

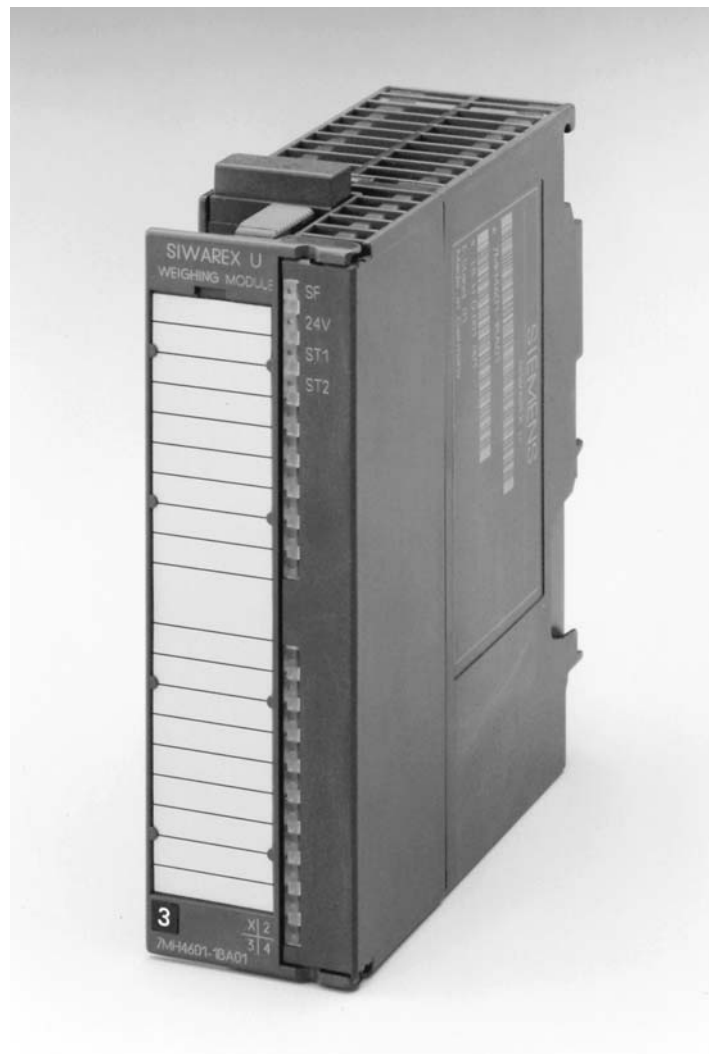


SIWAREX[®] U

Device manual

Version: 12/2007

For modules with order number 7MH4950-1AA01 and 7MH4950-2AA01



Safety instructions

This manual contains instructions which you must observe for your own safety and to avoid material damage. The instructions are signaled by a warning triangle and are presented as follows according to the degree of danger:



Danger

Means that failure to take the necessary safety precautions **will** result in death, serious injury or significant material damage.



Warning

Means that failure to take the necessary safety precautions **can** result in death, serious injury or significant material damage.



Caution

Means that failure to take the necessary safety precautions can result in a minor injury or material damage.

Caution

Means that failure to take the necessary safety precautions can result in material damage.

Attention

Refers to important information about the product, the handling of the product or the respective part of the documentation to which special attention should be given.

Qualified personnel

The commissioning and operation of a device may only be performed by **qualified personnel**. In the context of the safety instructions in this manual, qualified personnel means persons who have the authorization to commission, ground, and certify devices, systems, and power circuits in accordance with the applicable safety standards.

Proper use



Warning

The device may only be used for the applications described in the catalog and the technical description and only in conjunction with external devices and modules that are approved or recommended by Siemens.

Fault-free and safe operation of the product depends on proper transport, storage, assembly, and installation as well as careful operation and maintenance.

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Siemens AG
Automation & Drives Dept.
SIWAREX Weighing Systems
A&D SC PS1 WT
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

Disclaimer

We have tested the contents of this document for compatibility with the hardware and software described. This does not exclude the possibility of discrepancies, in which case we do not guarantee the complete compatibility of this document. The information in this document is assessed regularly and any necessary corrections are included in the next revision.
We are grateful for any suggestions for improvement.

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SIWAREX U

Universal weighing module for SIMATIC S7 300 and ET 200M

Technical manual for modules with order
number 7MH4950-1AA01 and 7MH4950-2AA01

Version 12/2007
A

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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.

The structure of the manual is oriented towards activities which have to be performed as part of configuration, commissioning and servicing.

Chapter	Description of contents
1 Preface	Notes on using this manual
2 Scope of delivery	Description of the scope of delivery of SIWAREX U.
3 Preface	Overview of the - Design - Functionality - System integration of SIWAREX U.
4 Hardware configuration and installation	Description of: - The individual hardware modules - Assembly and installation - The pin assignment - The preparation for operation.
5 Weighing functions	Description of all scale parameters and associated functions.
6 Commands	Description of the commands SIWAREX U can execute.
7 Messages and diagnostics	Description of the messages with notes on troubleshooting.
8 Communication in SIMATIC S7	Description of the data exchange with the SIMATIC CPU. This chapter is meant for those who write application software.
9 Communication with other systems	Description of the communication with other automation systems
10 Remote display	Connection to remote display Siebert S102
11 Setting the scale – SIWATOOL U	Description of: - The software installation - The software functions.
12 Order numbers and accessories	Ordering instructions for optional components such as: - Digital remote displays - Ex interface.
13 Technical data	Technical data
14 Index	Index
15 Abbreviations	List of abbreviations

Table 1-2 Chapter overview

1.4 Further support

Do you have more questions regarding the use of SIWAREX U? Then please contact your Siemens representative in the office or business location that is responsible for your area or technical support for SIWAREX Tel.: +49 (0)721 595 2811.

Up-to-date information on the subject of SIWAREX weighing technology can be found on the Internet site.

<http://www.siwarex.com>

2 Scope of delivery, compatibility

2.1 Scope of delivery

The scope of delivery of SIWAREX U comprises the manufacturer's conformity declaration and a supplementary sheet with the up-to-date additional information about the product.

To configure SIWAREX U in SIMATIC S7 you need the configuration package SIWAREX U for SIMATIC S7 with the order number 7MH4950-1AK01, which must be ordered separately.

The configuration package is composed of the following components:

- The Windows program SIWATOOL U for the setting of the scale during commissioning
- SIMATIC software for the operation of SIWAREX U in SIMATIC S7
- Device manuals in several languages.

For the first programming steps, the software "Getting Started" is very helpful. It can be found on the delivery CD or can be obtained for free on the Internet (www.siwarex.com).

To configure SIWAREX U in SIMATIC PCS7 you need the configuration package SIWAREX U for SIMATIC PCS7 with the order number 7MH4 683-3BA64, which must be ordered separately.

The configuration package is composed of the following components:

- The Windows program SIWATOOL U for the setting of the scale during commissioning
- Standard software (FB) for the operation of SIWAREX U in SIMATIC PCS 7
- Device manuals in several languages
- Ready-made face plates blocks for the operating station.

The required and optional accessories are listed in Chapter [12 Order numbers](#) and accessories.

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.

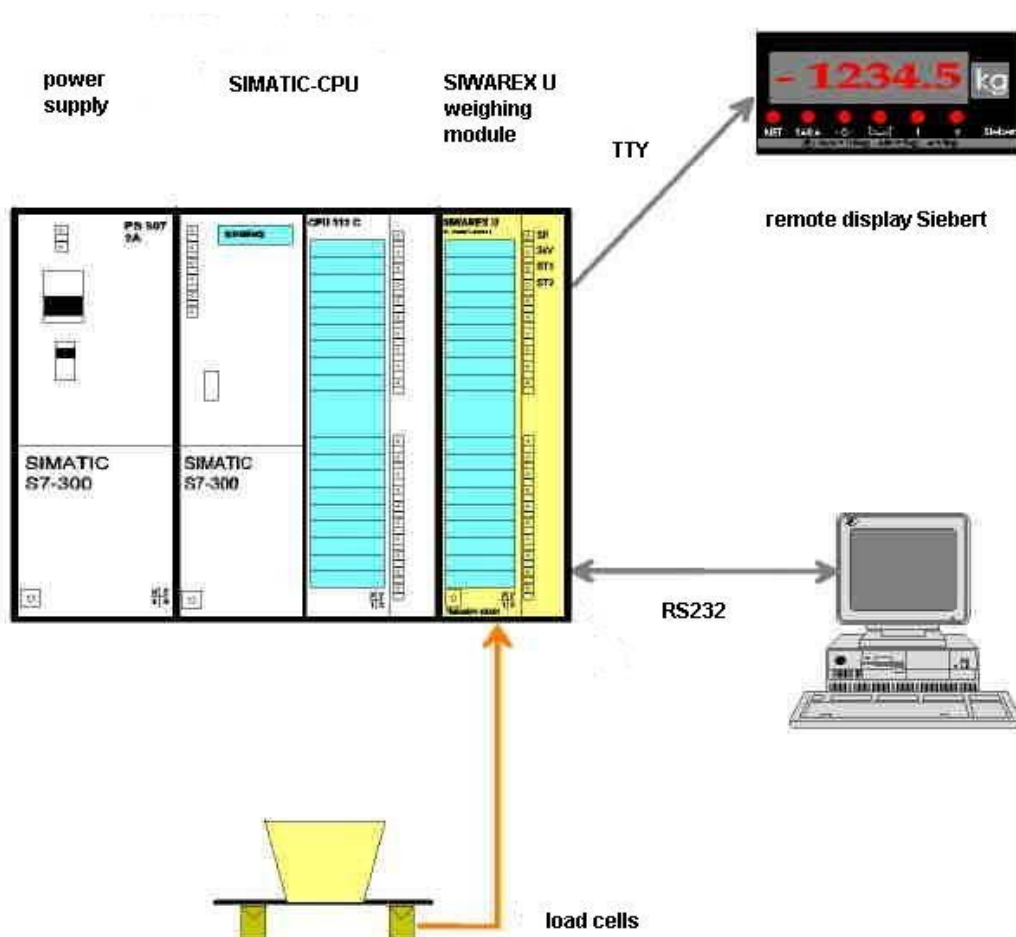


Figure 3-1 System overview with SIWAREX U

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.

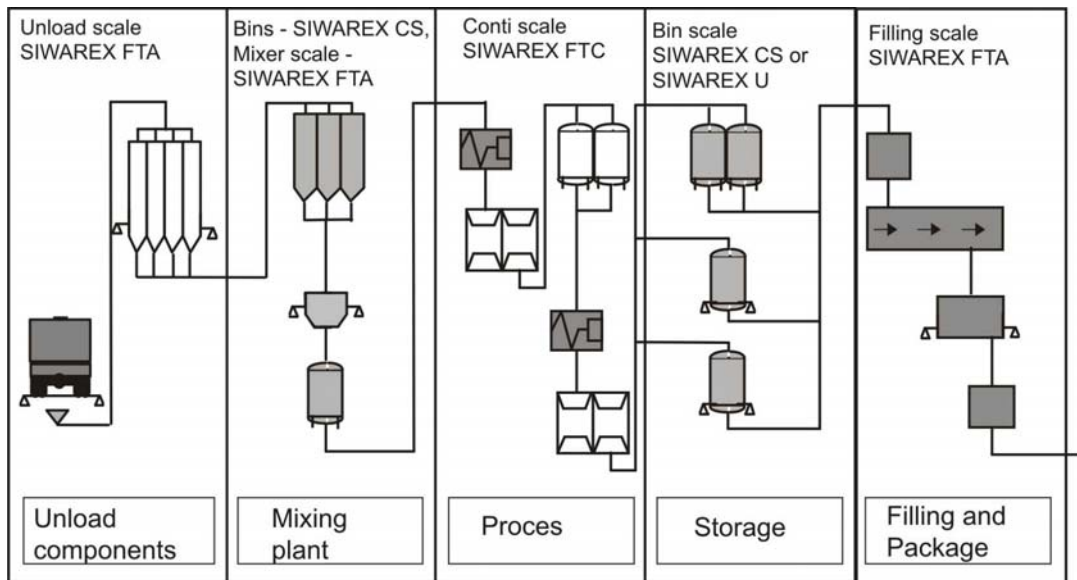


Figure 3-2 Areas of application of SIWAREX modules in the production chain

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.

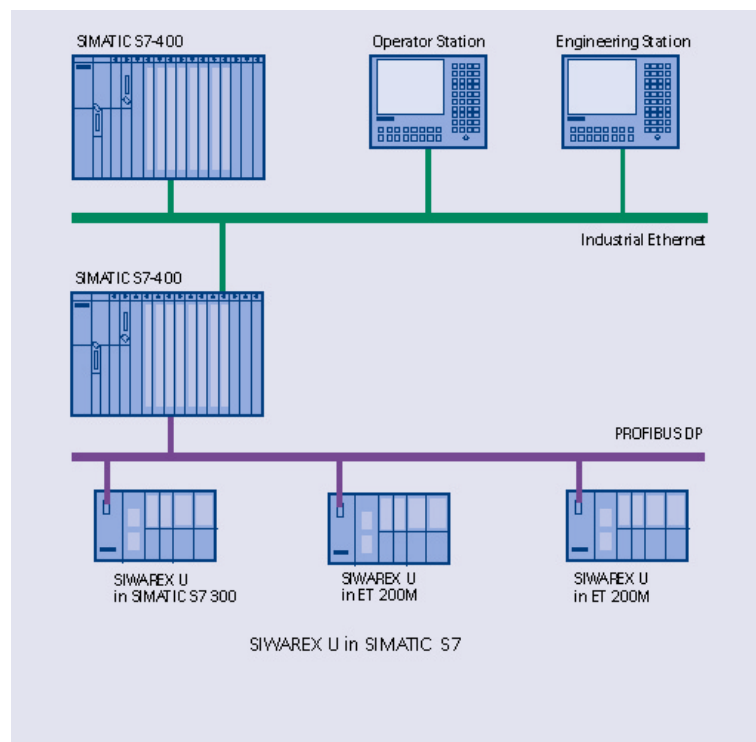


Figure 3-3 Typical configuration SIMATIC S7 with SIWAREX U

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.

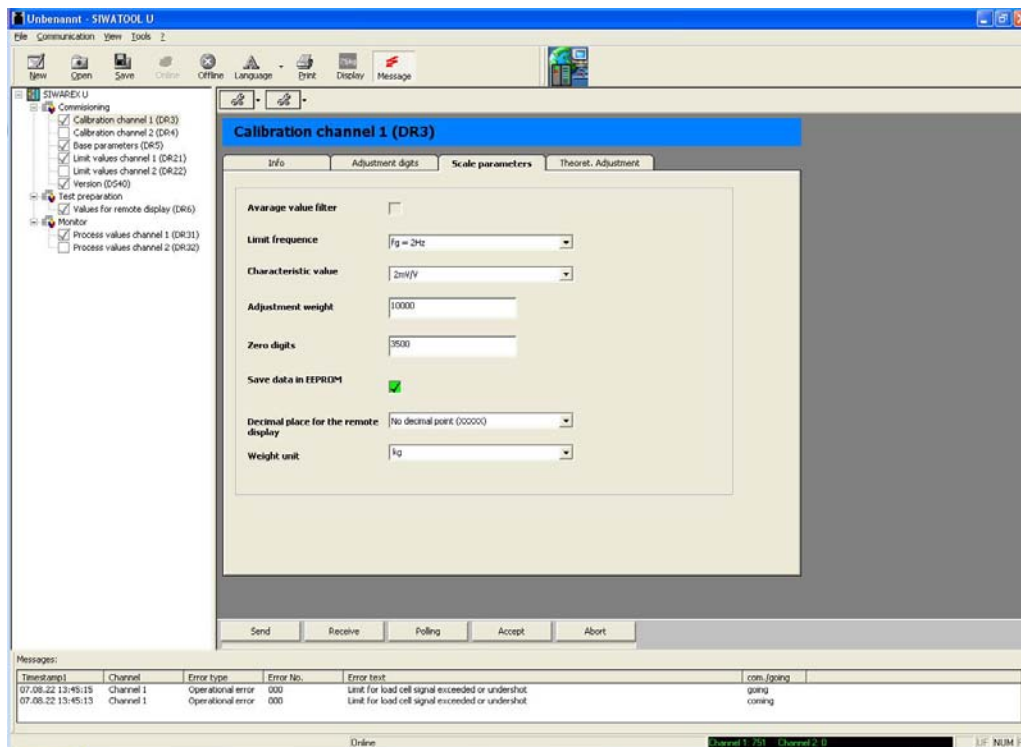


Figure 3-4 SIWATOOL U overview

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.

4 Hardware configuration and installation



Warning notices

For configuration, installation, and commissioning, the specifications of the SIMATIC manual apply. In this chapter you will receive additional information about the hardware configuration, installation, and preparation for operation of SIWAREX U.

It is imperative to observe the safety instructions.



Warning

Unqualified interventions in the device/system or a failure to observe the warning notices can result in serious injury or material damage. Therefore, only qualified personnel are permitted to perform interventions on this device/system.



