SIEMENS

SIWAREX U

(One and Two-Channel Model)

Equipment Manual

Release 06/2005

Safety Guidelines

This manual contains notices which you should observe to ensure your own personal safety, as well to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows to the level of danger.

Danger

indicates an imminently hazardous situation which, if not avoided, **will** result in death or serious injury.

Warning

indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.

Caution

used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate injury.

Caution

used without safety alert symbol indicates a potentially hazardous situation which, if not avoided, **may** result in property damage.

Notice

NOTICE used without the safety alert symbol indicates a potential situation which, if not avoided, **may** result in an undesireable result or state.

Qualified Personnel

The device/system may only be set up and operated in conjunction with this manual. Only **qualified personnel** should be allowed to install and work on this equipment. Qualified persons are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

Correct Usage

Note the following:

Warning

This device and its components may only be used for the applications described in the catalog or technical description, and only in connection with devices or components from other manufactorers which have been approved or recommended by Siemens.

This product can only function correctly and savely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

Trademarks

SIMATIC® and SIWAREX® are registered trademarks of Siemens AG.

Editor: A&D SE ES4
Publisher: A&D PI 14

Table of Contents

Figures

Tables

System Overview

1

This section gives you an overview of the functions of the SIWAREX U weighing module and a description of its integration into the system.

1.1 Introduction

Just what is SIWAREX U?

Everywhere where loads and forces must be weighed precisely and reliably, the SIWAREX U offers the best solution. A few examples: For fill levels of bins and hoppers, for monitoring trolley loads, for load measurement of conveyor belts or as overload protection for industrial elevators or milling lines.

The SIWAREX U is a weighing module which permits complete integration of weighing functions in the SIMATIC. The basic system is the SIMATIC S7-300.

The SIWAREX U is available in both one-channel and two-channel models.

SIWAREX U with one weighing channel: Order no. 7MH4 601-1AA01
SIWAREX U with two weighing channels: Order no. 7MH4 601-1BA01

By using standard components from the SIMATIC family, the SIWAREX U can be expanded as desired and thus offers an optimal hardware and software environment for implementation of system-specific solutions.

Using the ET 200M modular I/O device, the SIWAREX U can also be connected decentrally to a SIMATIC S5/S7/M7/PCS 7, or another standard DP master.

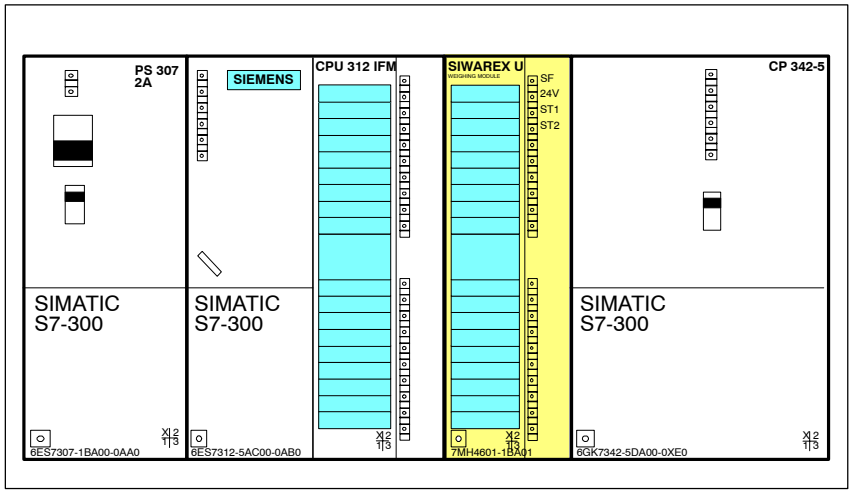


Figure 1-1 SIWAREX U with the SIMATIC S7-300

What can the SIWAREX U do?

The SIWAREX U handles execution of all weighing functions in process engineering.

The SIWAREX U generates the weight value and checks this value to determine whether a limit value has been exceeded.

The SIWAREX U can be used in potentially explosive areas (i.e., zones 1 and 2). The optional Ex-i interface (SIWAREX IS) ensures intrinsically safe supply of the load cells.

Additional features:

- 2 models (for one or two scales)
- Integration in SIMATIC S7/M7-300 as a function module (FM)
- Connection to PROFIBUS-DP via ET 200M
- 2 serial interfaces for remote display and PC connection
- Easy parameterization with Windows
- Module can be exchanged without readjusting the scales
- Theoretical adjustment without adjustment weights
- Setting to zero, parameterizable limit values and adjustable digital filter
- High degree of measuring precision (0.05%)
- CE, UL, CSA, FM, and ISO 9001 certification
- Choice of parameterization methods:
  - "SIWATOOL" parameterization software under WINDOWS on PC; direct transfer to the RS 232 interface of the SIWAREX U
  - Via data record transfer or via "ForceVar."
- Load cell interfaces:
  - Short circuit and overload-proof load cell supply at max. of 240 mA
  - Wire break detection (sensor, supply and measuring lines)
  - Load cell adaptation via software

System integration of the SIWAREX U into the SIMATIC

Integration of the SIWAREX U into the SIMATIC provides a freely programmable weighing system with which even complex tasks (e.g., multi-scale systems) can be implemented easily.

Central integration into the S7-300/ M7-300

The SIWAREX U is snapped directly onto the SIMATIC S7 bus as a function module (FM). This direct integration of the SIWAREX U into the SIMATIC S7-300/M7-300 permits optimal utilization of all functions of the automation system.

Hardware and software flexibility permits the implementation of a wide variety of applications (e.g., in the chemicals industry and foodstuffs industry). The complete family of SIMATIC S7-300 modules is available as the hardware platform. SIMATIC HMI operator panels are available for easy operator control and monitoring.

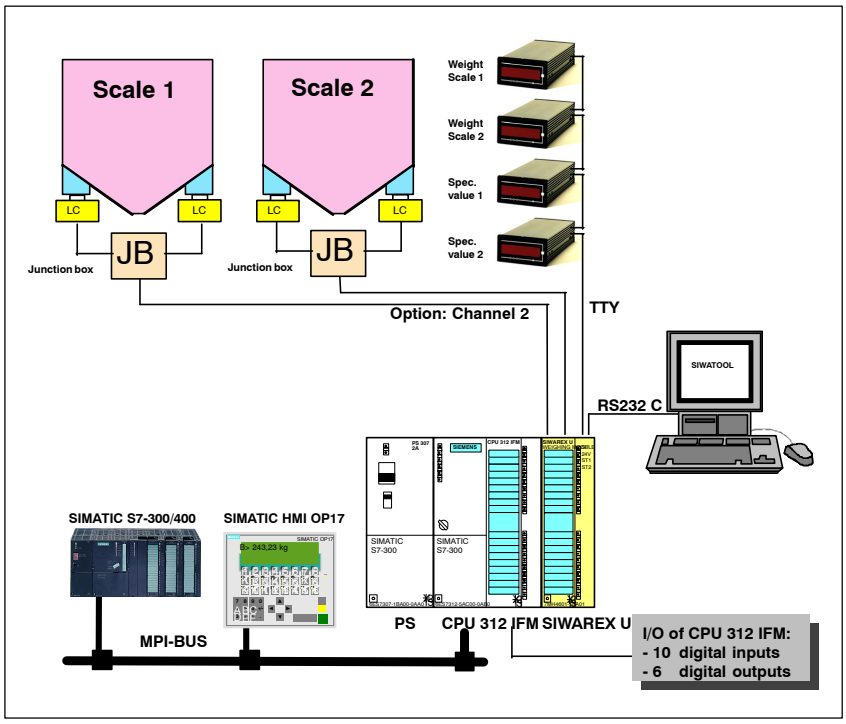


Figure 1-2 SIWAREX U in the SIMATIC S7-300

The SIWAREX U can also be operated centrally in the SIMATIC M7-300.

Distributed integration into the S7/S5/M7

Since the SIWAREX U can be connected to the PROFIBUS-DP via the ET 200M modular I/O system (IM 153-1 or IM 153-2 interface), the SIWAREX U can be linked as distributed periphery to the SIMATIC S5-95U, S5-115U/H, S5-135U or S5-155U/H or to the SIMATIC S7-300/M7-300 or S7-400/M7-400.

Transmission distances of up to 23 km are permitted.

Several SIWAREX U modules can be connected together with additional I/O modules on an IM 153-1 or IM 153-2.

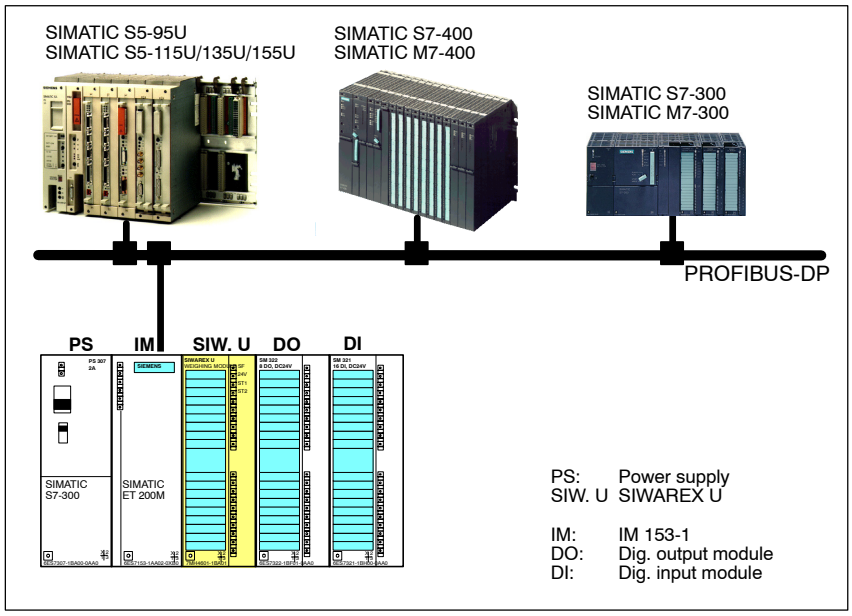


Figure 1-3 The SIWAREX U as distributed periphery in the SIMATIC S5/S7/M7

The central unit or expansion unit of the SIMATIC S5-115U/135U/155U requires an IM 308-C interface. Up to 122 bus nodes (32 without repeater) can be connected to this interface. In addition, a S5-95U with DP master interface can also be used as the master.

However, when the SIWAREX U is connected decentrally to a SIMATIC S7-300 or SIMATIC S7-400, an S7 CPU with PROFIBUS-DP interface or a CP 443-5 (release status 2 or later) or IM 467 for the bus connection is required. The CP 342-5 cannot be used for the bus connection.

Decentral connection to a SIMATIC M7 requires an IFM interface.

Distributed integration into the SIMATIC PCS 7

While the SIWAREX U is usually integrated in SIMATIC S5/S7 programmable controllers with the typical PLC programming languages STL (statement list), LAD (ladder diagram) or FBD (function block diagram), integration in the SIMATIC PCS 7 process control system is performed via graphic configuration in the CFC (continuous function chart). In other words, integration is structured instead of programmed.

The SIWAREX U modules are represented in the ES (i.e., engineering system) by “technology blocks” in the CFC. In contrast, with the OS (operator station), WinCC faceplates are used by the visualization system to re-present the SIWAREX U modules.

The faceplates can be used to monitor the weight values and control the SIWAREX U modules.

A separate SIWAREX U configuration package is available for the SIMATIC PCS 7 process control system which contains a block for the CFC chart, a faceplate for WinCC and the documentation.

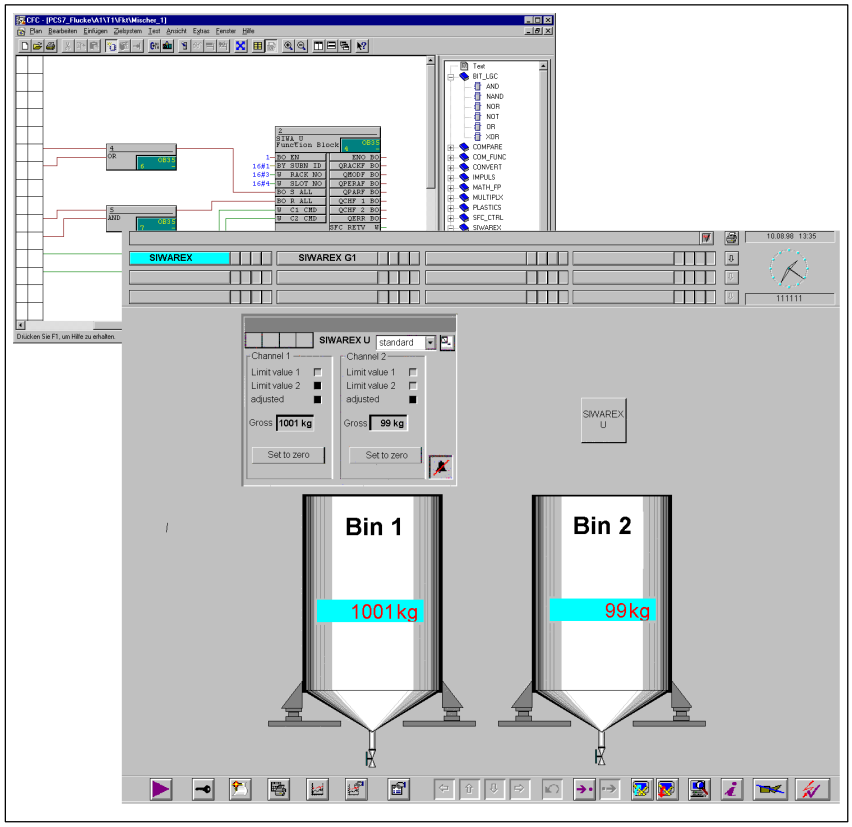


Figure 1-4 Representation of the SIWAREX U in the ES engineering system (left) and on the OS operator station (right)

Integration of the SIWAREX U independent of the controller

Using the serial interfaces of the SIWAREX U for a remote display or the connection of PC or host, the SIWAREX U can also be used as a field device which is not dependent on a controller. When the SIWAREX U is used without the SIMATIC S7/M7, an IM 153-1 interface must be used to power the SIWAREX U with 5 V over the backplane bus. The interface can be used later as a PROFIBUS interface.

