

# SIEMENS

## Repeater 820nm - 1300nm

7XV5451-0xA00 for mono mode fibre

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Operating Instructions

Version 3

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## **0 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 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.

Explanation of symbols used:



Read the operating instructions;  
operation by qualified personnel only



Double insulation



## Warning!

When operating electrical devices, certain parts of these devices are necessarily under dangerous tension. Therefore, noncompliance with the safety notices may cause severe bodily injury or property damage. Only adequately qualified personnel may work with this device. Correct and safe operation of this device requires appropriate transport, specialized storage, installation and assembly, as well as careful operation and maintenance. The devices are tested with AC 3.7 kV with respect to their insulation resistance.

## 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 Operating Instructions

### 1.1 Scope of Application

The optical repeater is used for conversion of signals with a wavelength of 820 nm to signals with a wavelength of 1300 nm and vice versa.

Operation is full-duplex.

With the optical repeater, transmission of data signals by monomode fiber is possible up to a distance of (typically) 14 km.

#### General Data

The optical repeater has a plastic housing that can be snapped onto a mounting rail. The 1300 nm optical interface is equipped with BFOC connectors.

Delivery of the 820 nm/1300 nm converter:

820 nm interface with FSMA connectors: 7XV5451-0AA00

The auxiliary power supply is fed in via two terminals. Because of its extremely wide auxiliary voltage range (DC 24 - 250 V and AC 60 - 250 V), 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.

### Data Transfer

The logic of the two optical interfaces 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 820 nm transmitter and the 820 nm receiver can be switched over to negative logic by means of one integrated switch each. On delivery, the converter is set to positive logic (Light OFF in idle state).

The 1300 nm optical interface can only operate with a negative logic (Light ON in idle state).

### Connection of the FO Channel

The FO cables are connected to the corresponding FO elements. The connector type for the 1300 nm cable is BOFC (ST) for monomode fiber and for the 820 nm multimode cable FSMA fiber.

Attention ! In the transmission of serial protocols like IEC 60870-5-103, IEC61850-5-101, DIGSI, Modbus, DNP3 etc. problems appeared in a few cases. Of the use in such applications we dissuade therefore urgently.

## 1.3 Technische Daten

<b>Mechanical Design</b> Housing Dimensions Weight Degree of protection Housing Terminals	Plastic, EG90 see dimensional drawings approx. 250 g acc. to EN60529 IP 51 plastic IP 20
<b>Auxiliary Power U<sub>H</sub></b> Rated input voltage - DC voltage - AC voltage  Class of protection  Power consumption - DC voltage - AC voltage	DC 24 V - 250 V ± 20 % AC 60 V - 230 V ± 20 % / 45-65 Hz  III  at U <sub>H</sub> = U <sub>HN'</sub> ; typical value 3 W 3.5 VA
<b>Fault Signal Output</b> Connector  Test voltage Switching voltage (rated voltage) Switching capacity Switching current Fault indicator	Measuring and control relay, 1 NC contact, potential-free 2-pole Phoenix terminal 3.7 kV <sub>eff</sub> DC 250 V  20 W/VA 1 A permanent Green LED: 5 V o.k.

<b>Optical 820 nm Interface</b> Optical inputs / outputs FO connector	1 transmitter, 1 receiver FSMA (plastic protective caps)
Data flow indicator	none
Wavelength	820 nm
Data output	-19dBm: gradient fiber 50/125µm -15dBm: gradient fiber 62,5/125µm
Sensitivity Optical budget	-30dBm 10 dB (+3 dB loss budget)
Maximum distance spanned	<ul style="list-style-type: none"> <li>• 3 km with 62,5/125 µm gradient fiber</li> <li>• In combination with SIPROTEC systems the distance spanned with multimode fiber 62,5/125 µm is 1,5km</li> <li>• 3,5m with plastic fiber 980/1000 µm</li> </ul>
Maximum baud rate	5 MBd
Minimum baud rate	9,6kBd