Warning

The device was developed, manufactured, tested, and documented observing the relevant safety standards. Under normal circumstances, the device presents no danger as regards material damage or the health of persons.



Danger

Commissioning is not permitted until it has been established that the machine in which these components are to be installed meets the requirements of Directive 89/392/EEC.

4.1 Configuring the hardware in SIMATIC

SIWAREX U is a function module (FM) in the automation system SIMATIC S7 300. It can be installed in all installation sites intended for function modules.

Use in SIMATIC S7 300 can take place in the central operation, in the extension rack or peripherally in the ET 200M system.

Operation with SIMATIC S7 400 can only take place peripherally in the ET 200M system. In this case, the active backplane bus can also be used.

For estimating the maximum number of SIWAREX U that can be used in a system, the following information is helpful:

Total width	Power requirements (5V) from the SIMATIC backplane bus	Main memory requirements in the SIMATIC CPU
n x 40 mm	n x 100 mA	4100 bytes + n x 170 bytes

Table 4-1 Requirements for n SIWAREX U

Max. number of modules in central operation – 8 SIWAREX U

Max. number of modules for multi-line extension – 8 SIWAREX U per line

Max. number of modules in the ET 200M system (PROFIBUS) – 7 SIWAREX U per station

The selection of the suitable SIMATIC CPU, the SIMATIC HMI (Human Machine Interface), and the communication modules is not exclusively determined by the requirements of SIWAREX U, rather by the overall job to be performed for the automation system.

4.2 EMC-compliant design

SIWAREX U is a highly accurate measuring device, which has to reliably measure the smallest of signals (approx. 1 μ V). For this reason, professional installation and wiring is absolutely necessary for fault-free operation.

4.2.1 Definition: EMC

EMC (electromagnetic compatibility) describes the ability of an electrical device to function fault-free in a specific electromagnetic environment without either being influenced by the environment or unduly influencing the environment.

4.2.2 Introduction

Although SIWAREX U was developed for use in an industrial environment and meets high EMC requirements, you should carry out EMC planning and detect potential sources of interference and include them in your considerations prior to the installation of your control system.

4.2.3 Potential interference

Electromagnetic interference can affect the automation system and SIWAREX U in various ways:

- Electromagnetic fields which affect the system directly
- Interference channeled in via bus signals (PROFIBUS-DP etc.)
- Interference that acts via the process wiring (e.g. measuring lines).
- Interference that enters the system via the power supply and/or protective earth.

The interference can impair the perfect functioning of SIWAREX U.

4.2.4 Coupling mechanisms

Depending on the propagation medium (conducted or non-conducted) and the distance between the source of interference and the device, interference gets into the automation system via four coupling mechanisms:

Conductive coupling

Capacitive coupling

Inductive coupling

Radiation coupling

4.2.5 Five basic rules for ensuring EMC

If you observe the five basic rules, you can ensure EMC in most cases.

Rule 1: Extensive grounding

When installing the automation devices, ensure the inactive metal parts are grounded well and extensively (see following sections).

Connect all inactive metal parts extensively and with low impedance with ground (large cross-sections).

Perform bolt connections on lacquered or anodized metal parts either with special contact disks or remove the insulating protective layers at the contact points.

Do not use aluminum components for ground connections if at all possible. Aluminum oxidizes a little and is therefore less suitable for grounding.

Make a central connection between the grounding and the ground/protective conductor system.

Rule 2: Proper wiring

Divide the wiring up into wire groups (high-voltage lines, power supply lines, signal lines, measuring lines, data lines).

Always lay the high-voltage lines and measuring/data lines in separate channels or bundles.

Lead the measuring lines as close as possible to ground planes (e.g. support beams, metal rails, cabinet panels).

Rule 3: Attaching the cable shields

Ensure the cable shields are attached properly.

Only use shielded data lines. The shielding must be connected extensively to ground on both sides of the data lines.

The shielding of the measuring lines must also be connected to ground at both ends.

The shielding should continue right up to the terminal connection. The unshielded line ends are to be kept as short as possible. Lay the cable shielding directly under SIWAREX U on the shield connection element. The connection between shield rails and cabinet/housing must be low in impedance.

Only use metallic or metallized plug housing for shielded data lines.

Rule 4: Special EMC measures

Wire all inductivities which are controlled with quenching circuits.

Use interference suppressed fluorescent lighting or incandescent lamps for illuminating cabinets or housings in the immediate vicinity of your controls.

Rule 5: Uniform reference potential

Create a uniform reference potential and ground all electrical equipment.

Lay sufficiently dimensioned potential equalization conductors when there are potential differences between parts in your system or where these are anticipated. For explosion applications, potential equalization is absolutely necessary.

4.3 Installation on the profile rail

When assembling the SIMATIC modules and SIWAREX U, the SIMATIC S7 set-up guidelines must be observed.

SIWAREX U is installed in the following steps:

- Check whether the SIMATIC bus connector is connected to the module left of SIWAREX U.
- Connect the SIMATIC bus connector for the following module group in the SIWAREX if necessary.
- Install the shield connection element under SIWAREX.
- Mount SIWAREX U on its place.
- Screw down SIWAREX U with the screw in the lower area of the module.

- Label SIWAREX U in accordance with its labeling system.

4.4 Connection and wiring

4.4.1 Connection areas of SIWAREX U

On the front side there is a 20-pin plug connector for load cell connection, RS232 and 24 V

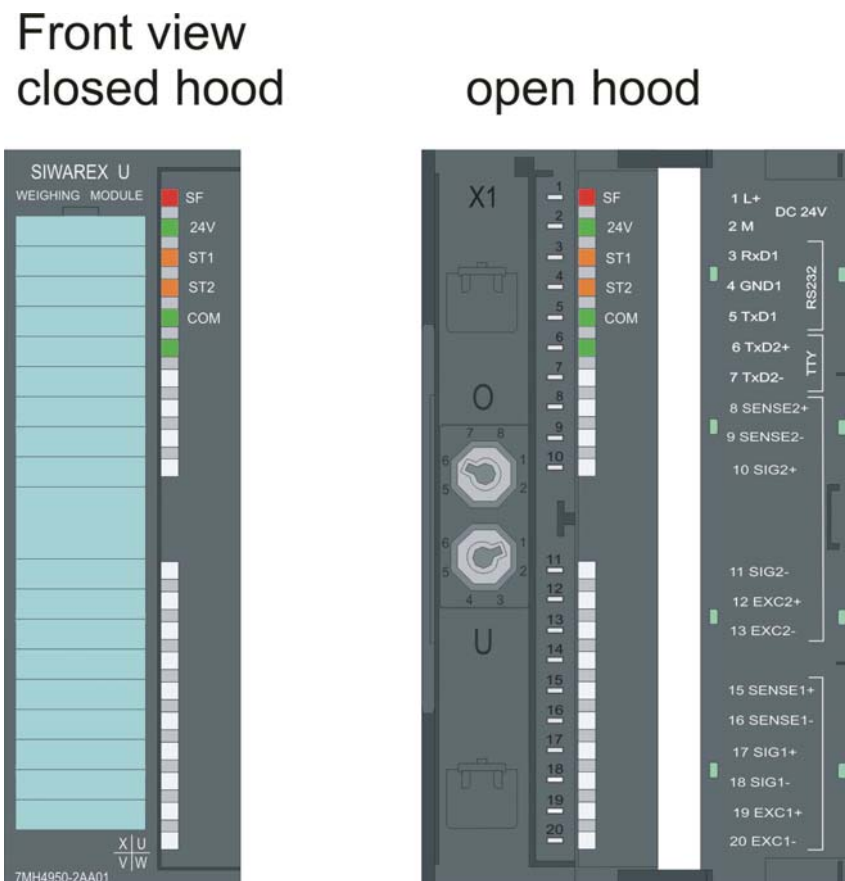


Figure 4-1 SIWAREX U front view, flap open

4.4.2 Shield connection

Special attention must be given to the shield support for the shielded lines. Only correct assembly ensures the interference immunity of the system.

A line is shielded in order to weaken the effect of magnetic, electric, and electromagnetic interference on the line. Interference on cable shielding is routed to ground through shield rails that are conductively connected with the housing. To ensure that this interference does not in turn become a source of interference, a low impedance connection to ground is especially important.

Only use cables with mesh shielding. The cover density of the shield should be at least 80%.

To attach the mesh shielding, only use metal cable clips. The clips must envelop the shield extensively and make good contact.

The shield clamps must be ordered separately to the shield connection element. The size of the shield clamp is to be chosen according to the cable diameter.

To attach a cable with the shield clamp, approx. 1.5 cm of the cable insulation is to be cut out of the place which is to be laid. The bare shield is then to be pressed tight against the shield connection element with the shield clamp.

The following figure shows the mounting of the shield clamps:

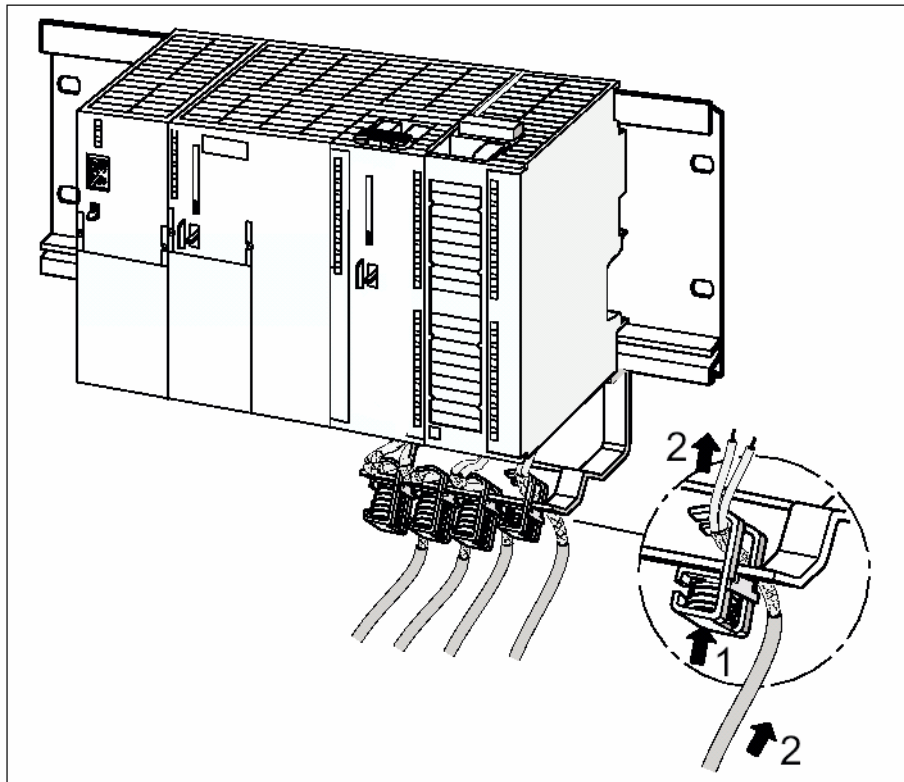


Figure 4-2 Installation diagram for the shield clamps

The shield should be pressed against the shield rail by means of the shield clamp.

4.4.3 Connections at the front connector

The SIMATIC set-up guidelines apply for the connection of the 20-pin connector.

You can use flexible lines with a cross-section of 0.25 to 1.5 mm². The stripping length is 6 mm, the lines should be provided with wire-end sleeves.

4.4.4 Connection of the 24 V power supply

Note

In the system S7 300 or ET200M, the SIMATIC CPU or IM 153 and SIWAREX U must be connected to the same 24 V power supply.

Use the 20-pin front connector to connect to the 24 V power supply.

Terminal	Signal name	Remarks
1 L+	24 V DC 1L+	Power supply +
2 M	24 V DC 1M	Power supply M

Table 4-2 Power supply connection

4.4.5 Load cell connection

Sensors which are equipped with strain gauges and meet the following conditions can be connected to SIWAREX U:

- Characteristic value 1.... 4 mV/V
- Supply voltage of 6 V is permissible

Use the 20-pin front connector to connect to the supply voltage. The connection should be made with the cable described in the chapter [Order numbers](#) and accessories. The cable was developed especially for the connection of load cells.

Terminal	Signal name	Remarks
15	SENSE1+	Channel 1: sensor line +
16	SENSE1-	Channel 1: sensor line -
17	SIG1+	Channel 1: measuring line +
18	SIG1-	Channel 1: measuring line -

Terminal	Signal name	Remarks
19	EXC1+	Channel 1: load cells supply voltage +
20	EXC1-	Channel 1: load cells supply voltage -

Table 4-3 Connection of load cells channel 1

Terminal	Signal name	Remarks
8	SENSE2+	Channel 2: sensor line +
9	SENSE2-	Channel 2: sensor line -
10	SIG2+	Channel 2: measuring line +
11	SIG2-	Channel 2: measuring line -
12	EXC2+	Channel 2: load cells supply voltage +
13	EXC2-	Channel 2: load cells supply voltage -

Table 4-4 Connection of load cells channel 2

The following rules are to be observed when connecting load cells (LC):

1. The use of a junction box (JB) becomes necessary when more than one LC is connected (the LCs must be connected in parallel).
2. If the distance between the LC and SIWAREX U is larger than the obtainable length of the LC connection cable, then you must use extension box (EB).
3. The cable shield is normally run on the cable guide supports of the junction box. Where there is a danger of potential equalization currents via the cable shield, a potential equalization conductor is to be laid parallel to the load cell cable or the shield clamp in the JB is to be used for the shield support. Using the potential equalization conductor is a preferable method as regards EMC (electromagnetic compatibility).

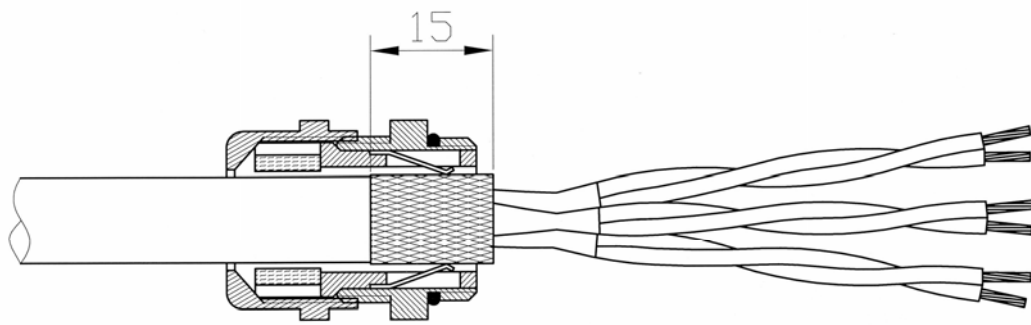


Figure 4-3 Shielding in the screw joint

3. Twisted pairs of conductors are necessary for the specified lines:
- Sensor line (+) and (-)
 - Measurement voltage line (+) and (-)
 - Supply voltage line (+) and (-)

