

# SIEMENS

## RS232-FO Converter 7XV5652-0xA00

### Operating Instructions

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## 1 General Instructions

This manual includes the information required for the normal use of the products described therein. It is intended for technically qualified personnel which has been specially trained or has special knowledge in the fields of protection-, instrumentation-, control-, and automatic control engineering (called automation in the following).

The knowledge and the technically correct translation of the safety instructions and warnings included in this manual are a prerequisite for the safe installation and commissioning, as well as for safety during operation and maintenance, of the product described. Only qualified personnel, as defined in the following explanation, possess the technical knowledge required to interpret correctly and to put into action for each individual case the safety instructions and warnings given in this document in a general manner.

This manual is an integral part of the scope of delivery. However, it cannot take into account every detail on all types of the described product and also every possible case regarding installation, operation or maintenance. If further information is desired or in case special problems should arise, which are not treated adequately in this document, it is possible to obtain additional details from the local Siemens office or from the addresses stated in the back of this manual.

Additionally, we point out that the content of this product documentation is not part of or modifies any previous or existing agreement, promise, or legal relationship.

All obligations by Siemens result from the respective purchase order which also includes the complete and exclusively valid warranty provision. The contractual warranty regulations are neither extended nor limited by the statements in this document.

## **1.1 Qualified Personnel**

Tampering with the device/system or noncompliance with the safety notices given in this manual may cause severe bodily injury or property damage. Therefore any interventions on the device/system may only be performed by adequately qualified personnel.

Qualified personnel as per the safety notices given in these instructions or on the product itself is:

- personnel involved in planning and configuration activities and familiar with the safety concepts used in automation engineering;
- operating personnel trained for working with automation systems and familiar with the content of this manual as far as it deals with operational aspects;
- commissioning and service personnel having adequate training and qualification to repair this type of automation equipment and/or having authorization to commission, release, ground and tag devices, systems and electrical circuits.

## 1.2 Safety Notes

These operating instructions contain notes that are to be complied with for your personal safety as well as to avoid property damages. These notes are marked by a triangular warning symbol and the different degrees of danger are categorized as follows:



### **Danger**

Disregard of the corresponding precautionary measures will cause death, severe bodily injury or considerable property damage.



### **Warning**

Disregard of the corresponding precautionary measures may cause death, severe bodily injury or considerable property damage.



### **Attention**

Disregard of the corresponding precautionary measures may lead to slight bodily injury or minor property damage.



### **Note**

Shall draw your attention to special information on the product, product handling or the corresponding section of the documentation.



### **Qualified personnel**

Commissioning and operation of the equipment is to be performed by qualified personnel only. In the context of safety notes in this manual, the term qualified personnel refers to persons authorized to perform commissioning, grounding and labelling of devices, systems and electrical circuits.

### 1.3 Intended Use

Please observe the following



#### **Warning**

The device must be operated only within the scope of its intended use according to these operating instructions and in connection with third-party equipment or compounds recommended or accepted by Siemens.

Faultless and safe operation of the product require proper transport, storage, mounting and installation as well as careful operation and maintenance.

### 1.4 Explanation of the symbols at the device:



#### **Danger**

Warning of a danger.

Please read the documentation.

To be operated only by qualified personnel.



Double insulation

## 1.5 Exclusion of liability

The contents of this document have been reviewed on their compliance with the hardware and software described therein. Yet, deviations cannot be excluded, so that we cannot guarantee full compliance. The specifications in this document are, however, reviewed at regular intervals. Necessary corrections will be included in the next edition. You are invited to send us your suggestions for improvement.

## 1.6 Copyright

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Subject to technical changes without notice.



## **2 Operating Instructions**

### **2.1 Scope of Application**

The RS232 / FO Converter is used for converting RS232 signals to signals for FO conductors with BOFC ST-connectors. It is equipped with one FO channel and one RS232 channel and switches automatically from "FO receiving data" to "FO transmitting data".

A power supply is integrated in the housing to generate the voltage required for the converter board from the auxiliary power supply. The RS232 / FO converter can be used for transmission rates up to 115200 bauds.

### **2.2 General Data**

The signal converter has a plastic housing that can be snapped onto a DIN EN 50022 mounting rail.

The auxiliary power supply is fed in via two terminals. Because of its extremely wide auxiliary voltage range (DC 24-250V and AC 60-250V), the converter can be connected without switchover to all common types of station batteries and AC mains voltage supplies.

The front cover has a green LED for indication of the operating voltage status. The status of the internal +5V operating voltage can be checked by means of a potential-free relay contact that is brought out to two terminals. An open contact means that the operating voltage is o.k. The readiness for service of the unit is indicated by means of a potential-free signalling contact (terminals 1,2) that can be used to communicate the following fault conditions to a control center:

- No supply voltage
- Failure of internal power supply

When a fault condition is present, the contact is closed.