<b>Optical 1300 nm Interface only HCS 9/125 <math>\mu</math>m monomode fiber (attenuation approx. 0.5 dB/km)</b> Optical inputs / outputs  FO connector Data flow indicator Fault indicator Wavelength Injective power Sensitivity Optical budget Minimum distance  Maximum baud rate Minimum baud rate	1 transmitter, 1 receiver Delivery state: Light OFF in idle state Transmitter : HFBR 1315M Receiver : HFBR 2315M  ST-plug Yellow LED receive Green LED: 5 V o.k. 1300 nm min. -23 dBm = 20uW typ. -45 dBm min 9dB 14 km with 9/125 $\mu$ m monomode fiber  5 MBd 9,6KBd
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<b>Safety Tests</b> acc. to DIN EN 61010 Part 1 Overvoltage category Pollution degree Fire integrity class acc. to UL 94	 III 2 V0
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<b>Insulation Tests</b> EN61010 IEC 255-5: ANSI/IEEE C37.90.0  Voltage test (routine test) - Auxiliary power to relay  Surge immunity test (type test) VDE0435, Pt. 303 - Auxiliary power to relay	 DC 5.25 kV / 1 s (with bypass capacitors) AC 3.7 kV / 50 Hz / 1 s (without bypass capacitors)  3 positive and 3 negative surges in intervals of 5 s all circuits, Class III (not on open contacts)
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<p><b>Electromagnetic Compatibility Tests</b>  Standard: EN 50081-1  Immunity to radio interference voltage on lines (auxiliary power lines only)  CISPR 22, EN 55022  DIN VDE 979 Part 22  Interference field strength  CISPR 22, EN 55022  DIN VDE 0878 Part 22</p>	<p>150 kHz bis 30 MHz</p> <p>Limit class B  Limit class B  30 MHz to 1000 MHz  Limit class B  Limit class B</p>
<p><b>Interference Immunity Tests</b>  IEC 255-22 (product standard)  EN 50082-2 (basic specification)</p> <p>Immunity to radio-frequency EM fields  IEC 255-22-1, Class III  VDE 0435 Part 303, Class III</p> <p>Immunity to electrostatic discharge ESD  IEC 1000-4-2, Class III  IEC 255-22-2 Class III  EN 61000-4-2, Class III</p> <p>Radiated RF immunity, unmodulated  IEC 255-22-3 Class III</p> <p>Radiated RF immunity, amplitude-modulated  IEC 1000-4-3  ENV 50140, Class III</p>	<p>1 MHz; 400 surges per sec.; duration 2 s  2.5 kV longit. voltage; 1 kV transverse voltage</p> <p>4 kV contact discharge  8 kV air discharge,  both polarities; 150 pF;  Ri = 330 ohms</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>Radiated RF immunity, pulse-modulated  IEC 1000-4-3  ENV 50140 / ENV50204, Class III</p> <p>Immunity to fast transient bursts  IEC 1000-4-4, Class IV  IEC 255-22-4, Class IV  EN 61000-4-4, Class IV</p>	<p>10 V/m; 900 MHz; repetition frequency 200 kHz;  ED 50 % or ED 100 %</p> <p>On auxiliary power lines  4 kV; 5/50 ns; 2.5 kHz;  burst duration 15 ms  Repetition rate 300 ms;  both polarities;  Ri = 50 ohms;  test duration 1 min</p>
<p>Immunity to fast transient bursts  IEC 1000-4-4, Class III  IEC 255-22-4, Class III  EN 61000-4-4, Class III</p>	<p>On signal lines  2 kV; 5/50 ns; 5 kHz;  burst duration 15 ms  Repetition rate 300 ms;  both polarities;  Ri = 50 ohms;  test duration 1 min</p>
<p>Immunity to conducted disturbances induced by radio frequency fields, amplitude-modulated  ENV 50141, Class III</p>	<p>10 V; 150 kHz to 80 MHz;  80% AM;  1 kHz</p>
<p>Immunity to power frequency magnetic fields  EN 61000-4-8, Class IV</p>	<p>30 A/m, permanent; 300 A/m during 3 s;  50 Hz</p>

<b>Mechanical Tests</b>	
<b>Vibration and shock test in stationary use</b>	
Vibration IEC 255-21-1, Class 1 IEC 68-2-6	sinusoidal 10 Hz to 60 Hz: $\pm 0.035$ mm ampl.; 60 Hz - 150 Hz: Acceleration 0.5 g Frequency sweep 10 octaves/min 20 cycles in 3 perpendicular axes
Shock IEC 255-21-2, Class 1	semi-sinusoidal Acceleration 5 g, duration 11 ms, 3 shocks each in both directions of the 3 axes
Seismic vibration IEC 255-21-3, Class 1 IEC 68-3-3	sinusoidal 1 Hz to 8 Hz: +3.5 mm amplitude (horiz. axis) 1 Hz to 8 Hz: +1.5 mm amplitude (vertic. axis) 8 Hz to 35 Hz: 1 g accel. (horiz. axis) 8 Hz to 35 Hz: 0.5 g accel. (vertic. axis) Frequency sweep 1 octave / min 1 cycle in 3 perpendicular axes

