

1 Preface

1.1 Purpose of the manual

In this manual you will find all the necessary information on the setup and operation of SIWAREX U.

1.2 Required basic knowledge

In order to be able to understand the manual, a general knowledge of SIMATIC automation technology is required. In addition, knowledge of weighing technology is beneficial.

1.3 Scope of this manual

This manual is valid for SIWAREX U modules which have been produced since October 2007.

Model	Name	Order number	From product revision (Version)	
SIWAREX U	SIWAREX U	7MH4950-1AA01	HW 1.0	FW 1.1
		7MH4950-2AA01		

Table 1-1 Scope of this manual

Note

The manual describes the weighing electronics SIWAREX U as part of the system SIMATIC S7 300 and ET 200M and is to be used in addition to the SIMATIC manuals.

Note

This manual contains the description of the modules which were valid at the time of publication.

We reserve the right to attach product information containing up-to-date information about the modules to new modules or modules in a later version.

2.2 Compatibility

The SIWAREX U modules with the new order number **7MH4950-*AA01** are fully compatible as regards software with the modules with order number 7MH4601-1*A01, which were produced from May 1997 to ca. November 2007.

As regards hardware, compatibility is also guaranteed, although from ca. November 2007 the modules work with a lower supply voltage for the load cells (6 V instead of 10 V), thus requiring less energy. The remaining hardware features (ports, frame size, pin assignment, etc.) remain unchanged. In this way, the replacement of a defective module 7MH4601-1*A01 with the order number 7MH4950-*AA01 is possible without any difficulty.

Newly implemented was the possibility with the modules 7MH4950-*AA01 to process the communication with the SIMATIC CPU alternatively via a function block, which is prepared in the project "Getting Started". The functioning of the new function block has already proven itself with the SIWAREX modules (SIWAREX FTA, SIWAREX FTC, SIWAREX CS).

The program SIWATOOL U was also updated and corresponds in its design and functionality to the SIWATOOL programs for SIWAREX FTA, SIWAREX FTC, SIWAREX CS, and SIWAREX MS.

With the new SIWATOOL U, the modules with the order number 7MH4601-1*A01, which were produced up to ca. October 2007, can also be operated. In this way, the saved scale data (xxx.sku) can be imported into the new SIWATOOL U environment and further used (xxx.swu).

3 Product overview

3.1 General information

SIWAREX U is a versatile and flexible weighing module, which can be used wherever static scales are to be used in the SIMATIC S7 automation system.

The function module (FM) SIWAREX U takes full advantage of all the features of the modern automation system, including the integrated communication, the diagnostic system and the configuration tools.

SIWAREX U is not designed for legal-for-trade within the meaning of OIML-R76.

Customer benefits:

SIWAREX U distinguishes itself by virtue of decisive advantages:

- o Uniform design technology and consistent communication via the use in SIMATIC S7
- o Uniform configuration with SIMATIC Manager
- o Use in the peripheral system concept in ET 200M (PROFIBUS, PROFINET)
- o Measurement of weight or force with high resolution of 16 bits
- o High accuracy 0.05 %
- o High measurement rate of 50 Hz
- o Monitoring of limit values
- o Flexible adaptation to different requirements with SIMATIC control
- o Simple setting of the scale with the program SIWATOOL U via the RS 232 port
- o Theoretical adjustment possible without adjustment weights
- o Replacement of the module possible without a new adjustment of the scale
- o Use in Ex-zone 2 / ATEX approval.
- o Intrinsically safe load cell powering for the Ex area Zone 1 (option with SIWAREX IS)
- o Diagnostic functions integrated in SIMATIC S7

3.2 Area of application

SIWAREX U is the optimal solution wherever the aim is to detect signals from strain gauge sensors or load cells. As weighing electronics, SIWAREX U offers good accuracy with a measuring time of 20 ms.