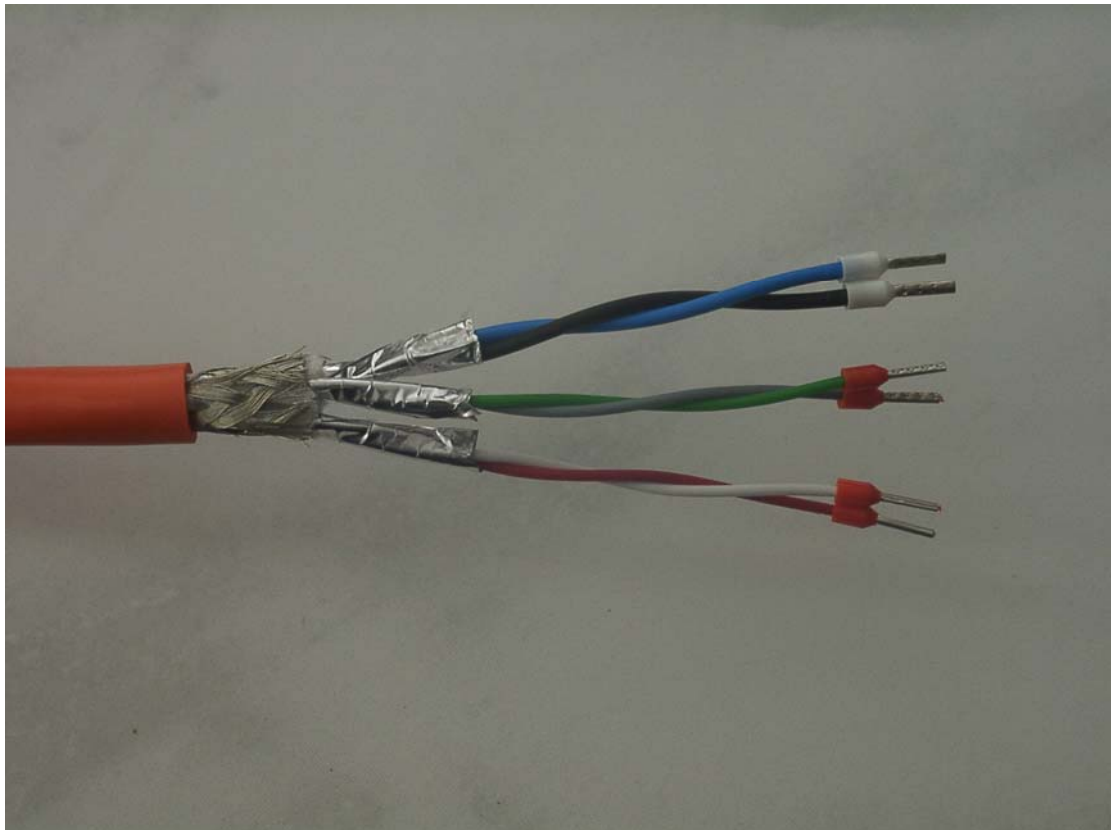


Figure 4-4 Pairs of conductors in the shielded cable

4. On SIWAREX U, the shield must be laid on the shield connection element.

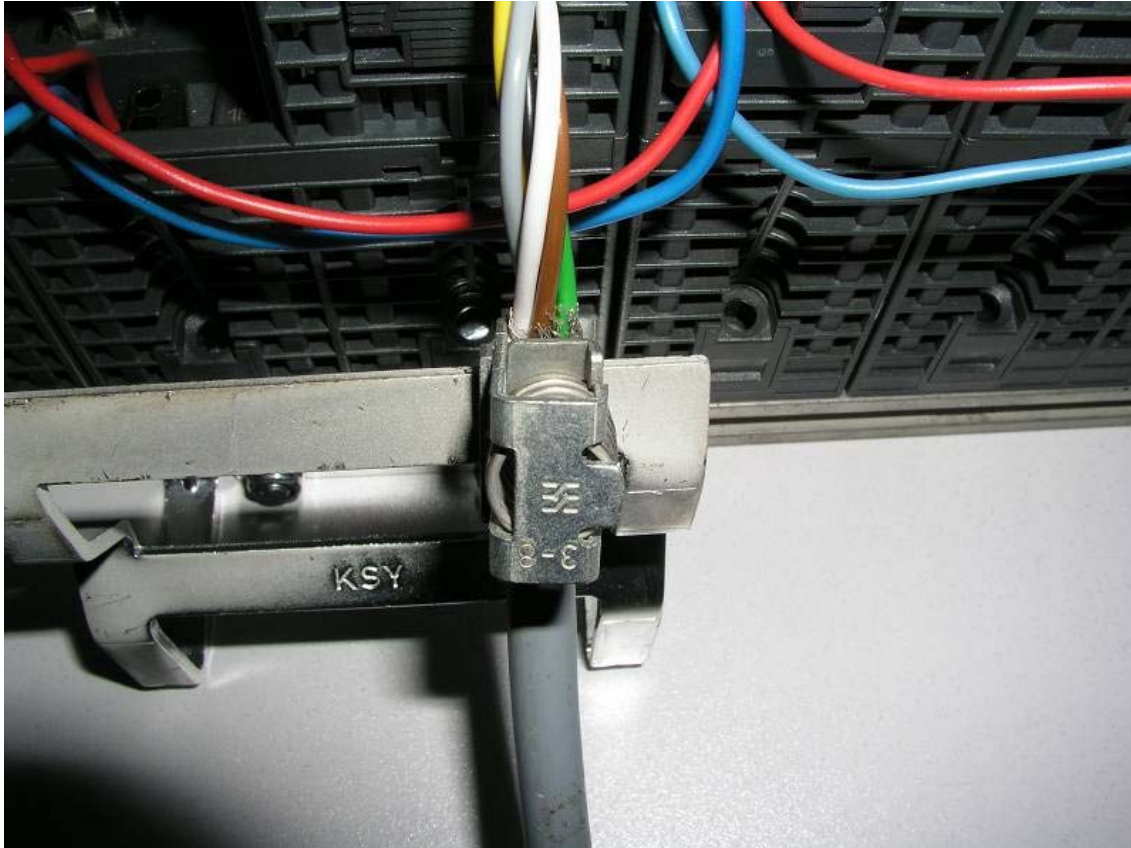


Figure 4-5 Example - Mounting of shield clamps on module

The following two diagrams show the load cell connection in the 4-wire and 6-wire systems.

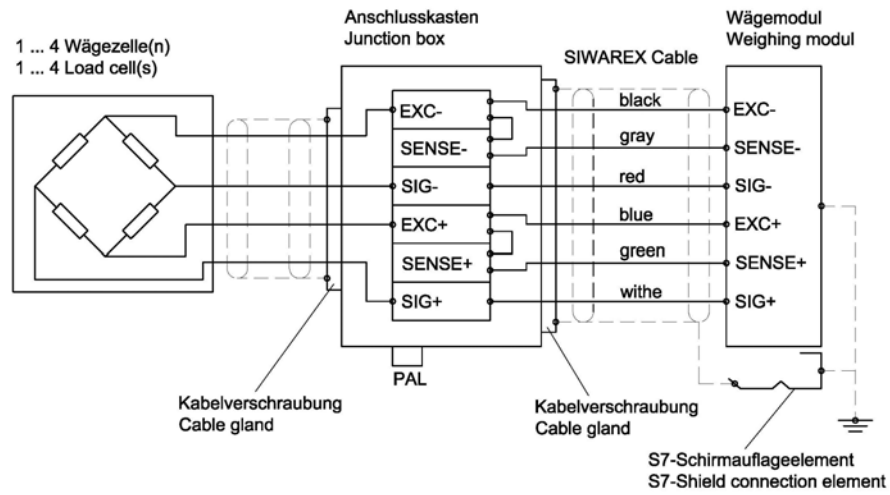


Figure 4-6 Load cell connection: 4-wire system

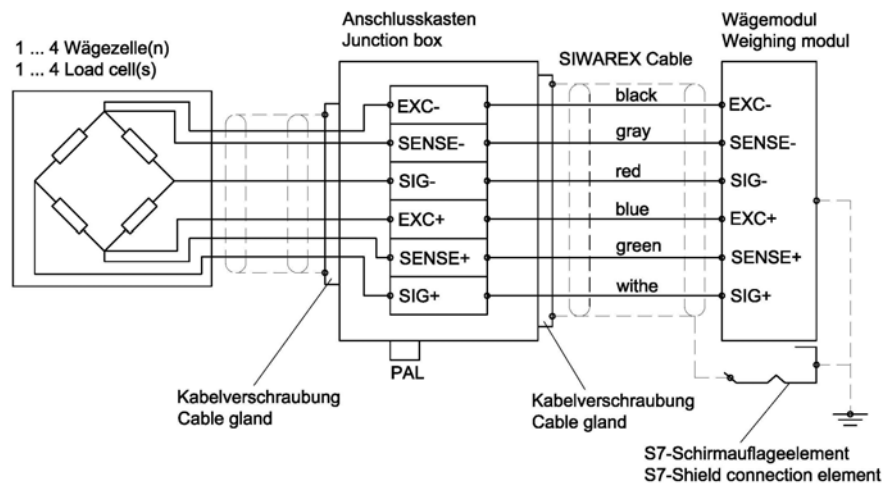


Figure 4-7 Load cell connection: 6-wire system

4.4.6 Connection of the Siebert digital remote display

The Siebert display Model S102 can be connected to the TTY port.

Connection in the terminal block	Signal name	Remarks
6	TXD2+	
7	TXD2-	

Figure 4-8 Connection of the Siebert S102 remote display

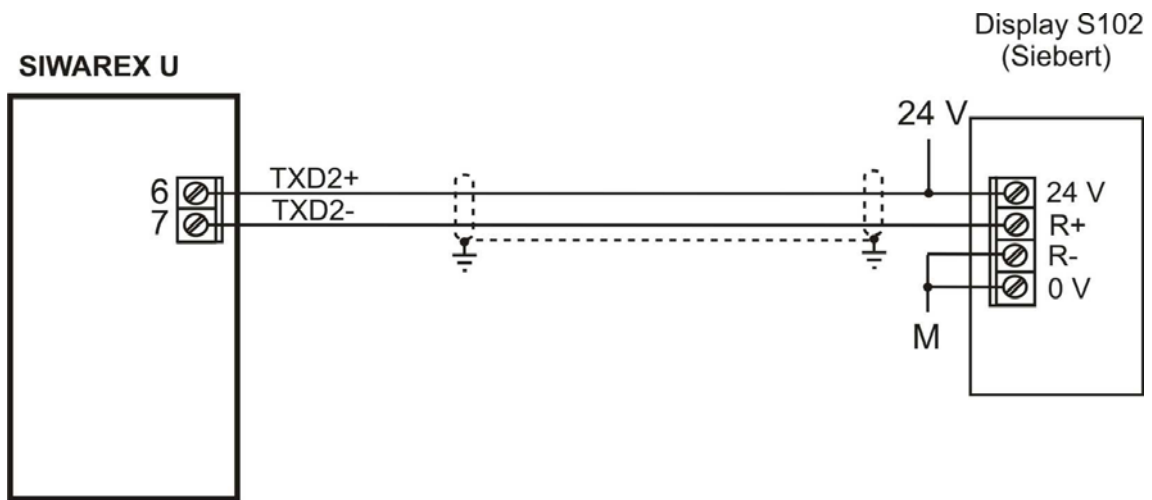


Figure 4-9 Connection of the S102 display

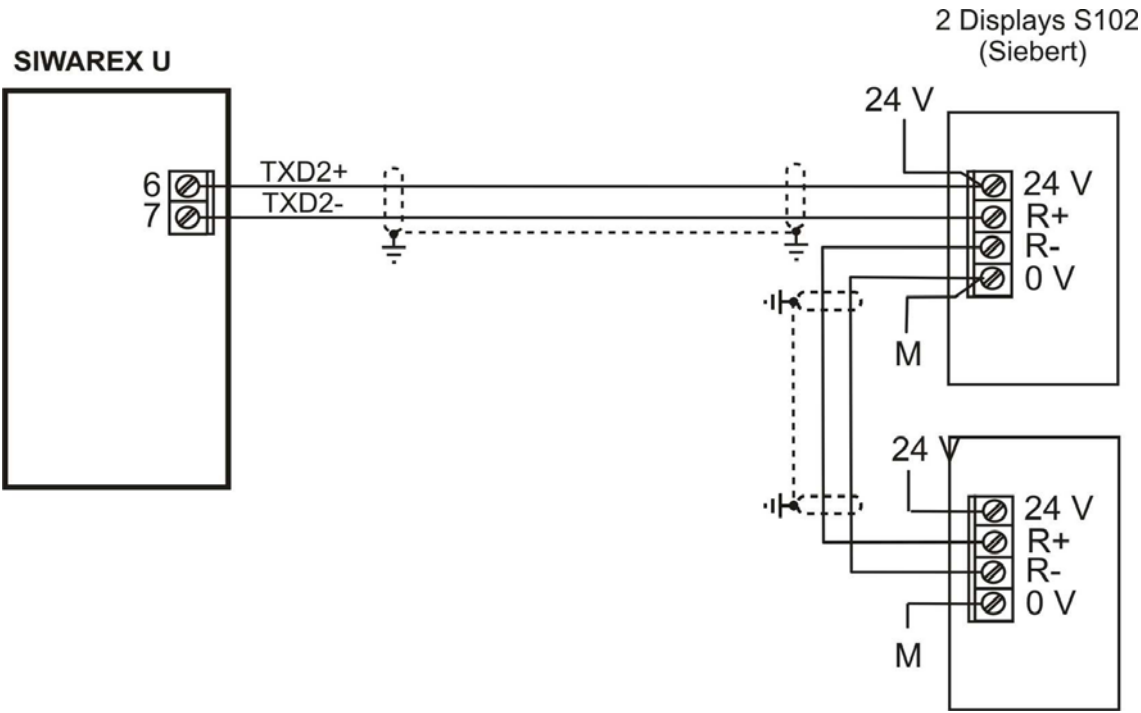


Figure 4-10 Connection of two S102 displays

4.4.7 Connection of the PC for SIWATOOL U

Connection in the terminal block	Signal name	Remarks
3	RXD1	When using the connecting line 7MH4 607-8CA: conductor name "RxD"
4	GND1	When using the connecting line 7MH4 607-8CA: conductor name "GND"
5	TXD1	When using the connecting line 7MH4 607-8CA: conductor name "TxD"

Table 4-5 Connection of the PC

Ready-made connecting cables are available for connecting the PC (see [Order numbers and accessories](#))

SIWAREX U RS 232C

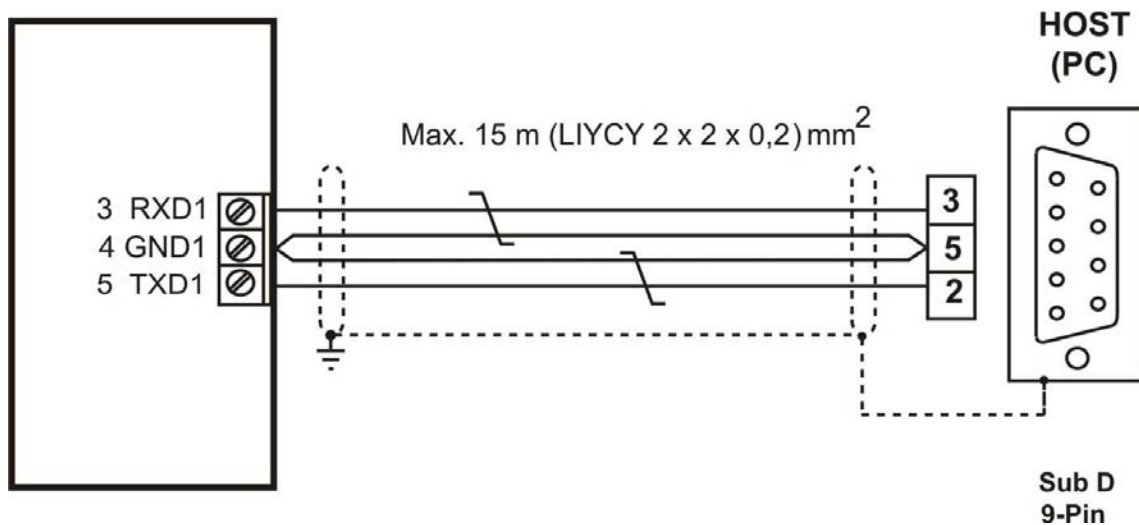


Figure 4-11 Connection of the PC

4.5 Preparing for operation

Introduction

After installing the module and making all connections, this stage of the commissioning process involves carrying out a partial functionality test for SIWAREX U and all connected modules. The individual steps of the partial test are to be performed in the following sequence:

Visual check

Check that all work steps completed to date have been executed correctly - this includes:

- Is the exterior of the SIWAREX U undamaged?
- Is the SIWAREX U in the correct installation position?
- Are all connecting cables connected and secured properly?
- Are all shields laid?
- Is the ground bus connected to the ground contact?
- Is the profile rail connected to the ground contact?
- Are all tools, materials, and parts not belonging to S7 or to SIWAREX U removed from the modules?

Turning on 24 V

Switch on power supply.

LED checks on SIWAREX U

After switching the 24V supply voltage on and a short initialization phase (internal tests), the SIWAREX U goes into operational state.

LED SF (system fault) must be in OFF state.

4.6 Usage in Ex zones



Danger

Failure to observe the setup instructions can result in
DANGER OF EXPLOSION!



The system may only be set up in the ex zone by observing the commissioning and safety instructions as per the system manual "SIMATIC explosion protection principles" A5E00206200.

Below you will find important notes on the installation of SIWAREX U in the ex zone.

SIWAREX U may only be used in accordance with the conditions specified in the associated certificate.

SIWAREX U can be used in the Ex area Zone 2
(in accordance with IEC/CENELEC, Directive 94/9/EC).

Some details on the certificates ATEX (Europe) and UL (USA, Canada) are described below.

Certificate: ATEX in preparation: XX

The following conditions are to be observed:

1.

The modules must be installed in a suitable housing. The environmental conditions in which the device is being installed must also be taken into account. In the area of validity of ATEX95 (formerly ATEX100a) EN 60079-15, this housing must comply with IP54 in accordance with EN 60529 as a minimum.

2.

When a temperature $> 70^{\circ}\text{C}$ is reached on the cable or the point at which the cable enters this housing under normal operating conditions or when the temperature at the conductor fork can be $> 80^{\circ}\text{C}$ under operating conditions, the temperature ratings of the cable must be in compliance with the temperatures actually measured.

3.

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. Protective measures must be undertaken in order to prevent transient excess voltages of more than 40% of the rated voltage. This is the case when the devices are operated exclusively with SELV (Safety Extra Low Voltage). The power supply board for the supply must comply with NEC Class 2, as described by National Electrical Code(r) (ANSI/NFPA 70).

Certificate in preparation: c-UL-us haz. loc.

UL file number USA:

UL file number Canada:

Note on c-UL-us haz.loc:

Danger of explosion – The electrical connections must not be undone live where it is not certain that the area is not explosive.