<b>Vibration and shock test in transport</b>	
Vibration IEC 255-21-1, Class 1 IEC 68-2-6	sinusoidal 5 Hz to 8 Hz: $\pm 7.5$ mm amplitude; 8 Hz to 150 Hz: 2 g acceleration Frequency sweep 1 octave/min 20 cycles in 3 perpendicular axes
Shock IEC 255-21-2, Class 1 IEC 68-2-27	semi-sinusoidal Acceleration 15 g, duration 11 ms, 3 shocks each in both directions of the 3 axes
Shock IEC 255-21-2, Class 1 IEC 68-2-27	semi-sinusoidal Acceleration 10 g, duration 16 ms, 1000 shocks each in both directions of the 3 axes



Climatic Tests	
Recommended operating temperature range	-5°C bis +55°C
Permissible operating temperature range	-20°C bis +70°C
Permissible storage temperature range in factory packing	-25°C bis +55°C
Permissible transport temperature range in factory packing	-25°C bis +70°C
Climatic utilization category EN60721-3-3	Temperature 3K8H Humidity 3K5 (condensation possible)

## 1.4 Description of the Functional Unit

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 FSMA (screw-type) terminals or BFOC ST-terminals.

The unit is free of silicone and halogen as well as flame-retardant.

### 1.4.1 Terminals Assignment



T: FO transmitter  
R: FO receiver  
X2: Supply voltage connection  
X5: Signalling contact

Fig. 1: Terminal Assignment

Terminal Assignment

Pin	Assignment	Symbol
X2, Pin 1	Power supply pin 1 (L+)	DC: L+ AC: L
X2, Pin 2	Power supply pin 2 (L-)	DC: L- AC: N
X5, Pin 1	Relay contact pin 1	1
X5, Pin 2	Relay contact pin 2	2

Tab.3-1: Screw-type terminals X2,X5

1.4.2 Switch Positions

The DIP switches can be actuated from outside.

Location of DIP switches: Down view

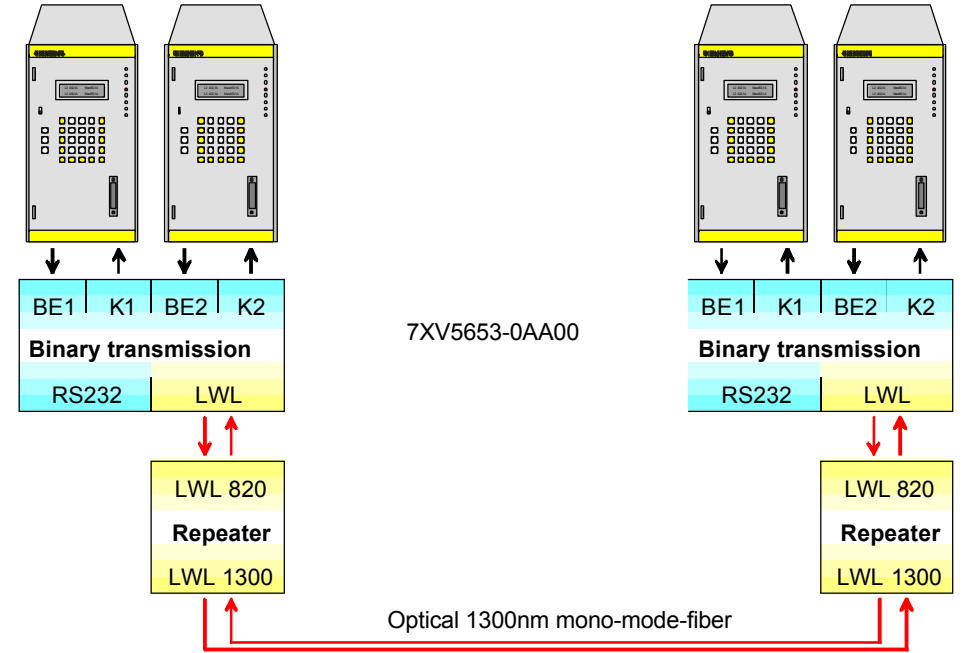
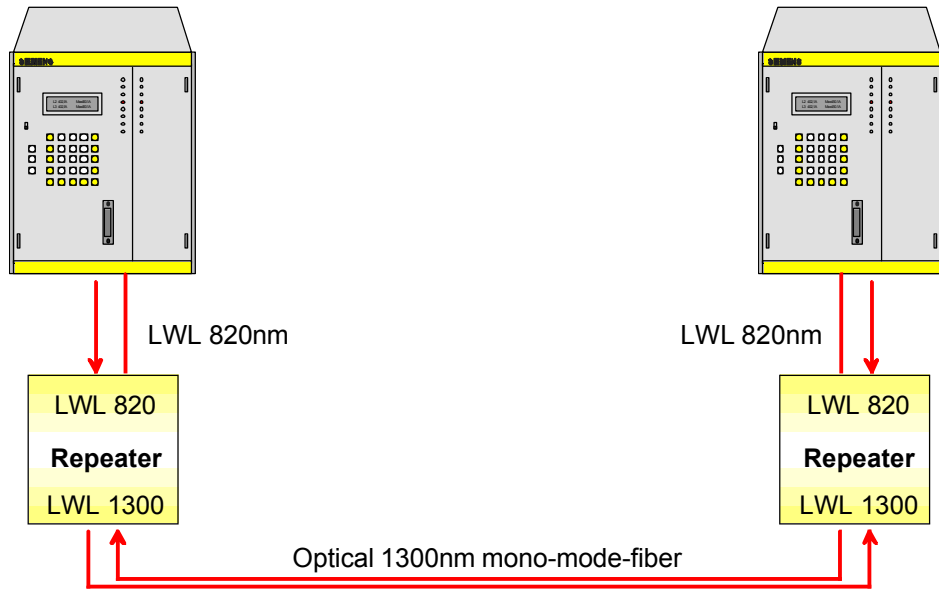