SIWAREX U is optimally equipped for the following applications:

- o The fill-level monitoring of silos and bunkers

- o The measurement of crane and rope loads, other strength measurements
- o Load measurement for industrial elevators or rolling mills
- o Weighing in areas with a risk of explosion (with SIWAREX IS Ex interface)
- o Belt tensioning measurement

3.3 Design

SIWAREX U is a function module (FM) for direct use in SIMATIC S7 300 or for peripheral operation via ET 200M. In this way, SIWAREX U can also work together with SIMATIC S7 400 and other automation systems. The installation and wiring outlay for the module is very small. The connection of the load cells, of the power supply, and of the serial ports is performed via the 20-pin front connector. With the operation of SIWAREX U in SIMATIC, there is a complete integration of weighing technology in the automation system.

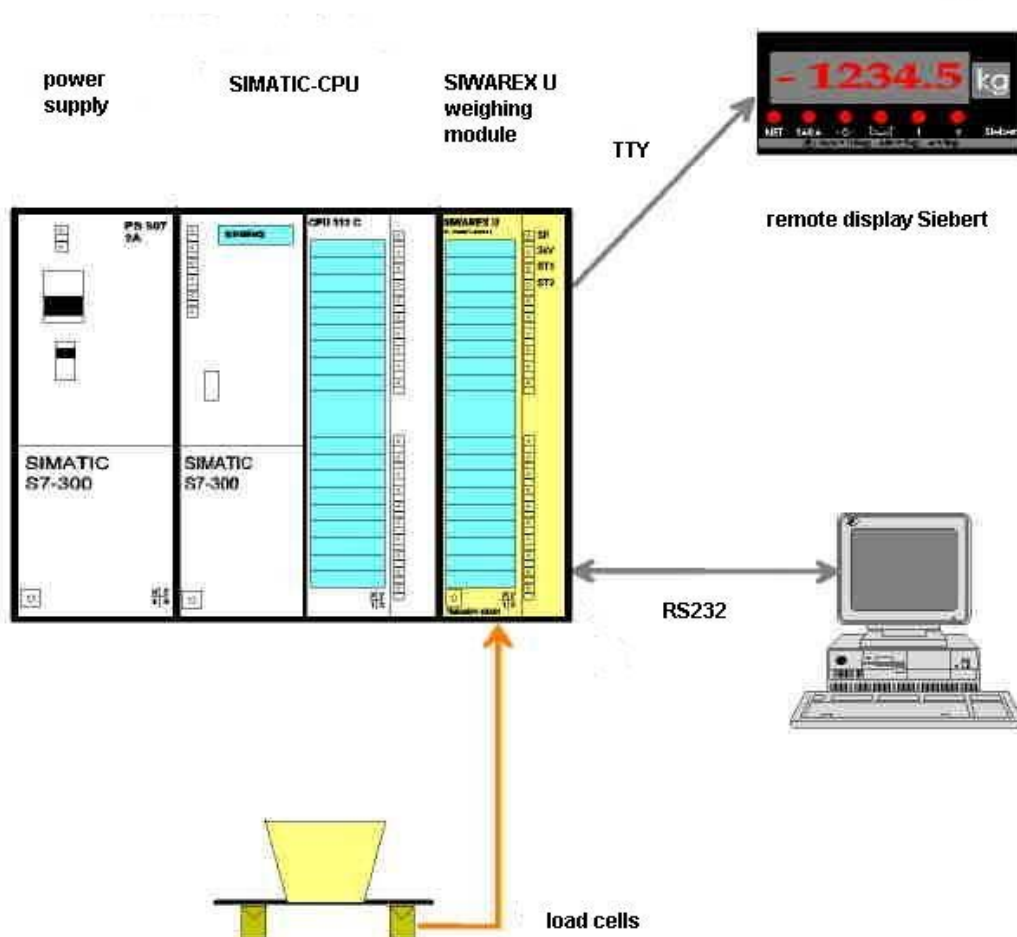


Figure 3-1 System overview with SIWAREX U

3.4 Function

The primary task of SIWAREX U consists in the measurement of the current weight value. By means of the integration in SIMATIC, there is the option of processing the weight value directly in the PLC.

SIWAREX U is already pre-adjusted in the factory. This makes possible the theoretical adjustment of the scale without adjustment weights as well as module replacement without a new adjustment of the scale.