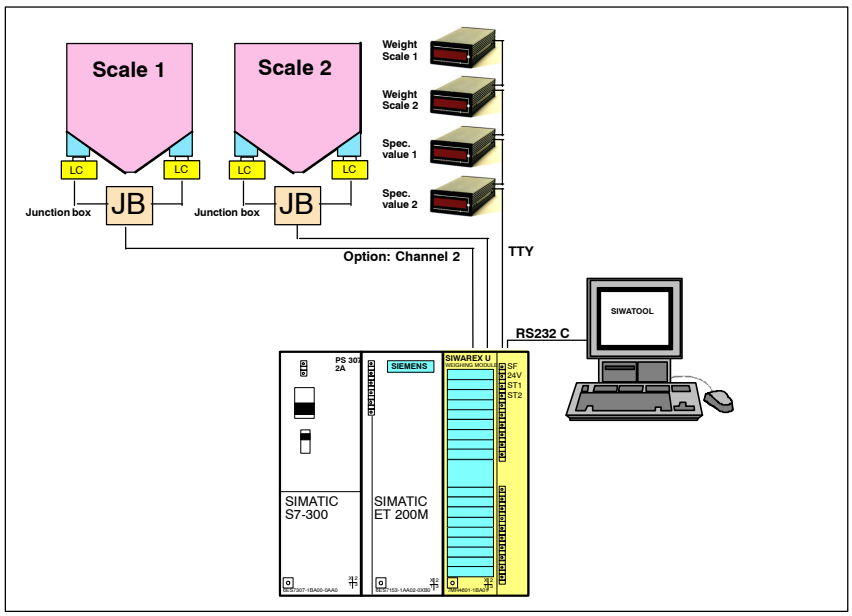


Figure 1-5 The SIWAREX U as a controller-independent field device

Periphery

In addition to the bus interface for the SIMATIC, the SIWAREX U is equipped with two other serial interfaces (i.e., TTY and RS 232C).

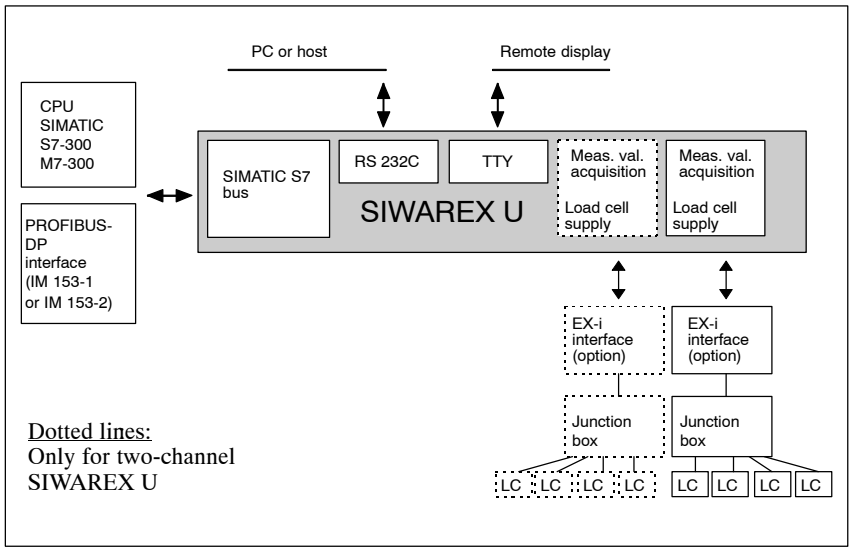


Figure 1-6 Diagram of the SIWAREX U setup

1.2 Setup and Components of a Weighing Machine

A complete industrial weighing machine (scales) consists of the following primary components.

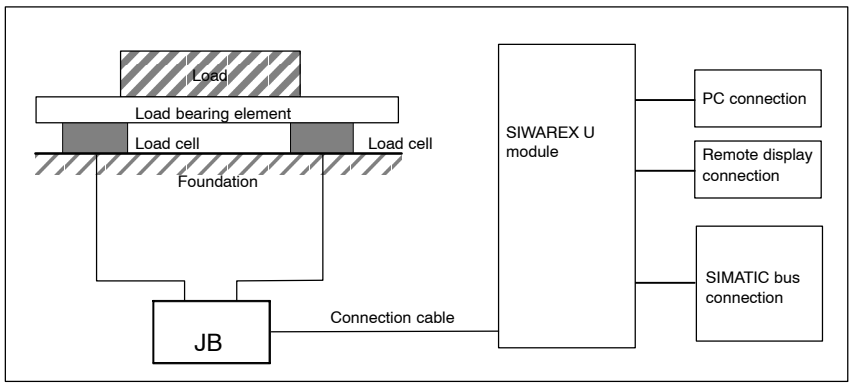


Figure 1-7 Setup of the weighing system with a SIWAREX U

Load bearing implement

Load bearing implements are used to hold the load to be weighed. Examples include platforms, hoppers, trolleys, containers and so on.

Load cell

Load cells are measuring sensors which convert a physical value (i.e., weight) into a proportionate electrical signal.

Mounting elements

Mounting elements ensure that the load cells function correctly. Mounting and guide elements prevent faulty loading which can cause measuring errors and damage to the load cells. Faulty loading is caused by forces (e.g., lateral forces) for which the direction of action of the load cell springs is not designed.

Junction box

The junction box (JB) is used to add together the load cell signals from several load cells switched in parallel.

SIWAREX U

The SIWAREX U module is used as an electronic evaluation device which acquires and further evaluates the signal coming from the load cell.

1.3 Weighing Functions

Weighing electronics for fill level measurement and load and force measurement

SIWAREX U offers the following functions:

- Adjustment of the scales (theoretical adjustment also)
- Measured value filtering
- Weight determination
- Setting to zero
- Limit value monitoring (min./max.)

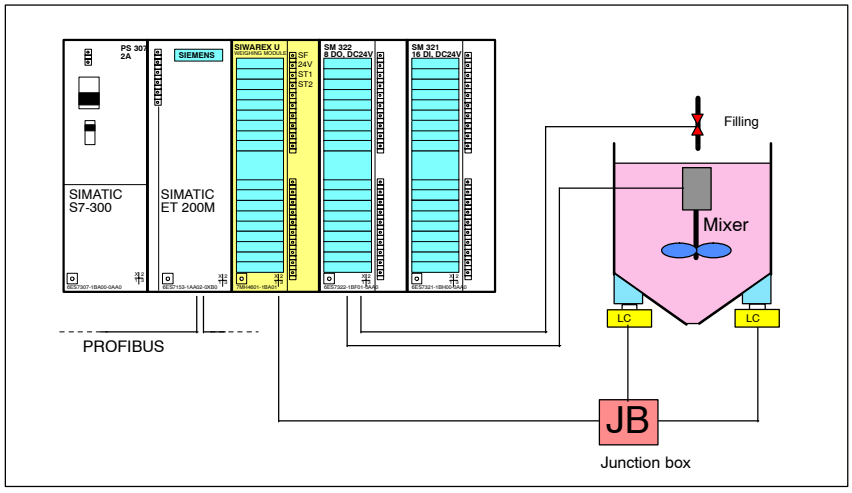


Figure 1-8 SIWAREX U fill level scales

Fill level scales are used to acquire the fill levels of hoppers, tanks or other containers. The SIWAREX U offers weighing functions such as gross weight calculation, setting to zero and limit value monitoring. These basic weighing functions can also be used to implement other types of scales such as:

- Monitoring trolley loads
- Load measurement of conveyor belts
- Overload protection of industrial elevators or milling lines and so on

Many other types of scales can also be implemented when standard components from the SIMATIC family are used.

Scales for potentially explosive areas, zones 1 and 2

Connection of load cells located in potentially explosive areas requires an Ex-i-Interface (type SIWAREX IS) which is placed between the SIWAREX weighing module and the load cell (special model for potentially explosive areas) or the junction box (JB).

The intermediate box contains an Ex-i interface and must be mounted outside the potentially explosive area.

Process I/O in the Ex area

Appropriate SIMATIC modules are available for digital or analog inputs/outputs in the potentially explosive area.

Ex modules are used in the automation of chemical plants and are suitable for applications in measuring, and open-loop and closed-loop control technology. The primary task of the Ex modules is to separate the intrinsically safe electrical circuits of the potentially explosive area and the non-intrinsically safe, internal electrical circuits of the programmable controller.

Remote displays in the Ex area

Remote displays with an analog interface can be used, for example, as remote displays for the Ex area. These remote displays are connected to the intrinsically safe analog output of the SIMATIC. Another choice is to use pressure encapsulated remote displays.

Controlling and monitoring in the Ex area

Special intrinsically safe operator panels are available from various manufacturers for use in the potentially explosive areas of zones 1 and 2. These operator panels can be connected to the SIMATIC S7 via the MPI interface of the S7 CPU or via an additive communications module (CP), for example.

Pressure encapsulated operator panels (SIMATIC HMI) can also be used instead of intrinsically safe devices.

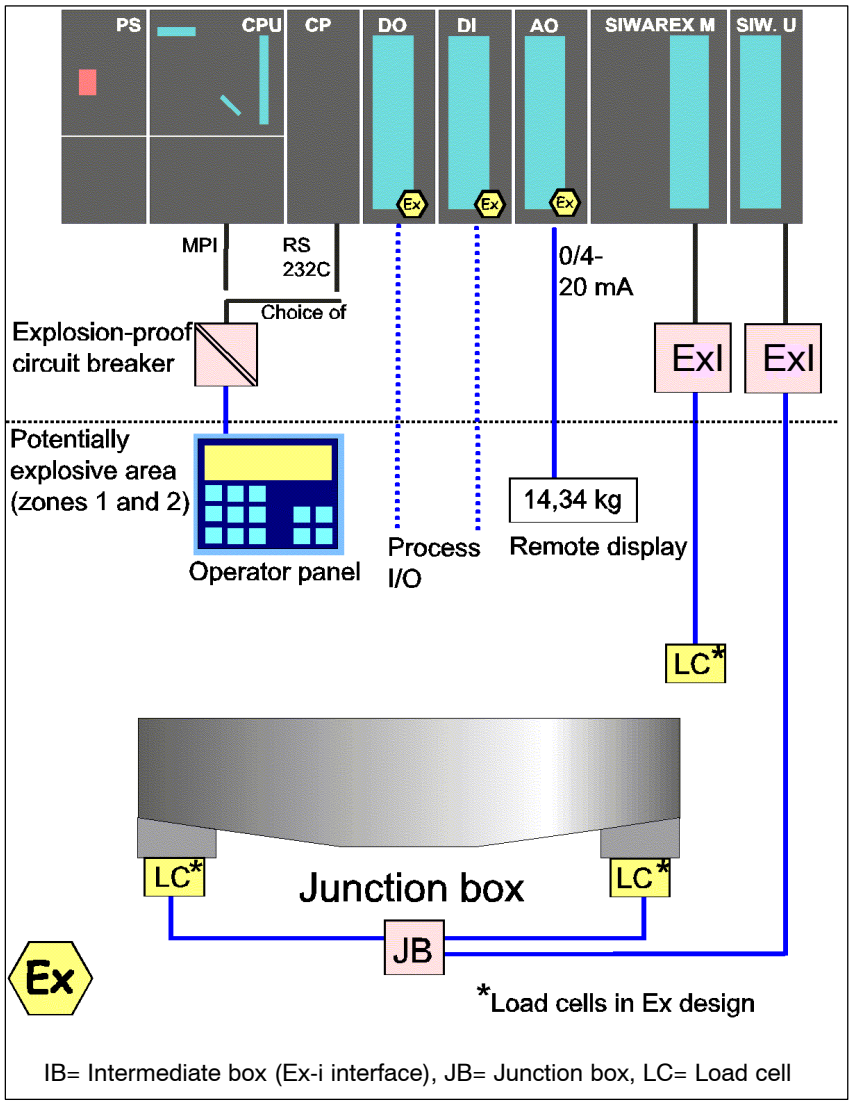


Figure 1-9 Scales for potentially explosive area

Hardware Description and Commissioning 2

This section contains all information required for commissioning. Subjects include mounting, connection, assignment of parameters, and a description of the interfaces and indicator elements.