Fig. 3: DIP switches  
S1: 4 DIP switches

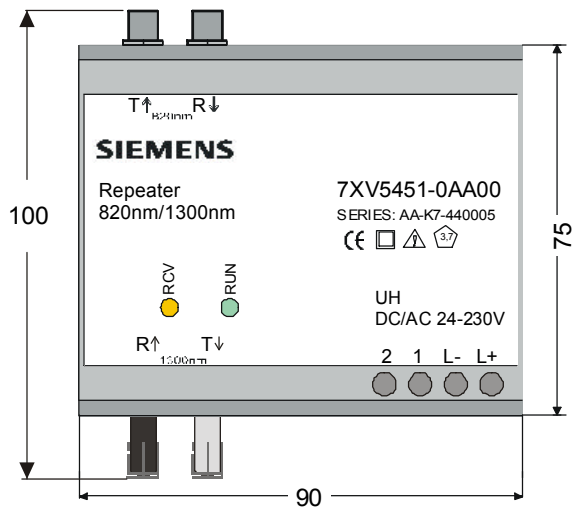
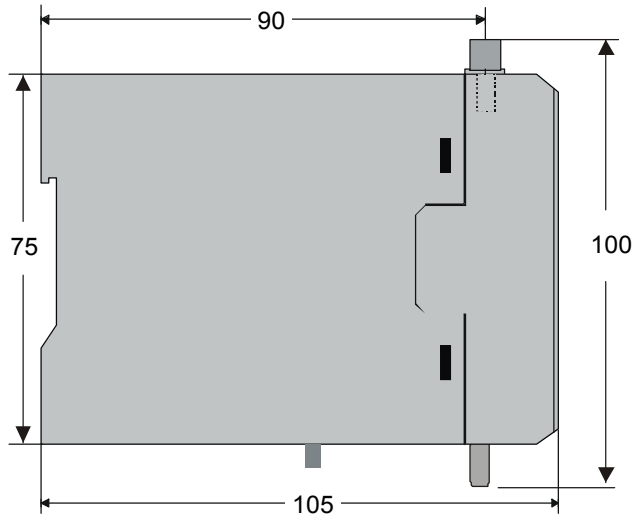
Switch	Position	Meaning
1	<b>open</b> = off	<b>Light OFF in idle state</b>
	closed = on	Light ON in idle state
2	<b>open</b> = off	<b>Light OFF in idle state</b>
	closed = on	Light ON in idle state
3	<b>offen</b> = off	not assigned
4	<b>offen</b> = off	not assigned

Tab 3-2: DIP switches  
**bold:** factory setting

### 1.4.3 Applications



### 1.5 Dimension Drawings



### 1.5 Ordering Data

Name	Order No.	code
Repeater 820/1300 nm 7XV	5451 - 0 A 00	
<b>Connector Types of Optical Inputs and Outputs</b>		
820 nm FSMA-connector / 1300 nm BFOC-ST-Monomode	A	

### 1.6 Mounting and Operation

**Warning !**

When operating electrical devices, certain parts of these devices are necessarily under dangerous tension. Therefore, noncompliance with the safety notices may cause severe bodily injury or property damage. Only adequately qualified personnel may mount and connect the device. In particular, all warnings must be strictly adhered to.