**2.3 Data Transfer**

The logic of the optical interface is positive (Light OFF in idle state), incoming light signals are treated as active = 1 (high). For use in systems operating with a negative logic, the converter can be switched over to negative logic by means of a switch that is accessible from outside. Inversion of the logic applies to both the optical output and the RS232 interface output. On delivery, the converter is set to positive logic (Light OFF in idle state).

**2.4 Connection of the FO Channel**

The FO cables are connected to the corresponding FO elements. The connector type is BOFC (ST). When wiring FO cables, the specified bending radius must be observed.

**2.5 Connection of the RS 232 Channel**

The RS232 channel is connected by a special RS232 cable with 9-pin Sub-D male connector.

**2.6 Terminal Assignment 7XV5100-4**

The serial connection cable 'DIGSI-cable' connects a 9-pole serial PC-interface (e.g. COM1) with the serial interface of the relay or a starcoupler or a converter, which have also a 9-pole serial interface.. The following devices have a 9-pole serial interface: 7SJ531, 7SJ602 and all SIPROTEC 4 devices, e.g. 7SA522, 7SD52, 7SA6x, 7SJ61/62/63, 6MD6x, ... . In addition the starcouplers 7XV5300, 7XV5450, 7XV5550 and the converter 7XV5652 are directly connected with this cable.

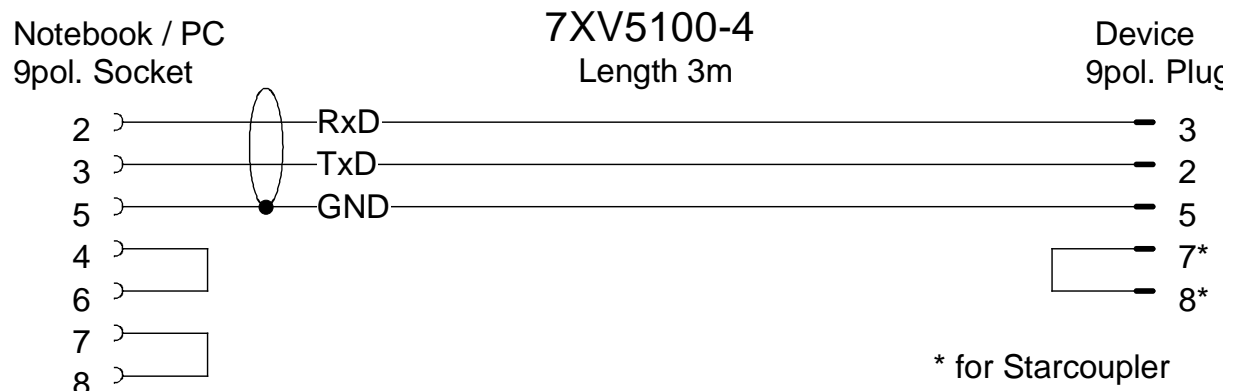


Fig. 2: Terminal Assignment 7XV5100-4

**3 Technical datas**

**3.1 Hardware features**

<p><b>Mechanical design</b>  Housing  Dimensions  Weight  Degree of protection      Housing      Terminals</p>	<p>Plastic, EG90  see dimensional drawings  approx. 250g  according EN60529, IEC60529      IP 20      IP 20</p>
<p><b>Auxiliary voltage <math>U_H</math></b>  Rated input voltage  - DC voltage  - AC voltage  Fuse internal  Class of protection (depends on input voltage)   Power consumption  - DC voltage  - AC voltage</p>	<p>24 V - 250 V DC <math>\pm</math> 20 %  24 V - 230 V AC <math>\pm</math> 20 % / 45-65 Hz  1,25 A slow blow (not changeable)  III   With <math>U_H = U_{HN}</math>; typical value  3 W  2.5 W; 3.5 VA</p>
<p><b>Alarm relay</b>  1 Relay   Connector  Test voltage  Switching voltage (nominal value)  Switching capability  Switching current  Fault indicator</p>	<p>MSR-Relay, 1 NC (open) contact, potential free  2-pol. Phönix terminal  3,7 kV<sub>eff</sub>  250 V DC  20 W/VA  1 A permanent  LED green: 5 V o.k,</p>
<p><b>RS232-interface</b>  Connector  Baudrate  Test voltage</p>	<p>9-pol. SUB-D, socket  DC - 115200 bauds  2 kV AC towards other connections</p>