General safety notes

Adherence to these safety notes is mandatory. Non-compliance will invalidate your warranty.

Warning

Persons who are not qualified should not be allowed to handle this equipment/system. Non-compliance with warnings appearing on the equipment itself or on the system cabinet can result in severe personal injury or substantial property damage. Only qualified personnel should be allowed to work on this equipment/system.

Note

This product has been developed, manufactured, tested and documented in accordance with relevant safety standards. Under normal conditions, this product will not be a source of danger to property or life.

Danger

Commissioning is prohibited until it has been determined that the machine in which these components are to be installed meets the requirements of the 89/392/EC guidelines.

Warning

The following rules must be complied with to ensure that the requirements contained in EU guidelines 89/336/EC are complied with.

- The setup guidelines and safety notes in the applicable manuals and supplementary documentation must be adhered to for both the automation system and the SIWAREX U.
- All signal lines to the SIWAREX U must be shielded and applied to a grounded shield retainer rail (see section 2).

2.1 Installing the SIWAREX U

Preparations

Before beginning actual, physical installation, relevant safety precautions must be taken and the following points adhered to or clarified.

- Was the module still in its original packaging ?
- Check the shipment for transportation damages.
- Check the shipment for completeness.

In case of damage or other discrepancies, contact your SIEMENS representative.

Slot

The S7 interface of the SIWAREX U corresponds to the serial I/O bus (P bus) of the SIMATIC S7-300.

All slots of the SIMATIC S7/M7 which can be used by function modules (FM) can also be used for the SIWAREX U.

For additional information, see the SIMATIC S7/M7-300 manual.

The maximum number of SIWAREX U modules which can be installed in the SIMATIC depends on the following factors:

- Maximum number of modules in the central/expansion rack (CR/ER) or modular ET 200M I/O device.
- Memory requirements on the S5-/S7-/C7-/M7-CPU
- Current consumption (5 V) from the S7 backplane bus

Table 2-1 Technical data of the SIMATIC

<table>
<tr><td colspan="2"></td><td colspan="3">Number of plug-in modules in the CR/ER
power feed-in (5 V) on the S7 backplane bus</td><td></td></tr>
<tr><td colspan="2">Type of setup</td><td colspan="3">Central setup</td><td>Distributed setup</td></tr>
<tr><td colspan="2"></td><td>1-line</td><td>2-line</td><td>Max. of
4-line</td><td></td></tr>
<tr><td>CPU</td><td>Working storage of the CPU in Kbytes</td><td>CR</td><td>IM 365</td><td>1 • IM 360
3 • IM 361</td><td>ET 200M

Interface:
IM 153-1 or
IM 153-2</td></tr>
<tr><td>CPU 312 IFM</td><td>6</td><td>8 MOD

800 mA</td><td colspan="2">Multiple-line setup not possible</td><td rowspan="10">7 MOD per IM
1000 mA

Exceptions:
Max. of 8 MOD per IM
For
- CPU 318-2 CP
- CPU 417-4 DP
- CP 443-5 Ext.
- IM 467
Max. of 1 MOD per IM
For
SIMATIC S5-95U/ DP master

The number of slave stations (ET 200M) per CPU depends on the CPU used.

Example:
CPU 315-2 DP with max. of 32 slave stations (ET 200M) per CPU</td></tr>
<tr><td>CPU 313</td><td>12</td></tr>
<tr><td>CPU 314</td><td>24</td><td rowspan="8">8 MOD

1200 mA</td><td>8 + 8 MOD

Total of 1100 mA</td><td>1 • 8 MOD

1 • 850 mA

Plus
3 • 8 MOD

3 • 800 mA

<u>Exception:</u>
For CPU 314 IFM, total of up to 31 modules</td></tr>
<tr><td>CPU 314 IFM</td><td>32</td></tr>
<tr><td>CPU 315</td><td>48</td></tr>
<tr><td>CPU 315-2 DP</td><td>64</td></tr>
<tr><td>CPU 316</td><td>128</td></tr>
<tr><td>CPU 318-2 DP</td><td>512,
Of this, max. of
256 for code
256 for data</td></tr>
<tr><td>CPU 31X-2 DP
CPU 41X-X DP
C7-6XX DP
S5-1X5U with IM 308C</td><td>Depends on the CPU used</td><td>-</td><td>-</td><td>-</td></tr>
</table>

MOD = SIWAREX U modules, CR = central rack, ER = expansion rack

Table 2-2 Requirements on the SIWAREX U side

For use of	Power requirements (5 V) from S7 backplane bus	Requirements on CPU working storage
m • SIWAREX U	m • 100 mA	Approx. m • 100 bytes

m = Number of SIWAREX U modules

2.2 Mounting the Module on the Rail

Note

It is imperative to adhere to EMC guidelines when installing the cables (also those outside the cabinets).

Do not place cables next to energy-technology cables, and shield the cables as described.

In most cases, two-sided shield application is recommended. However, if interference is primarily low-frequency, one-sided shield application may be more effective.

Adhere to the grounding concept of the SIMATIC S7-300 to avoid problems with the potential.

The setup guidelines of the SIMATIC S7 (see manual of the S7-300 programmable controller under setup and CPU data) must be adhered to for all mounting steps, and the following instructions must be performed in the order shown below.

Mounting steps

1. Switch off all voltages on the SIMATIC S7, ensure that it cannot be switched back on again, and mark accordingly.
2. Make or check protective conductor connection. (See setup guidelines)
3. Mount shield connecting element.
   - The shield connecting element must be mounted on the rail directly under the slot in which the SIWAREX U is installed.
   - Each cable to be connected to the SIWAREX U requires a shield terminal on the shield rail of the shield connecting element (see section 2.3 on connection and wiring).
4. Insert bus connector. (See setup guidelines)
   - A bus connector is supplied with each SIWAREX U. The bus connector must be inserted first on the module installed in the slot to the left of the SIWAREX U.
5. Hang SIWAREX U. (See setup guidelines)
6. Screw down SIWAREX U. (See setup guidelines)
7. Label SIWAREX U. (See setup guidelines)

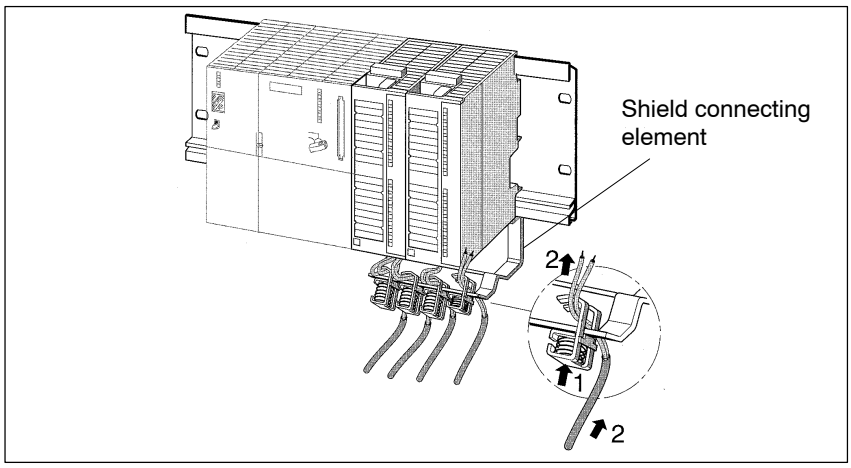


Figure 2-1 Shield connecting element

2.3 Connection and Wiring

Rules for wiring

Since the rules for wiring listed in the table below apply to SIMATIC S7-300 modules, they must also be used for the wiring of front connector on the SIWAREX U.

Table 2-3 Rules for wiring

Rule for	Flexible Line	Flexible Line with Core End Sleeves
Max. line cross section	0.25 to 1.5 mm^2	0.25 to 1.5 mm^2
Number per connection	1	Max. of 2 (in one end sleeve)
Stripping length	6 mm	6 mm
Core end sleeves	-	Without insulation collar (short) DIN 46228
Turning moment	60-80 Ncm	60-80 Ncm

Non-flexible lines may not be used.

Shield terminals

Select the shield terminal size appropriate to the cable diameter.

Securing a cable with the shield terminal requires that approximately 1.5 cm of the cable insulation be cut away at the appropriate location so that the shield is bared. The shield must be cut away starting at the shield terminal (i.e., the cables are not shielded between the shield terminal and the 20-way, multi-point connector strip).

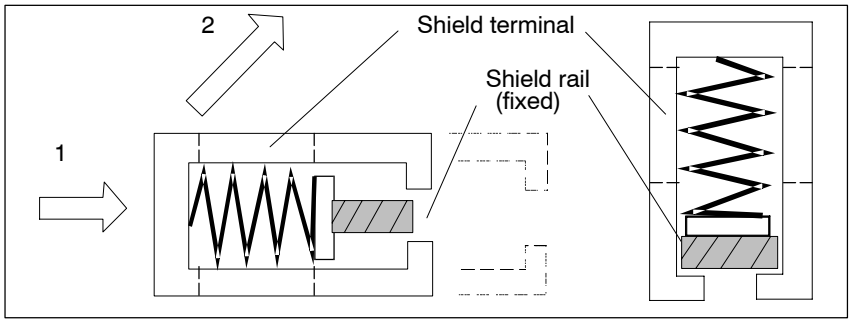


Figure 2-2 Mounting the shield terminals

Caution

Make sure that you do not damage the shield braiding when stripping the cable.

When applying shields to all cables connected to the SIWAREX U, make sure that there is enough cable between the shield connecting element and the SIWAREX U so that the SIWAREX U can be removed with all its cables still connected.

Indication and connection elements

The following figure shows all available indication and connection elements on the front of the SIWAREX U.

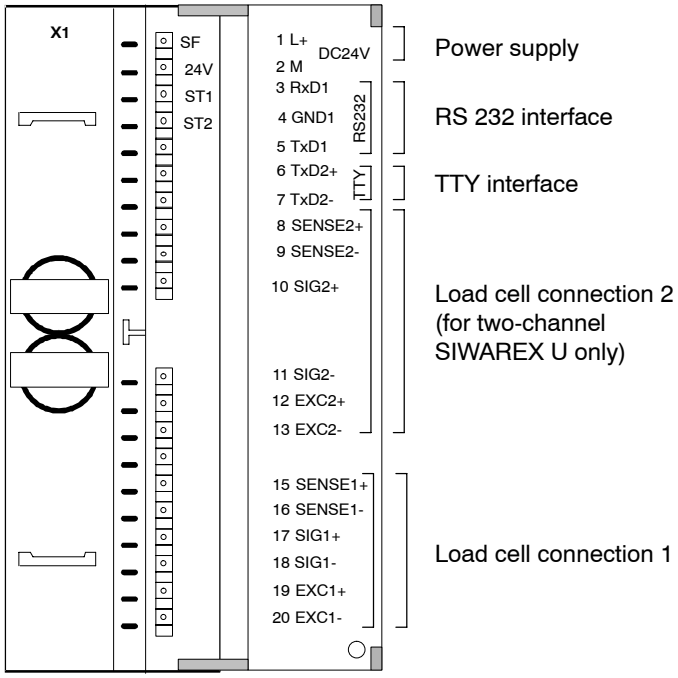


Figure 2-3 Connection elements on the front of the SIWAREX U

Indication elements

Table 2-4 Indication elements on the front of the SIWAREX U

Label	LED Color	Position	Explanation
SF	Red	LED 1	System fault
24 V	Green	LED 2	Power supply
ST1	Yellow	LED 3	Status 1
ST2	Yellow	LED 4	Status 2

Labelling

You can label the individual connections of the front plug connector with a label strip which is included in delivery. This provides customized identification.

Power supply

The SIWAREX U module requires a 24 V power supply.

Its maximum current consumption is 220 mA.

The cables are connected to front connector X1 on screw contacts 1 and 2. (see figure 2-3).

Note

In addition to the 24 V supply via the front connector, the SIWAREX U is powered with 5 V via the backplane bus of the SIMATIC S7. The 5 V current is fed in by the S7 CPU or the IM module.

Front connector

The front connector is equipped with 20 screw contacts for wiring the following connections.

- Power supply
- Load cells
- Serial interfaces (TTY and RS 232C)

The required cable cross sections can be found in this section.

Disconnect the front connector from the module to make connection work easier.