SIWAREX U possesses two serial ports. The TTY port is for the connection of digital remote displays. A PC can be connected to the RS 232 port for the setting of SIWAREX U.

The weighing module SIWAREX U can also be used in areas with a risk of explosion (Zone 2). Via an optional Ex interface SIWAREX IS, the load cells are securely connected for Zone 1 applications.

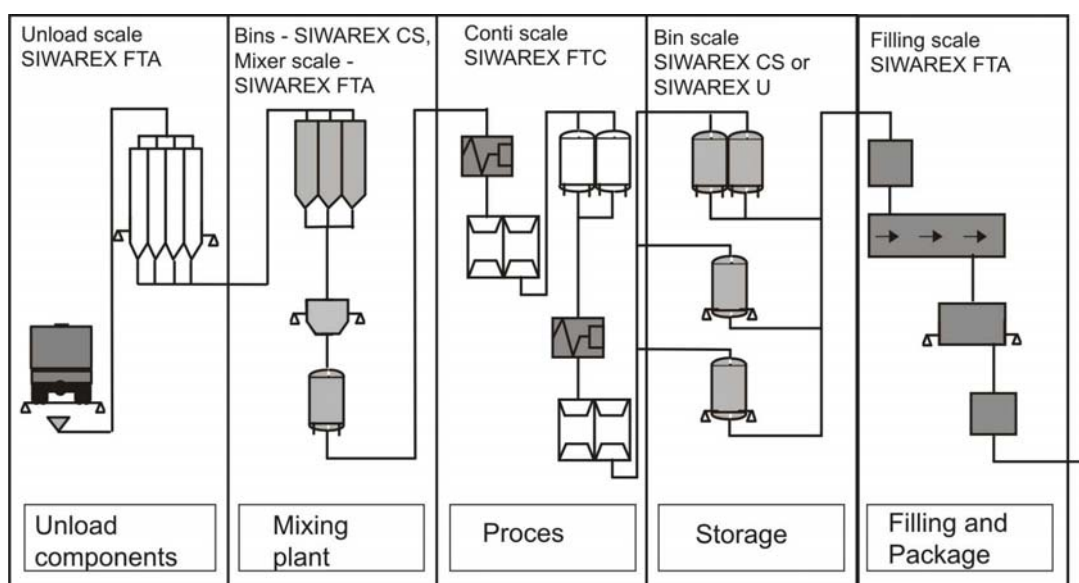


Figure 3-2 Areas of application of SIWAREX modules in the production chain

3.5 System integration in SIMATIC

SIWAREX U is a module of SIMATIC S7 300. The user is fully free in the configuration of the automation solution, including the weighing application. By means of a relevant combination of the SIMATIC modules, optimal solutions can be found for small, medium-sized, and large systems. With the aid of the configuration package and sample applications for SIMATIC, customer-specific/sector-specific solutions can be developed very quickly. The following picture shows a typical combination for a medium-sized system.