<b>Optical interfaces</b> Optical inputs / outputs  Optical connectors Laser class 1 acc. EN60825-1/-2  Data flow indication Wave length Launched power  Sensitivity Optical budget  Maximum distance spanned  Baud rates	1 transmitter, 1 receiver Factory setting: Light OFF in idle state BFOC ST-connectors (plastic protective caps)  none 820 nm -19dBm with 50/125µm multimode fibre -15dBm with 62,5/125µm multimode fibre -6,2dBm with 200µm HCS fibre -30dBm 10dB (+3 dB system budget-safety margin) 3.0 km with 62,5/125µm multimode fibre 1.5 km in combination with SIPROTEC systems with 62,5/125µm multimode fibre 3.5 m with 980/1000 plastic fibre DC - 115200 Baud
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### 3.2 Safety Tests

<b>Safety tests</b> according DIN EN 61010 Teil1 Overvoltage category Degree of pollution Fire resistance classification according to UL 94	III 2 V0
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**3.3 Dielectric Tests**

<p><b>Dielectric tests</b>  EN61010 IEC 255-5:  ANSI/IEEE C37.90.0</p> <p>Voltage test (routine test)  Auxiliary power to relay  Auxiliary power to RS232 interface  Relay to RS232 interface</p> <p>Surge voltage test (type test)  VDE 0435, Pt. 303  Auxiliary power to relay  Auxiliary power to RS232 interface  Relay to RS232 interface</p>	<p>5,25 kV DC / 1s (with bypass capacitors)  3,7 kV AC / 50Hz / 1s (without bypass capacitors)</p> <p>5 kV (peak); 1,2/50 <math>\mu</math>s; 0,5 J;  3 pos. and 3 neg. surges in intervals of 5 s  all circuits, class III  (not on open contacts)</p>
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**3.4 Interference Emission**

<p><b>Interference Emission</b>  Standard: EN 50081-1  Conducted interference, only power supply voltage  IEC CISPR 22, EN55022  VDE 0878 Teil 22</p> <p>Radio interference field strength  IEC CISPR 22, EN55022  VDE 0878 Teil 22</p>	<p>150 kHz to 30 MHz</p> <p>Limit class B  Limit class B</p> <p>30 MHz to 1000 MHz  Limit class B  Limit class B</p>
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## 3.5 Interference immunity

<p><b>Interference immunity</b> IEC 255-22 (product standards) EN 61010-1 (Generic standard)</p> <p>High frequency test IEC 60255-22-1, class III VDE 0435 Teil 303, Klasse III</p> <p>Electrostatic discharge (ESD) IEC 61000-4-2, class III IEC 60255-22-2 class III EN 61000-4-2, of degree 4</p> <p>Irradiation with HF field, non modulated IEC 60255-22-3, Klasse III</p> <p>Irradiation with HF field, amplitude modulated IEC 61000-4-3 ENV 50140, class III EN 61000-4-3</p> <p>Irradiation with HF field, pulse modulated IEC 61000-4-3 ENV 50140 / ENV50204, class III</p> <p>Fast transient disturbance / burst IEC 61000-4-4, class IV  IEC 60255-22-4, class IV  EN 61000-4-4, class IV</p>	<p>1 MHz; 400 surges per s; dur. 2 s 2,5 kV longit.voltage; 1,0 kV transverse voltage</p> <p>4 kV contact discharge, 8 kV air discharge, both polarities; 150 pF; Ri = 330 Ohm</p> <p>10 V/m; 27 MHz to 500 MHz</p> <p>10 V/m; 80 MHz to 1000 MHz; 80% AM; 1kHz</p> <p>10 V/m; 900 MHz; repetition frequency 200 Hz; duty cycle of 50% or duty cycle of 100%</p> <p>On auxiliary voltage inputs 4 kV; 5/50 ns; 5 kHz; burst duration 15 ms Repetition 300 ms; both polarities; Ri = 50 Ohm; Test duration 1 min</p>
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<p>Fast transient disturbance / burst IEC 61000-4-4, Klasse III</p> <p>IEC 60255-22-4, Klasse III</p> <p>EN 61000-4-4, Klasse III</p>	<p>On signal lines 2 kV; 5/50 ns; 5 kHz; burst duration 15 ms Repetition 300 ms; both polarities; Ri = 50 Ohm; Test duration 1 min</p>
<p>Line conducted HF, amplitude modulated IEC 61000-4-6, class III EN 61000-4-6, class III</p>	<p>10 V; 150 kHz to 80 MHz; 80% AM; 1 kHz</p>
<p>Immunity to power frequency magnetic field EN 61000-4-8, class IV</p>	<p>30 A/m, permanent; 300 A/m during 3 s; 50 Hz</p>