2.3.1 Load Cell Connection

Load cells which can be connected

In principle, all measured value sensors (i.e., load sensors) can be connected to the SIWAREX U provided they meet the following requirements:

- Characteristic value up to 4 mV/V
- Supply voltage 10.3 V
- Measuring procedure based on the Wheatstone bridge

Table 2-5 Allocation of the load cell connection

Screw Terminal	Load Cell	Signal	Meaning
8	U_F +	SENSE2 +	Sensor line + (channel 2)
9	U_F -	SENSE2 -	Sensor line - (channel 2)
10	U_M +	SIG2 +	Meas. voltage + (channel 2)
11	U_M -	SIG2 -	Meas. voltage - (channel 2)
12	U_S +	EXC2 +	Supply voltage + (channel 2)
13	U_S -	EXC2 -	Supply voltage - (channel 2)
14	-	-	Reserved (Do not use.)
15	U_F +	SENSE1 +	Sensor line + (channel 1)
16	U_F -	SENSE1 -	Sensor line - (channel 1)
17	U_M +	SIG1 +	Meas. voltage + (channel 1)
18	U_M -	SIG1 -	Meas. voltage - (channel 1)
19	U_S +	EXC1 +	Supply voltage + (channel 1)
20	U_S -	EXC1 -	Supply voltage - (channel 1)

Load cell connection for normal areas (standard)

Load cells must be connected in accordance with the following rules:

1. A junction box must be used under the following conditions:
   - More than one load cell is connected. (Remember that the load cells must then be switched in parallel.)
   - The distance between load cell and SIWAREX U is greater than the longest available length of load cell connection cable.
2. Under normal conditions, the shield is applied to the cable leadin supports of the junction box. When there is a danger of equipotential bonding currents from the cable shield, an equipotential bonding conductor must be installed parallel to the load cell cable, or the shield terminal in the junction box must be used to apply the shield. An equipotential bonding conductor should be used for EMC (Electro-Magnetic Compatibility) purposes.
3. Twisted core pairs should be used for the lines specified below.
   - (+) and (-) sensor line
   - (+) and (-) measuring voltage line
   - (+) and (-) supply voltage line
4. The shield on the SIWAREX U must be applied to the shield holder element.

Load cell connection for potentially explosive areas

The “SIWAREX IS” Ex-i interface is required when load cells are to be operated in potentially explosive areas.

Load cell connection, 6-wire technique with junction box

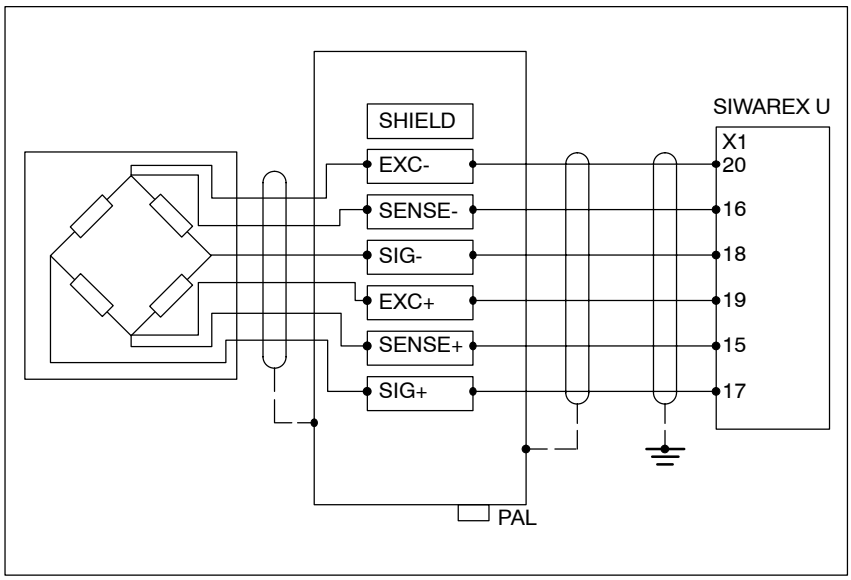


Figure 2-4 Connection of load cells using the 6-wire technique (example: connection to channel 1)

Load cell connection, 4-wire technique with junction box

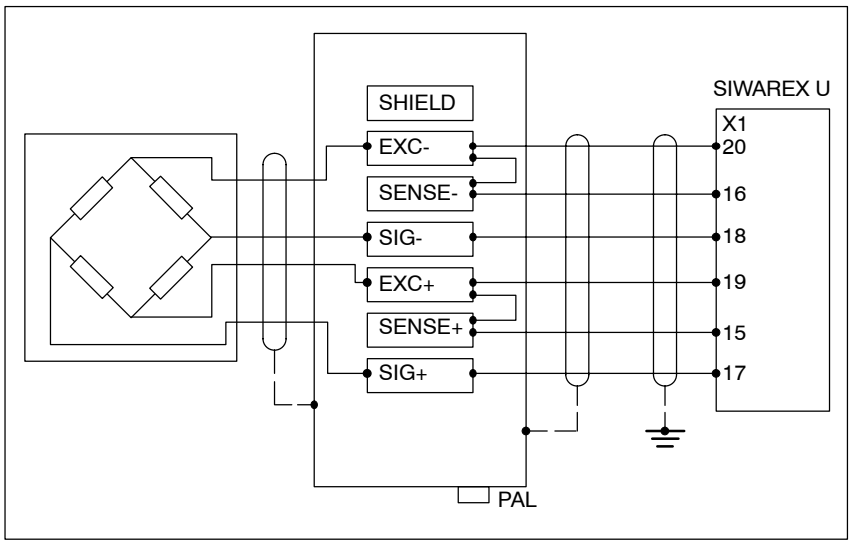


Figure 2-5 Connection of load cells using the 4-wire technique (example: connection to channel 2)

When the 4-wire technique is used to connect the load cells, the signals (SUPPLY+) and (SENSE+), as well as (SUPPLY-) and (SENSE-) must be jumpered in the junction box.

The 6-wire technique must always be used for the connection of the junction box to the SIWAREX U to compensate for temperature and line influences.

Load cell connection, 4-wire technique without junction box

When the 4-wire technique is used to connect the load cells directly to the SIWAREX U the following must be jumpered in the front connector of the SIWAREX U.

- Screw contacts 15 with 19, and 16 with 20 or
- Screw contacts 8 with 12, and 9 with 13

Parallel circuiting of the load cells in the junction box

The cable of each load cell is led through the cable leadin supports (PG screw-type connection). The cable shield must be applied to the PG screw-type connection.

The individual cores of the load cell cable are circuited in parallel to the respective soldering tags (i.e., SUPPLY, SENSE and SIGNAL).

– Solder all feeder voltage lines (+) of the load cells and the weighing electronics to soldering tag “SUPPLY +”.

– Solder all feeder voltage lines (-) of the load cells and the weighing electronics to soldering tag “SUPPLY -”.

– Use the same procedure on all remaining lines.

Soldering tags A and B are reserve connection elements (e.g., for installation of precision resistors for the cut-off load calibration). A cut-off load calibration is usually only performed for scales on which cut-off loads occur (e.g., vehicle scales).

2.3.2 RS 232C Interface

Description

The RS 232C interface uses the RxD and TxD signals.

The interface is non-floating.

The screw contacts of the 20-way multi-point connector strip are used for the connection. A SIWAREX protocol driver is available on the RS 232C interface.

Components which can be connected

The following components can be connected to the RS 232C interface.

- PC (for commissioning/parameterization)
- HOST (link to a control system)

Connection

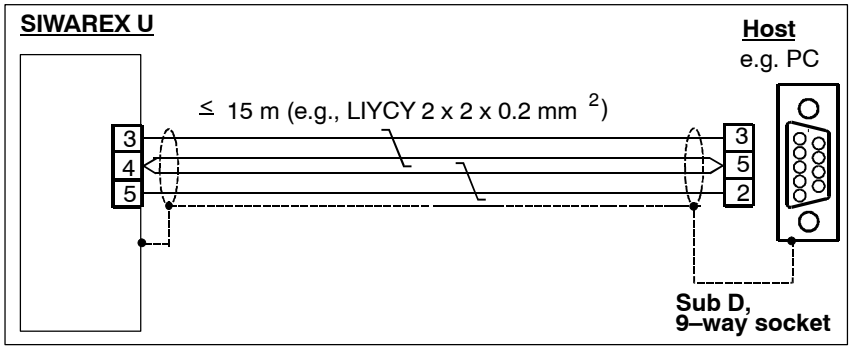


Figure 2-6 Connection of a PC to the RS 232 interface

Assignment

Table 2-6 Assignment of the RS 232C interface for SIWAREX U

SIWAREX U Screw Terminals	Pin Assignment of 9-Way PC Interface	Pin Assignment of 25-Way PC Interface	Signal Name	Explanation
3	3	2	RxD1	Receiving data
4	5	7	GND1	Operating ground
5	2	3	TxD1	Sending data

Interface converter

When the RS 232C interface is to be available for connection during parameterization and diagnostic, this can be done with an interface converter (e.g., from Weidmüller). The interface converter converts the screw terminals to sub D plug connectors (9-way socket).

When an interface converter from screw terminal to 9-way sub D socket is used, the socket should be allocated as shown below so that the same PC plug-in cables (order no. 7MH4 702-8C...) can be used as for the SIWAREX M weighing and proportioning module.

Table 2-7 Assignment of the interface converter

Screw Terminals	Assignment to Sub D Socket	Explanation
3	2	Receiving data, SIWAREX U
4	5	Operating ground, SIWAREX U
5	3	Sending data, SIWAREX U

2.3.3 TTY Interface

Description

The TTY interface uses the TxD signal and must be operated in passive mode (floating).

The screw contacts of the 20-way multi-point connector strip are used for the connection.

Up to four digital remote displays can be connected to the TTY interface. The following values can be indicated on the remote display:

- Weight, measuring channel 1
- Weight, measuring channel 2 (for two-channel SIWAREX U only)
- Specification value 1
  (can be assigned as desired via SIMATIC, PC or host)
- Specification value 2
  (can be assigned as desired via SIMATIC, PC or host)

Connection

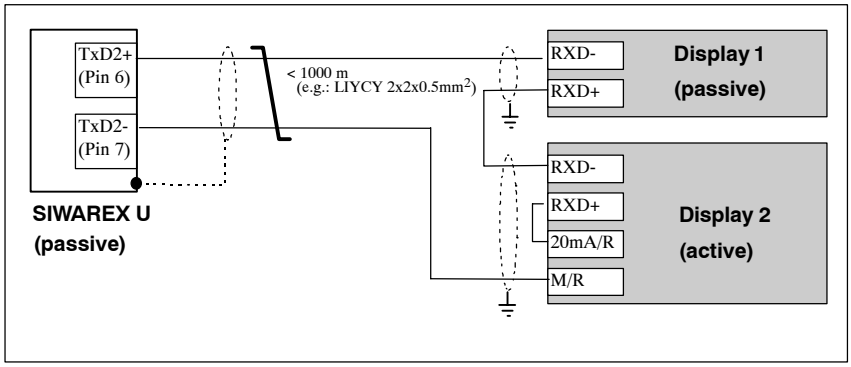


Figure 2-7 Connection of digital remote displays

Assignment

Table 2-8 Assignment

Connection		Meaning of the TTY Interface
PIN	**Signal**	
6	TxD2 +	Sending data + of the SIWAREX U
7	TxD2 -	Sending data - of the SIWAREX U

2.4 Preparing the SIWAREX U for Operation

Introduction

After the module has been mounted and all connections have been set up, a partial function test of the SIWAREX U and all connected components must be performed at this stage of the commissioning procedure.

Perform the individual steps of the partial test in the order specified below.

Visual inspection

Check to determine whether you have performed all steps up to now correctly.

- Is the exterior of the module undamaged ?
- Is the module installed in the correct slot ?
- Have all mounting screws been tightened correctly ?
- Have all connection cables been connected correctly and secured ?
- Has the front plug connector been plugged in correctly ?
- Have all shields been applied to the shield holder element ?
- Have you removed all tools, materials and parts not belonging to the S7 or the SIWAREX U from the mounting rail and the modules ?

Applying 24 V to the SIWAREX U

Turn on the power supply.

Note

The SIWAREX U must be powered over the S7 backplane bus. When the SIWAREX U is used without the SIMATIC S7/M7, an IM 153-1 interface must be used so that the SIWAREX U is supplied with 5 V over the backplane bus.

LED test on the SIWAREX U

After the power is turned on, the SIWAREX U switches to operation mode. If operating correctly, the LEDs below will indicate the following states:

LED (24 V) → ON status

LED (SF) → OFF status

If the LEDs do not indicate the correct states, proceed as described in section 12.

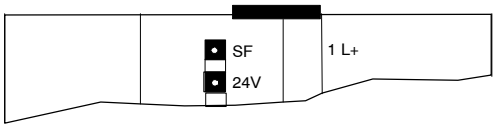


Figure 2-8 Location of the LEDs to be tested

2.5 Assigning Parameters

Introduction

Depending on your system configuration, there are various ways to assign parameters and commission the SIWAREX U.

Use the overview below to select the best method of parameter assignment and commissioning for your special system configuration.