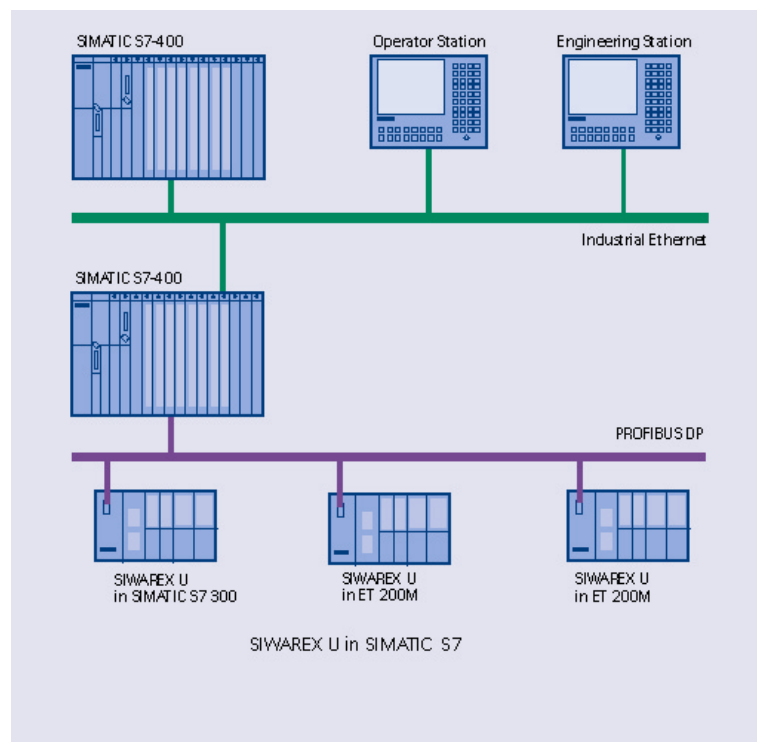


Figure 3-3 Typical configuration SIMATIC S7 with SIWAREX U

3.6 Setting the scale with SIWATOOL U

For the setting of the scale, there is a special program SIWATOOL U for Windows XP operating system.

The program enables the weighing specialist to commission the scale without having any prior knowledge of automation technology. When servicing, you can analyze and test the processes in the scale independently of the automation system with the aid of the PC. The diagnostic information readout from SIWAREX U is very helpful for analyzing events.

The following picture shows the layout of the individual program windows.

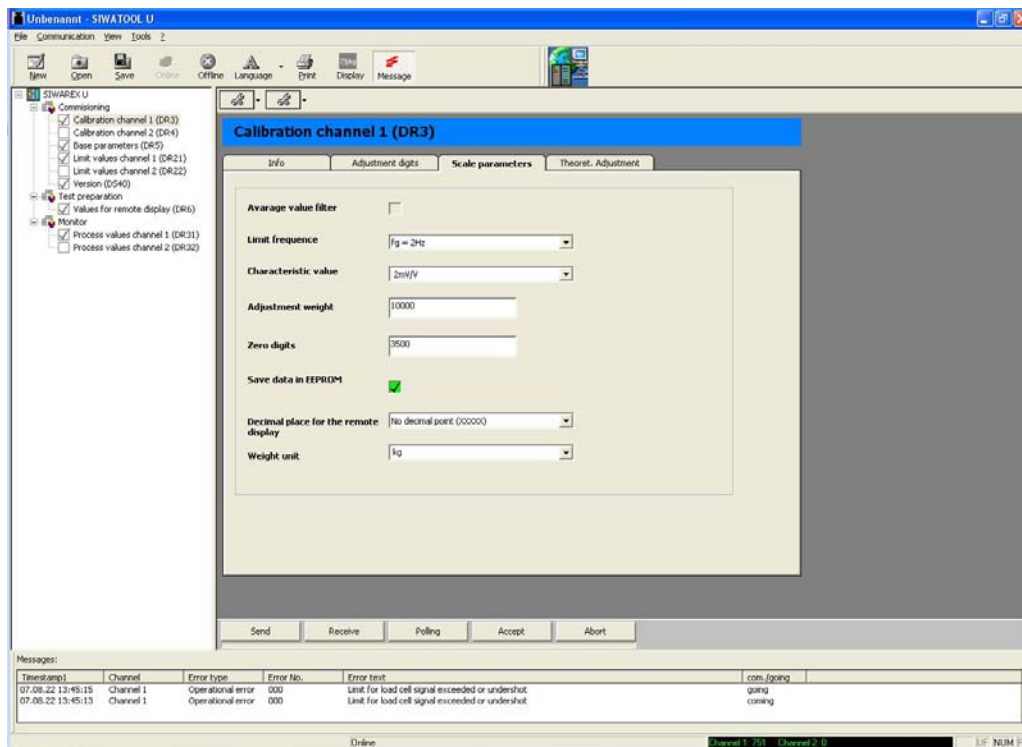


Figure 3-4 SIWATOOL U overview

SIWATOOL U doesn't just support you in the setting of the scale. The feature of analyzing the diagnostic buffer, which can be saved after the readout from the module along with the parameters, is very helpful.

It is possible to switch between German and other languages in the program.

12 Order numbers and accessories

There are essential and optional accessories for SIWAREX U.

The essential accessories are indicated in the following table.

