SIEMENS

SIMATIC NET

S7-300
Compact Switch Module CSM 377

Operating Instructions

Edition 11/07
A2B00073499E

Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠DANGER
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠WARNING
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠CAUTION
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE
indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

⚠WARNING
This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

All names identified by ® are registered trademarks of the Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Siemens AG
Automation and Drives
Postfach 48 48
90327 NÜRNBERG
GERMANY

Ordernumber: A2B00073499E
℗ 11/2007

Table of contents

Introduction

1

1.1 Preface

Overview

This section provides you with an overview of the functions of the unmanaged compact switch module CSM 377.

Purpose of the Commissioning Manual

This commissioning manual supports you when commissioning networks with the compact switch module CSM 377.

Validity of this Commissioning Manual

This commissioning manual is valid for the following device:

CSM 377
6GK7377-1AA00-0AA0

Further documentation

The "SIMATIC NET Industrial Ethernet Twisted Pair and Fiber Optic Networks" manual contains additional information on other SIMATIC NET products that you can operate along with the CSM 377 switch in an Industrial Ethernet network.

Finding information

To help you to find the information you require more quickly, the manual includes not only the table of contents but also the following sections in the Appendix:

- Index
- Glossary

Audience

This commissioning manual is intended for personnel involved in the commissioning of networks with the CSM 377 compact switch module.

Standards and approvals

The CSM 377 compact switch module meets the requirements for the CE, UL, C-Tick, FM and ATEX marks. You will find detailed information in the section "Approvals and Markings" in this commissioning manual in the "Approvals" table.

Note

The specified approvals apply only when the corresponding mark is printed on the product.

1.2 Introduction

What is possible?

The CSM 377 device allows the cost-effective installation of Industrial Ethernet bus or star structures with switching functionality.

Note

It is not possible to use the CSM 377 switch in a redundant ring because it does not support redundancy.

Note

If the CSM 377 switch is supplied over long 24 V power supply lines or networks, measures are necessary to prevent interference by strong electromagnetic pulses on the supply lines. These can result, for example, due to lightning or switching of large inductive loads.

One of the tests used to attest the immunity of the switch to electromagnetic interference was the "surge immunity test" according to EN61000-4-5. This test requires overvoltage protection for the power supply lines. A suitable device is, for example, the Dehn Blitzductor VT AD 24 V type no. 918 402 or comparable protective element.

Manufacturer:
DEHN+SÖHNE GmbH+Co.KG Hans Dehn Str.1 Postfach 1640 D-92306 Neumarkt, Germany

⚠ WARNING

When used under hazardous conditions (zone 2), the CSM 377 switch must be installed in an enclosure.

To comply with ATEX100a (EN 60079-15), this enclosure must meet the requirements of at least IP54 in compliance with EN 60529.

WARNING – EXPLOSION HAZARD: DO NOT DISCONNECT EQUIPMENT WHEN A FLAMMABLE OR COMBUSTIBLE ATMOSPHERE IS PRESENT.

Network topologies

2

2.1 Network topologies

Switching technology allows extensive networks to be set up with numerous nodes and simplifies network expansion.

Which topologies can be implemented?

Linear (bus) and star topologies can be implemented with the compact switch module CSM 377.

Note

Make sure that the maximum permitted cable lengths for the relevant devices are not exceeded. You will find the permitted cable lengths in the technical specifications.