Overview of possible parameter assignments and commissioning

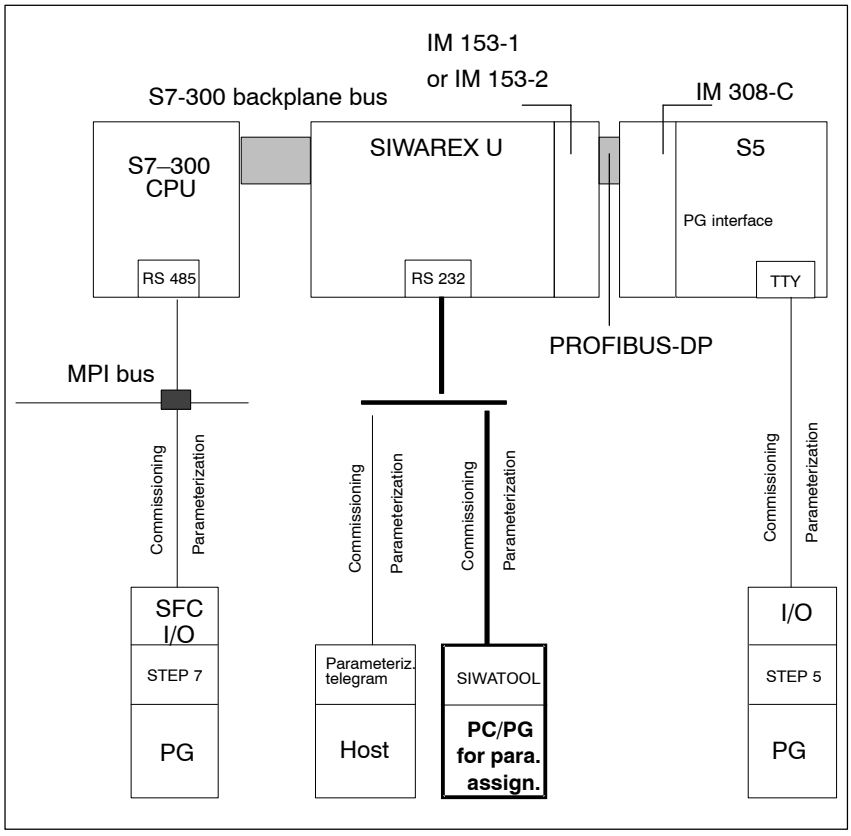


Figure 2-9 Methods of parameter assignment for various system configurations

Link to the SIMATIC S7

Via SFC call (DR communication)

The data records are transferred by SFC calls.

Via I/O area

The data records are transferred over the I/O area.

Link to the SIMATIC M7

Via M7 record call (DR communication)

The data records are transferred via M7LoadRecord or M7StoreRecord calls.

Via I/O area

The data records are tranferred via M7Load_ or M7Store_.

Link to the SIMATIC S5

Via I/O area

The data records are transferred over the I/O area.

Link to the SIMATIC PCS 7

Edit I/O bar of the SIWAREX block in the CFC chart, and then transfer the modified data to the SIWAREX U.

Link to a PC with SIWATOOL

Via PC/PG with SIWATOOL

Install SIWATOOL on the PC/PG.

SIWATOOL uses pull-down menus and runs under WINDOWS.

Note

See section 11 for a description of SIWATOOL and how to use it.

Link to the host

Via data telegram

Data telegrams are used to perform parameter assignment and commissioning.

Function Description

3

Introduction

The SIWAREX U can be integrated in SIMATIC S7-300 and M7-300 automation systems and can also be used as modular periphery in the ET 200M. The SIWAREX U can also communicate with other host systems via the serial interface.

The SIWAREX U handles execution of the weighing functions of a fill level scale within a complete weighing system.

The SIWAREX U can also be used in potentially explosive areas.

Overview

SIWAREX U offers functions, which are listed below:

- Measured value filtering
- Weight calculation
- Setting to zero
- Adjustment of the scales
- Limit value monitoring (min./max.)

This section contains a function description of the SIWAREX U weighing module.

3.1 A/D Conversion (Measured Value Acquisition)

Description

The analog/digital converter supplies a raw measuring value of 16 bits. This corresponds to a resolution of 65,535 parts. The A/D converter is operated in uni-polar mode, but low negative voltages (-4% full scale = total weighing range) can also be acquired.

The raw measuring value (converter value) is determined every 20 msec (every 100 msec for SIWAREX U up to release status 4) and is represented as uni-polar (i.e., without sign).

Calibration

Since the SIWAREX U has been precalibrated at the factory, the module can be exchanged without having to adjust the scales again. A test weight can be used to adjust the SIWAREX U, or a theoretical adjustment can be performed using the characteristic value and nominal load of the load cell.

Adjustment weights are not required for the theoretical adjustment.

3.2 Digital Filtering

Description

An adjustable digital filter compensates for interference caused by vibration and load fluctuations, for example. This filter is particularly recommended if you are using worm drives, vibrating troughs and mixers.

The digital filter has the following features:

- Critical damped filter to the 4th power
- Settable filter frequencies: 0.05 to 5 Hz (factory setting = 2 Hz)
- A floating mean value filter (MVF) can be switched in front of the digital filter.

Illegal filter settings are rejected, and the old value is retained. The filtered, raw, measured value can be viewed in the service data area.

Filtering principle

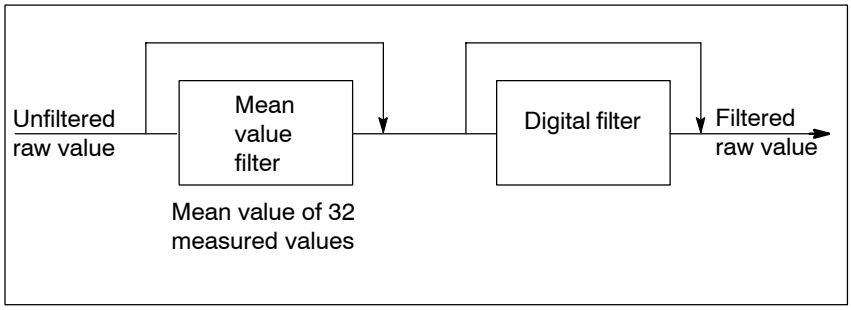


Figure 3-1 Filtering principle of the SIWAREX U

Table 3-1 A/D conversion

Function	Data Record, Channel 1 (Channel 2)					Format	Comments
	S5	S7					
	DR No.	DR No.	From DR Byte	DR Bit	Length (Byte)		
Filter setting	65	3 (4)	2	5-8	10	WORD	Bit 8=0: MVF Inactive (*) Bit 8=1: MVF Active Bit 7-5=000: DF = off Bit 7-5=001: DF = 5 Hz Bit 7-5=010: DF = 2 Hz (*) Bit 7-5=011: DF = 1 Hz Bit 7-5=100: DF = 0.5 Hz Bit 7-5=101: DF = 0.2 Hz Bit 7-5=110: DF = 0.1 Hz Bit 7-5=111: DF = 0.05 Hz
Filtered raw value	73	31 (32)	4	-	10	INT	Unit = digit

(*) Factory setting of SIWAREX U

3.3 Weight Calculation and Adjustment

Weight calculation

Weight calculation is used to convert raw measured values into standardized, gross weight values. The required standardization or adjustment factor is determined during adjustment.

The weight values are represented in integer format, providing a number range from -32,768 to 32,767 for the representation of weight values.

Characteristic value

The characteristic value entry specifies the measuring range set for the A/D converter. Possible entries are 1, 2 and 4 (i.e., three measuring ranges).

The next greater characteristic value must be specified for the values which are between 1, 2 or 4. In individual cases, it is also possible to specify a smaller characteristic value when the load cell(s) is (are) not utilized up to their nominal load.

Decimal place

All input and output values related to weight refer to the same decimal place. This makes the internal calculations independent of the decimal place. The decimal place can be specified between **XXXXX** and **.XXXXX**. The decimal place is only relevant for indications.

Adjustment

Adjustment is performed in 2 steps.

During the first step, the filtered raw value is stored (via “set as zero” command) for the scales zero point in adjustment digit 0.

During the second step, the filtered raw value is stored (via “adjust” command) for the adjustment weight in adjustment digit 1, and the adjustment factor is calculated.

Adjustment digits 0 and 1 are indicated when adjustment has been completed.

Note

When certain commands (i.e., “set as zero”, “adjust” or “factory setting”) are called directly after each other, a waiting period of 5 seconds must be maintained between calls. Otherwise the commands will be rejected by the SIWAREX U.

A timeout prevents the maximum permissible number of write cycles for an EEPROM from being exceeded by an accidental cyclic call of these commands (see section 3.6).

When an attempt is made to call one of these three commands again within these 5 seconds, the command is rejected and the 5-second waiting period is retriggered again.

The minimum adjustment weight must be at least 5 % of the measuring range set. This is checked by the SIWAREX U during the adjustment procedure (≙ 3,000 digits).

The scales are also adjusted by transferring plausible adjustment digits JD0 and JD1 (JD1 ≥ JD 0 + 3,000 digits).

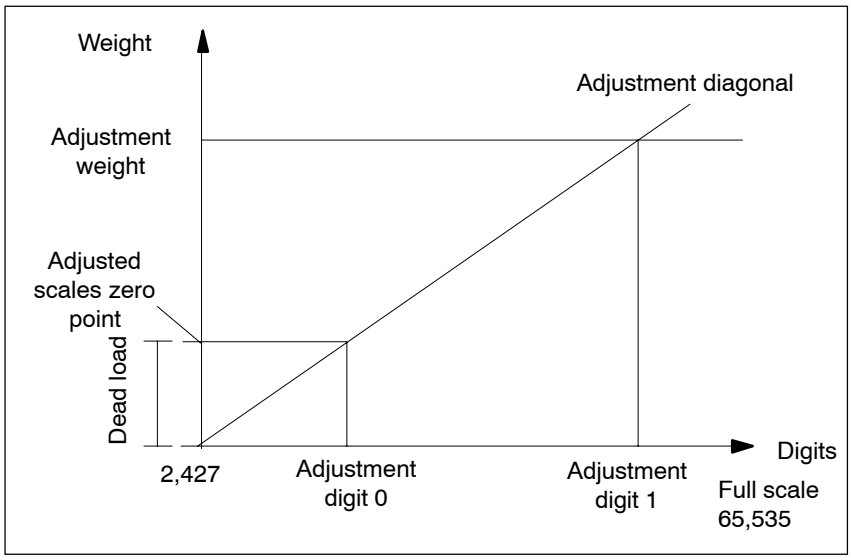


Figure 3-2 Adjustment procedure

Readjustment

When the scales have already been adjusted, readjustment can be performed with the “set as zero” and/or “adjust” command.

Note

The analog/digital converter supplies a raw measuring value of 16 bits. This corresponds to a resolution of 65,535 parts. The A/D converter is operated in uni-polar mode, but low negative voltages (-4 % full scale = total weighing range) can also be acquired.

Theoretical adjustment

In special situations (e.g., no adjustment weights are available, etc.), a theoretical adjustment can be performed although this reduces accuracy depending on the characteristic value tolerances of the load cells. The theoretical adjustment is possible because the modules have already been pre-calibrated at the factory. Use of the theoretical adjustment requires that the physical setup of the scales be correct (e.g., free of force bypasses, cut-off loads, etc.).

There are 2 ways to perform theoretical adjustment.

1. Calculation of the adjustment digits based on the nominal data of the load cells
2. Calculation of the adjustment digits based on the measuring logs of the load cells

Transmission of the JD0 adjustment digits for the zero point of the scales and the JD1 adjustment digits for the nominal load of the load cells on the SIWAREX U then replaces adjustment with adjustment weights.
You can calculate the adjustment digits yourself. Or you can enter the load cell parameters in SIWATOOL and have the calculation done by the program.

Calculation of the adjustment digits also calculates the characteristic curve of the scales. To conclude theoretical adjustment, the empty scales must be set to zero. This determines the dead weight and deducts it from the present weight value.

Calculation of the adjustment digits based on the nominal data of the load cells

1. Set characteristic value range of the SIWAREX U (i.e., 1, 2 or 4 mV/V).
2. Specify the sum of the load cell nominal loads as the adjustment weight.
3. Enter the value 2,427 digits in “JD0 adjustment digits ”.
4. Calculate JD1:

$$\text{JD1} = \frac{\text{Char. value\_WZ} \times 60,680 \text{ digits}}{\text{Char. val. range of SIWAREX U}} + 2,427 \text{ digits; enter and send}$$

5. Unload the scales, and activate the “set to zero” command.
   Remember to use the “set to zero” command and not the “zero point valid” adjustment command.

An even more precise theoretical adjustment can be achieved if the exact data (offset and characteristic value) of the load cells used is known (see measuring log of the load cells).

Calculation of the adjustment digits based on the test records of the load cells

1. The load cells have a nominal characteristic value of 2 mV/V. Therefore, the characteristic value range of the SIWAREX U must be set to 0 to 2 mV/V.
2. Specify the sum of the load cell nominal loads as the adjustment weight.
3. Calculate JD0: $\text{JD0} = \frac{\text{Offset\_WZ} \times 60,680 \text{ digits}}{\text{Char. val. range of SIWAREX U}} + 2,427 \text{ digits}$
4. Calculate JD1:

   $\text{JD1} = \frac{\text{Char. value\_WZ} \times 60,680 \text{ digits}}{\text{Char. val. range of SIWAREX U}} + \text{JD0; enter and send}$

5. Unload the scales and activate the “set to zero” command (“set to zero” not “zero point valid”!)

Example

Since there are no adjustment weights for 20-ton, pig iron scales, a theoretical adjustment is to be performed. The following technical information can be taken from the measuring logs for the 3 load cells used.