	Order no.
SIWAREX U for SIMATIC S7 and ET 200M, incl. bus connectors, weight 0.3 kg	
• One-channel design ^{1) A)} for the connection of one scale	7MH4950-1AA01
• Two-channel design ^{2) A)} for the connection of two scales	7MH4950-2AA01
SIWAREX U device manual	
• In various languages Free download on the Internet at: www.siemens.de/waegetechnik	
Configuration package³⁾ SIWAREX U for SIMATIC S7 and TIA-Portal on CD-ROM • PC software SIWATOOL U (various languages), new design • Sample program "Getting started" – ready-made application for SIMATIC S7 • Device manual SIWAREX U on CD (various languages) • Quick Guide • HSP Hardware Support Package for incorporation of SIWAREX U in STEP 7 classic	7MH4950-1AK02
Configuration package SIWAREX U for PCS 7, Version 7.x in German and English on CD-ROM, block for CFC plan and face-plate (image block)	7MH4950-3AK61
SIWATOOL connection cable^{A)} from SIWAREX U/CS with serial PC port, for 9-pin PC ports (RS 232), length 3 m	7MH4607-8CA
Installation material (absolutely necessary)	
Front connector 20-pin with screw contacts (required for each SIWAREX module)	6ES7392-1AJ00-0AA0
Shield connection element sufficient for two SIWAREX U modules	6ES7390-5AA00-0AA0

13 Technical data

13.1 24 V power supply

SIWAREX U weighing modules are designed for operation with SELV (Safety Extra Low Voltage). Accordingly, only SELV (Safety Extra Low Voltage) power supply connections may be connected in accordance with IEC950/EN60950/VDE0805.

An isolated function low voltage (in accordance with EN60204-1) is to be ensured by the system power supply.

Rated voltage	DC 24 V input via the front connector (reverse polarity protection)
Upper/lower limits static	DC 20.4 V/28.8V
Upper/lower limits dynamic	DC 18.5 V/30.2 V
Non-periodic excess voltage	DC 35 V for 500 ms with a recovery time of 50 s.
Maximum current consumption (with rated voltage)	150 mA(single-channel)/240 mA (double-channel)
Starting current surge at 25°C (typical)	2.4 A
Power loss of the module typical	3.6W (single-channel)/5.8W (double-channel)

Table 13-1 Data: Power supply 24 V

13.2 Power supply from the S7 backplane bus

Current consumption (5 V) from the -backplane bus	< 100 mA
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Table 13-2 Data: Power supply from the S7 backplane bus

13.3 Load cell activation

Error limit in accordance with DIN1319-1 from measurement range end value at 20 °C ± 10 K	≤ 0.05 %
Update rate	50 Hz
Resolution internal	65,535 parts
Display range of the weight values	-32,768 to 32,767
3 measurement ranges	0 to 1 mV/V 0 to 2 mV/V 0 to 4 mV/V
Temperature coefficient range	$\leq \pm 10$ ppm/K v. E.
Adjustment zero temperature coefficient	$\leq \pm 0.3$ μ V/K
Max. distance of LC	500 m *

Max. distance between LC and Ex interface in Ex area	150/500 m for gas group IIC 500 m* for gas group IIB (see device manual SIWAREX IS)
Load cell powering: Voltage regulated Maximum current	6 V DC 150 mA
Permissible load cell resistance without Ex-i-interface (per channel)	Input resistance > 40 Ω Output resistance < 4010 Ω
Permissible load cell resistance with Ex-i-interface (per channel)	Input resistance > 87 Ω Output resistance < 4010 Ω
Monitoring of the sensor inputs (typical)	≥ 5.3 V Hysteresis 0.1 V
Max. permissible input voltage at the signal and sensor inputs	15 V
Response time sense line monitor	≤ 1 s
Common mode suppression CMRR @50 Hz	> 80 dB
Low-pass filter cutoff frequency	0.05...5 Hz
Measured value filtering for mean value filter	30 values (20 ms)
Potential isolation	500 V (DC)

*Possible up to 1000 m under certain conditions, when using the recommended cable (accessories)