Bus topology

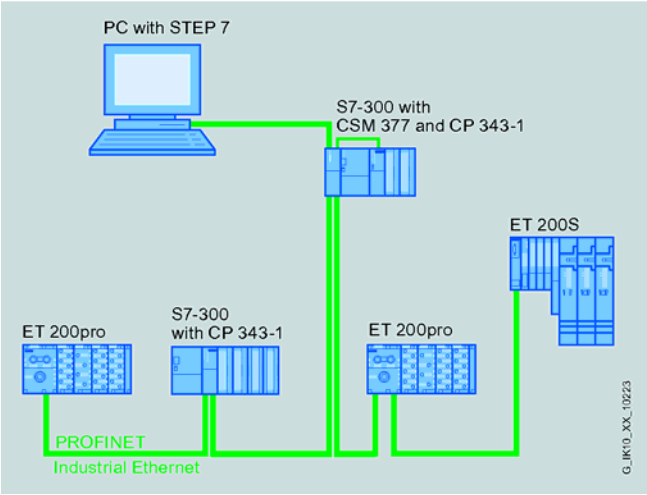

Figure 2-1 Bus topology with the CSM 377

Star topology

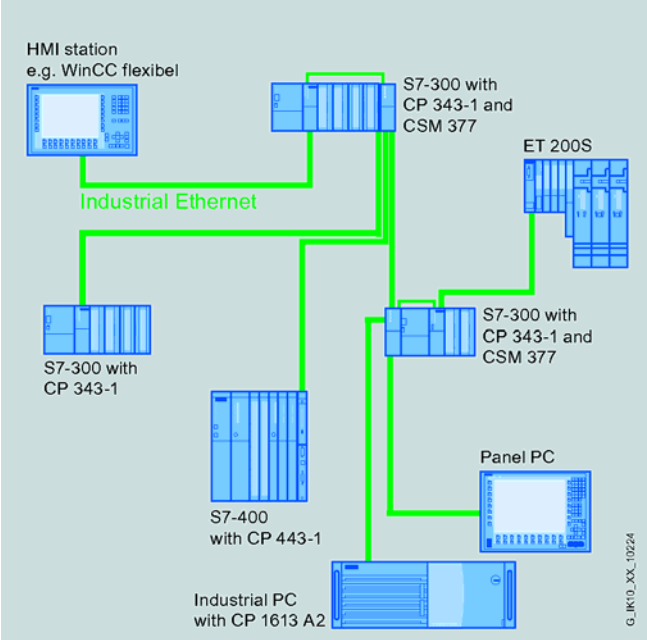

Figure 2-2 Star topology. Example with the CSM 377

Product properties

3

3.1 Components of the product

The CSM 377 compact switch module always ships with the following:

- 2-pin terminal block (power supply)
- Operating Instructions (on the CD)
- CD

3.2 Unpacking and checking

Unpacking, checking

1. Make sure that the package is complete.
2. Check all the parts for transport damage.

⚠ WARNING
Do not use any parts that show evidence of damage!

3.3 CSM 377 product characteristics

Possible attachments

The CSM 377 has four RJ-45 jacks for the connection of end devices or other network segments.

Figure 3-1 Compact Switch Module CSM 377

3.4 TP ports

Connector pinout

On the CSM 377, the TP ports are implemented as RJ-45 sockets with MDI-X assignment (Medium Dependent Interface–Autocrossover) of a network component.

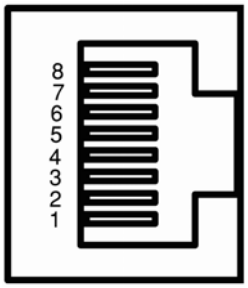

Figure 3-2 RJ-45 jack

Table 3-1 Pin assignment of the RJ-45 jack

Pin number	Assignment
Pin 8	n. c.
Pin 7	n. c.
Pin 6	TD-
Pin 5	n. c.
Pin 4	n. c.
Pin 3	TD+
Pin 2	RD-
Pin 1	RD+

NOTICE
TP cords or TP-XP cords with a maximum length of 10 m can be connected to the RJ-45 TP port. With the IE FC cables and IE FC RJ-45 plug 180, an overall cable length of up to 100 m is permitted between two devices depending on the cable type.

Autonegotiation

Autonegotiation means the automatic detection of the functionality of the port at the opposite end. Using autonegotiation, network components or end devices can detect the functionality available at the port of a partner device allowing automatic configuration of different types of device. With autonegotiation, two components connected to a link segment can exchange parameters and set themselves to match the supported communication functionality.

Note

Devices not supporting autonegotiation must be set to 100 Mbps/ half duplex or 10 Mbps half duplex.