Danger of explosion – The replacement of modules can impair suitability for use in Class I, Division 2.

The device can be used in Class I, Division 2, Groups A, B, C, D or non-Ex areas.

Connection of load cells to SIWAREX U:

Load cells located in Zone 1 or Zone 2 can be connected to SIWAREX U.

For a connection of load cells in Zone 2 it is sufficient when the load cells also have an authorization for Zone 2 and all relevant guidelines and assembly instructions are observed.

For a connection of load cells in Zone 1 the load cells require the relevant authorizations and relevant measures pursuant to the guidelines must ensure safe operation. For example, the connection of SIWAREX R load cells via the Ex interface SIWAREX IS is intrinsically safe. The instructions for the Ex interface, the load cells, and from the ATEX and c-UL-CSA guidelines must be observed here.

Installation and maintenance:

The necessary connection and installation work may only be performed by qualified personnel.

Repairs may only be carried out at the place of manufacture of the module.

5 Weighing functions

5.1 General information

All parameters are set with default values from the manufacturer. With the command "Load factory setting", the ex-factory parameter settings can be restored. With the two-channel SIWAREX U, this command affects both channels.

The default parameters are set so that the scale is immediately ready for operation. It is not necessary to re-enter all parameters. The advantage of this solution is that you yourself can determine to what extent the default values are to be kept and the degree to which the behavior of the scale should be adapted to the application.

All parameters are divided into data records (DR). The data records are organized according to work steps (tasks) which you must carry out during commissioning or during the process itself.

In the following parameter description, the weighing functions affected by the parameters are described at the same time.

The parameters of a data record are shown in a table to start with. This is then followed by the precise parameter description for the parameters of this data set.

After receiving new parameters, SIWAREX U runs a plausibility test. If a parameter error occurs, the data set will not be accepted by SIWAREX U (not saved) and a "synchronous" message is output (see Chapter [7 Messages and diagnostics](#)).

5.2 DR3 adjustment parameters Channel 1, DR 4 adjustment parameters Channel 2

The adjustment parameters must be checked for each scale and changed where necessary. With a single-channel SIWAREX U there is only DR3; with a two-channel SIWAREX U the adjustment parameters for channel 2 are stored in DR4.

The scale is basically defined by the adjustment parameters and adjustment execution.

Procedure:

- o Check all parameters and modify as necessary.
- o Send DR3 (DR4) to the scale.
- o Carry out the adjustment of the scale.
- o Receive DR3 (DR4) from the scale.

Name	Model	Length	Default	Range of values/Meaning
Zero set value	WORD	2	0	Zero set value (digital value) [0 to: $2^{16}-1$]
Char. value/Filter/Other	WORD	2	41	Char. value range LC / Filter setting / Setting data
Adjustment digit 0	WORD	2	5461	Scale adjustment zero (AD0) [0 to: 2^{16}] Description: see Chapter 5.2.3
Adjustment digit 1	WORD	2	60074	Adjustment digits for adjustment weight 1 (AD1) [0 to: 2^{16}] Description: see Chapter 5.2.3
Adjustment weight	INT	2	10000	Adjustment weight 1 (AW1) Description: see Chapter 5.2.3

Table 5-1 Allocation of DR3 for channel 1 / DR4 for channel 2

5.2.1 DR3/4 - Zero set value

After the adjustment the zero set value corresponds to the value for adjustment digits 0. If the scale is set to zero after the adjustment for correction purposes, the zero set digits are recalculated; the characteristics of the scale will not be changed as a consequence, merely shifted.

By means of a parameter bit it can be specified whether the new zero set value will be saved only in the RAM or also in the EEPROM. If the command "Set to zero" is used frequently, then the zero set value should only be saved in the RAM memory, since the maximum number of write cycles of an EEPROMS is limited to 100,000.

When transferring DR3 or DR4 with a pre-assigned zero set value, the saving always occurs in the EEPROM memory.

5.2.2 DR3/4 – Characteristic value range LC, low-pass filter, mean value filter, setting data

Dependent on the characteristic value of the connected load cells, the value 1 mV/V, 2mV/V or 4 mV/V must be selected. Since SIWAREX U supplies the load cells with approx. 6 V, the measurement input is adjusted according to the anticipated measured voltage (max. 6 mV, max. 12 mV or max. 24 mV). If the characteristic value of the connected load cells is, for example, 2.85 mV/V, then the next highest characteristic value must generally be set, i.e. 4 mV/V.

For the suppression of interference, a critically damped low-pass filter of the fourth order is planned. The following diagram shows the step response of the filter ($f_g = 2 \text{ Hz}$).

A decimal place can be specified for the Siebert remote display connected. Since the decimal place cannot be represented in the framework of the 16-bit number representation, all weight input counts as having this decimal place. For example, if the decimal place is set to 2, then the measurement range of 20 kg is to be specified as 2000. As process value the weight value is simultaneously output as 2000 at the SIMATIC port.

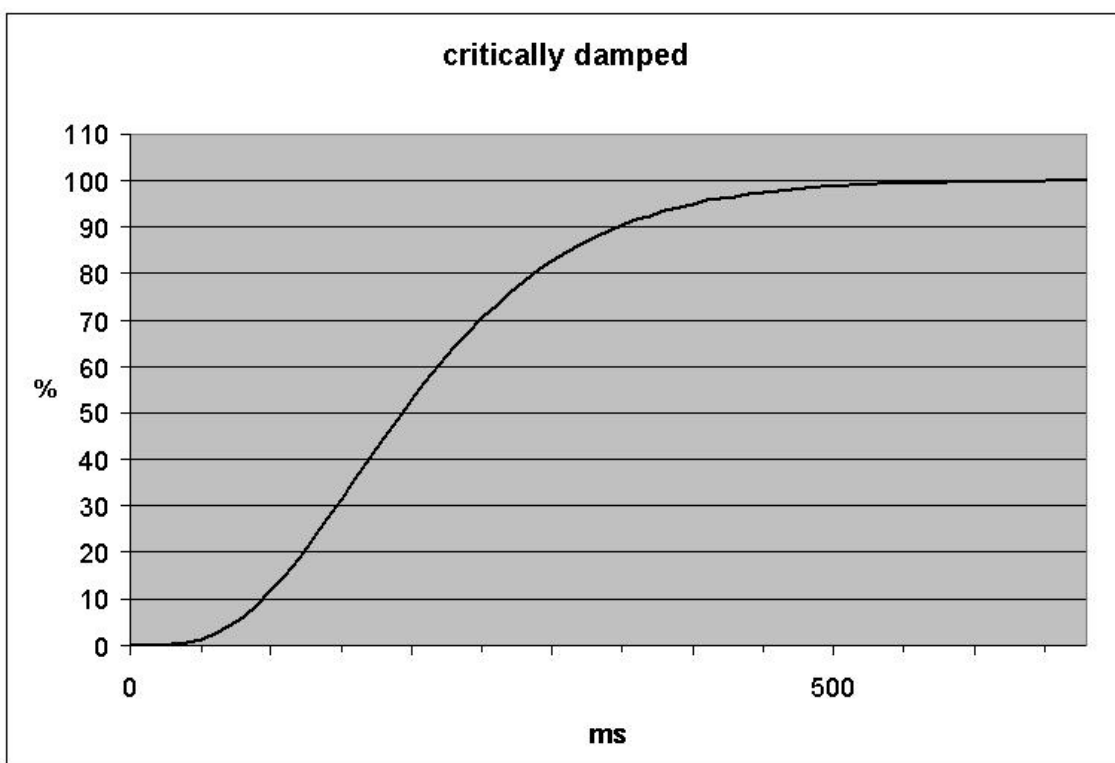


Figure 5-1 Step response of the digital low-pass filter where $f_g = 2$ Hz

The specification of the cutoff frequency has a decisive significance for the suppression of interference. With the specification of the cutoff frequency, the "quickness" of the reaction of the scale to the change of the measured value is determined.

For example, a value of 5 Hz leads to a relatively rapid reaction of the scale to a change in weight; a value of 0.5 Hz makes the scale more "sluggish".

The mean value filter is used to calm the weight value when there is incidental interference. The weight value is formed afresh every 20 ms from the last 30 weight values.

Bit																Meaning	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
																Char. value of the load cell	
																0 0	≤ 1 mV/V
																0 1	≤ 2 mV/V (default)
																1 0	≤ 4 mV/V
																1 1	Reserve
																Decimal place for remote display	
																0 0 0	Decimal place 0 (default)
																0 0 1	Decimal place 1
																0 1 0	Decimal place 2
																0 1 1	Decimal place 3
																1 0 0	Decimal place 4
																1 0 1	Decimal place 5
																Filter setting	
																0 0 0	No filtering
																0 0 1	Cutoff frequency: 5 Hz
																0 1 0	Cutoff frequency: 2 Hz (default)
																0 1 1	Cutoff frequency: 1 Hz
																1 0 0	Cutoff frequency: 0.5 Hz
																1 0 1	Cutoff frequency: 0.2 Hz
																1 1 0	Cutoff frequency: 0.1 Hz
																1 1 1	Cutoff frequency: 0.05 Hz
																Mean value filter	
																0	No mean value filter (default)
																1	Mean value filter switched on (30x20ms)
																Memory goal (only relevant for limit values and zero set value via set to zero command)	
																0	Carry over into EEPROM (default)
																1	Keep in RAM only
																Operational state - channel	
																0	Channel switched on (default)
																1	Channel switched off (default channel2 of U1)
																Reserve	
																0	
																1	
																Weight unit (only relevant for SIWATOOL, is only saved in SIWAREX U)	
																0 0 0	, (default)
																0 0 1	, g ,
																0 1 0	, kg ,
																0 1 1	, t ,
																1 0 0	, oz ,
																1 0 1	, lb ,
																1 1 0	, lbs ,
																1 1 1	, kN ,
																Reserve (Reserve, currently not used)	
																0	(default)
																1	

Figure 5-2 Parameter table for setting data

5.2.3 DR3/4 - Adjustment digits for the adjustment zero, adjustment digits and adjustment weight

The analog signal arriving from the load cells is converted into a digital value in an analog-digital converter. Then a weight value is calculated from this digital value. All functions of SIWAREX U then use this weight value for the status determination and messages.

To calculate the weight value from the digital value, the characteristic curve of the measurement system must be determined. The characteristic curve is determined using the operating points 0 and 1. The first operating point (point 0) is always determined by the empty scale alone with its own construction weight. Through the weight of the scale's own construction, the load cells deliver a measured voltage to SIWAREX U. After the analog-digital conversion of the measured voltage, the zero point is assigned to the digital value (adjustment digits for the adjustment zero) with the command "Adjustment zero valid (1)".

If the scale is loaded with a known calibration weight (e.g. 100% of the measurement range), the second operating point can be determined. The new digital value from the analog-digital converter is now assigned the calibration weight.

Ensure that the difference between two adjustment weights is at least 5% of the measurement range.

The adjustment consists of the following steps:

Define the adjustment weight and other parameters of the data record DR3 or DR4.

Send DR3 or DR4 to the scale

When the scale is empty, actuate the command "Adjustment zero valid (1)"

Load the scale with the defined calibration weight

Actuate the command "Adjustment weight valid (2)"

Receive DR3 or DR4 from the scale

Save the data as scale file on data carrier

The adjustment sequence for the increasing adjustment weights must be retained.

Example:

Adjustment zero = 0.0 kg (always)	results in 7800 digits
-----------------------------------	------------------------

Adjustment weight = 100 kg	results in 60074 digits
----------------------------	-------------------------

The characteristic curve is thereby determined and the scale can now calculate the weight values for the entire measurement range.

Note:

Since the theoretical maximum terminal value for adjustment digits is 60074 and the value for completely empty load cells (without their own construction weight) is 5461, the plausibility of the characteristic curve can be roughly tested in order, for example, to detect force shunts.

The illustration clarifies the relationship between the adjustment digits and the adjustment weight.

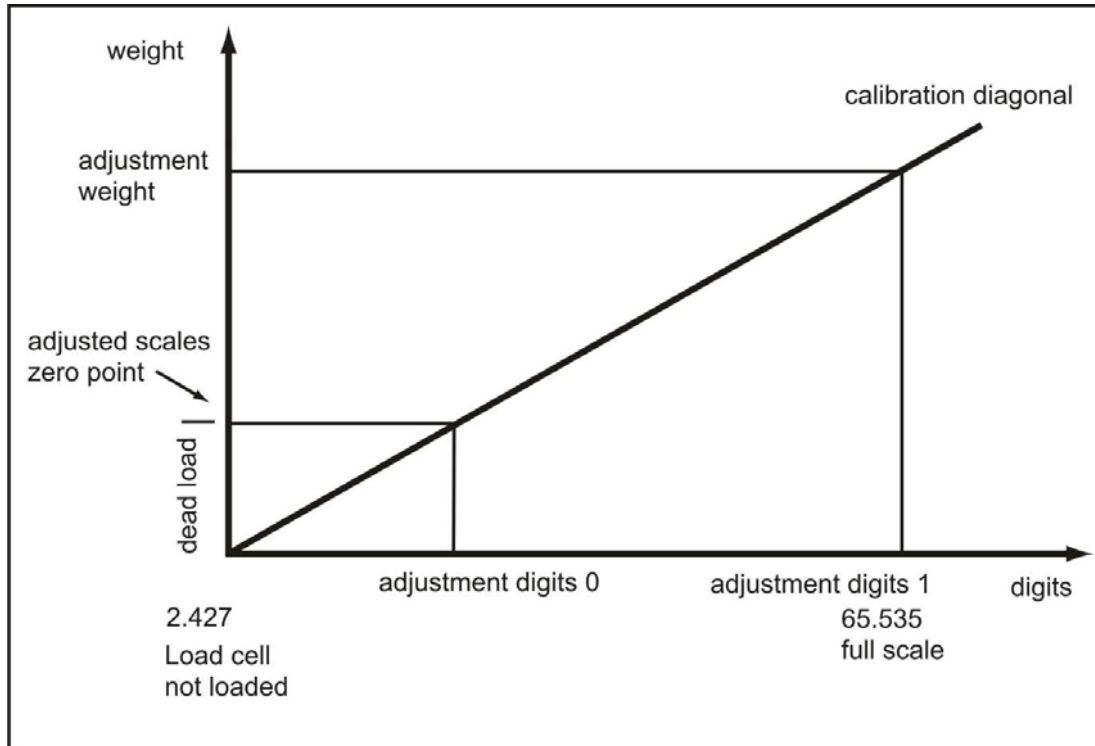


Figure 5-3 Adjustment digits and weight value

If the adjustment weights and adjustment digits of a SIWAREX U are known, the adjustment procedure does not have to be carried out. They will simply be sent with the data record DR 3 and/or DR 4 to SIWAREX U and the scale is immediately ready for operation.

The program SIWATOOL U supports you in quickly carrying out the adjustment.

Option 1:

After commissioning and adjustment, all data records for the scale are read out of SIWAREX U and saved as a scale file ScaleX.SWU.

Identical scales can now be put into operation immediately. Connect the PC to the new scale and activate the "Send all data records" function. The adjustment weights and adjustment digits are also transferred in the process – the characteristic curve is immediately determined. Naturally, the same goes for the exchange of a SIWAREX U.

Option 2:

Use the SIWATOOL U "Theoretical adjustment" function and determine the characteristic curve of the scale from the technical data of the load cells alone. This case assumes proper construction of the scale.

5.3 Theoretical adjustment

If performing the adjustment is not possible using adjustment weights, the scale can also be put into operation without adjustment weights, assuming the mechanical structure of the scale is correct and the measuring logs are available for the individual load cells. The execution takes place with the aid of SIWATOOL U in the processing of the adjustment parameters. We call this procedure "theoretical adjustment".

First, the characteristic value range (1mV/V, 2mV/V or 4mV/V) must be defined in the "Weighing parameters" tab of the data record for the adjustment data. Then switch to "Theoretical adjustment" tab.

To perform the theoretical adjustment, first of all the rated load of all load cells is specified, e.g. 3 load cells with 1000 kg each produce a rated load of 3000 kg. Then the adjustment zero offset (unit $\mu\text{V/V}$) and the characteristic value (unit mV/V) for each individual load cell is entered. These values are taken from the respective load cell measurement log. The characteristic value is generally entered with up to 5 decimal places, e.g. 2.01201.

After the entry of the data for each load cell, the adjustment digits are calculated by pressing the button "Calculate adjustment digits" and the result is displayed. Then the calculated adjustment digits can be adopted into the data record with adjustment data (DR 3 and/or DR 4) by pressing the button "Accept calculation". Then the data record with the new adjustment data is sent to the weighing module.

Depending on the mechanics of the device, a completely empty scale may indicate a value that deviates from the adjustment zero slightly. In this case the command "Adjustment zero shift/Set to zero (3)" can be executed.