	Characteristic Value	Offset
Load cell 1	2.0511 mV/V	+17.23 µV/V
Load cell 2	1.9998 mV/V	-12.47 µV/V
Load cell 3	2.0245 mV/V	-9.01 µV/V
Calculated mean values	2.0251 mV/V	-1.42 µV/V

Calculation of the adjustment digits:

$$JD0 = \frac{-1.42\ \mu V/V \times 60,680\ \text{digits}}{2\ mV/V} + 2,427\ \text{digits} = 2,384\ \text{digits}$$

$$JD1 = \frac{2.0251\ mV/V \times 60,680\ \text{digits}}{2\ mV/V} + 2,384\ \text{digits} = 63,826\ \text{digits}$$

Measured value update counter
Measured value update bit

Starting with release status 5, the measured value update counter and measured value update bit functions are available with SIWAREX U modules.

These two functions can be used to determine via the SIMATIC user program when the SIWAREX U updates its weighing and status values. The functions are only required for special applications (e.g., when an exact time base is required for calculation of material flow).

Measured value update bit

The measured value update bit is inverted on the SIWAREX U module each time the module updates its weighing value. Evaluation of the measured value update bit makes it mandatory that DR31/DR32 (with SFC communication) or the I/O area (with I/O communication) be read out at least every 10 msec.

Measured value update counter

The measured value update counter is incremented on the SIWAREX U module each time the module updates its weighing value.

When the counter reaches 255, it is reset to 0 during the next measuring cycle.

The measured value update counter is only available for SFC communication.

Example:

Ten increments of the measured value update counter (e.g., from 240 to 250 or from 250 to 4) represent ten 20-msec measuring cycles of the SIWAREX U (i.e., a time period of 200 msec).

Commands and Messages

Table 3-2 Commands and messages for adjustment

Function	Data Record, Channel 1 (Channel 2)					Format	Comments
	S5	S7					
	DR No.	DR No.	From DR Byte	DR Bit	Length (Byte)		
Decimal point	65	3 (4)	2	2-4	10	WORD	Bit 4-2=000: xxxxx (*) Bit 4-2=001: xxxx.x Bit 4-2=010: xxx.xx Bit 4-2=011: xx.xxx Bit 4-2=100: x.xxxx Bit 4-2=101: .xxxxx
Characteristic value range	65	3 (4)	2	0-1	10	WORD	Bit 1-0=00: ≤ 1 mV/V Bit 1-0=01: ≤ 2 mV/V (*) Bit 1-0=10: ≤ 4 mV/V Bit 1-0=11: Reserved
Adjustment digit 0	60	3 (4)	4		10	WORD	0 (*)
Adjustment digit 1	61	3 (4)	6		10	WORD	0 (*)
Adjustment weight	62	3 (4)	8		10	INT	10000 (*)
Set as zero	57	11 (12)	0		2	WORD	Selection code (dec.) = 1
Adjust	57	11 (12)	0		2	WORD	Selection code (dec.) = 2
Measured value update bit	I1.5	31 (32)	2	5	10	BYTE	Starting with release status 5
Measured value update counter	-	31 (32)	3		10	BYTE	Starting with release status 5
Illegal code	76 I1.1 (**)	31 (32)	8	3	10	WORD	Synchronous error Pertains to - decimal point, for example.
Scales adjusted	I1.4	31 (32)	2	4	10	BYTE	
Adjustment weight too small	76 I1.1 (**)	31 (32)	8	0	10	WORD	Synchronous error
Wait time of 5 seconds not adhered to	76 I1.1 (**)	31 (32)	8	6	10	WORD	Synchronous error
Job could not be executed due to a malfunction.	76 I1.1 (**)	31 (32)	8	1	10	WORD	Synchronous error
The adjustment weight is negative.	76 I1.1 (**)	31 (32)	8	7	10	WORD	Synchronous error

I/O area: Relative address
(*) Factory setting of SIWAREX U
(**) Group error bit for synchronous errors over input area

3.4 Setting to Zero

Setting to zero

Soiled scales can cause a shift in the zero point of the scales.

The move zero point command sets the scales zero point of the gross weight again. This zero point is then used for all subsequent weighing procedures until the “setting to zero” command is triggered again.

During execution of the setting to zero command, the current digit value is stored in memory where it is available to the interfaces. When calculating the weight, the zero setting value is calculated from the difference to the adjusted zero point.

The SIWAREX U can be set to zero over the entire measuring range.

Note

A parameterization bit can be selected to specify whether the new zero setting value (calculated when the setting to zero command was triggered) is only to be stored in the RAM or in both the RAM and the EEPROM. When the setting to zero command is used frequently, the zero setting value should only be stored in the RAM since the maximum number of write cycles of an EEPROM is limited to 100,000 write cycles. See also maximum number of write cycles of an EEPROM in section 3.6.

When a new zero setting value is specified by a data record transfer (e.g., transfer of data records DR3/DR4/DR64 from the SIMATIC to the SIWAREX U), the zero setting value is always stored in the EEPROM.

Table 3-3 Setting to zero

Function	Data Record, Channel 1 (Channel 2)					Format	Comments
	S5	S7					
	DR No.	DR No.	From DR Byte	DR Bit	Length (Byte)		
Weight value	74 IB2,3	31 (32)	0		10	WORD	
Setting to zero	57	11 (12)	0		2	WORD	Selection code (dec.) = 3
Zero setting value	64	3 (4)	0		10	WORD	0 (*)
Command cannot be executed since scales are not adjusted.	76 I1.1 (**)	31 (32)	8	5	10	WORD	Synchronous error
Waiting time of 5 sec not adhered to	76 I1.1 (**)	31 (32)	8	6	10	WORD	Synchronous error
Job could not be executed due to malfunction.	76 I1.1 (**)	31 (32)	8	1	10	WORD	Synchronous error

Table 3-3 Setting to zero

Function	Data Record, Channel 1 (Channel 2)					Format	Comments
	S5	S7					
	DR No.	DR No.	From DR Byte	DR Bit	Length (Byte)		
Storage of the limit values and the zero setting value	65	3 (4)	2	9	10	WORD	Storage in Bit 9=0: EEPROM (*) Bit 9=1: RAM
Illegal code	76 I1.1 (**)	31 (32)	8	3	10	WORD	Synchronous error

I/O area: Relative address
(*) Factory setting of SIWAREX U
(**) Group error bit for synchronous errors over input area

3.5 Limit Values

Description of limit values

The SIWAREX U has two parameterizable limit values whose switch-on and switch-off points can be specified as desired in units of weight. The entries refer to the gross weight. Any minimum and maximum functions can be parameterized. The status of the limit values is available as status information.

Separate specification of the switch-on and switch-off point makes it possible to specify whether the limit value is to be used as minimum or maximum limit value and how large the hysteresis is to be. A parameterized hysteresis prevents the limit value output from switching on and off continuously when the weight value is hovering around the parameterized limit value, for example.

Specifying switch-on value > switch-off value provides a maximum limit value. Specifying switch-off value > switch-on value provides a minimum limit value.

Note

A parameterization bit can be used to select whether the limit values are only to be stored in the RAM or in both the RAM and the EEPROM. When the limit values are changed frequently, the limit values should only be stored in the RAM since the maximum number of write cycles of an EEPROM is limited to 100,000 write cycles. See also maximum number of write cycles of an EEPROM in section 3.6.

Example

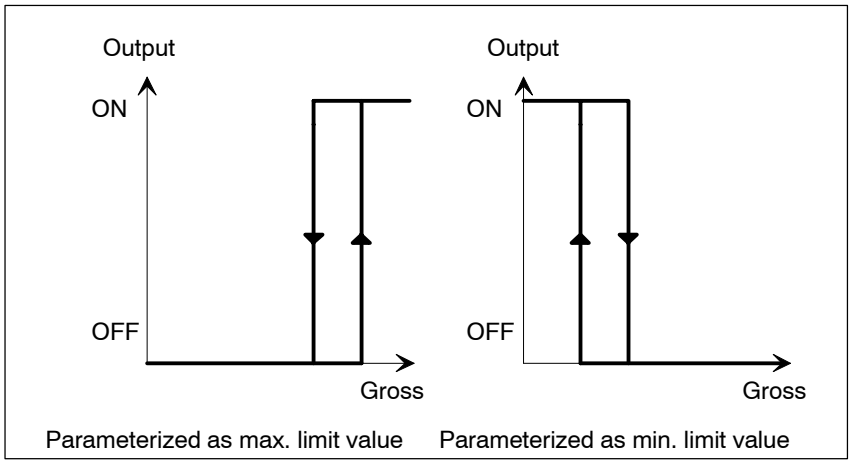


Figure 3-3 Example of assigning parameters

Warning

The limiting values may not be used for safety-related functions.

Special case

Specification of switchon value = cutoff value represents a special case.

The table below provides information on this special case.

Table 3-4 Limit values - special cases

Limit value 1 operates as max. function without hysteresis.	
Active if gross	> Switchon/cutoff point 1
Inactive if gross	≤ Switchon/cutoff point 1
Limit value 2 operates as min. function without hysteresis.	
Active if gross	< Switchon/cutoff point 2
Inactive if gross	≥ Switchon/cutoff point 2

Messages and Data

Table 3-5 Limit values

Function	Data Record, Channel 1 (Channel 2)					Format	Comments
	S5	S7					
	DR No.	DR No.	From DR Byte	DR Bit	Length (Byte)		
Switch-on point for limit value 1	66	21 (22)	0		8	INT	10000 (*)
Switch-off point for limit value 1	67	21 (22)	2		8	INT	9990 (*)
Switch-on point for limit value 2	68	21 (22)	4		8	INT	1000 (*)
Switch-off point for limit value 2	69	21 (22)	6		8	INT	1010 (*)
Storage of the limit values and the zero setting value	65	3 (4)	2	9	10	WORD	Storage in: Bit=0: EEPROM (*) Bit=1: RAM
Limit value 1 has been triggered	I1.2	31 (32)	2	2	10	WORD	Bit=0: LV inactive Bit=1: LV active
Limit value 2 has been triggered.	I1.3	31 (32)	2	3	10	WORD	Bit=0: LV inactive Bit=1: LV active

I/O area: Relative address

(*) Factory setting of SIWAREX U

3.6 Operational Reliability

Booting

To increase operational reliability, the following test procedures are automatically performed during each boot procedure.

- Initialization of the micro-controller
- Initialization of the I/O blocks (e.g., UART, A/D converter, etc.)
- Initialization of the RAM (e.g., pointers, etc.)
- EPROM test
- RAM test
- EEPROM test
- Load parameterization and adjustment data from EEPROM
- Check load cell input for wire break

Wire break monitoring

The signal and sense lines are monitored for wire break. When several load cells are circuited in parallel, the failure of one load cell is not detected (i.e., wire break monitoring only up to the junction box). A wire break in the signal lines is detected when the control limit of the A/D converter is exceeded. A wire break in the sense lines is reported when a drop below a minimum voltage occurs. A wire break in the supply lines is detected indirectly over the sense lines.

The test is performed by the self-test during the booting phase, and then cyclically during operation.

Table 3-6 Messages for the test routines

Function	Data Record, Channel 1 (Channel 2)					Format	Comments
	S5	S7					
	DR No.	DR No.	From DR Byte	DR Bit	Length (Byte)		
Control limit of AD converter dropped below or exceeded	75 I1.0 (**)	31 (32)	6	0	10	WORD	Asynchronous error
Minimum voltage on sense line dropped below	75 I1.0 (**)	31 (32)	6	1	10	WORD	Asynchronous error
Watchdog error	75 I1.0 (**)	31 (32)	6	2	10	WORD	Asynchronous error
EPROM error	75 I1.0 (**)	31 (32)	6	3	10	WORD	Asynchronous error
EEPROM error	75 I1.0 (**)	31 (32)	6	4	10	WORD	Asynchronous error
RAM error	75 I1.0 (**)	31 (32)	6	5	10	WORD	Asynchronous error
AD converter error during read-in	75 I1.0 (**)	31 (32)	6	6	10	WORD	Asynchronous error
Number overflow for gross weight	75 I1.0 (**)	31 (32)	6	7	10	WORD	Asynchronous error
Ext. supply voltage (24 V) missing	75 I1.0 (**)	31 (32)	7	0	10	WORD	Asynchronous error

I/O area: Relative address
(*) Factory setting of SIWAREX U
(**) Group error bit for synchronous errors over input area

Data backup during power failure

The parameters are stored on an EEPROM, safe from loss due to a power failure.

Caution

Since the permissible number of write cycles on the EEPROM is 100,000 cycles, a write-access is only performed when the data to be written differs from the data already stored on the EEPROM. The parameter data (i.e., setting data, limit values, etc.) are stored on the EEPROM. See section 4 for a list of data records which are stored in the EEPROM.

When the limit values are changed continuously or the move zero point command is used frequently, the limit values and the zero setting value should only be stored in the RAM.

Since the number of write cycles on an EEPROM is limited, cyclic write-accesses to the EEPROM by the user program should be avoided.