Note

The CSM 377 is a plug-and-play device that does not require settings to be made for commissioning.

Auto polarity exchange

If the pair of receiving cables are incorrectly connected (RD+ and RD- swapped over), the polarity is adapted automatically.

MDI /MDIX autocrossover function

The advantage of the MDI /MDIX autocrossover function is that straight-through cables can be used throughout and crossover Ethernet cables are unnecessary. This prevents malfunctions resulting from mismatching send and receive wires. This makes installation much easier for the user.

NOTICE
Please note that the direct connection of two ports on the switch or accidental connection over several switches causes an illegal loop. Such a loop can lead to network overload and network failures.

3.5 Displays

Power indicator (green LED)

The status of the power supply is indicated by a green LED:

Status	Meaning
LED lit green	Power supply is connected
LED not lit	Power supply is not connected or < 14 V Refer to the Note in Section 4.6

Port status indicator (green/yellow LED)

The status of the interfaces is indicated by four green/yellow LEDs:

Status	Meaning
Port 1 through 4 LED lit green	TP link exists, no data reception
Port 1 through 4 LED lit yellow	TP link exists, data received at TP port
Ports 1 through 4 LEDs flash synchronized	Test phase during power on

3.6 Technical specifications

Technical specifications of the CSM 377

Connectors	
Attachment of end devices or network components over twisted pair	4 x RJ-45 sockets with MDI-X pinning 10/100 Mbps (half/ full duplex), floating
Connector for power supply	2-pin plug-in terminal block
Electrical data	
Power supply	Power supply 19.2 to 28.8 V DC safety extra-low voltage (SELV)
Power loss at 24 V DC	1.6 W
Current consumption at rated voltage	70 mA
Overvoltage protection at input	PTC resettable fuse (0.5 A / 60 V)
Permitted cable lengths	
Connection over Industrial Ethernet FC TP cables	
0 – 100 m	Industrial Ethernet FC TP standard cable with IE FC RJ-45 plug 180 or over Industrial Ethernet FC outlet RJ-45 with 0 - 90 m Industrial Ethernet FC TP standard cable + 10 m TP cord
0 – 85 m	Industrial Ethernet FC TP marine/trailing cable with IE FC RJ-45 plug 180 or 0 - 75 m Industrial Ethernet FC TP marine/trailing cable + 10 m TP cord
Aging time	
Aging time	300 seconds

Permitted ambient conditions	
Operating temperature	0°C through +60°C
Storage/transport temperature	-40°C through +70°C
Relative humidity in operation	‹ 95% (no condensation)
Operating altitude	2000 m at max 56 °C ambient temperature 3000 m at max. 50 °C ambient temperature
Immunity	EN 61000-6-2
Emission	EN 61000-6-4
Degree of protection	IP20
MTBF	
MTBF	144 years
Construction	
Dimensions (W x H x D) in mm	40 x 125 x 118
Weight in g	200
Installation options	S7-300 standard rail
Order numbers	
CSM 377	6GK7377-1AA00-0AA0
"Industrial Ethernet TP and Fiber Optic Networks" manual	6GK1970-1BA10-0AA0
TP Cord RJ-45/RJ-45 0.5 m	6XV1850-2GE50
IE FC Stripping Tool	6GK1901-1GA00
IE FC blade cassettes	6GK1901-1GB00
IE FC TP standard cable	6XV1840 2AH10
IE FC TP trailing cable	6XV1840-3AH10
IE FC TP marine cable	6XV1840-4AH10
IE FC RJ-45 Plug 180 pack of 1	6GK1 901-1BB10-2AA0
IE FC RJ-45 Plug 180 pack of 10	6GK1 901-1BB10-2AB0
IE FC RJ-45 Plug 180 pack of 50	6GK1 901-1BB10-2AE0

Note

The number of connected switches influences the frame delay.