**3.6 Climatic Stress tests**

<p><b>Ambient Temperatures</b> EN 60068-2-1 and -2-2</p>	
<p>Recommended operating temperature</p>	<p>-5°C to +55°C (+23° F to +131°F)</p>
<p>Limiting temporary (transient) operating</p>	<p>-20°C to +70°C (-4° F to +158°F)</p>
<p>Limiting temperature during storage (packing from the factory)</p>	<p>-25°C to +55°C (-13° F to +131°F)</p>
<p>Limiting temperature during transport (packing from factory)</p>	<p>-25°C to +70°C (-13° F to +158°F)</p>
<p>Permissible humidity</p>	<p>mean value per year &lt; 75% relative humidity, 30 days per yaer 95% rel. humidity, condensation not permissible!</p>

**3.7 Mechanical Stress Tests**

<p><b>Vibration and shock during operation</b></p> <p>Vibration IEC 60255-21-1, class 1 IEC 60068-2-6</p> <p>Shock IEC 60255-21-2, class 1</p> <p>Seismic vibration IEC 60255-21-2, class 1 IEC 60068-3-3</p>	<p>sinusoidal 10 Hz to 60 Hz: ±0,035mm amplitude.; 60Hz - 150 Hz: 0,5g acceleration Frequency sweep rate 10 oktave/min 20 cycles in 3 orthogonal axes,</p> <p>semi-sinusoidal Acceleration 5 g, duration 11 ms, 3 shocks in each direction of 3 orthogonal axes</p> <p>sinusoidal 1 Hz to 8 Hz: +3,5mm amplitude (horizontal axis) 1 Hz to 8 Hz: +1,5mm amplitude (vertical axis) 8 Hz to 35 Hz: 1g acceleration (horizontal axis) 8 Hz to 35 Hz: 0,5g acceleration (vertical axis) Frequency sweep rate 1 octave / min 1 cycle in 3 orthogonal axes</p>
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<b>Vibration and shock during transport</b>	
Vibration IEC 60255-21-1, class 1 IEC 60068-2-6	sinusoidal 5 Hz to 8 Hz: $\pm 7,5$ mm amplitude; 8 Hz to 150 Hz: 2 g acceleration Frequency sweep rate 1 octave / min 20 cycles in 3 orthogonal axes
Shock IEC 60255-21-2, Klasse 1 IEC 60068-2-27	half-sine shaped Acceleration 15 g, Duration 11 ms, 3 shocks in each direction of 3 orthogonal axes

## 3.8 Dimension Drawings

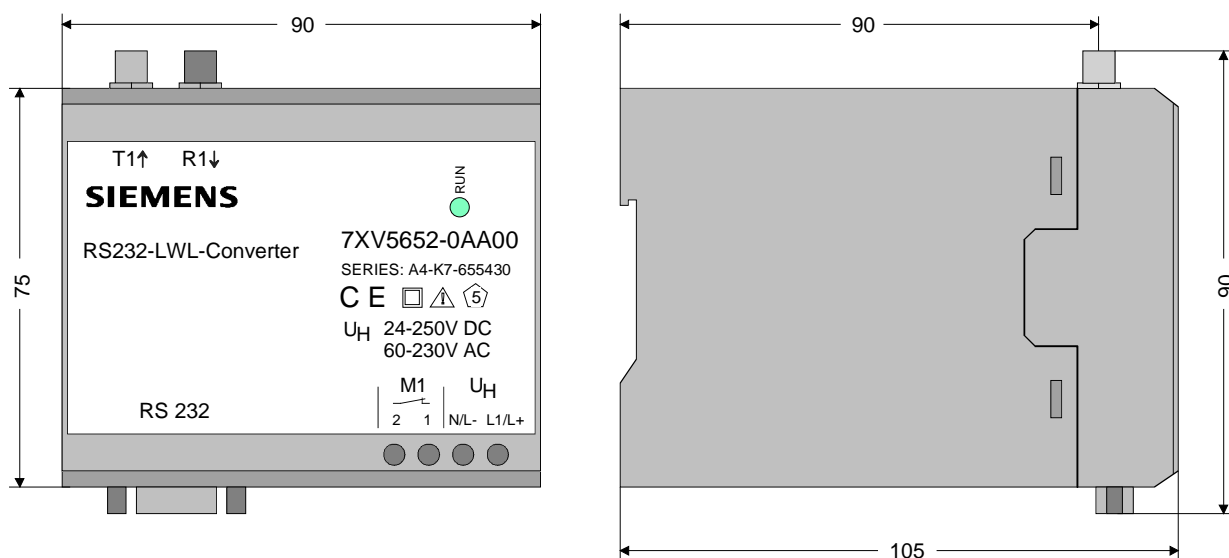


Fig. 3: Dimension Drawings

## 3.9 Ordering Data

Name	Order-No.
<b>RS232-FO Converter</b>	<b>7 X V 5 6 5 2 - 0</b>
With 1 FO-Interface and 1 RS232- Interface	<b>A 0 0</b>
<b>Optical inputs / outputs</b>	
BOFC-connector (ST-connector)	<b>B</b>

## 4 Description of the Functional Unit

### 4.1 General description

The housed signal converter is a hard-wired and tested functional unit. It is provided with a snap-on mounting device for a 35 mm DIN EN 50022 rail and with screw-type terminals for safe connection of the auxiliary power supply. The fiber-optic channels are connected by BOFC ST-terminals. The RS232 interface is connected to a 9-pin Sub-D socket. The unit is free of silicone and halogen as well as flame-retardant.