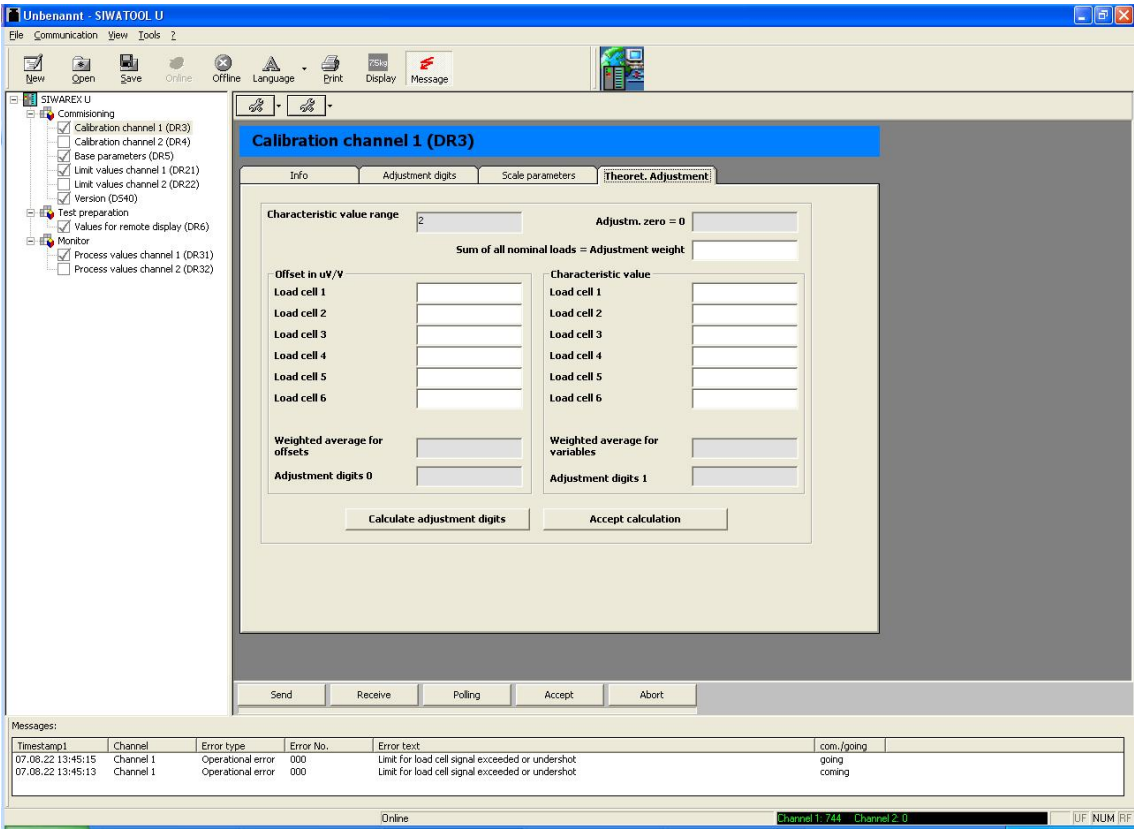


Figure 5-4 Theoretical adjustment with SIWATOOL U

5.4 DR 5 General parameters

- In DR5, parameters are specified which affect the module as a whole, i.e. which have no connection to a measurement channel. Procedure:
- o Check all parameters and modify as necessary.
 - o Send DR 5 to the scale

Name	Model	Length	Default	Range of values/Meaning												
Module numbers	BYTE	1	0	Each module can be assigned a module number.												
Port parameters	BYTE	1	0	This setting is valid both for the RS232 port and the TTY port. The baud rate is fixed at 9600 bit/s. <table><tr><td>Bit no.</td><td>reset</td><td>set</td></tr><tr><td>0</td><td>with parity bit (default)</td><td>without parity bit</td></tr><tr><td>1</td><td>parity even (default)</td><td>parity odd</td></tr><tr><td>2 - 7</td><td>reserve</td><td></td></tr></table>	Bit no.	reset	set	0	with parity bit (default)	without parity bit	1	parity even (default)	parity odd	2 - 7	reserve	
Bit no.	reset	set														
0	with parity bit (default)	without parity bit														
1	parity even (default)	parity odd														
2 - 7	reserve															
Display type	BYTE	1	0	<table><tr><th>Code (dec)</th><th>Meaning</th></tr></table>	Code (dec)	Meaning										
Code (dec)	Meaning															

				0	no display	
				1	4-digit display Siebert display	
				2	5-digit display Siebert display	
				3	6-digit display Siebert display	
Assignment LED1	BYTE	1	101	Code	Status information	Channel no.
				100	Channel error	Channel 1
				101	Limit value 1	Channel 1
				102	Limit value 2	Channel 1
				103	Scale adjusted	Channel 1
				200	Channel error	Channel 2
				201	Limit value 1	Channel 2
				202	Limit value 2	Channel 2
				203	Scale adjusted	Channel 2
				100	Channel error	Channel 1
Assignment LED2	BYTE	1	102	Reserve		
Reserve	BYTE	1	0			
		6				

Table 5-2 Allocation of DR 5

5.4.1 DR 5 – module number

Each module can be assigned a number. With SIWAREX U modules with order number 7MH4601... and when using SIWATOOL U Version 1.7, the number of the module is checked against the number saved in the SIWAREX module while establishing an online connection. Establishing a connection is only possible when the number in SIWATOOL U matches that of the module or when the number "0" is specified.

This module number only serves information purposes from SIWATOOL U Version 2.0 on or for modules with order number 7MH4950.... The online connection is established in every case.

5.4.2 DR 5 – port parameters

The setting of port parameters is only possible to a limited degree. This setting is valid both for the RS232 port and the TTY port. The baud rate is fixed at 9600 bit/s.

Bit no.	reset	set
0	with parity bit (default)	without parity bit
1	parity even (default)	parity odd
2 - 7	reserve	

5.4.3 DR 5 – display model

The Siebert remote display Model S102 can be connected to the SIWAREX U module via the TTY port. Dependent on the number of display elements, corresponding codes are allocated.

Code (dec)	Meaning
------------	---------

0	no display
1	4-digit display Siebert display
2	5-digit display Siebert display
3	6-digit display Siebert display

5.4.4 DR 5 – assignment LED1, LED 2

A meaning can be assigned to both status LEDs on the front side of the SIWAREX modules ST1 and ST2. The following meanings are possible:

<u>Code</u>	<u>Status information</u>	<u>Channel no.</u>
100	Channel error	Channel 1
101	Limit value 1	Channel 1
102	Limit value 2	Channel 1
103	Scale adjusted	Channel 1
200	Channel error	Channel 2
201	Limit value 1	Channel 2
202	Limit value 2	Channel 2
203	Scale adjusted	Channel 2
100	Channel error	Channel 1

5.5 DR 6 Output values for the remote display.

In DR6, values currently to be output are specified for the remote display.

- o Check all parameters and modify as necessary.
- o Send DR 6 to the scale

Name	Model	Length	Default	Range of values/Meaning
Value 1 for display	INT	2	0	Value to be displayed on the Siebert remote display, set to Address 1.
Value 2 for display	INT	2	0	Value to be displayed on the Siebert remote display, set to Address 2.
		4		

Table 5-3 Allocation of DR 6

5.5.1 DR 6 – value 1, value 2 for display

An optional value can be displayed on up to two connected external Siebert displays. The first display must be set to Address 1 and the second to Address 2.

After the transfer of DR 6 to SIWAREX U, the corresponding value is output on the remote display.

5.6 DR 11 commands for channel 1, DR 12 commands for channel 2

In DR11/12 commands for SIWAREX U can be placed. Procedure:

- o Write command number in DR11/12.
- o Send DR 11/12 to the scale
- o Check for data or command errors

Name	Model	Length	Default	Range of values/Meaning
Command code	Int	2	0	Code of the command to be executed. See Chapter 6 Commands .
		2		

Table 5-4 Allocation of DR 11/12

For command list see Chapter [6 Commands](#).

5.7 DR 21 limit values channel 1, DR 22 limit values channel 2

In DR21 and/or DR22, the activation and deactivation values for the limit values are parameterized.

Procedure:

- o Check all parameters and modify as necessary.
- o Send DR 21 and/or DR 22 to the scale.

Name	Model	Length	Default	Range of values/Meaning
Activation value Limit value 1	SHORT	2	400	Activation point limit value 1
Deactivation value Limit value 1	SHORT	2	220	Deactivation point limit value 1
Activation value Limit value 2	SHORT	2	1000	Activation point limit value 2
Deactivation value Limit value 2	SHORT	2	980	Deactivation point limit value 2
		8		

Table 5-5 Allocation of DR 21, DR 22

5.7.1 DR 21/22 – switch-on weight limit value 1

The switch-on and cut-off weight can be specified separately for each limit value. In this way, both a minimum value monitor and maximum value monitor can be realized by hysteresis.

A maximum value monitor is realized with the following specification:

Activation value > deactivation value

A minimum value monitor is realized with the following specification:

Activation value < deactivation value

The following diagram illustrates the function of limit values 1 and 2.

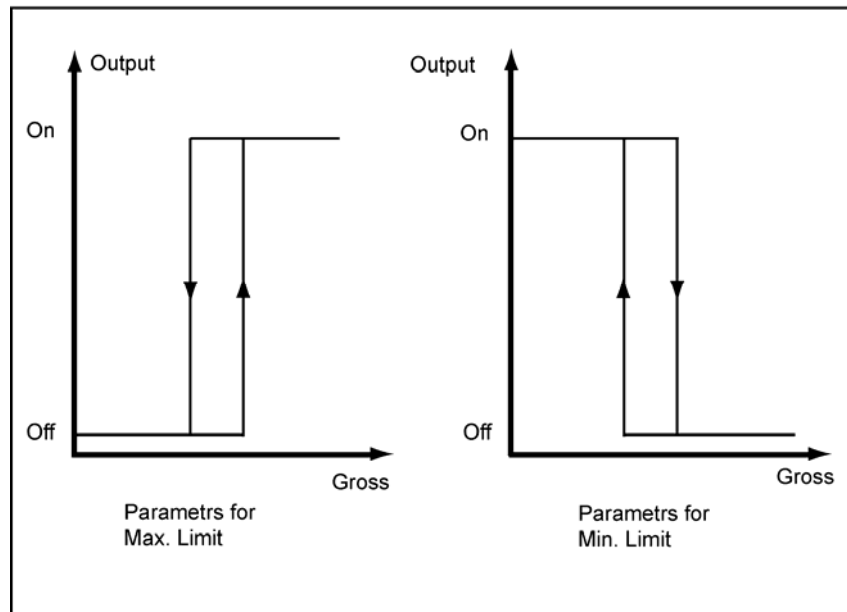


Figure 5-5 Parameterization of the limit values

5.7.2 DR 21/22 – cut-off weight limit value 1

See: Switch-on weight limit value 1

5.7.3 DR 21/22 – switch-on weight limit value 2

See: Switch-on weight limit value 1

5.7.4 DR 21/22 – cut-off weight limit value 2

See: Switch-on weight limit value 1

5.8 DR 31 Process values channel 1, DR 32 process values channel 2

In data record DR31, the current process values of measurement channel 1 are displayed. The design of DR32 is identical and the measurement values relate to measurement channel 2. With the aid of the process values, the current statuses and data in the scale can be observed.

Name	Model	Length	Default	Range of values/Meaning
Current weight	INT	2	---	Current weight 5.8.5.8.1
Scale status	BYTE	1	---	Scale status 5.8.2
Update counter	BYTE	1	---	Update counter 5.8.3
Filtered ADC value	WORD	2	---	Filtered digital value from the AD converter 5.8.4
Operating messages	WORD	2	0	Current operating messages (faults) 5.8.5
Data and command errors	WORD	2	0	Data or command errors 5.8.6
		10		

Table 5-6 Allocation of DR 31/32

5.8.1 DR 31/32 – current weight

The temporary weight value after signal filtering.

5.8.2 DR 31/32 – scale status

The status information gives information about the current status of the scale.

Bit_no.	Name	Range of values/Meaning
0	Operational fault	1 = an operational fault exists
1	Data or command errors	1 = during the last action, a data or command error occurred.
2	Limit value 1 active	1 = limit value 1 is activated
3	Limit value 2 active	1 = limit value 2 is activated
4	Adjusted	1 = scale is already adjusted
5	Measured value toggle bit	Measured value toggle bit is inverted with each new measured value
6	Live bit	Live bit is set or reset according to specification (I/O communication only)
7	Command acknowledgement	Command bit is inverted after an instruction (I/O communication only)

Table 5-7 Scale status

5.8.3 DR 31/32 – update counter

The measurement value update counter is incremented by SIWAREX U each time that a new measurement value is prepared by the ADC (every 20 ms). If a counter level of 255 is reached, the counter value 0 is output at the next measurement cycle.

5.8.4 DR 30 – filtered digital value from the AD converter

The current digital value from the AD converter after the digital signal filtering.

The filter parameters are specified in DR3/4.

5.8.5 DR 31/32 – operating errors

In the 16 bits the pending operating errors are displayed.

Bit no.	Name	Remarks
0	1= limit for load cell signal exceeded or undershot	See message list Chapter 7.8
1	1= minimum voltage at the sense line undershot	See message list Chapter 7.8
2	1= watchdog	See message list Chapter 7.8
3	1= error in EPROM	See message list Chapter 7.8
4	1= error in EEPROM	See message list Chapter 7.8
5	1= error in RAM	See message list Chapter 7.8
6	1= ADC error	See message list Chapter 7.8
7	1= number overflow in weight calculation	See message list Chapter 7.8
8	1= No 24 V supply	See message list Chapter 7.8
9	Reserve	

Table 5-8 Operating errors

5.8.6 DR 31/32 – data and command errors

In the 16 bits, the data or command errors which occurred most recently are displayed. The display is reset at the next command or next data transfer.

Bit no.	Name	Remarks
0	1= adjustment command could not be executed as distance between adjustment points is too small	See message list Chapter 7.7
1	1= instruction could not be executed due to fault	See message list Chapter 7.7
2	1= a non-existent or inactive channel was addressed	See message list Chapter 7.7
3	1= code not defined (e.g. cutoff frequency, digital filter etc.)	See message list Chapter 7.7
4	1= data record/command unknown	See message list Chapter 7.7
5	1= command not possible because scale is not adjusted	See message list Chapter 7.7
6	1= waiting time of 5 sec. for adjustment commands not observed	See message list Chapter 7.7
7	1= the adjustment weight is negative	See message list Chapter 7.7
9	Reserve	

Table 5-9 Data or command errors

5.9 DR 40 module info

No entries can be made in DR40. The purpose of the data record is to provide information about the module version.

Name	Model	Length	Default	Range of Values / Meaning / Display
FW version	WORD	2		Firmware version
FW checksum	WORD	2		0.....65535
Reserve	BYTE	1	0	Reserve
Number of channels	BYTE	1	1/2	Number of channels
Model	BYTE	1	1/0	0= 7MH4601....., 1= 7MH4950.....
Reserve	BYTE	1	0	Reserve
		8		

Table 5-10 Allocation of DR 40

The information in data record 40 serves the purpose of identifying the module, the hardware, and the firmware.

6 Commands

6.1 Command groups

Each command has a unique number. The triggering of a command occurs by means of the sending of DR 11 (channel 1) or DR 12 (channel 2) and can be done via various ports (SIMATIC, SIWATOOL U).

After each command transfer to SIWAREX U, it must be tested whether the command was executed correctly. The reported data and command errors (synchronous errors, see Chapter 7.7) give information on why a command could not be executed.

After the receipt of a command, SIWAREX U checks whether the command can be executed. If the check turns out negative, you will be notified of the output of a "synchronous" message about the cause (see Chapter 7.7).

6.2 Command list

Code	Command explanation	Remarks
1	Adjustment command adjustment zero valid Adjustment zero command valid (activates calibration mode) The start of the characteristic curve - adjustment zero of the scale - is defined with the momentary dead-load.	Transfer via DR11 for channel 1 Transfer via DR12 for channel 2
2	Adjustment command - adjustment weight 1 valid The first adjustment point is determined by the momentary weight of the positioned adjustment weight.	Transfer via DR11 for channel 1 Transfer via DS12 for channel 2
3	Set scale to zero The current weight is set to zero.	Transfer via DR11 for channel 1 Transfer via DR12 for channel 2
4	Reserve	
5	Predefine all data records with default values All parameters are set to the status that was assigned originally by the manufacturer. The command always works on both channels.	Transfer via DR11 or DR12. Always works on both channels.

Table 6-1 Command list of SIWAREX U

Further commands can be activated at the SIMATIC S7 port of the FB SIWA_U.

