be used for **crossover** cables, and **gray** bending protection sleeves for **1:1** wired cables. The cables required between the corresponding Factory Line components are specified in the following table.

	FL HUB ...	FL SWITCH XX/XX	FL SWITCH 5TX (-ZF)	FL SWITCH 4TX/FX	FL IBS SC/I-T	FL IL 24 BK ...	FL MC ...	PC/Notebook	RFC ...	IBS 24 ETH DSC/I-T	IBS S7 400 ETH DSC/I-T
FL HUB ...	C/O	C/O	X	X	1:1	1:1	C/O	1:1	1:1	1:1	1:1
FL SWITCH XX/XX	C/O	C/O	X	X	1:1	1:1	C/O	1:1	1:1	1:1	1:1
FL SWITCH 5TX (-ZF)	X	X	X	X	X	X	X	X	X	X	X
FL SWITCH 4TX/FX	X	X	X	X	X	X	X	X	X	X	X
FL IBS SC/I-T	1:1	1:1	X	X	C/O	C/O	1:1	C/O	C/O	C/O	C/O
FL IL 24 BK ...	1:1	1:1	X	X	C/O	C/O	1:1	C/O	C/O	C/O	C/O
FL MC ...	C/O	C/O	X	X	1:1	1:1	C/O	1:1	1:1	1:1	1:1
PC/Notebook	1:1	1:1	X	X	C/O	C/O	1:1	C/O	C/O	C/O	C/O
RFC ...	1:1	1:1	X	X	C/O	C/O	1:1	C/O	C/O	C/O	C/O
IBS 24 ETH DSC/I-T	1:1	1:1	X	X	C/O	C/O	1:1	C/O	C/O	C/O	C/O
IBS S7 400 ETH DSC/I-T	1:1	1:1	X	X	C/O	C/O	1:1	C/O	C/O	C/O	C/O

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Pin Assignment of Crossover/1:1 Cables
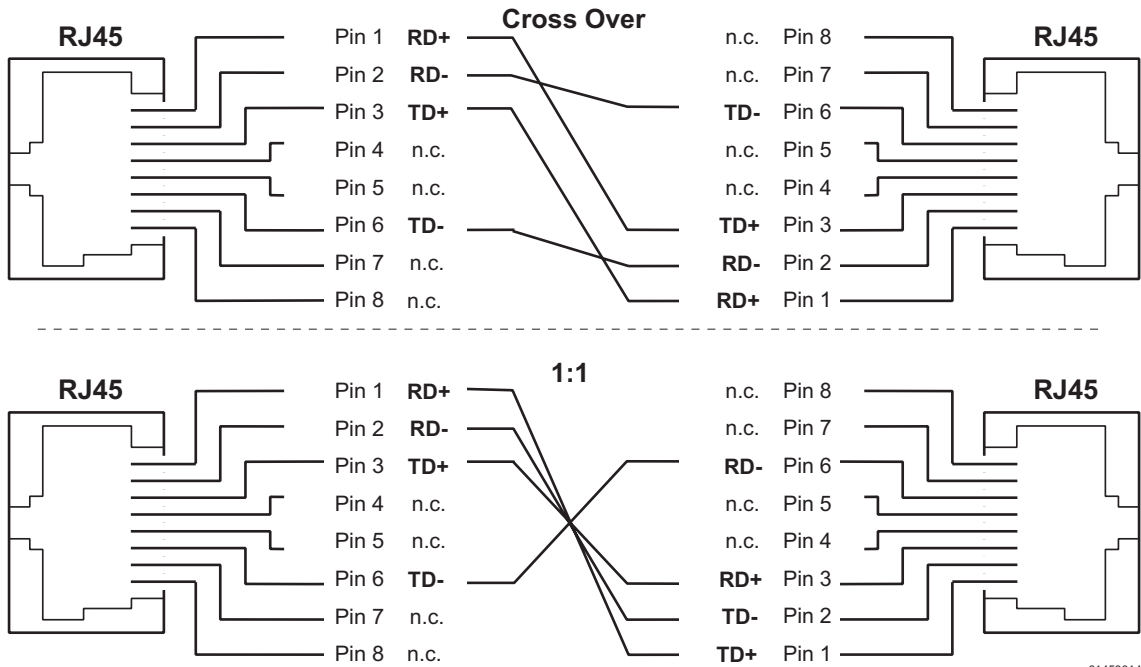
Figure 6   Pin assignment of crossover/1:1 cables