### 4.2 Terminal Assignment

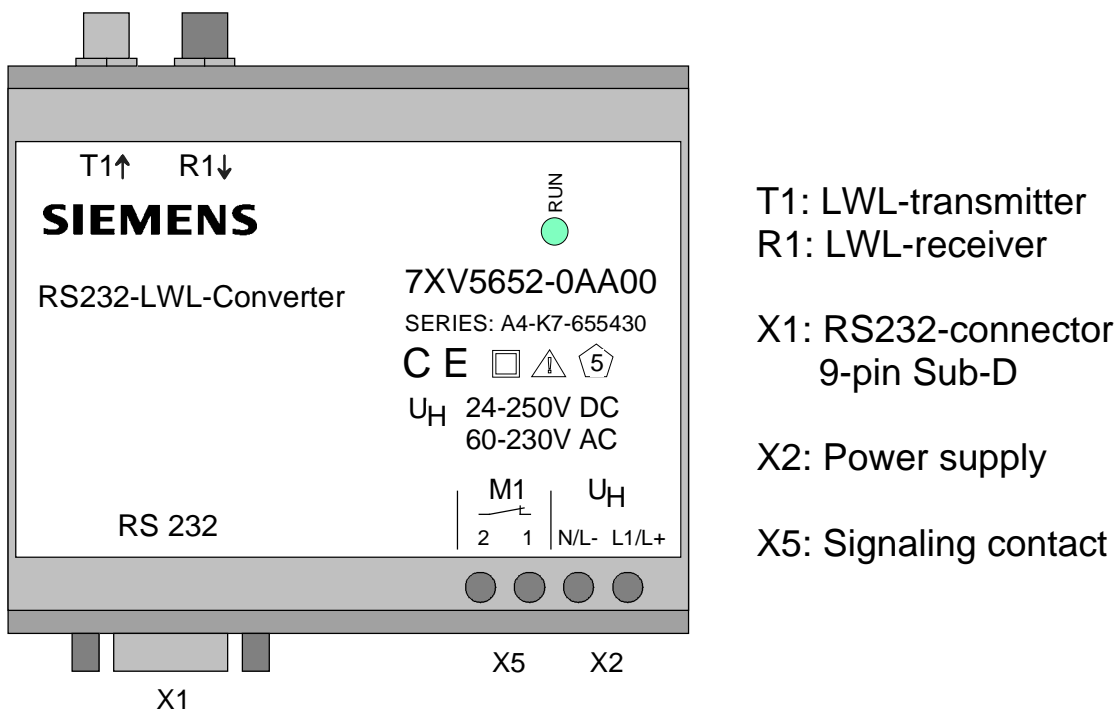


Fig. 4: Terminal Assignment

## 4.3 Pin assignment X1, X2, X5

Pin	Assignment	Symbol
X2	Power supply	DC: L+    AC: L1
X2	Power supply	DC: L-    AC: N
X5	Relay contact 1	1
X5	Relay contact 2	2