Command group	Description
1... 99	Commands for channel 1: Commands are passed on to the module via data record 11. The meaning of the commands corresponds to the list in Table 6-1 Command list of SIWAREX U . The numbers for existing commands are permissible (1, 2, 3, 5, 9). The command 9 corresponds to the command 0 for channel 1.
101... 199	Commands for channel 2: Commands are passed on to the module via data record 12. The meaning of the commands corresponds to the list in Table 6-1 Command list of SIWAREX U , though increased by 100. The numbers for existing commands are permissible (101, 102, 103, 105, 109). The command 109 corresponds to the command 0 for channel 2.
203... 240	Reading of a data record 3... 40. The numbers for existing data records are permissible.
403... 422	Writing of a data record 3... 22. The numbers for existing data records are permissible.
605	Read all data records from SIWAREX U (DR3, DR4, DR5, DR6, DR21, DR22, DR31, DR32, DR40)
610	Write all data records (DR3, DR4, DR5, DR6, DR21, DR22) to SIWAREX U

Table 6-2 Command groups of SIWAREX U

Further information on the command transfer from the control program via the SIMATIC port can be found in Chapter [8 Communication in SIMATIC S7](#).

7 Messages and diagnostics

7.1 Message types

The SIWAREX U messages are divided into several types.

The **asynchronous** messages (see Chapter 7.8) can arise spontaneously at any time due to an unforeseen event. This includes internal and external hardware faults (operating faults), which can arise spontaneously during a weighing.

The **synchronous** messages (see Chapter 7.7) always arise in response to a command.

There are data errors when a plausibility error was detected in a data package which was sent to the module and the acceptance of the data package by the module is refused. These are command errors if the module in the current operating status cannot execute the given command.

The status bits (see Chapter 5.8.2) on the other hand are not error messages at all. The status describe the status of the scale in normal operation and can be monitored/evaluated at any time.

7.2 Message paths

The SIWAREX U messages reach the operator over different paths. During configuration, it is important to choose the right path for routing and processing the messages.

Essentially, the messages are processed for two purposes:

- For display on a control unit
- For the control software to control certain reactions in the process.

The following message paths are possible:

- Output of DR31/32 to the program SIWATOOL U
- Output via the SIWA_U function block to its message outlets
- Diagnostic alarms in SIMATIC CPU with OB82 evaluation
- Process alarms (for limit value monitoring only) in the SIMATIC CPU with the evaluation in the process alarm OBs.

7.3 Detecting messages with the aid of SIWATOOL U

The messages are not buffered on the module. After the switching over of SIWATOOL U to "online" operation, all status and message bits are polled and displayed in the online error log with the corresponding message texts.

7.4 Detecting messages using SIWA_U FB

Using FB SIWA_U, all messages of the SIWAREX U module can be detected via the message bits and processed in the controller. By means of an output variable FB_ERR, additional errors in the working of the SIWA_U FB are reported (see Chapter [8 Communication in SIMATIC S7](#)).

7.5 Detecting messages with the aid of the diagnostic alarms in the SIMATIC CPU

7.5.1 Evaluating the diagnostic alarm with OB82

With the aid of the evaluation of the diagnostic alarms, the operating messages (hardware faults) can be detected in the SIMATIC CPU.

In the case of enabled diagnostic alarm (in the HW config.) operating faults are reported to the S7 CPU per diagnostic alarm. The diagnostic messages can be evaluated via the OB82 local data.

Procedure:

1. If a diagnostic alarm is triggered, the diagnostic alarm OB (OB82) is called. If this OB is not loaded in the S7 CPU, the CPU goes into the "STOP" operating state.
2. If the diagnostic alarm is to be evaluated, a program for the evaluation of the OB82 local data or of the diagnostic data sets DS0 and DS1 is to be implemented in OB82.

You can find further information on the evaluation of DS0 and DS1 in the SIMATIC S7–300/400 reference manual.

MESSAGES AND DIAGNOSTICS

In the two following tables the content of the diagnostic information is listed as DS0 and DS1.

Byte	Bit	Meaning	Remarks
0	0	Component fault	
	1	Internal error	
	2	External error	
	3	Channel error present	
	4	External auxiliary voltage missing	
	5		not used, always 0
	6	Parameterization missing	
1	7	Incorrect parameters in component	(here EEPROM error)
	0 to 3	Component class	0101 = analog component 0000 = CPU 1000 = function component = SIWAREX U 1100 = CP 1111 = digital component
	4	Channel info present	
	5	User information present	
	6		not used, always 0
	7		not used, always 0
	0		not used, always 0
	1		not used, always 0
	2		not used, always 0
	3	Watchdog error	
2	4		not used, always 0
	5		not used, always 0
	6		not used, always 0
	7		not used, always 0
	0		not used, always 0
	1		not used, always 0
	2		not used, always 0
	3	EPROM error	
	4	RAM error	
	5	ADU error	(ADU error during read-in)
3	6		not used, always 0
	7	Process alarm lost	
	0		not used, always 0
	1		not used, always 0
	2		
	3		
	4		not used, always 0

Table 7-1 Content of DS0

Byte	Bit	Meaning	Remarks
4	0 to 6	Channel type	
	7	(further channel type available)	–
5	0 to 7	Number of diagnostic bits per channel	all bits are being used
6	0 to 7	Number of channels	(here 1 or 2)
7	0	Channel error - channel 0 (SIWAREX U: weighing channel 1)	channel-specific errors - see byte 9 / 10
	1	Channel error - channel 1 (SIWAREX U: weighing channel 2)	
	2		
	3		
	4		
	5		
	6		
	7		
8,9	0	0	byte 9 = channel 1 byte 10 = channel 2
	1	0	
	2	0	
	3	0	
	4	Minimum voltage undershot at the sense lines	
	5	0	
	6	Gross weight number overflow	
	7	Measuring range exceeded	
10–15		Not allocated (factory setting = 0)	

Table 7-2 Content of DS1

7.5.2 Diagnosis by means of the data set DS31/32

Alternatively, operating faults can also be determined by reading data sets DS31/32, e.g. in the case of disabled diagnostic alarm. It should be noted here, however, that brief errors may not be detected under certain circumstances when the duration of the error is short relative to the cycle of the SIMATIC CPU.

7.5.3 Diagnosis by means of the component status

The component status of SIWAREX U can be displayed in SIMATIC Manager.

The operating faults are reported to the SIMATIC CPU as a diagnostic alarm and can be displayed via the component status in STEP 7 (see picture, Component status).

7.5.4 Diagnostic buffers on SIWAREX U

SIWAREX U components from Version 5 on possess their own diagnostic buffer. In this diagnostic buffer, data and operator errors, operating faults, and process messages are entered and can be displayed when required via the component status in STEP 7 (see picture, Component status).

The last 9 entries are listed in chronological order. Since SIWAREX U does not have a clock, the time indications given are relative to the time the SIWAREX U component was switched on. No entries are made for the date.

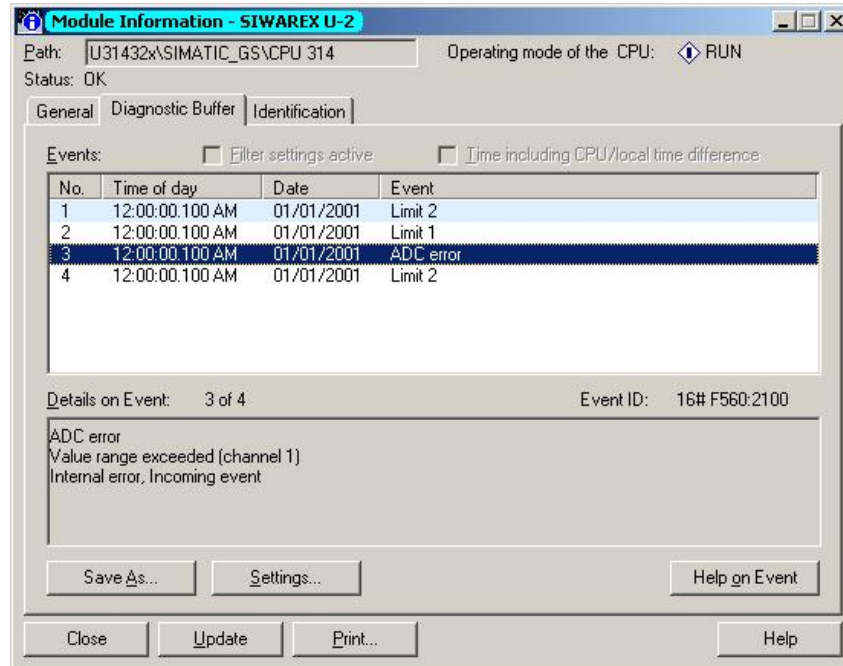


Figure 7-1 Component status in SIMATIC Manager

7.6 Process alarms

Process alarms are used to detect the status change of the limit values. In OB40 the status change in the local data byte 8 is recorded:

- Bit 0: Channel 1, limit value 1 comes
- Bit 1: Channel 1, limit value 1 goes
- Bit 2: Channel 1, limit value 2 comes
- Bit 3: Channel 1, limit value 2 goes
- Bit 4: Channel 2, limit value 1 comes
- Bit 5: Channel 2, limit value 1 goes
- Bit 6: Channel 2, limit value 2 comes
- Bit 7: Channel 2, limit value 2 goes

7.7 Message list of data and command errors (synchronous messages)

Error no.	Data and operator errors - Meaning	Description
0	Adjustment command could not be executed as distance between adjustment points is too small	The adjustment command could not be executed as the distance between the adjustment points is too small. The adjustment weight should cause at least a 5% change of the signal at the load cell output.
1	Instruction could not be executed due to fault	The instruction could not be executed due to a fault. The fault must be corrected first.
2	A non-existent or inactive channel was addressed	A non-existent or inactive channel was addressed. The channel may have to be activated.
3	Code not defined (e.g. cutoff frequency digital filter, etc.)	The parameter code is not defined (e.g. cutoff frequency digital filter, etc.).
4	Unknown data record	The data record does not exist.
5	Command not possible because scale is not adjusted	The command can not be executed because the scale is not adjusted. The scale must be adjusted first. The scale is adjusted when the adjustment digits for the adjustment zero, the adjustment weight, and the digits for the adjustment weight are defined/determined.
6	Waiting time of 5 sec. for adjustment commands not observed	The waiting time of 5 sec. for adjustment commands was not observed. This minimum time must be observed for two consecutive adjustment commands.
7	The adjustment weight is negative	The adjustment weight is negative and therefore impermissible.
8	Reserve	Reserve
9	Reserve	Reserve
10	Reserve	Reserve
11	Reserve	Reserve
12	Reserve	Reserve
13	Reserve	Reserve
14	Reserve	Reserve
15	Reserve	Reserve

Table 7-3 List of data and command errors

7.8 Message list of operating messages (asynchronous errors)

If an error generates an operating message, the red SF LED on the front of the module is illuminated. The incoming and outgoing operating messages are signaled in the diagnostic alarm.

Error no.	Operating messages - Meaning	Description
0	Limit for load cell signal exceeded or undershot	The measurement signal is too high. Measure the measurement voltage with a multimeter and check the load cells. Check the set characteristic value in DR3.
1	Minimum voltage at the sense line undershot	Minimum voltage at the sense line undershot. The following reasons are possible: - The voltage drop in the line up to the junction box - Line break - Jumpers missing for 4-wire option - Short circuit in the lines.
2	Watchdog	The error can mean that the module is defective. Contact the SIWAREX hotline.
3	Error in EPROM	The error can mean that the module is defective. Contact the SIWAREX hotline.
4	Error in EEPROM	The error can mean that the module is defective. Contact the SIWAREX hotline.
5	Error in RAM	The error can mean that the module is defective. Contact the SIWAREX hotline.
6	ADC error	The AD converter had to be restarted due to a serious fault. The error can mean that the module is defective. Contact the SIWAREX hotline.
7	Number overflow in weight calculation	The record parameters lead to the number overflow during the weight calculation. The weight can be displayed with 15 bits plus prefix.
8	No 24 V supply	The external 24 V supply is not present.
9-15	Reserve	Reserve

Table 7-4 List of operating messages

7.9 Messages via LEDs

The LEDs on the front of the SIWAREX U are used to signal the following status and error messages.

Label	LED color	LED	Explanation	Status display during operation
SF	Red	LED 1	Error display System fault (hardware fault, operating error)	OFF: there is no operating error ON: there is an operating error
24 V	Green	LED 2	Ext. 24 V supply	OFF: No 24 V supply ON: 24 V supply present
ST1	Orange	LED 3	Status 1	The meaning can be determined during parameterization.
ST2	Orange	LED 4	Status 2	The meaning can be determined during parameterization.
COM	Green	LED 5	Communication	OFF: communication via RS232 is not taking place FLASHING: communication via RS232 (SIWATOOL U) is taking place

Table 7-5 List of LED messages

8 Communication in SIMATIC S7

8.1 General information

SIWAREX U was developed for operation in SIMATIC S7.

In the SIMATIC Manager, SIWAREX U is configured like a function module (FM).

If SIWAREX U is missing in the module catalog of SIMATIC Manager, the HSP from the CD of the configuration package must be read in.

As part of the configuration package, a project which is necessary for the operation of SIWAREX U is delivered along with the standard software (FB 45 SIWA_U).

The program SIWAREX U "Getting Started" is also provided. This program shows how application software can be created.

We recommend using the "Getting Started" program and expanding it for different applications.

8.2 SIWAREX U in the HW-configuration

During the configuration of the hardware of the SIWAREX U module in the SIMATIC Hardware Configuration, the basic characteristics of the module are laid down:

- The peripheral address of the module
- The diagnostic alarm enable/disable
- The process alarm enable/disable
- Peripheral communication I/O (for other automation systems) or data record communication SFC/SFB/FB (for SIMATIC S7/PCS7).

SIWAREX U occupies 16 bytes in the input and output area.

After the selection of data record communication, several possibilities are available:

- Communication by calling SFC 58/59
- Communication by calling SFB 52/53
- Reading the current weight values via the periphery (cyclical)
- Using the FB_SIWA_U in the "Getting started" project – recommended

The scale-specific parameters, which are also changed during the control program runtime, can be defined in two ways:

- Using the SIWATOOL U set-up software
- Using the parameterization in the scale data block with subsequent transfer to SIWAREX U. The cyclical communication between the SIWAREX U module and the SIMATIC CPU is processed by the standard block FB SIWA_U (FB45).

8.3 SIWAREX U in the cyclical STEP 7 program

SIWAREX U communicates with the SIMATIC CPU using the function block FB SIWA_U. When programming the call, an instance data block is created for the FB SIWA_U. Alongside the instance data block, a scale DB is required **for each SIWAREX U**, in which the scale parameters can be stored. To create the Scale_DB, the UDT delivered along with it can be used.

In addition, the vector DB must be loaded in the SIMATIC CPU. **A vector DB can be used by several SIWAREX U.**

The function block FB SIWA_U and the data blocks are to be found on the CD of the configuration package SIWAREX U for SIMATIC S7 in the project "Getting started".

The function block prepares specific current process values cyclically without data set communication (via the peripheral area) and supports on request (commands) the data record communication with the aid of internal calls of the SFB 52/53 modules.

```
CALL "SIWA_U", DB 10 (
  ADDR           := 256,
  DB_SCALE       := 9,
  DB_VECTOR      := 8,
  CMD_IN         := "DB_SIWA_U".i_CMD_CODE_INPUT,
  CMD_INPR       := "DB_SIWA_U".bo_CMD_IN_PROGRESS,
  CMD_FOK        := "DB_SIWA_U".bo_CMD_FINISHED_OK,
  CMD_ERR        := "DB_SIWA_U".bo_CMD_ERR,
  CMD_ERR_C      := "DB_SIWA_U".b_CMD_ERR_CODE,
  REF_COUNT1     := "DB_SIWA_U".b_CYCLE_COUNT_CH1,
  SC_STATUS1     := "DB_SIWA_U".b_SCALE_STATUS_CH1,
  ASYNC_ERR1     := "DB_SIWA_U".w_OPR_ERR_MSG_CH1,
  GROSS1         := "DB_SIWA_U".i_GROSS_WEIGHT_CH1,
  FLT_RAW1       := "DB_SIWA_U".w_ADC_VALUE_FILTERED_CH1,
  REF_COUNT2     := "DB_SIWA_U".b_CYCLE_COUNT_CH2,
  SC_STATUS2     := "DB_SIWA_U".b_SCALE_STATUS_CH2,
  ASYNC_ERR2     := "DB_SIWA_U".w_OPR_ERR_MSG_CH2,
  GROSS2         := "DB_SIWA_U".i_GROSS_WEIGHT_CH2,
  FLT_RAW2       := "DB_SIWA_U".w_ADC_VALUE_FILTERED_CH2,
  FB_ERR         := "DB_SIWA_U".bo_FB_ERR,
  FB_ERR_C       := "DB_SIWA_U".b_FB_ERR_CODE,
  START_UP       := "DB_SIWA_U".bo_STARTING_UP,
  RESTART        := "DB_SIWA_U".bo_RESTART,
  CMD_EN         := "DB_SIWA_U".bo_CMD_TRIGGER);
```

Figure 8-1 Call parameters of the FB SIWA_U

8.4 Call parameters of the FB SIWA_U

The call parameters of the FB SIWA:U are described in the following section. In the delivery condition, the call parameters were defined as variables in the scale DB. It is possible to define the call parameters with other variables of the same type.