Table 3-7 Storage of the limit values and zero setting value

Function	Data Record, Channel 1 (Channel 2)					Format	Comments
	S5	S7					
	DR No.	DR No.	From DR Byte	DR Bit	Length (Byte)		
Storage of the limit values and the zero setting value	65	3 (4)	2	9	10	WORD	Storage in: Bit=0: EEPROM (*) Bit=1: RAM

(*) Factory setting of SIWAREX U

3.7 Special Functions

Load default values

When a data loss occurs or errors are made during parameterization, the factory setting status of the SIWAREX U can be restored with the “factory setting” command.

The SIWAREX U changes to the “not adjusted” operating mode and accepts the factory setting as described in section 9. The basic SIMATIC parameters (DR0/DR1) are not affected by this.

Caution

When the two-channel model of the SIWAREX U is used, the “factory setting” command takes effect on both channels.

Note

When certain commands (i.e., “set as zero”, “adjust” or “factory setting”) are called directly after each other, a waiting period of 5 seconds must be maintained between calls. Otherwise the commands will be rejected by the SIWAREX U.

A timeout prevents the maximum permissible number of write cycles for an EEPROM from being exceeded by an accidental cyclic call of these commands (see section 3.6).

When an attempt is made to call one of these three commands again within these 5 seconds, the command is rejected and the 5-second waiting period retriggered again.

Allocation of the status LEDs

The status LEDs can be allocated as desired to an internal status bit, permitting the two most important status messages to be indicated for a particular application.

Table 3-8 Allocation of the status LEDs

Code	Status	Channel
100	Channel error	Channel 1
101	Limit value 1	Channel 1
102	Limit value 2	Channel 1
103	Scales adjusted	Channel 1
200	Channel error	Channel 2
201	Limit value1	Channel 2
202	Limit value 2	Channel 2
203	Scales adjusted	Channel 2

Channel on/off

The measuring channel (measuring channels for two-channel SIWAREX U models) can be switched on and off. If, for example, only one measuring channel of a two-channel SIWAREX U is used at first, the second unused channel should be switched off to prevent it from continuously generating an error message indicating that the scales are not connected.

OD/BASP function

The OD (i.e., Output Disable) or BASP (i.e., command output disable) are not evaluated by the SIWAREX U since the SIWAREX U is not equipped with I/O devices. In the S5, S7 and M7 system, the OD/BASP signal (i.e., CPU operating state Stop) stops interrupts from being output.

100 msec measuring cycle (only for service purposes)

The “100 msec measuring cycle” command sets the measuring cycle from 20 msec to 100 msec for SIWAREX U modules starting with release status 5. The command is used exclusively for service purposes and affects both channels on a two-channel module. Since the setting is only stored in the RAM, the command must be repeated each time the power is turned off/on.The SIWAREX U can also be reset to 20-msec mode by the “load factory settings” command.

Table 3-9 Messages for the special functions

Function	Data Record, Channel 1 (Channel 2)					Format	Comments
	S5	S7					
	DR No.	DR No.	From DR Byte	DR Bit	Length (Byte)		
Load factory setting	57	11 (12)	0		2	WORD	Selection code (dec.) = 5
100 msec measuring cycle (only for service purposes)	57	11 (12)	0		2	WORD	Selection code (dec.) = 100 (only for SIWAREX U starting with release status 5)
Allocation, LED 1	63	5	3		6	BYTE	Selection code 101 (*)
Allocation, LED 2	63	5	4		6	BYTE	Selection code 102 (*)
Channel in operation	65	3 (4)	2	10	10	WORD	0 = channel on (*) 1 = channel off
A nonexistent or inactive channel was addressed.	76 I1.1 (**)	31 (32)	8	2	10	WORD	Synchronous error
Illegal code	76 I1.1 (**)	31 (32)	8	3	10	WORD	Synchronous error

I/O area: Relative address
(*) Factory setting of SIWAREX U
(**) Group error bit for synchronous errors over input area

Overview of System Integration

4

This section describes the available links to various host systems.

4.1 System Integration

Description

There are several ways to link the SIWAREX U with a higher order host system.

The P bus interface (i.e., the internal I/O bus of the SIMATIC S7) on the back of the housing can be used to integrate the SIWAREX U as a function module directly in the SIMATIC S7-300 or SIMATIC M7-300. The SIWAREX U can also be decentrally connected to the SIMATIC S5, SIMATIC S7 or SIMATIC M7 with the modular ET 200M I/O device (slave interface IM 153–1 or IM 153–2).

The RS 232C serial interface permits connection to other host systems (e.g., a host computer).

Caution

No priorities or modification rights are assigned to the individual interfaces with respect to the use of various interfaces. This means that all commands assigned to the interfaces can be issued without restriction to all interfaces at all times. It is up to the user to ensure realistic utilization.

Configurator

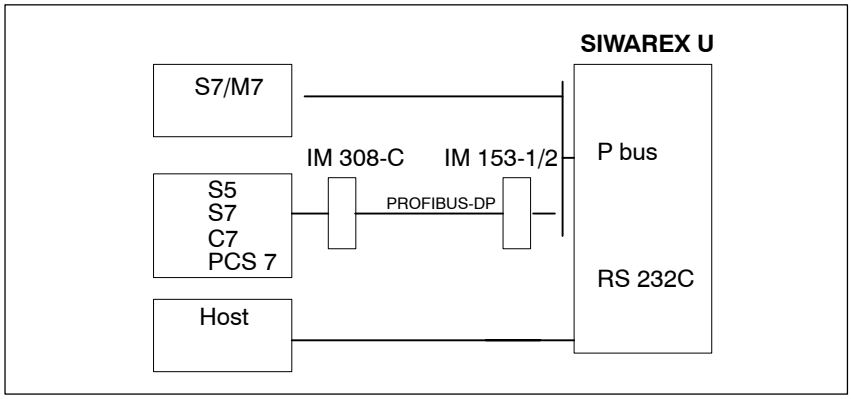


Figure 4-1 Possible links to a host system

Caution

Since only 100,000 write cycles are guaranteed for the EEPROM, write-accesses are only performed when the data to be written differ from the data in the EEPROM. Parameter data (i.e., settings, limit values, etc.) are stored on the EEPROM.

Since the number of write cycles is limited with an EEPROM, cyclic write-accesses to the EEPROM by the user program should be avoided.

Overview of data records

The following table gives you an overview of data records which are provided by the SIWAREX U and are required for communication with a host system.

Table 4-1 Overview of the data records

	DR No.		Function	Channel[1]	Length Bytes	Interfaces[2]			
	Hex.	Dec.				SFC/DR	I/O	RS 232	EEPROM
S7 data records	0/1	0/1	Diagnostic data	-	4/16	O	-	-	No
	0/1	0/1	Basic parameters	-	4/16	I	I	-	No
	3	3	Adjustment data and scales parameters	1	10	I/O	-	I/O	Yes
	4	4	Adjustment data and scales parameters	2	10	I/O	-	I/O	Yes
	5	5	General parameters	-	6	I/O	-	I/O	Yes
	6	6	Specified value, remote display	-	4	I/O	-	I/O	No
	B	11	Commands	1	2	I	-	I	No
	C	12	Commands	2	2	I	-	I	No
	15	21	Limit values	1	8	I/O	-	I/O	3)
	16	22	Limit values	2	8	I/O	-	I/O	3)
	1F	31	Measured values/status/ error	1	10	O	-	I	No
	20	32	Measured values/status/ error	2	10	O	-	I	No
	28	40	Version/checksum	-	8	O	-	I	No
S5/S7 data records (once per channel)	39	57	Commands	X	2	-	I	-	No
	3A	58	Module number	-	2	-	I/O	-	Yes
	3B	59	Interface parameters	-	2	-	I/O	-	Yes
	3C	60	Adjustment digit 0	X	2	-	I/O	-	Yes
	3D	61	Adjustment digit 1	X	2	-	I/O	-	Yes
	3E	62	Adjustment weight	X	2	-	I/O	-	Yes
	3F	63	LED allocation	-	2	-	I/O	-	Yes
	40	64	Zero setting value	X	2	-	I/O	-	Yes
	41	62	Char. value of LC/filter/ setting data	X	2	-	I/O	-	Yes

1) Explanation:
   1: Only channel 1
   2: Only channel 2
   X: Both channels
   -: Not dependent on channel
2) I: Input (from external source to SIWAREX U)
   O: Output (from SIWAREX U to external source)
3) Dependent on parameterization bit

Table 4-1 Overview of the data records

	DR No.		Function	Channel[1)]	Length Bytes	Interfaces[2)]			
	Hex.	Dec.				SFC/DR	I/O	RS 232	EEPROM
S5/S7 data records (once per channel)	42	66	Limit value 1 on	X	2	-	I/O	-	3)
	43	67	Limit value 1 off	X	2	-	I/O	-	3)
	44	68	Limit value 2 on	X	2	-	I/O	-	3)
	45	69	Limit value 2 off	X	2	-	I/O	-	3)
	46	70	Specification value1 for TTY	-	2	-	I/O	-	No
	47	71	Specification value2 for TTY	-	2	-	I/O	-	No
	48	72	Remote display type	-	2	-	I/O	-	Yes
	49	73	Current digit value	X	2	-	O	-	No
	4A	74	Gross	X	2	-	O	-	No
	4B	75	Asynchronous errors	X	2	-	O	-	No
	4C	76	Synchronous errors	X	2	-	O	-	No
	4D	77	Version	-	2	-	O	-	No
	4E	78	Checksum	-	2	-	O	-	No
	4F	79	Reserved	-	2	-	O	-	No
Communication telegrams	64	100	Fetch telegram	-	1	-	-	I	No
	65	101	Acknowledgment telegram	-	3	-	-	O	No

1) Explanation:
   1: Only channel 1
   2: Only channel 2
   X: Both channels
   -: Not dependent on channel
2) I: Input (from external source to SIWAREX U)
   O: Output (from SIWAREX U to external source)
3) Dependent on parameterization bit

Caution

When channel independent data records are transfered to the module and a two-channel module is used, the data can be transferred for the first or second channel. When different values are transferred for both channels simultaneously, the value for channel 2 overwrites the value for channel 1.

SIMATIC S7

5

Note

A knowledge of the SIMATIC S7 is required for comprehension of the steps described in this section.

Introduction

The SIWAREX U is linked as an intelligent function module to the SIMATIC S7-300 system. The interface to the S7 CPU is the backplane I/O bus (P-bus). Since communication between the CPU and the SIWAREX U is handled by either the system functions (SFCs) of the S7 CPU or via the I/O area, no special function block is required for this communication.

Communication will be discussed using a sample STEP 7 program. The RD_REC (SFC 59) and WR_REC (SFC 58) system functions are used in the sample program.

SETUP

The S7 SETUP program must be executed so that the SIWAREX U module is listed in the STEP 7 module catalog. In addition to linking the SIWAREX U in STEP 7, sample STEP 7 programs and SIWATOOL are installed.

DR0 and DR1 basic parameters

Basic parameters DR0 and DR1 can be modified in HW-CONFIG (STEP 7). During rack configuration, the parameterization window of the basic parameters (DR0 and DR1) can be accessed with a double-click after the SIWAREX U modules have been entered (either one or two-channel SIWAREX U models possible). Modified data are stored in an SDB and thus transferred from the CPU to the module each time a startup occurs.

The following can be selected for the basic parameters in the parameter assignment window.

- SFC communication (data record communication)

  Or

- I/O communication

In addition, the process interrupts and/or diagnostic alarms can be enabled or disabled.

The section only describes SFC communication. I/O communication is described in Chapter 6.8. (Connection to SIMATIC S5) and can also be used in SIMATIC S7.

User-related data records

User-related parameters (i.e., parameters for the scales) are kept in data records (DR3 to DR6, 21 and 22, 57 to 79) by the SIWAREX U. They can be transferred in both directions (i.e., read/write).

The transfer can be triggered in the following ways:

a) By the user program (communication via SFCs or I/O)

b) By the user, using SIWATOOL

Parameterization configuration

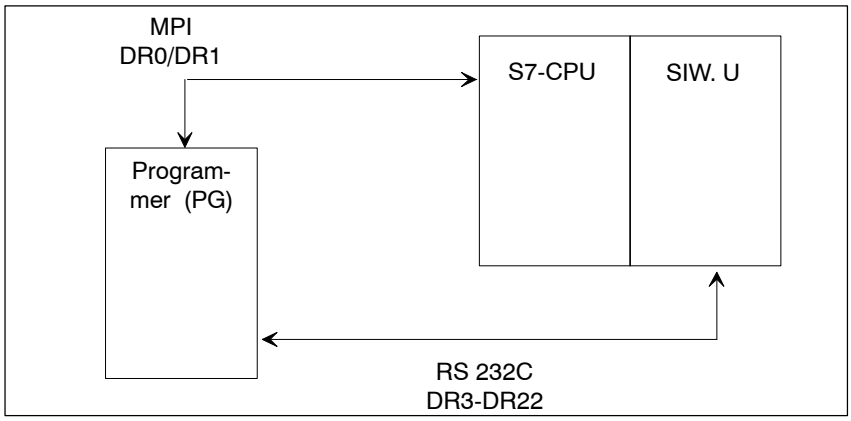


Figure 5-1 Parameterization configuration

Active backplane bus

Connecting and disconnecting the SIWAREX U under power can only be performed in connection with an active backplane bus of the S7-300.