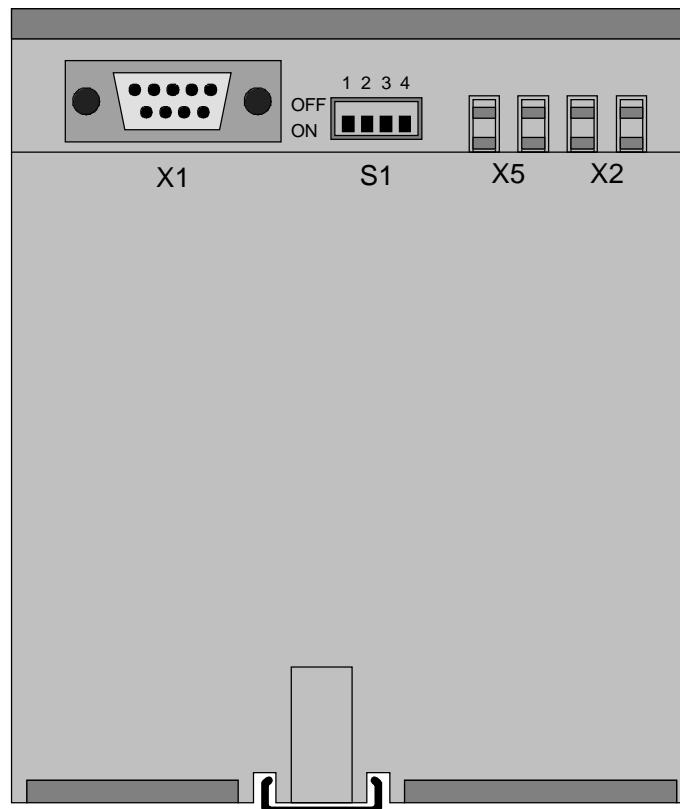
Tab. 1: Screw-type terminals X2, X5

Pin	Assignment	Symbol	Data direction when used as DTE
1	nc		
2	Receive Data	RxD	In
3	Transmit Data	TxD	Out
4	nc		
5	Signal ground	GND	GND
6	nc		
7	nc		
8	nc		
9	nc		

Tab. 2: 9-pin Sub-D socket X1

#### 4.4 Switch positions

The DIP switches can be actuated from outside.



Down view:

Switch	Position	Meaning	
1	open <b>closed</b>	off <b>on</b>	Light ON in idle state FO receiving <b>Light OFF in idle state FO receiving</b>
2	open <b>closed</b>	off <b>on</b>	Light ON in idle state FO transmitting <b>Light OFF in idle state FO transmitting</b>
3	<b>closed</b>	<b>on</b>	not assigned
4	<b>closed</b>	<b>on</b>	not assigned

Fig. 3: Switch positions (factory settings)

## 5 Installation and Commissioning



### **Warning**

When operating electrical devices, certain parts are necessarily under dangerous voltage. Therefore, disregard of the operating notes may cause severe bodily injury or property damage. Installation and electrical connection of the device should be performed by adequately qualified personnel only. In particular, all warnings must be strictly observed.



### **WARNING**

Do not look directly in the FO-transmitter diodes T1 – T5 if you wear optical aid (glasses, contact lens)

### 5.1 Reference to Installation

- The devices are permitted only for operation within enclosed housings or cabinets and places of installation are to be accessible only for qualified personnel.
- The device is clipped on a 35 mm top-hat rail (according to EN50022).
- The installation location should be free of vibrations. The admissible temperature (operation or functional temperature) is to be observed (see technical data).
- Disregard of the temperature range required for proper function may cause malfunction, failure or destruction of the device.

### 5.2 Connection

The chapter 'Connection' describe how to connect data- and power supply cables for a save operation. For the electrical connection the regulations on the raise of heavy-current installations are to be observed.



### **Warning**

Any connections with litz wire are to be realized with the help of wire end ferrules.

**5.2.1 Voltage for operation – Auxilliary voltage**

The wires for the auxilliary voltage are screwed on terminal X2 at he bottom side of the device. The assignment of the terminals is printed at the front side or can be read in this manual. Because the device has no ON/OFF switch this switch must be installed external if it’s necessary.

Connection to screw terminals:

Terminal cross section:	max. 2,5 mm <sup>2</sup>
Stripping length:	3 bis 5 mm
Cable cross section: (Single core cable or litz wire)	0,14 bis 1,5 mm <sup>2</sup>

**5.2.2 Alarm relay terminals X5**

X5 offers a potential free contact, which is closed if the device fails. The loss of the power supply is a device failure.

The wires for the alarm contacts are screwed on terminal X7 at he bottom side of the device. The assignment of the terminals is printed at the front side or can be read in this manual.

Connection to screw terminals:

Terminal cross section:	max. 2,5 mm <sup>2</sup>
Stripping length:	3 bis 5 mm
Cable cross section: (Single core cable or litz wire)	0,14 bis 1,5 mm <sup>2</sup>

**5.2.3 Fibre Optic (FO) connections**

- Only optical fibres prepared according the regulations are to be used. The admissible optical budget is to be observed
- FO-types (only multimode) and max. distance see technical datas.
- Transmitter diodes are printed with Tx.
- Receiver diodes are printed with Rx.
- The FO-cables must be crossed, that means a FO-connection is done between Tx output and Rx input and vice versa.



**Note**

When installing optical fibres the prescribed bending radius is to be observed.

## 5.2.4 RS232 connection

- After the connection of a serial cable to the 9 pole Sub-D connector at the device (X1) it should be screwed. For temporarily use it's not necessary to screw it. But please check if it's connected.