Table 13-3 Data: Load cell activation

13.4 RS 232C port

Baud rate	9600 baud
Data bits	8
Parity	even
Stop bits	1
Max. distance	15 m
Signal level	in accordance with EIA-RS232C
Potential isolation	500 V (DC)

Table 13-4 Data: RS 232C port

13.5 TTY port

Operating mode	Passive and unidirectional, i.e. transmitter only (TxD)
Baud rate	9600 baud
Data bits	8
Parity	even
Stop bits	1
Max. line length (@ 20 mA)	125 m
Potential isolation	500 V (DC)
Transmitter voltage drop	< 2 V
Max. loop current	25 mA

Table 13-5 Data: TTY port

13.6 Data buffering

Buffer time of data in EEPROM	200 years
Permissible number of write cycles for EEPROM	1,000,000

Table 13-6 Data buffering in EEPROM

13.7 Dimensions and weight

Dimensions W x H x D	40 x 125 x 130 mm
Weight	0.275 kg

Table 13-7 Data: Dimensions and weight

13.8 Environmental conditions

The use of SIWAREX U is intended under the following conditions in SIMATIC S7 systems.

Usage conditions in accordance with IEC 60721:

Operation: IEC60721-3-3
Stationary use, weather-protected
Class 3M3, 3K3

Storage/Transport: IEC 60721-3-2
Packaged for transport, no condensation
Class 2M2, 2K4

For use in extreme operating conditions (e.g. heavy dust, corrosive vapors or gases etc.), additional measures are to be taken such as encapsulation.

Table 13-8 Data: Environmental conditions

13.9 Mechanical requirements and data

Test	Standards	Test values
Vibration in operation	IEC 60068-2-6	<u>Test Fc</u> 5 ... 9 Hz: 3.5 mm movement 9 ... 150 Hz: 9.8 m/s ² 10 cycles per axis 1 octave / min.
Shock in operation	IEC 60068-2-27	<u>Test Ea</u> 150 m/s ² , half sine Duration: 11 ms Number: 3 per axis in neg. and pos. direction
Vibration during transport	IEC 60068-2-6	<u>Test Fc</u> 5 ... 9 Hz: 3.5 mm movement 9 ... 500 Hz: 9.8 m/s ² 10 cycles per axis 1 octave / min.
Shock during transport	IEC 60068-2-29	<u>Test Eb</u> 250 m/s ² , half sine Duration: 6 ms Number: 1000 per axis
Free fall	IEC 68000-2-32	<u>Test Ed</u> Height of fall: 1 m in transport packaging 0.3 m in product packaging

Table 13-9 Data: Mechanical requirements

13.10 Electrical, EMC, and climatic requirements

13.10.1 Electrical protection and safety requirements

Note:

The licenses that are currently valid for SIWAREX U are indicated on the SIWAREX U rating plate.

	Directives: 2004/108/EC "Electromagnetic compatibility" 94/9/EC "Explosion protection" Note: Further information on EC directives can be found in the product documentation accompanying every SIWAREX U.
	Underwriters Laboratories Inc. in accordance with UL 508 (Industrial Control Equipment) UA C22.2 No. 142 (Process Control Equipment) UL 1604 (Hazardous Location) UA-213 (Hazardous Location) APPROVED for use in Class I, Division 2, Group A, B, C, D Tx; Class I, Zone 2, Group IIC Tx
	Factory Mutual Research (FM) in accordance with Approval Standard Class Number 3611, 3600, 3810 APPROVED for use in Class I, Division 2, Group A, B, C, D T4; Class I, Zone 2, Group IIC T4
	Explosion protection in accordance with EN 60079-15: 2005 (Electrical apparatus for potentially explosive atmospheres; Type of protection "n") Class II 3 G EEx nA II T4 For the use of SIWAREX FTA in the Ex area the important information in the manual "SIMATIC automation systems - Explosion protection principles (Doc. no. A5E00206200)" must be observed!