When a frame passes through the CSM 377, it is delayed by the store and forward function of the switch
- with a 64 byte frame length by approx. 8 µs (at 100 Mbps)
- with a 1500 byte frame length by approx. 125 µs (at 100 Mbps)

This means that the more CSM 377 switches that a frame passes through, the higher the frame delay will be.

Mounting

4

4.1 Installation

Type of mounting

The CSM 377 compact switch module is intended only for mounting on a SIMATIC S7-300 standard rail.

Note

When installing and operating the device, keep to the installation instructions and safety-related notices as described here and in the manual SIMATIC NET Industrial Ethernet Twisted Pair and Fiber Optic Networks /1/.

Note

Provide suitable shade to protect the device against direct sunlight. This avoids unwanted warming of the device and prevents premature aging of the device and cabling.

⚠ WARNING

If temperatures in excess of 70 °C occur on the cable or at the cable feed-in point, or the temperature at the branching point of the cables exceeds 80 °C, special measures need to be taken. If the equipment is operated at an ambient temperature of 50°C - 60°C, use cables with a permitted ambient temperature of at least 80°C.

⚠ WARNING

Protective measures must be taken to avoid the rated voltage of the equipment being exceeded by more than 40% by transient overvoltages. This is the case if the equipment is supplied exclusively by SELV circuits.

⚠ WARNING

If the CSM 377 is operated in an ambient temperature of more than 55 °C, the temperature of the device housing may be higher than 70 °C.

The subject unit must be located in a Restricted Access Location where access can only be gained by SERVICE PERSONNEL or by USERS who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken when operated in an air ambient in excess of 55 °C.

4.2 Installation on a standard rail

Installation on a SIMATIC S7-300 standard rail

Note

The CSM 377 does not have a feedthrough for the backplane bus. It must therefore be mounted either at the start or end of the station!

1. Place the upper guide at the top of the CSM housing in the S7 standard rail.
2. Screw the CSM 377 compact switch module to the underside of the standard rail.
3. Fit the connectors for the power supply. See Figure 4-3
4. Insert the terminal block into the sockets on the device. See Figure 4-2

Figure 4-1 CSM 377 installation on a SIMATIC S7-300 standard rail

Uninstalling

To remove a CSM 377 compact switch module from the SIMATIC S7-300 standard rail:

1. First disconnect all connected cables. See Figure 4-6
2. Loosen the device screws on the underside of the S7 standard rail and lift the device away from the rail.

4.3 Power supply

Power supply

The power supply is connected using a 2-pin plug-in terminal block. The power supply is connected over a high resistance with the S7 standard rail to allow an ungrounded setup. The power supply is non-floating.

Figure 4-2 Connecting the power supply

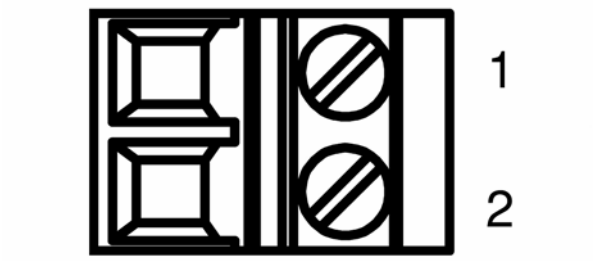

Figure 4-3 Pin assignment of the terminal block

Table 4-1 Pin assignment for the power supply

Pin number	Assignment
Pin 1	L+ (19.2 - 28.8 V DC)
Pin 2	M (chassis ground)

⚠ WARNING

The device is designed for operation with safety extra-low voltage. This means that only safety extra-low voltages (SELV) complying with IEC950/EN60950/ VDE0805 can be connected to the power supply terminals.

The power supply unit for the device power supply must meet NEC Class 2, as described by the National Electrical Code(r) (ANSI/NFPA 70).

The power of all connected power supply units must total the equivalent of a power source with limited power (LPS limited power source).

Never connect the device to AC voltage.
Never operate the device with DC voltage higher than 28.8 V DC.

4.4 Grounding

S7 standard rail

The device is grounded over its rear panel and the neck of the screw.