## 5.3 Commissioning

- Clip the Active Mini-Starcoupler on the top-hat rail according EN 50022 with the help of clip-on mounting. Do not make any changes at the device.
- Check whether the operation data comply with the values on the rating plate. Not change any DIP-switch at the device, before reading this manual.
- Connect FO cable to FO receiver (Rx) and FO transmitter (Tx) with the help of ST-plugs. Be carefull when connecting the FO plugs and avoid any dust at the FO – connections.
- Connect to RS485 and RS232 terminals and screw them for permanent use.
- Connect the alarm relay terminals X5.
- Connect auxiliary power to the terminals X2 (DC: L+ / AC: L1 and DC: L- / AC: N).
- The device is ready for use after switching on the auxiliary power. The green LED `RUN´ lights up.

## 5.4 Maintenance

The signal converter requires no maintainance. For cleaning please use a dry and free of fuzz rag. Put the caps onto the FO-interfaces to avoid dust pollution and interference from sun light or any artifical light source.

**Do not use any liquid agents or substances for cleaning.**



## 6 Applications

### 6.1 Optical star-structur for devices V3 with RS232-Interface

In an existing optical star structure with starcouplers version 3 devices with an electrical RS232-interface can be connected by converting from electrical to optical with 7XV5652-converters.

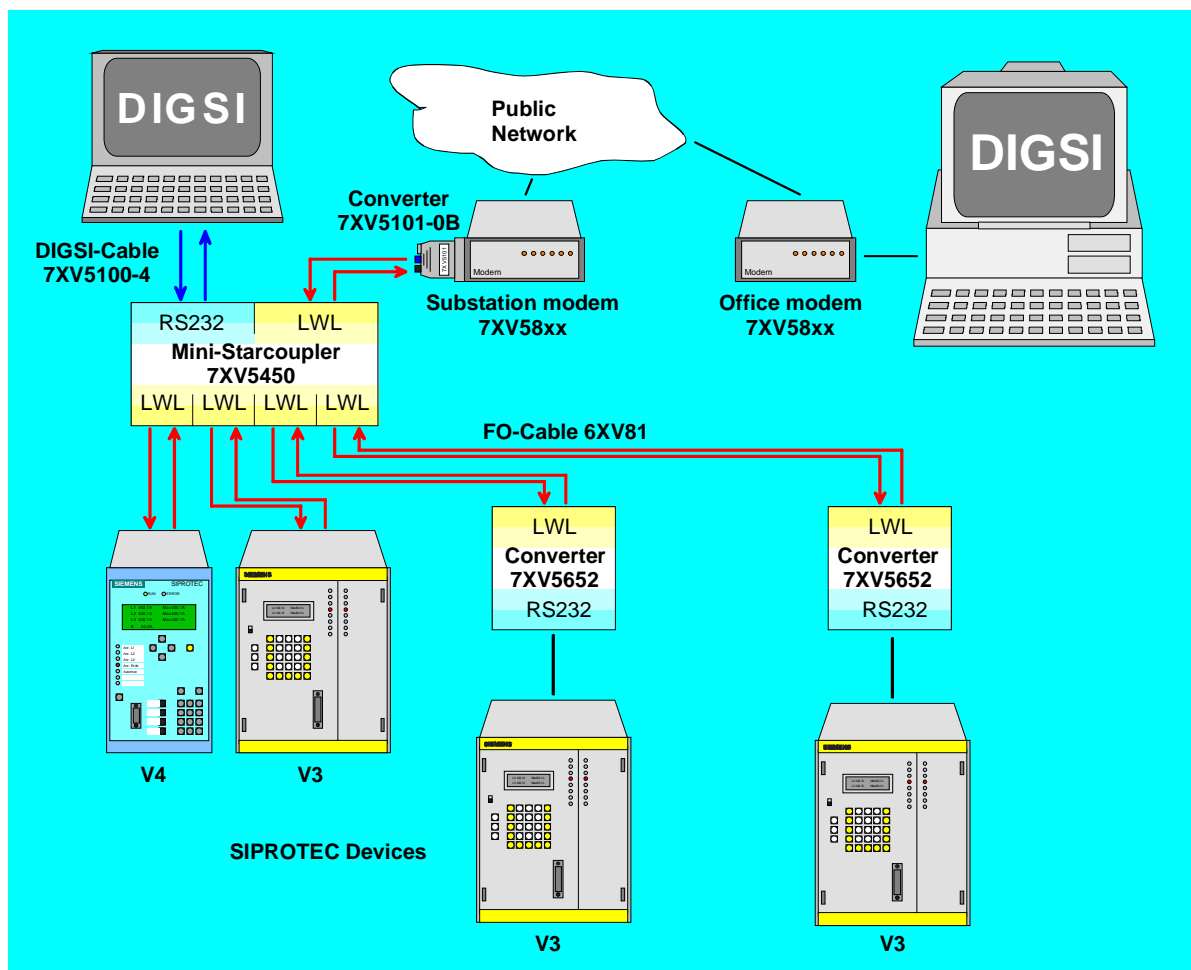


Fig. 6: Optical star-structur for devices V3 with RS232-Interface

## 6.2 Data communication for Digital Differential Protection Relays with FO-Interface

Two differential relays with an 820 nm FO-interface can be connected together via a communication system. The communication devices provide no optical input interfaces but have for example RS232-interfaces. With 7XV5652 the optical signals can be converted to the electrical RS232 signals direct at the multiplexer.