SIWAREX U meets the following requirements:

Requirements fulfilled	Standards	Comments
IP protection type	IP 20 in accordance with IEC 60529	• Protection against contact with standard test fingers • Protection against foreign matter with diameters over 12.5 mm • No protection against water
Air gaps and creepage distances	IEC 60664 IEC 61010-1 IEC 61131-2 UL508 CSA C22.2 No142	Betw. insulated circuits ≥ 0.5 mm At terminals ≥ 3.2 mm Excess voltage category II Degree of contamination 2 Circuit board material IIIa/IIIb Rated surge voltage: 0.5kV

Requirements fulfilled	Standards	Comments
Insulation resistance	IEC 61131-2: CSA C22.2 No142	500 VDC (The insulation resistance was demonstrated in the type test.)
Material	SN 36350	
Fire resistance	UL 94 (10/1996) IEC 60695-11-10 (08/2003) IEC 61131-2 (02/2003)	Flammability rating UL94V-1 or UL94V-0

Table 13-10 Data: Electrical protection and safety requirements

13.10.2 Electromagnetic compatibility

Emitted interference (industrial use): EN 61000-6-4		
Comments	Standard	Limit values
Emission of radio interference (electromagnetic fields)	IEC 61131-2	EN 55011 Class A, Group 1 30 – 230 MHz: < 40dB(μV/m) Q 230-1000MHz: < 47dB(μV/m) Q
Emission on power supply lines	IEC 61131-2	EN 55011 Class A, Group 1 EN 55014

Interference immunity (industrial use): EN 61000-6-2		
Comments	Standard	Degree of severity
Burst pulses on power supply lines	IEC 61000-4-4 IEC 61131-2 NAMUR NE 21	2 kV
Burst pulses on data and signal lines	IEC 61000-4-4 IEC 61131-2 NAMUR NE 21	1 kV (RS232 port) 2 kV (remaining data and signal lines)
Electrostatic contact discharge (ESD)	IEC 61000-4-2 NAMUR NE 21	6 kV
Electrostatic air discharge (ESD)	IEC 61000-4-2 NAMUR NE 21	8 kV
Voltage spikes/Surge on power supply lines	IEC 61000-4-5 NAMUR NE 21 IEC 61131-2	+ 2 kV unsym.* ± 1 kV sym.*
Voltage spikes/Surge on data and signal lines	IEC 61000-4-5 NAMUR NE 21 IEC 61131-2	± 1 kV unsym. (on cable shield)
HF irradiation (electromagnetic fields)	IEC 61000-4-3 IEC 61131-2 NAMUR NE 21	80 MHz to 1000 MHz and 1.4 GHz to 2.0 GHz: 10 V/m 900 MHz and 1.89 GHz: 10 V/m 2.0 GHz – 2.7 GHz : 1V/m
HF current feed Data, signal, and power supply lines	IEC 61000-4-6 IEC 61131-2 NAMUR NE 21	9 kHz – 80 MHz 10V (80% AM 1 kHz)

Table 13-11 Data: Electromagnetic compatibility

- * To meet the requirements, an ext. protection element should be fitted (e.g.: Blitzductor BVT AD24 from Dehn&Söhne).

Attention

This is a class A device. In residential areas, this device can cause radio interference. In such areas, users must take suitable measures (e.g.: use in 8MC cabinets).

13.10.3 Climatical requirements

Climatical requirements		
Comments	Environmental conditions	Areas of use
Operating temperature: horizontal installation other installation positions	DIN EN 60068-2-2 0 to +60°C 0 to +40°C	
Storage and transport temperature	DIN EN 60068-2-2 - 40 to +70°C	
Relative air humidity	15 to 95%	Without condensation, relative humidity (RH) corresponds to stress factor 2 in accordance with DIN IEC 61131-2
Air pressure in operation	DIN EN 60068-2-13 from 1080 to 795 hPa	Corresponds to an altitude of -1000 to 2000 m above sea level
Air pressure in storage	DIN EN 60068-2-13 from 1080 to 600 hPa	Corresponds to an altitude of -1000 to 3500 m above sea level
Function-endangering gases	DIN IEC 60721-3-3 Class 3C3 SO ₂ : 10cm ³ /m ³ H ₂ S: 1cm ³ /m ³	
Function-endangering dust	DIN IEC 60721-3-3 Class 3S2 without occurrence of sand	

Table 13-12 Data: Climatical requirements