When calling the FB SIWA_U, the number of the instance DB to be generated must be specified.

The parameters are explained for channel 1. For the two-channel module, these explanations apply accordingly. The variables for channel 2 have the appendix "2", e.g. "DB_SIWA_U".i_GROSS_WEIGHT_CH2.

8.4.1 ADDR:= 256, input, INT

SIWAREX U requires for operation 16 bytes in the input and output address area of the SIMATIC-CPU. The ADDR parameter must correspond with the definition in the HW configuration.

8.4.2 DB_SCALE:= 9, input, INT

A scale DB must be defined for every SIWAREX U, in which the parameter of the SIWAREX U and the current actual value are found. The number of the DB can be chosen freely. DB9 has been defined as the scale DB in the project planning package. In addition, UDT9 is delivered as a template for data block creation.

8.4.3 DB_VECTOR:= 8, input, INT

The content of the vector DB may not be changed by the user. It only has to be loaded once per SIMATIC CPU, independently of the number of SIWAREX U modules used. The number of the DB can be chosen freely.

8.4.4 CMD_IN:= "DB_SIWA_U".i_CMD_INPUT, input, INT

The user controls all command using this input variable, whether for transferring a data record or executing a weighing task. The commands are described in Chapter [6 Commands](#). The user prepares the command number using this variable and triggers the command using variable

CMD_EN:= "DB_SIWA_U".bo_CMD_EN (see Chapter [8.4.18](#)). The FB SIWA_U doesn't delete the command number, but after the execution of the command resets the trigger variable

CMD_EN:= "DB_SIWA_U".bo_CMD_EN.

8.4.5 CMD_INPR:= "DB_SIWA_U".bo_CMD_IN_PROGRESS, Output, BOOL

The bit informs the user that a command is currently being processed.

8.4.6 CMD_FOK:= "DB_SIWA_U".bo_CMD_FOK, output, BOOL

The bit notifies the user for a cycle that his command has been executed without any errors (finished OK). The bit is set for one cycle (edge) only.

8.4.7 CMD_ERR:= "DB_SIWA_U".bo_CMD_ERR, output, BOOL

The bit notifies the user for a cycle that his command has not been executed. The bit is set for one cycle (edge) only. In the same cycle, the cause can be shown with the variable CMD_ERR_C:= "DB_SIWA_U".b_CMD_ERR_CODE. The number is itemized in the table "Data and operator errors" in Chapter 7.7. When no error code is specified, it must be checked in the same cycle in "DB_SIWA_U".b_FB_ERR_CODE whether an FB error is present.

8.4.8 CMD_ERR_C:= "DB_SIWA_U".b_CMD_ERR_CODE, output, BYTE

For a command that is not executed (Finished with errors), the error number is output here. The number that is output is decoded in table "Data and operator errors" in chapter 7.7. The value remains in the output until the next command is triggered. The evaluation is to be performed when the set bit CMD_ERR:= "DB_SIWA_U".bo_CMD_ERR appears. When no error code is specified, it must be checked in the same cycle in "DB_SIWA_U".b_FB_ERR_CODE whether an FB error is present.

8.4.9 REF_COUNT1:= "DB_SIWA_U".b_CYCLE_COUNT_CH1, output, BYTE

The current output values, which are prepared as output variables of the FB SIWA_U, are read out from the FB cyclically via the peripheral area. SIWAREX U updates the counter internally in a 20 ms rhythm. Each updating is given a serial number, which can be used as a time stamp in the SIMATIC CPU. The number can be between 0 and 255.

8.4.10 SC_STATUS1:= "DB_SIWA_U".b_SCALE_STATUS_CH1, output, BYTE

The current status of the scale is output via this variable. The meaning of the status bits corresponds to the status byte in DR31.

8.4.11 ASYNC_ERR1:= "DB_SIWA_U".w_OPR_ERR_MSG_CH1, output, BYTE

Via this word the current operating errors (asynchronous errors) are displayed. This error display is automatically reset with the correction of the error.

8.4.12 GROSS1:= "DB_SIWA_U".i_GROSS_WEIGHT_CH1, output, INT

Via this variable the user is provided with the current weight value for channel 1.

8.4.13 FLT_RAW1:= "DB_SIWA_U".w_ADC_VALUE_FILTERED_CH1, output, INT

Via this variable the user is provided with the current digital filtered value from the ADC for channel 1.

8.4.14 FB_ERR:= "DB_SIWA_U".bo_FB_ERR, output, BOOL

If an error has occurred in the processing of the block itself, this is reported via this variable.



Warning

If a processing error occurs for FB SIWA_U, we have to assume that the variables that have been output do not correspond with the actual status in the module.

8.4.15 FB_ERR_C:= "DB_SIWA_U".b_FB_ERR_CODE

The error number of the FB SIWA_U is output through this variable.

The following messages can be output:

- Bit 0 - DB_SIWA_U or DB_VECTOR are missing or have incorrect lengths
- Bit 1 - Error in the internal call of SFB52 or SFB53; the value RET_VAL is entered in the DB in DW4 for a cycle
- Bit 2 - Error interpreting a data record / command, specified data record or command number is incorrect
- Bit 3 - Error life bit; SIWAREX U is not responding
- Bit 4 - Reserve
- Bit 5 - Activated command was broken off due to a restart
- Bit 6 - Reserve
- Bit 7 - Reserve



Warning

If a processing error occurs for FB SIWA_U, we have to assume that the variables that have been output do not correspond with the actual status in the module.

8.4.16 START_UP:= "DB_SIWA_U".bo_STARTING_UP

During the start-up of the control program in OB100, the variable RESTART is set by the user. The FB_SIWA_U recognizes the set variable in the cyclical program, sets the variable START_UP, and deletes, where appropriate, commands which have not been processed internally. Then the FB resets the two variables RESTART and START_UP and accepts new commands.

8.4.17 RESTART:= "DB_SIWA_U".bo_RESTART

During the start-up of the control program in OB100, the variable RESTART is set by the user. The FB_SIWA_U recognizes the set variable in the cyclical program, sets the variable START_UP, and deletes, where appropriate, commands which have not been processed internally. Then the FB resets the two variables RESTART and START_UP and accepts new commands.

8.4.18 CMD_EN:= "DB_SIWA_U".bo_CMD_EN

After the entry of the command number in the variable CMD_IN:= "DB_SIWA_U".i_CMD_INPUT, the execution of the command is triggered with this bit. To prevent the command from being triggered more than once, the bit should be created as an edge. After execution of the command, the FB SIWA_U resets the trigger variable CMD_EN:= "DB_SIWA_U".bo_CMD_EN.

8.5 Allocation of the scale DB

There are variables that are available in the SIMATIC-CPU in the scales DB. The structure corresponds to the data record structure. The variable names are in English.

8.6 Process alarms

The exceeding of limit values 1 or 2 can - depending on the selection in the basic data of SIWAREX U in the HW config. - trigger a process alarm.

8.7 Peripheral area for SFC, SFB, FB communication

In simple applications where only the weight values and status information is to be read, the user can access the peripheral address of the SIWAREX module directly.

The following table shows the assignment of the peripheral area when communication to "SFC, SFB, FB" is selected in the HW config. Byte "0" corresponds to the address of the SIWAREX U module in the HW config.

Byte	S7 output area	S7 input area
Channel 1		
0	Not used	BYTE cyclic counter
1	Not used	BYTE status
2	Not used	INT gross weight
3	Not used	
4	Not used	WORD digital value from the ADC
5	Not used	
6	Not used	WORD operating faults - asynchronous errors
7	Not used	
Channel 2		
8	Not used	BYTE cyclic counter
9	Not used	BYTE status
10	Not used	INT gross weight
11	Not used	
12	Not used	WORD digital value from the ADC
13	Not used	
14	Not used	WORD operating faults - asynchronous errors
15	Not used	

Table 8-1 Allocation of the peripheral area

8.8 Peripheral area for I/O communication

Communication via the peripheral area can be used when "I/O" communication has been selected in the HW config for the communication with external systems when using the peripheral system ET200 M.

The details are described in a separate chapter (see Chapter [9 Communication with other systems](#)).

9 Communication with other systems

9.1 Hardware and software requirements

For the communication with other automation systems, the ET 200M system is used.

In the framework of the communication system ET 200M, various "head" components (interface modules) are offered, which are connected to the communication bus (PROFIBUS or PROFINET). Up to 7 SIWAREX U modules can be configured per PROFIBUS interface module. According to the PROFINET specification, up to 12 modules can be operated at a head station per interface module.

For the configuration, GSD or GSDML files are used for the communication system ET 200M. These are made available as a download by SIMATIC Support.

The installation of the GSD or GSDML file is described in the manual of the respective automation system.

With the aid of the GSD or GSDML file, SIWAREX U can be configured in the respective automation system.

Note:

There are various *.GS? files. The *.GSD files are language-independent files, i.e. there are no user texts. In these files only the compulsory parameters are stored for compatibility reasons. The *.GSD files are only intended for configuration programs which do not support the extended parameters. The *.GS? (where ? E=English, F=French, G=German, I=Italian, S=Spanish) are language-dependent. They contain user texts for configuration in the language of the respective country. All the information required for the configuration of the plug-in components is contained in the language-dependent *.GS? files (this is not the case for the *.GSD files). Since not all important information for the initialization of SIWAREX U is present in the *.GSD files, one must ensure that the **language-dependent *.GS* file is used as the data base**.

Each SIWAREX U module occupies 16 bytes for data input (reading from the module) and 16 bytes for data output (writing to the module) in the address area of the control.

The addresses in the following description (table) are given relative to the basic address of SIWAREX U in the automation system.

9.2 Communication via the I/O area

To process communication, the status byte and the byte for task controlling are used.

Bit 6 in the status byte (input byte 1 for channel 1 and input byte 9 for channel 2) can be evaluated as a live bit.

By means of the live bit it can be determined whether the component is still "alive". To do this, bit 6 in the status byte is to be evaluated. If the status of the live bit in

Status is the same as bit 6 in Task Controlling (output byte 3 for channel 1 or output byte 11 for channel 2), then SIWAREX U has synchronized the live bit.

In Task Controlling, the live bit must now be inverted. SIWAREX U will in turn set the same status for the live bit in Status.

If this does not occur within a certain period, the component/communication has failed. The period at the end of which a component is deemed to have failed can be specified using the user program.

Bit_no.	Name	Range of values/Meaning
0	Operational fault	1 = an operational fault exists
1	Data, operator errors	1 = during the last action, a data or operator error occurred.
2	Limit value 1 active	1 = limit value 1 is activated
3	Limit value 2 active	1 = limit value 2 is activated
4	Adjusted	1 = scale is already adjusted
5	Measured value toggle bit	Measured value toggle bit is inverted with each new measured value (every 20 ms).
6	Live bit	The live bit is specified by the user in the output area and is synchronized in the input area (I/O communication only).
7	Instruction acknowledgement	The instruction bit is inverted after the execution of an instruction (I/O communication only).

Table 9-1 Content of the status byte

Bit 7 in the status byte (input byte 1 for channel 1 and input byte 9 for channel 2) is used to process the writing to SIWAREX U together with the instruction bit of the byte for task controlling (output byte 3 for channel 1 and output byte 11 for channel 2).

Bit_no.	Name	Range of values/Meaning
0-5	Reserve	
6	Live bit	The live bit is specified by the user in the output area and is synchronized in the input area (I/O communication only).
7	Instruction bit	The user must check the instruction bit for consistency in the input area. A new instruction is executed when this bit is changed and the bit "Instruction acknowledgement" follows this change in the input area (I/O communication only).

Table 9-2 Byte for task controlling

Byte	S7 output area	S7 input area
Channel 1		
0	Number n for reading DR(n) and DR(n+1)	Confirmation of number n for DR(n) and DR(n+1) prepared for reading
1	Number m for writing DR(m)	Status byte
2	Reserved	Current weight (H) (updated cyclically)
3	Task controlling	Current weight (L) (updated cyclically)
4	Variable (H) of DR(m) for writing	Current variable (H) corresponding to data record number n
5	Variable (L) of DR(m) for writing	Current variable (L) corresponding to data record number n
6	Default value for remote display 1 (H) (transferred cyclically)	Current variable (H) corresponding to data record number n+1
7	Default value for remote display 1 (L) (transferred cyclically)	Current variable (L) corresponding to data record number n+1

Channel 2		
8 *)	Number n for reading DR(n) and DR(n+1)	Confirmation of number n for DR(n) and DR(n+1) prepared for reading
9 *)	Number m for writing DR(m)	Status byte
10 *)	Still free	Current weight (H) (updated cyclically)
11 *)	Task controlling	Current weight (L) (updated cyclically)
12 *)	Variable (H) of DR(m) for writing	Current variable (H) corresponding to data record number n
13 *)	Variable (L) of DR(m) for writing	Current variable (L) corresponding to data record number n
14 *)	Default value for remote display 1 (H) (transferred cyclically)	Current variable (H) corresponding to data record number n+1
15 *)	Default value for remote display 1 (L) (transferred cyclically)	Current variable (L) corresponding to data record number n+1

*) for 2-channel module

Table 9-3 Assignment of the peripheral area

9.3 Reading data records from the module

The current weight values are automatically prepared cyclically.

In the area "Current variable" (4 bytes), only the selected data records are read. Via the number of the data record to be read "n", it is determined which data records are to be read from SIWAREX U. Here, the specified data record "n" and the following data record "n+1" are always read and entered in the area "Current variable".

Via "Confirmation of the number n for DR(n) and DR(n+1) prepared for reading" one should now check whether SIWAREX U has already made available the requested data records in the area "Current variable corresponding to data record number n and n+1". (Depending on the cycle time of the automation device, it can take several CPU cycles before the requested data records are available). If the "Number n for reading DR(n) and DR(n+1)" and the "Confirmation of number n for DR(n) and DR(n+1) prepared for reading" are the same and if it has been established via the live bit that the component is reacting, then the requested current data records are available in the area "Current variable".

If a command or writing which changes the content of a data record to be read is being executed prior to the reading of a data record, then the reading may only be carried out when the instruction bit and instruction acknowledgement bit for the writing are the same (i.e. no write task is running or the last write task has ended).

Example:

The command "Adjustment weight valid" affects the data record DR61 (adjustment digits).

The data record should only be read out when the command has been completed.

When the "Number n for reading DR(n) and DR(n+1)" does not change, the variables are prepared anew every 20 ms by the module.

9.4 Writing data records to the module

If data records are to be written to SIWAREX U alongside the default value for the remote display, which is updated cyclically, this can be done via the "Number m for writing DR(m)" and the specification of the value in the area "Variable of DR(m) for writing".

A write request is only accepted by SIWAREX U when the instruction bit is different from the instruction acknowledgement bit. If an instruction was accepted, then further instructions will only be accepted once SIWAREX U brings it about that the instruction bits are the same, i.e. the data transfer has been completed. The instruction bit is only required for the writing of data records.

One should proceed as follows:

- Query instruction acknowledgement bit in the Status input byte 1.7 (9.7) to see whether it is identical with the instruction bit output byte 3.7 (11.7) in Task Controlling.
- Transfer the desired data record number "m" to the output byte 1 (9).
- Transfer the desired value of the data record "m" to the output word 4 (12) and invert the instruction bit in Task Controlling.
- Query the instruction acknowledgement bit in Status for as long as it takes to verify whether the module has synchronized it from the instruction bit.
- If the instruction bit and instruction acknowledgement bit are identical, this means that the task has been completed.
- Query data or operator errors. In the input byte 1 (9), (status byte), bit 1 is to be queried.
- If a data or operator error has occurred, then data record 76 (synchronous errors) can be read for detailed error information.

9.5 Data records for I/O communication

The data exchange via the I/O area takes place by means of parameters, commands, and process values, which each possess their own data record number (mini data records - one parameter - one data record). Here only a limited selection of data is available as per the following table. Where channel-specific, the listed mini data records exist separately for each channel.

DR number	Meaning	Unit	Format	Default	Channel-specific	Access	Explanation
57	Commands	-	INT	0	y	w*	see DR11, 12 Commands
58	Scale number	-	CHAR	0	n	r/w	see DR5 Scale number
59	Port parameters	-	8 x BIT	0	n	r/w	see DR5 Port parameters
60	Adjustment digits0	Digits	WORD	0	y	r/w	see DR3, 4
61	Adjustment digits1	Digits	WORD	0	y	r/w	see DR3, 4
62	Adjustment weight	Weight	INT	10000	y	r/w	see DR3, 4
63	LED assignment	Code	2 x Byte	101,102	n	r/w	see DR5 LED assignment low byte K1; high byte K2
64	Zero set value	Digits	WORD	0	y	r/w	see DR3, 4
65	Char. value LC / Filter setting / Setting data	-	16x BOOL	0x0041	y	r/w	see DR3, 4
66	Limit value1 ON	Weight	INT	10000	y	r/w	see DR21, 22
67	Limit value1 OFF	Weight	INT	9990	y	r/w	see DR21, 22
68	Limit value2 ON	Weight	INT	1000	y	r/w	see DR21, 22
69	Limit value2 OFF	Weight	INT	1010	y	r/w	see DR21, 22
70	Default value1 for remote display	-	INT	0	n	r/w	see DR6
71	Default value2 for remote display	-	INT	0	n	r/w	see DR6
72	Display type	-	WORD	0	n	r/w	see DR5 (only low byte used)
73	Curr. digit value	Digits	WORD	-	y	r	see DR31, 32 0....65535
74	Gross	Weight	INT	-	y	r	see DR21, 22 -32768..... +32767
75	Asynchronous errors	-	16 x BOOL	-	y	r	see DR21, 22
76	Synchronous errors	-	16 x BOOL	-	y	r	see DR21, 22
77	Version	-	WORD	-	n	r	see DR40
78	Checksum	-	UINT	-	n	r	see DR40
79	Component type	-	2 x BYTE	-	n	r	low byte: reserved high byte: number of channels;

* r=read, w=write

Table 9-4 Data records for I/O communication

Note: In the case of channel-independent data records, where there is a two-channel component data can be transferred for the first or second channel. If values are transferred for both channels simultaneously (different), the value for Channel 2 overwrites that of Channel 1.