**Warning !**

Persons with eyeglasses or contact lenses should not look directly into the FO elements!

## Mounting

- The unit should be mounted at a location that is free of vibrations. The permissible ambient temperature (recommended or permissible operating temperature) must not be exceeded (see Technical Data).
- Operation of the unit operates outside the permissible operating temperature range may lead to measurement errors and to failure of the signal converter.
- Plastic housing, overvoltage category III acc. to DIN EN 61010 Part 1.
- The signal converter can be snapped onto a 35 mm DIN EN 50022 rail.
- The units may only be operated in closed cubicles or cabinets. Alternatively, they must be mounted in places that are accessible to qualified personnel only.

## Connection

- The electrical installation must be carried out in conformity with the regulations for the erection of electrical power installations.
- The auxiliary power supply must be protected against short circuits by a fused external disconnecter. The selected fuse dimension depends on the cross-section of the connecting wires. The external disconnecter must be identified appropriately.
- Only FO cable assemblies of the specified types may be used.
- For permissible types of FO cables, please refer to the Technical Data.
- The permissible optical budget must be adhered to (chapter 1.3, Technical Data).
- When wiring FO cables, the specified bending radius must be observed.
- Conductor diameters for screw-type terminals:
 

Auxiliary power:	max. 2.5mm <sup>2</sup>
Fault signal output:	max. 2.5mm <sup>2</sup>



## Warning !

With stranded conductors, insulated end sleeves must be used to prevent fraying of the conductor end.

Recommended stripping length: 3-5 mm



## Warning !

All stipulations and execution statements of Accident Prevention Regulation VBG 4.0 must be adhered to, in particular Section 8: "Admissible deviations when working on live parts". The tools used must be suited for working on electrical installations.



## Warning !

OPERATION OF THE UNIT WITH THE HOUSING REMOVED IS NOT PERMITTED.

**Inbetriebnahme**

- Check if the operating data correspond to the values stated on the rating plate.
- Do not modify the signal converter in any way whatsoever.
- Snap the mounting device of the signal converter onto a DIN rail.
- Connect the auxiliary power to terminals -X2/1(DC :L+ / AC: L) and X2/2 (DC: L / AC: N).
- Connect the FO cable assemblies with BFOC ST-connectors to receiver R1 and transmitter T1 on the 1300 nm side and the FO cable assemblies with FSMA screw-type connectors to receiver R2 and transmitter T2 on the 820 nm side.
- The signal converter is now operational as soon as the auxiliary power supply is energized. The green LED lights to indicate that the unit is operational.

**1.7 Settings**

All settings on the signal converter can be made from outside by means of a DIL switch. It is not necessary to open the housing.

The settings are described in Section 1.4.2

**1.8 Maintenance**

The signal converter is maintenance-free.

Do not use liquids for cleaning the unit.

# EG-Konformitätserklärung

## EC Declaration of Conformity

No. E471015 - 4

Hersteller: Siemens Aktiengesellschaft  
 Manufacturer: Anlagenbau und Technische Dienstleistungen  
 Anschrift: Siemensstraße 33  
 Address: D - 71254 Ditzingen  
 Bundesrepublik Deutschland

Produkt- 850 / 1300 nm Optical Repeater  
 bezeichnung: 7XV5451 - 0xA00  
 Product  
 description

**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:*

89/338/EWG Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit (geändert durch 91/263/EWG, 92/311/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, 92/311/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 Reference number	Ausgabedatum Edition	Referenznummer Reference number	Ausgabedatum Edition
EN 61010 - 1	1993	EN 50082 - 2	1995
EN 50081 - 1	1992		

Ditzingen, den / the 20. August 1998

Siemens AG

Pflugfelder, GL

Name, Funktion  
Name, function


Unterschrift  
signature

Gottwald, Kaufm. HGL

Name, Funktion  
Name, function


Unterschrift  
signature

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*





# SIEMENS

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