4.5 Fitting the IE FC RJ-45 Plug 180

IE FC RJ-45 Plug 180

The robust connectors of the nodes are designed for industry and are PROFINET-compliant. Due to the locking mechanism on the casing, they provide additional strain and torsion relief.

Assembly of the IE FC RJ-45 Plug 180 on an IE FC standard cable

For information on assembling an IE FC RJ-45 Plug 180 on a SIMATIC NET Industrial Ethernet FastConnect cable, please refer to the instructions supplied with the IE FC RJ-45 Plug.

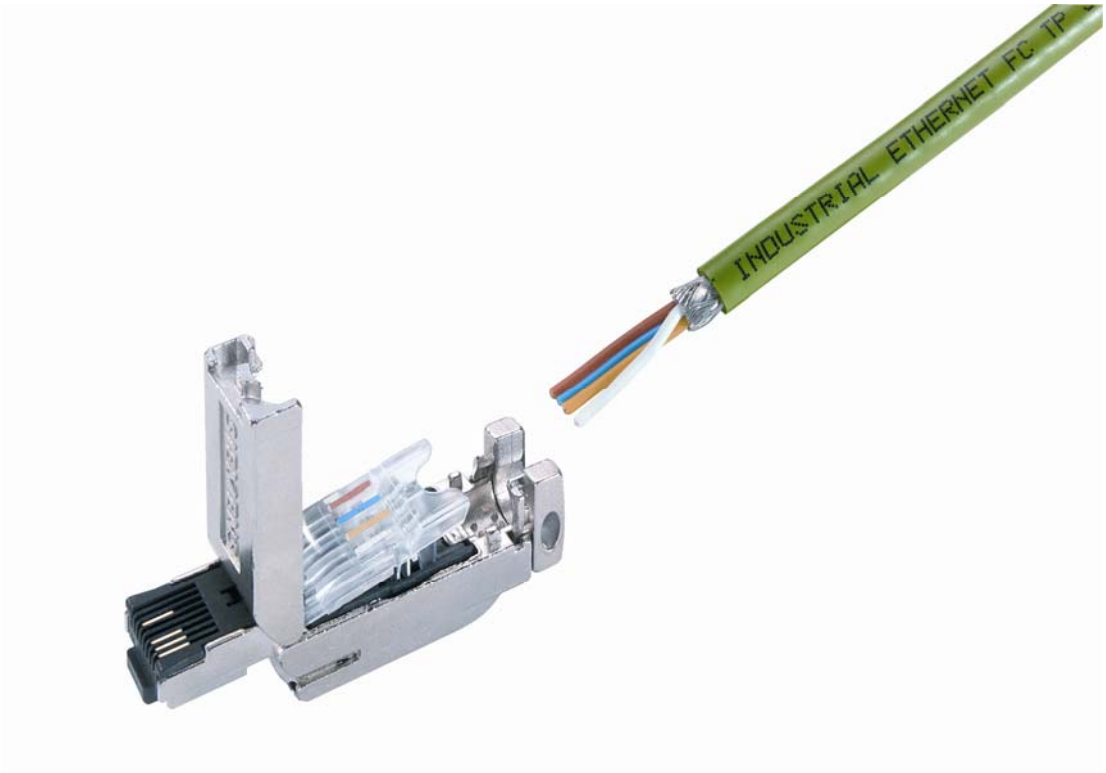

Figure 4-4 IE FC RJ-45 Plug 180

Inserting the IE FC RJ-45 Plug 180

Insert the IE FC RJ-45 Plug 180 into the twisted pair port of the CSM 377 until it locks in place.

Figure 4-5 Inserting the IE FC RJ-45 Plug 180

The flush fit and locking mechanism of the PROFINET-compliant IE FC RJ-45 Plug 180 along with the securing collar on the TP port of the CSM 377 guarantee a robust node connection suitable for industrial conditions providing tensile and bending strain relief for the twisted pair socket.

Removing the IE FC RJ-45 Plug 180

Release the catch of the IE FC RJ-45 Plug 180 using a 2.5 mm screwdriver.