Housing Dimensions
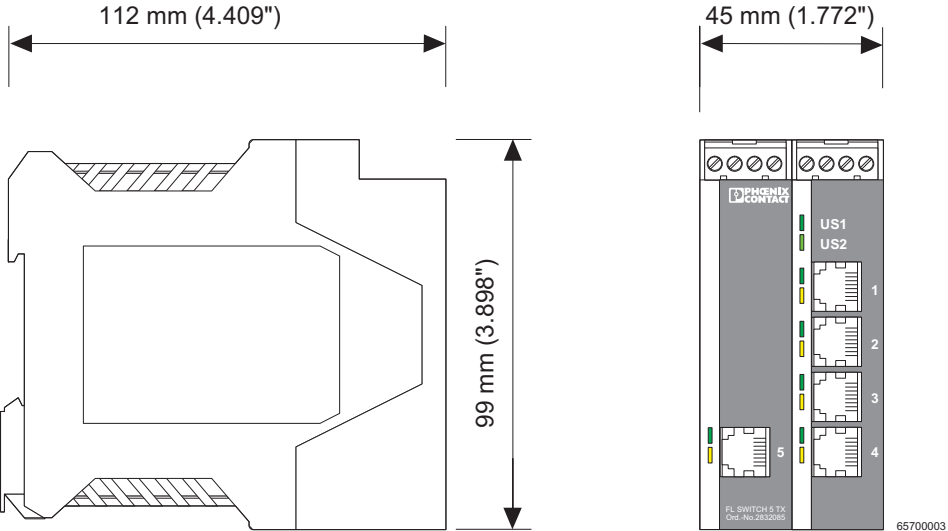

Figure 7   Housing dimensions for the FL SWITCH 5TX
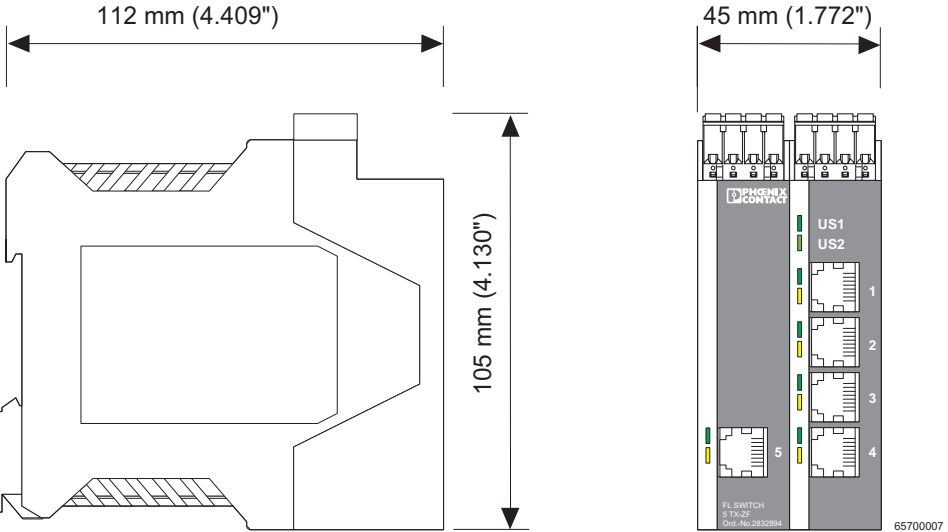

Figure 8   Housing dimensions for the FL SWITCH 5TX-ZF

Technical Data

General Data	
Function	Switch/repeater; conforms to the IEEE 802.3 standard
Housing dimensions without COMBICON (width x height x depth)	45 mm x 99 mm x 112 mm (1.772 in. x 3.898 in. x 4.409 in.)
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	IP 20, 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
Environmental compatibility	Free from substances that would hinder coating with paint or varnish (according to VW specification)
Resistance to solvents	Standard solvents
Resistance to gases that may endanger functions according to DIN 40 436 Parts 36 and 37	Sulfur dioxide (SO_2) 10 ± 0.3 cm^3/m^3 Hydrogen sulfide (H2S) 1 ± 0.3 cm^3/m^3 each at 25°C (77°F) and 75% humidity and an exposure time of four days
Weight	225 g, typical

I/O Supply Voltage (US)	
Connection	Via COMBICON; maximum cable diameter = 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	180 mA, typical

I/O Supply Voltage (US)	
Test Voltage	500 V DC for 1 minute
Protection against polarity reversal	Present
Power consumption	4.3 W, typical

Interfaces	
Ethernet interfaces	
Number	5
Connection method	8-pos. RJ45 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 24 AWG)
Cable impedance	100 Ω
Transmission rate	10/100 Mbit/s
Maximum network segment expansion	100 m (328.084 ft.)
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 B
IEC 61000-4-5 (surge)	Criterion B

Conformance With EMC Directives	
IEC 61000-4-6 (conducted noise immunity)	Criterion A
IEC 61000-4-8 (noise immunity against magnetic fields)	Criterion A
EN 55022 (noise emission)	Criterion A

Approvals	
Approvals	cUL 508, cUL 2279, cUL 1604 Class 1 Div 2

Difference to the previous version
FL SWITCH 5TX-ZF listed within this data sheet

Ordering Data

Description	Order Designation	Order No.
Ethernet Switch with screw clamp terminals	FL SWITCH 5TX	28 32 08 5
Ethernet Switch with spring cage terminals	FL SWITCH 5TX-ZF	28 32 89 4
RJ45 connector set **gray** for 1:1 cable (2 pieces)	FL PLUG RJ45 GR/2	27 44 85 6
RJ45 connector set **green** for crossover cables (2 pieces)	FL PLUG RJ45 GN/2	27 44 57 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
Startup/diagnostic software	FL SWT	28 31 04 4
Medium converter 660 nm	FL MC 10BASE-T/FO POF	27 44 51 3
Modular Ethernet hub	FL HUB 10BASE-T	28 31 02 8
Management head station	FL HUB AGENT	28 31 07 3
10/100 Base-T(X) switch with redundancy option (copper)	FL SWITCH TX/TX	28 32 03 0
10/100 Base-T(X) switch with redundancy option (FO)	FL SWITCH FX/FX	28 31 08 6

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