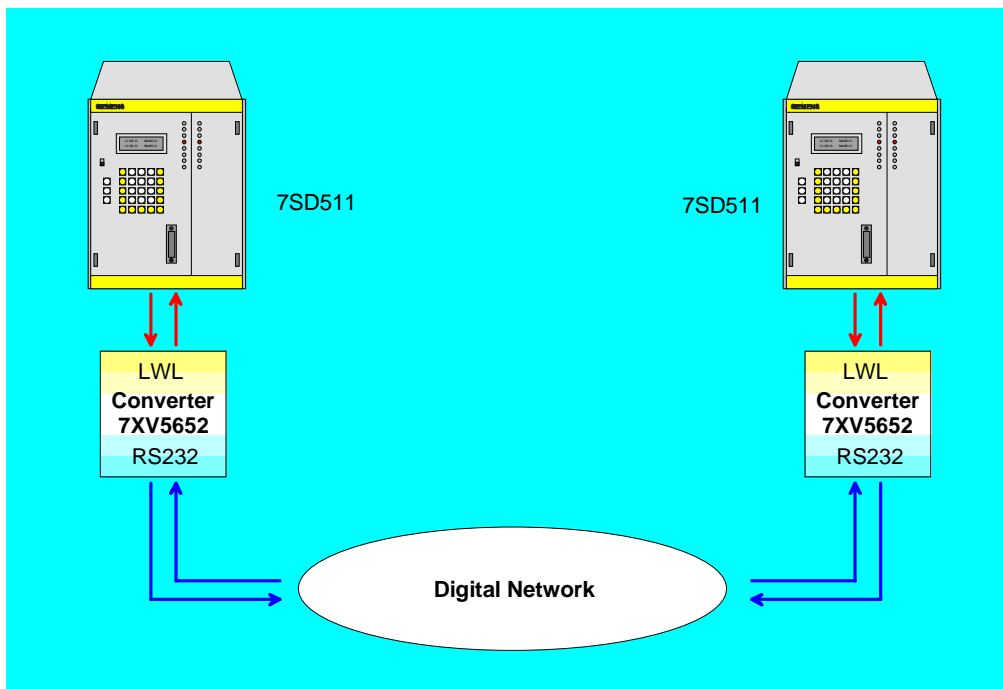


Bild 7: Data communication for digital Differential Protection Relays with FO-Interface

### Note:

Communication via comms-systems or modem delays the data. The relay can compensate a maximum delay of 30 ms.

**EG-Konformitätserklärung**  
**EC Declaration of Conformity**  
 No E471015-2

Hersteller: Siemens Aktiengesellschaft  
 Manufacturer: Bereich Anlagenbau und Technische Dienstleistungen ATD  
 Technische Dienstleistungen TD

Anschrift: Siemensstraße 33  
 Address: D - 71254 Ditzingen  
 Bundesrepublik Deutschland

Produkt-  
 bezeichnung: RS232-LWL Konverter  
 Product  
 description: 7XV5652-0xA00  
 RS232-FO Converter

**Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender Europäischer Richtlinien überein:**  
*The product described above in the form as delivered is in conformity with the provisions of the following European Directives:*

89/336/EWG Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit  
 (geändert durch 91/263/EWG, 92/31/EWG, 93/68/EWG und 93/97/EWG).

*Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility (amended by 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC)*

73/23/EWG Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen (geändert durch 93/68/EWG)

*Council Directive on the approximation of the laws of the Member States related to electrical equipment designed for use within certain voltage limits (amended by 93/68/EEC)*

Die Konformität mit den Richtlinien wird nachgewiesen durch die Einhaltung folgender Normen:

*Conformity to the Directives is assured through the application of the following standards:*

Referenznummer <i>Reference number</i>	Ausgabedatum <i>Edition</i>	Referenznummer <i>Reference number</i>	Ausgabedatum <i>Edition</i>
EN 50081-1	1992	EN 50082-2	1995
EN 61010	1993		

Ditzingen, den / the 20. August 1998  
 Siemens AG

Pust, GL /Pflugfelder, GL

Name, Funktion  
*Name, function*

  
 Unterschrift  
*signature*

Gottwald, Kaufm. HGL

  
 : Internat. und  
 : 1998

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.

*This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail*

If you have any notes or questions on this product please contact us under the following address:

## **Siemens AG**

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Power Automation

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