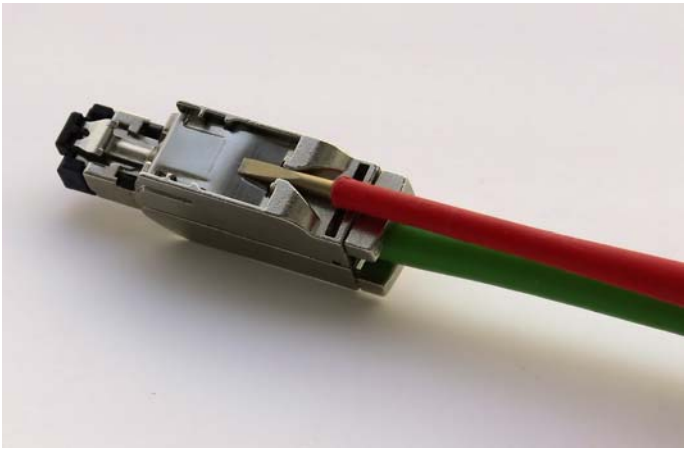

Figure 4-6 Releasing the catch of the RJ-45 Plug

Once you have released the catch, you can remove the IE FC RJ-45 Plug 180 from the twisted pair socket.

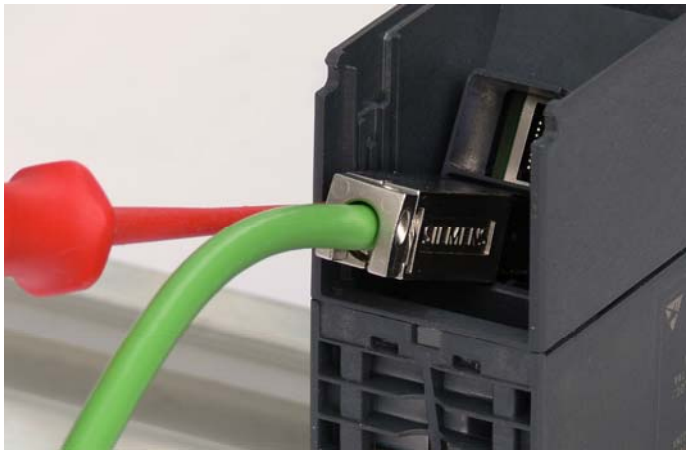

Figure 4-7 Removing the IC FC RJ-45 Plug by releasing the RJ-45 Plug using a screwdriver

4.6 Possible sources of problems and how to deal with them

Fuses

Note

The CSM 377 compact switch module has a resettable fuse / PTC. If the fuse triggers (all LEDs are off despite correctly applied power supply), the device should be disconnected from the power supply for approximately 30 minutes before turning it on again.

LED display when voltage drops

If the power supply sinks below approximately 14 V, the internal power supply switches off, the L-LED and all port LEDs go off. The functionality of the CSM 377 is no longer available.

Device defective

If a fault develops, please send the device to your SIEMENS service center for repair. Repairs on-site are not possible.

Approvals and markings

5

5.1 Notes on the CE Mark

Product name

Compact switch module		
SIMATIC NET	CSM 377	6GK7377-1AA00-0AA0

EMC directive

89/336/EEC "Electromagnetic Compatibility"

Area of application

The product is designed for use in an industrial environment:

Area of application	Requirements	
	RF interference level	Immunity
Industrial area	EN 61000-6-4: 2001	EN 61000-6-2: 2001

Installation guidelines

The product meets the requirements if you keep to the installation instructions and safety-related notices as described here and in the manual "SIMATIC NET Industrial Ethernet Twisted Pair and Fiber Optic Networks" /1/ when installing and operating the device.

Conformity certificates

The EC Declaration of Conformity is available for the responsible authorities according to the above-mentioned EC Directive at the following address:

Siemens Aktiengesellschaft
Bereich Automatisierungs- und Antriebstechnik
Industrielle Kommunikation (A&D SC IC)
Postfach 4848
D-90327 Nürnberg

Notes for the manufacturers of machines

This product is not a machine in the sense of the EC Machinery Directive. There is therefore no declaration of conformity relating to the EC Machinery Directive 98/37/EEC for this product.