10 Remote display

10.1 Overview

Siebert digital remote displays can be connected to the TTY port of SIWAREX U.

As standard, the 6-digit display model "S102-W6/14/0R-000/0B-TM for Siwarex U/M/A/CS with TTY" is intended.

A corresponding protocol is realized in SIWAREX U for the connection.

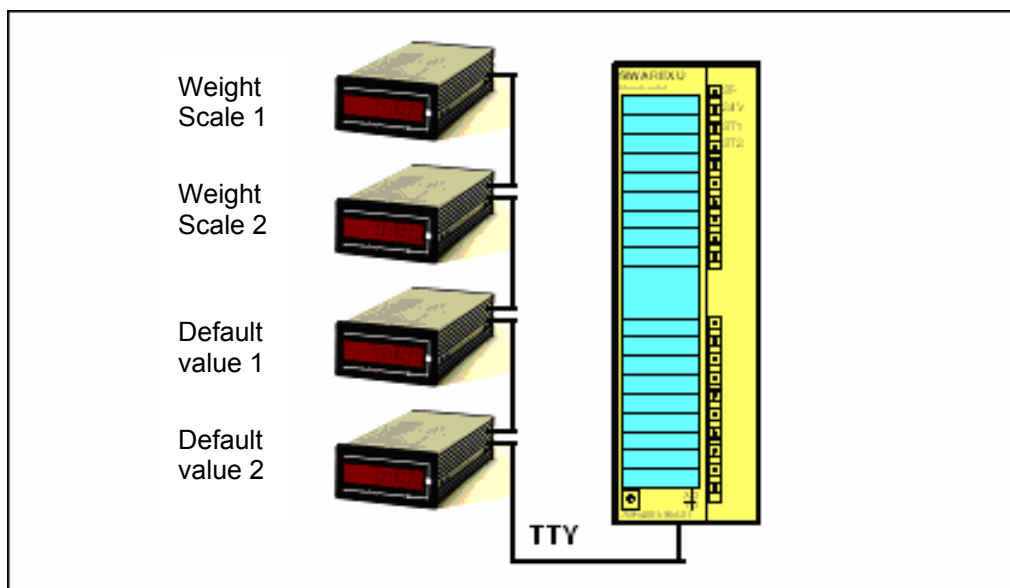


Figure 10-1 Connection of up to 4 remote displays

The following values can be displayed:

- Gross weight value - weighing channel 1
- Gross weight value - weighing channel 2 (only with two-channel SIWAREX U)
- Default value 1 (can be freely assigned via SIMATIC)
- Default value 2 (can be freely assigned via SIMATIC)

Which of the values is displayed is determined by a corresponding address on the remote display.

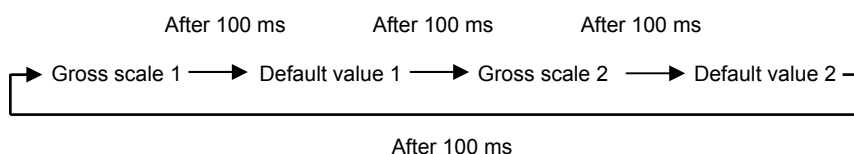
In the case of particular operating states (e.g. when the display range of the remote display has been exceeded), SIWAREX U sends corresponding ASCII characters via the protocol, providing the remote display is able to display these ASCII characters.

Display	Description
" _ _ _ _ _"	The display range of the remote display has been exceeded. (Example: 11,456 kg cannot be displayed on a 4-digit display.)
"E r r"	SIWAREX U reports an operational fault (System Fault SF).
" _ _ _ _ _" or "≡ ≡ ≡ ≡ ≡"	Timeout function for the monitoring of the serial connection for wire breakage. This function must be implemented in the remote display and is displayed differently depending on the display model.

Table 10-1 Remote display – Special displays

Several digital remote displays can be connected via the SIWAREX U isolated TTY port (20-pin plug connector) (see 4.4.6). The port is unidirectional, i.e. the weight values are transferred cyclically.

When the display is set via the data record DR5 (SIWATOOL U) or DR72 (I/O communication), the data to be displayed is output every 100 ms at the TTY port.



10.2 Remote display settings

If a remote display is connected to SIWAREX U, then settings are also to be made on the remote display. You can find the exact procedure for the parameterization of remote displays in the remote display documentation.

Meaning	Setting
Port:	TTY
Data format:	8 bit
Parity:	Even
Baud rate:	9600 baud
Protocol:	STX/ETX
Protocol answer:	None
Ignore characters:	Ignore one character
Address length:	2 places
Address:	Gross value Channel 1 = 01 Default value 1 = 05 Gross value Channel 2 = 21 Default value 2 = 06
Timeout:	e.g. timeout after 2 s
Decimal point:	No decimal point
Leading zeros:	Leading zeros are displayed
Segment test:	Where available, segment test can be activated

Table 10-2 Remote display settings

The decimal place can be set separately for the Channel 1 weight and Channel 2 weight via SIWATOOL or SIMATIC.

The setting of the decimal place is static. When a decimal place has been parameterized in SIWAREX U, it is also transferred into the protocol.

If several remote displays are connected, some remote displays also offer the possibility of setting the decimal place individually at each remote display (no decimal place is then parameterized at SIWAREX U). The desired decimal place is then to be set directly at the remote display. The default values are generally transferred by SIWAREX U to the remote display without a decimal place. If the display of a decimal point is desired, this is to be set at the remote display. An address must be set at each display. The value to be displayed is determined by the address.

Siebert contact details:

Siebert Industrieelektronik GmbH
Postfach 1180
66566 Eppelborn, Germany
Tel.: +49 (0)6806/980-150
Fax: +49 (0)6806/980-111
Internet: <http://www.siebert.de>

11 Setting the scale – SIWATOOL U

11.1 General information

You can use the SIWATOOL U program to set the scale without commissioning of the SIMATIC automation system.

This program is included in the configuration package supplied.

The program (directory SIWATOOL_U) must be installed in the first step. Less than 30 MB is required on the hard drive.

11.2 Windows and functions of SIWATOOL U

The program is designed to facilitate navigation in the parameter environment of SIWAREX U. On the left side the overview of the parameters is arranged as a tree structure. The parameter grouping corresponds with the various activities which can happen during the configuration, commissioning, tests and for service cases. Each branch of the tree structure corresponds to a data record in SIWAREX U. A data record summarizes several parameters. In the right-hand window, the parameters in a data record can be edited in index card format.

The first card in a box is set up as an information sheet. This info sheet describes which tasks can be processed using the parameters from the selected data record. For sending, receiving and transferring, the entire data record is always handled, not just an index card.

11.3 Configuring offline

All scale parameters can be processed and stored without SIWAREX U. In this way, the commissioning time can be reduced.

The parameters for several scales can be prepared in the office and then transferred to SIWAREX U during the commissioning.

Data from one scale that is currently in operation can be read and used in the commissioning of another scale.

11.4 Online operation

To switch to online operation, the PC must be connected to SIWAREX U with the SIWATOOL cable (see [Order numbers](#) and accessories). The PC's COM interface can be set up in the communication menu.

All parameters can be changed in online operation. A message window shows the current messages on SIWAREX U. The current process values can be observed in various windows. For test purposes all commands can be sent to SIWAREX U.

All data can be read out and stored as a file or printed for archiving purposes.



All data can be edited in the module in online operation. The changes are not automatically transferred to the corresponding scale data blocks in SIMATIC-CPU. You decide whether the data comparison is necessary and carry it out when you decide that it is.

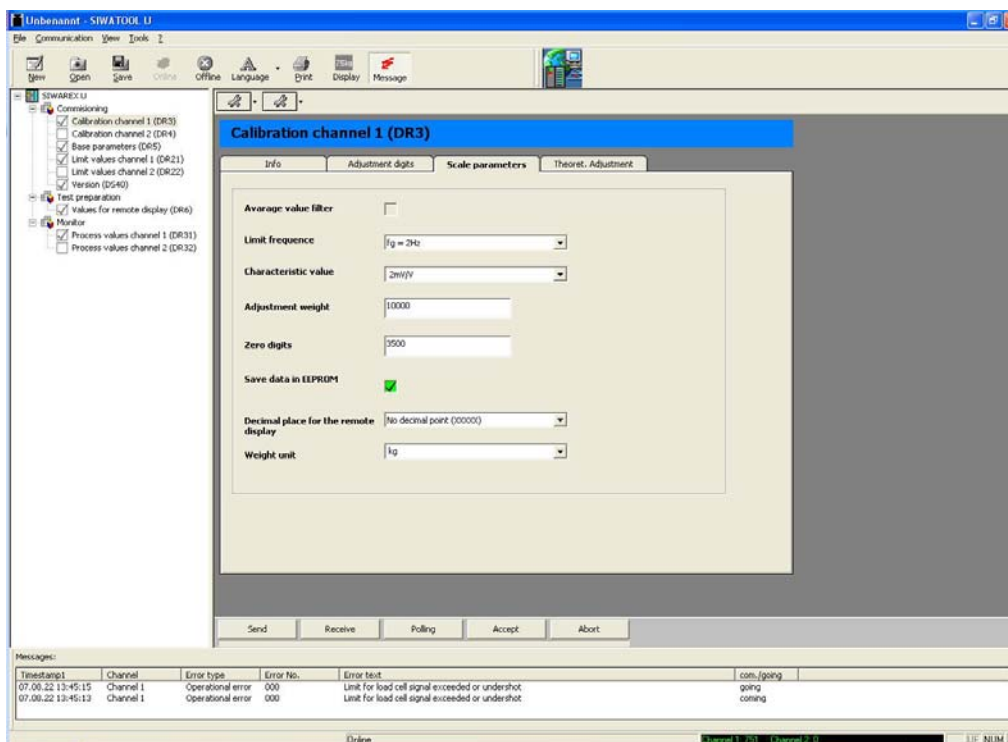


Figure 11-1 Window arrangement SIWATOOL U

11.5 Compatibility with old *.SKF files

The SIWATOOL U files from an earlier version can be imported into the new SIWATOOL U version via the import function (File>Import). When being saved, the imported files are given the appendix *.swu.

11.6 Help

After selecting a data record in the left program window, the card "Info" can be selected in the right program window. A description of the affect of the data record on the behavior of the scale is shown in a white area.

After the selection of a card, a section of the corresponding data record is displayed in the form of input and output fields. In addition to the parameter designation, the Tool Tips can also be helpful in remembering the meanings of certain parameters (text is displayed if the mouse pointer is positioned over a field).

After clicking menu point "Help", the "SIWAREX U" manual is opened. Acrobat Reader must be installed so that you can read the manual.

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 from Version 5.4 on CD-ROM	7MH4950-1AK01
• 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), new design • HSP Hardware Support Package for incorporation of SIWAREX U in STEP 7	
Configuration package SIWAREX U for PCS 7, Version 6.x in German and English on CD-ROM, block for CFC plan and face-plate (image block)	7MH4683-3BA64
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

Shield terminal clamp Contents: 2 pieces (suitable for cable with diameter 4–13 mm) Note: One shield terminal clamp is required for each of the following: • Scale connection • RS 485 port • RS 232 port	6ES7390-5CA00-0AA0
S7 profile rail	
• 160 mm	6ES7390-1AB60-0AA0
• 480 mm	6ES7390-1AE80-0AA0
• 530 mm	6ES7390-1AF30-0AA0
• 830 mm	6ES7390-1AJ30-0AA0
• 2000 mm	6ES7390-1BC00-0AA0
Accessories (optional)	
Power supplies PS 307 (only required when no DC 24 V available) AC 120/230 V; DC 24 V, incl. connection comb	
PS 307-1B; 2 A	6ES7307-1BA00-0AA0
PS 307-1E; 5 A	6ES7307-1EA00-0AA0
PS 307-1K; 10 A	6ES7307-1KA00-0AA0
Labeling strips (10 pieces, replacement part)	6ES7392-2XX00-0AA0
Remote displays (optional)	
The digital remote displays can be connected directly to SIWAREX U via a TTY port. Remote displays which can be used: S102, S302 Siebert Industrieelektronik GmbH Postfach 1180 66565 Eppelborn, Germany Tel. +49 (0)6806/980-0 Fax: +49 (0)6806/980-999 Internet: http://www.siebert.de For detailed information, contact the manufacturer.	
Junction box SIWAREX JB, aluminum housing for parallel switching of up to 4 load cells and for the connection of several junction boxes.	7MH4710-1BA
Junction box SIWAREX JB, stainless steel housing for parallel switching of up to 4 load cells.	7MH4710-1EA

ORDER NUMBERS AND ACCESSORIES

Ex interface, model SIWAREX IS with ATEX approval, but without UL and FM approval, for the intrinsically safe connection of load cells, incl. device manual, suitable for the weighing modules SIWAREX U, CS, MS, FTA, FTC, M, and CF, use in the EU possible.	
• With short circuit current < DC 199 mA	7MH4710-5BA
• With short circuit current < DC 137 mA	7MH4710-5CA
Cable (optional)	
Cable Li2Y 1 x 2 x 0.75 ST + 2 x (2 x 0.34 ST) - CY, orange coated for the connection of SIWAREX U, CS, MS, FTA, FTC, M, and CF with junction and distributor box (JB), extension box (EB) or Ex interface (Ex-I) as well as between two JBs, for stationary laying, occasional bending is possible, 10.8 mm external diameter, for ambient temperature -40 to +80 °C.	7MH4702-8AG
Cable Li2Y 1 x 2 x 0.75 ST + 2 x (2 x 0.34 ST) - CY, blue coated connection of junction box (JB) or extension box (EB) in the explosive area and Ex interface (Ex-I), for fixed installation, occasional bending is possible, blue PVC insulating cover, approx. 10.8 mm external diameter, for ambient temperature -40 to +80 °C.	7MH4702-8AF
Cable LiYCY 4 x 2 x 0.25 mm² ^{A)} for TTY (connect 2 pairs of conductors connected in parallel in each case), for the connection of a remote display.	7MH4407-8BD0 ^{A)}

¹⁾ Compatible with 7MH4601-1AA01; supply of load cells changed to DC 6 V.

²⁾ Compatible with 7MH4601-1BA01; supply of load cells changed to DC 6 V.

³⁾ Follow-up product to 7MH4683-3AA63.

^{A)} Subject to export regulations AL: N, ECCN: EAR99H.

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)	> 40 Ω < 4010 Ω
Permissible load cell resistance with Ex-i-interface (per channel)	> 87 Ω < 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 (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

TECHNICAL DATA

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) **:		
Comments	Standard	Limit values
Emission of radio interference (electromagnetic fields)	EN 61000-6-4 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	EN 61000-6-4 IEC 61131-2	EN 55011 Class A, Group 1 EN 55014

Interference immunity (industrial use):		
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	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	26 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).

** For use in residential areas, additional measures must be taken (e.g.: use in 8MC cabinets).

EMC

For EMC, guidelines in accordance with NAMUR NE21 Part 1 and 2004/108/EC regarding the radiation and insensitivity of electromagnetic interference have been observed.

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

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15 Abbreviations

ADC	Analog-Digital Converter
ASCII	American Standard Code for Information Interchange
G	Gross weight
O&O	Operating & Observing
CPU	Central Processing Unit
DB	Data block
FC	STEP7 Function Call
FB	Function Block (S7)
FM	Function Module (for S7-300)
HMI	Human Machine Interface (SIMATIC Operator Panel)
HW	Hardware
HSP	Hardware support package
MPI	Multi-Point Interface
OD	Output Disable (S7)
OP	Operator Panel (SIMATIC)
PC	Personal Computer
RAM	Random Access Memory
S7-300	Siemens automation system for the medium performance range
S7-400	Siemens automation system for the upper performance range
SFC	System Function Call (S7)
STEP 7	Configuration device software for SIMATIC S7
TP	Touch Panel (SIMATIC)
UDT	Universal Data Table (S7)
LC	Load Cell(s)