If the product is part of the equipment of a machine, it must be included in the procedure for obtaining the declaration of conformity by the manufacturer of the machine.

Certifications and approvals

c-UL-us	UL 508
	CSA C22.2 No. 142
c-UL-us for hazardous locations[1]	UL 1604, UL 2279Pt.15 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP, IIC, T.. CL.1, Zone 2, AEx nC IIC T..
FM[1]	FM 3611 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP. IIC, T.. Ta:..
C-TICK	AS/NZS 2064 (Class A)
CE	EN 61000-6-4, EN 61000-6-2
ATEX Zone 2[1]	EN60079-15 II 3 G Ex nA II T.. KEMA 06 ATEX 0021 X

[1]For the temperature code "T.." or the maximum ambient temperature "Ta:..", refer to the type plate.

References

6

6.1 References

Sources of information and other documentation

3. SIMATIC NET Industrial Twisted Pair and Fiber-Optic Networks,
   Order numbers:
   6GK1970-1BA10-0AA0 German
   6GK1970-1BA10-0AA1 English
   6GK1970-1BA10-0AA2 French
   6GK1970-1BA10-0AA4 Italian
4. PROFINET Installation Guide
   Can be ordered from the PROFIBUS User Organization (PNO)

6.2 Internet

Further information on the Internet

You will find further information on SIMATIC NET products on the Internet at
http://www.automation.siemens.com/net/index_00.htm

Graphics

7

7.1 Dimension drawings

Dimension drawing

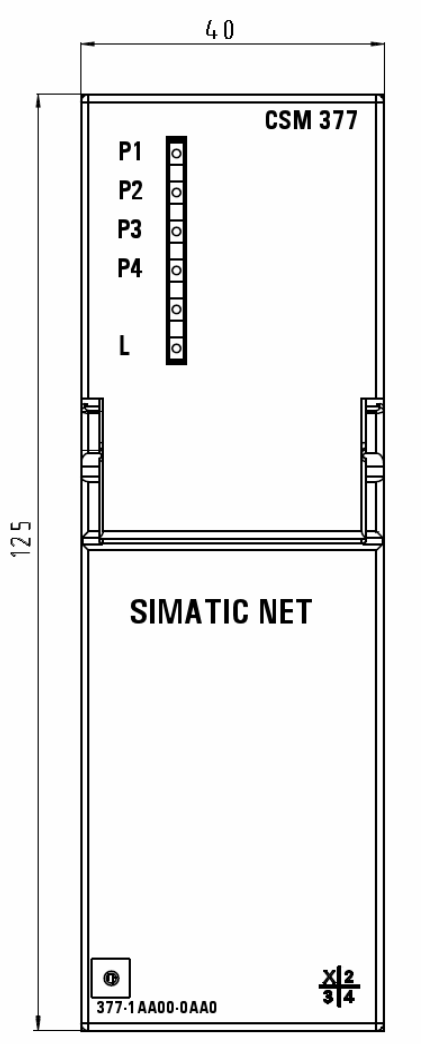

Figure 7-1 Dimension drawing, view from above

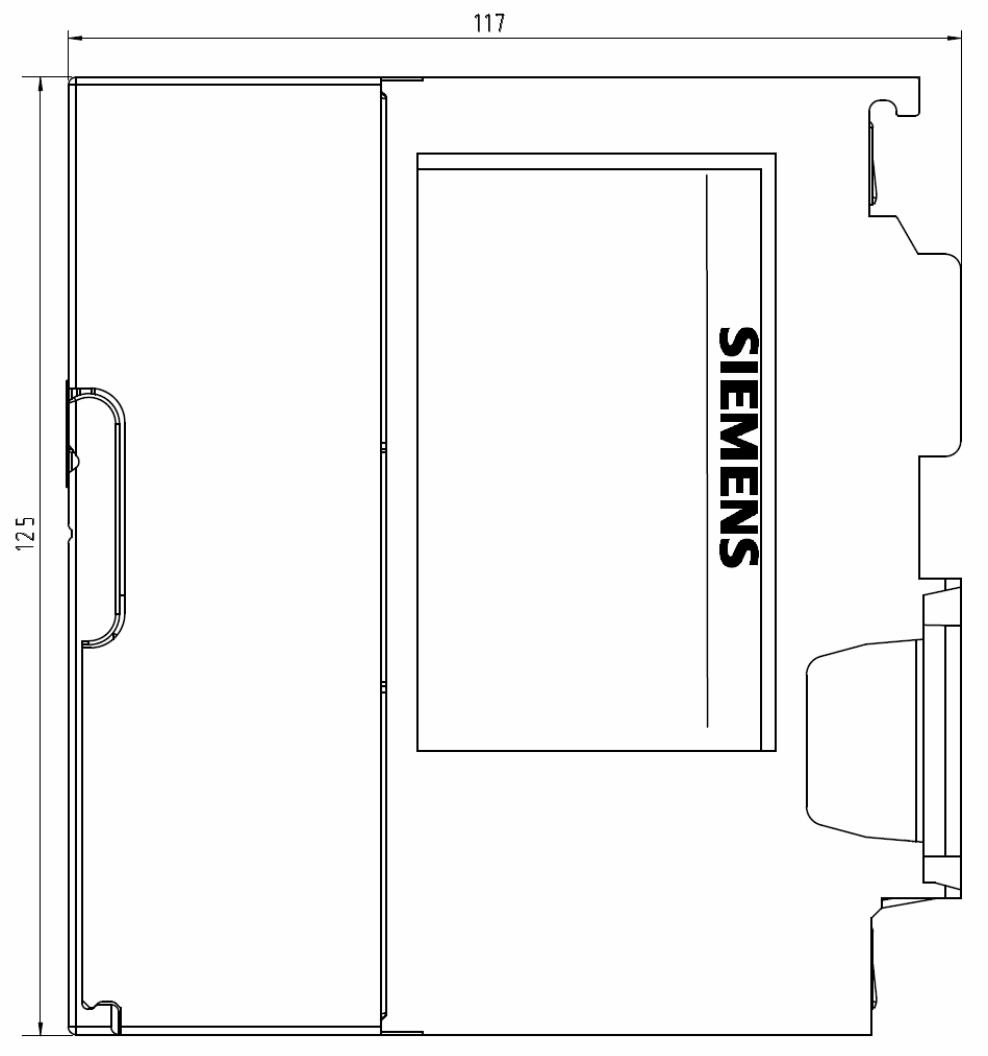

Figure 7-2 Dimension drawing, view from side

Glossary

Aging time

The aging time is the time after which a learned MAC address is discarded if a CSM 377 has not received frames with this sender address during this time.

Autocrossover

Technique with which a TP port is automatically switched over between MDI and MDI-X assignment to make a connection independent of the port assignment of the device being attached. This means that crossover cables are not required. The autocrossover function can only be used when the port is set to autonegotiation mode.

Autonegotiation

Procedure standardized by IEEE 802.3 in which the transmission parameters (for example 10/100 Mbps, full/half duplex) are negotiated automatically between the devices.

CRC

Cyclic Redundancy Check. A checksum used in transmission protocols to detect errors in frames.

Multicast

A frame with a multicast address is received by all nodes prepared to receive this address.

Segment

In the Ethernet bus system, transceivers connected together over the bus cable along with the nodes connected over patch cables form a segment. Several such segments can be connected via repeaters. When using twisted pair and fiber-optic cables, each subsection forms a segment.

Store and forward

An entire frame is received, its validity checked (checksum, length etc.) and then buffered. Invalid frames are discarded, in other words, a frame is forwarded only when it is error-free.

TP

Twisted Pair

TP port

Port with a TP connector (RJ-45 jack)

Index