The active backplane bus is based on a special version of the modular ET 200M I/O device which is connected to a SIMATIC S7-400 via PROFIBUS-DP.

Process interrupt

When limit values 1 and 2 are exceeded, a **process interrupt** can be triggered based on the entry in parameter data record 0.

Diagnostic alarm (asynchronous errors)

If enabled in parameter data record 0, external or internal asynchronous errors are reported with a **diagnostic alarm**.

Handling and data errors (synchronous errors)

Handling or data errors which may occur when data or commands are being transferred are made available to the user in a data record. See section 5.1. An interrupt is not triggered.

Sample programs for SIMATIC S7

The sample programs are installed in STEP 7 via the S7 setup and located under “Projects”.

5.1 Diagnostic Capabilities in the SIMATIC S7 Program

Synchronous errors

Synchronous errors are reported in data records DR31 (for weighing channel 1) and DR32 (for weighing channel 2 of a two-channel module).

Proceed as follows.

1. Transfer a data record to the SIWAREX U or trigger a command.
2. Read DR31 or DR32 to determine whether an error has occurred when the data were transferred or the command was triggered. Any error information remains entered in DR31 or DR32 until new data are transferred or a command is triggered.

Asynchronous errors

If a diagnostic alarm is enabled (see parameter data record 0), asynchronous errors are reported with diagnostic alarms to the S7 CPU. The diagnostic messages can be evaluated via local data of OB82 or via diagnostic data records 0 and 1.

Proceed as follows.

1. When a diagnostic alarm is triggered, the diagnostic alarm OB (OB82) is called. If the S7 CPU does not have this OB, the CPU assumes STOP status.
2. When the diagnostic alarm is to be evaluated, a program for evaluating the local data of OB82 or diagnostic data records DR0 and DR1 must be implemented in OB82. See section 10 for the layout of data records DR0 and DR1.

   For additional details on evaluating DR0 and DR1, see the reference manual of the SIMATIC S7-300/400.

Alternate methods:
Asynchronous errors can also be determined by reading data records D31/32 (e.g., when the diagnostic alarm is disabled). Remember, however, that short-term errors may not be acquired when the duration of the error is short in comparison to the cycle in which the data records are read out.

Warning

In the event of errors and faults, suitable measures must be implemented to make the system safe.

Module status (STEP 7)

The module status of the SIWAREX U can be indicated via STEP 7.

Asynchronous errors

Asynchronous errors are reported to the SIMATIC CPU as diagnostic alarms which can be indicated with STEP 7. See figure on diagnostic alarm register.

Diagnostic buffer on the SIWAREX U

Starting with release status 5, SIWAREX U modules have their own diagnostic buffer. Synchronous and asynchronous error messages are entered in this diagnostic buffer and, if necessary, can be indicated via the module information in STEP 7. See figure on diagnostic buffer register. The last 9 entries are listed chronologically. Since the SIWAREX U does not have a clock, time information is relative to the time the SIWAREX U module was turned on.
No entries are made for the date.

To be able to indicate the diagnostic buffer of the SIWAREX U in STEP 7, you will need a SIWAREX U configuration package
(order no. 7MH4 683-3AA6* and at least version 5 of STEP 7).

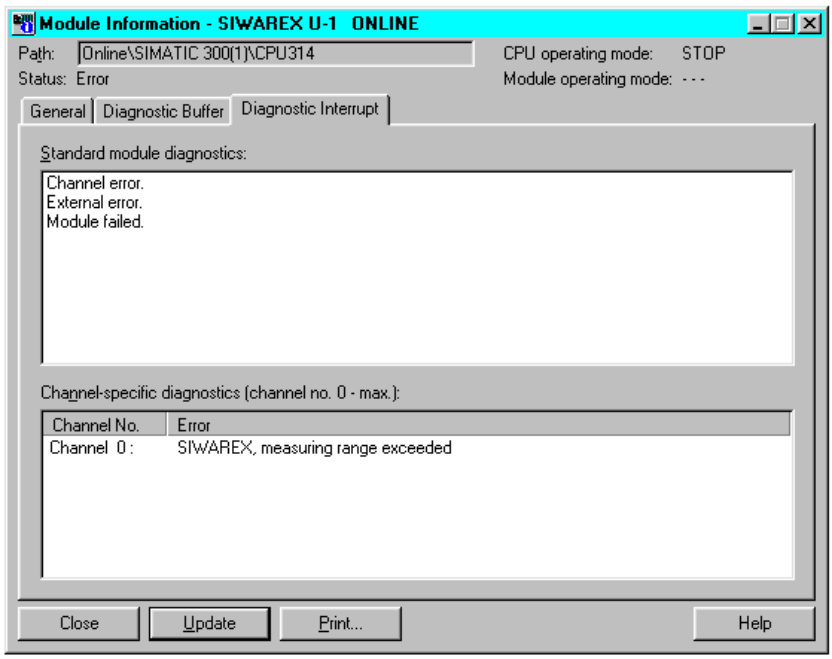


Figure 5-2 Module status in STEP 7

5.2 Evaluation of the Process Interrupts

Process interrupts

When process interrupts are enabled (see parameter data record 0), exceeded limit values are reported to the S7 CPU with process interrupts. These process interrupt messages can be evaluated via the local data of OB40.

Procedure:

1. When a process interrupt is triggered, the process interrupt OB (i.e., OB40) is called. If this OB is not loaded in the S7 CPU, the CPU assumes the "STOP" operating state.
2. When a process interrupt is to be evaluated, a program for evaluating the local data of OB40 must be provided in OB40.

   For additional information on evaluation of the local data of OB40, see the reference manual of the SIMATIC S7-300/400.

Example of evaluating the local data of OB40:

OB40_MDL_ADDR: Reports the logical base address of the module which triggered the interrupt

OB40_POINT_ADDR: Corresponds to local data double word 8

The meanings of the individual bits of local data byte 8 are listed below.

Bit 0:	Channel 1, limit value 1, arriving
Bit 1:	Channel 1, limit value 1, departing
Bit 2:	Channel 1, limit value 2, arriving
Bit 3:	Channel 1, limit value 2, departing
Bit 4:	Channel 2, limit value 1, arriving
Bit 5:	Channel 2, limit value 1, departing
Bit 6:	Channel 2, limit value 2, arriving
Bit 7:	Channel 2, limit value 2, departing

Alternate method:

Another method (e.g., when process interrupts are disabled) is to determine exceeded limit values by reading one of the following.

- Data records DR31/32 (for data record communication)
- The status in the input area of the CPU (for I/O communication)

Remember, however, that briefly exceeded limit values may sometimes not be acquired if the duration of the message is short in comparison to the read cycle of the data records.

5.3 Writing a Data Record with SFC58 “WR_REC”

Description

With SFC58 “WR_REC” (write record), you transfer the data record contained in RECORD to the addressed module.
You start the write job by assigning the value 1 to the input parameter REQ when SFC58 is called. If the write job could be executed immediately, the SFC returns the value 0 at the output parameter BUSY. If BUSY has the value 1, writing is not yet completed.

Parameters

Table 5-1 Parameters for SFC 58 “WR_REC”

Parameter	Declaration	Data Type	Memory Area	Description
REQ	INPUT	BOOL	I, Q, M, D, L, const.	REQ = 1: Request to write
IOID	INPUT	BYTE	I, Q, M, D, L, const.	For SIWAREX U: Always B#16#54
LADDR	INPUT	WORD	I, Q, M, D, L, const.	Logical address of the module
RECNUM	INPUT	BYTE	I, Q, M, D, L, const.	Data record number (permissible values: 3 to 22) For description of the data records, see section 9.
RECORD	INPUT	ANY	I, Q, M, D, L	Data record. Only data type BYTE is permitted.
RET_VAL	OUTPUT	INT	I, Q, M, D, L	If an error occurs while the function is being processed, the return value contains an error code.
BUSY	OUTPUT	BOOL	I, Q, M, D, L	BUSY = 1: The write-access has not been concluded yet.

Input parameter RECORD

The data to be transferred are read from the RECORD parameter when the SFC is first called. If transmission of the data record takes longer than one call, the contents of the RECORD parameter are no longer relevant the next time the SFC is called for the same job.

Error information

If an error occurs while the function is being processed, the return value contains an error code. See table 5-3.

Note

(Only for S7-400)

If general error W#16#8544 occurs, this only means that access to at least one byte of the I/O memory area containing the data record was denied. Data transmission was continued.

Input parameter RECNUM

Specification of the number of the data record to be written.
For a detailed description of the data records, see section 10.

5.4 Read Data Record with SFC 59 “RD_REC”

Description

SFC 59 “RD_REC” (read record) is used to read the data record with the number RECNUM from the addressed SIWAREX U module. The read procedure is started by assigning 1 to the REQ input parameter when SFC 59 is called. If the read-access was able to be executed immediately, the SFC returns the value 0 in the BUSY output parameter. If BUSY contains the value 1, the read-access has not been concluded yet. After correct data transmission, the data record which was read is entered in the target area specified by RECORD.

Parameters

Table 5-2 Parameters for SFC 59 “RD_REC”

Parameter	Declaration	Data Type	Memory Area	Description
REQ	INPUT	BOOL	I, Q, M, D, L, const.	REQ = 1: Request to read
IOID	INPUT	BYTE	I, Q, M, D, L, const.	For SIWAREX U: Always B#16#54
LADDR	INPUT	WORD	I, Q, M, D, L, const.	Logical address of the module
RECNUM	INPUT	BYTE	I, Q, M, D, L, const.	Data record number (permissible values: 3 to 40) For description of the data records, see section 10.
RET_VAL	OUTPUT	INT	I, Q, M, D, L	If an error occurs while the function is being processed, the return value contains an error code.
BUSY	OUTPUT	BOOL	I, Q, M, D, L	BUSY = 1: The read-access has not been concluded yet.
RECORD	OUTPUT	ANY	I, Q, M, D, L	Target area for the data record which was read

Input parameter RECNUM

Specification of the number of the data record to be written
For a detailed description of the data records, see section 10.

Output parameter RET_VAL

If an error occurred while the function was being processed, the return value contains an error code. See table 5-3.

Note

(Only for S7-400)

If general error W#16#8745 occurs, this only means that access to at least one byte was not possible during the write-access to the process image. The data record was read correctly by the module and written to the I/O memory area.

RECORD

The length information contained in the RECORD output parameter is interpreted as follows.

Length of the data to be read from the selected data record (i.e., the length information contained in RECORD may not be greater than the actual length of the data record).

We recommend selecting the length of the actual data record as the length of RECORD.

Error information

A distinction is made between two types of errors in the "real" error information (error codes W#16#8xyz) in table 5-3.

Temporary errors (error codes W#16#80A2 to 80A4, and 80Cx)
⇒ Repeat the procedure (call SFC again).
Example of a temporary error:
Required resources are temporarily busy (W#16#80C3).

Permanent errors (error codes W#16#809x, 80A0, 80A1, and 80Bx)
This type of error will not correct itself (i.e., its correction requires action by you). There is no point in calling the SFC again until you have corrected the error.

Example of a permanent error:
Wrong length specified in RECORD (W#16#80B1)

Table 5-3 Specific error information for SFC 58 "WR_REC" and SFC 59 "RD_REC"

Error Code (W#16#...)	Explanation	Restrictions
7000	First call with REQ = 0: No data transmission active. BUSY has value 0.	-
7001	First call with REQ = 1: Data transmission triggered. BUSY has value 1.	Distributed I/O
7002	Interim call (REQ irrelevant): Data transmission already active. BUSY has value 1.	Distributed I/O
8090	Specified logical base address invalid: No assignment exists in SDB1/SDB2x or there is no base address.	-

Table 5-3 Specific error information for SFC 58 “WR_REC” and SFC 59 “RD_REC”

Error Code (W#16#...)	Explanation	Restrictions
8092	ANY reference contains a type other than BYTE.	Only with S7-400
8093	The module selected via LADDR and IOID is not permitted for this SFC. Permitted are S7-300 modules for S7-300, S7-400 modules for S7-400, and S7-DP modules for S7-300 and S7-400.	-
80A0	Negative acknowledgment while reading from the module (i.e., module removed during the read-access or module defective).	Only for SFC 59 “RD_REC”
80A1	Negative acknowledgment while writing to the module (i.e., module removed during the write-access or module defective).	Only for SFC 58 “WR_REC”
80A2	DP protocol error in layer 2, possibly hardware fault.	Distributed I/O
80A3	DP protocol error for user interface/user, possibly hardware fault.	Distributed I/O
80B0	SFC for module type not possible Module does not recognize the data record. Data record number ≥ 241 not permitted. Data records 0 and 1 are not permitted for SFC 58 “WR_REC.” This error can also occur when the SIWAREX U is addressed via SFCs although I/O communication is set as the type of communication.	-
80B1	Wrong length in RECORD parameter	For SFC 58 “WR_REC”: Wrong length For SFC 59 “RD_REC”: Specification > DR length
80B2	The configured slot is not being used.	-
80B3	Actual module type is not the module type in SDB1.	-
80C0	The module has the data record, but there are still no data to be read	-
80C1	The data of the previous write job on the module for the same data record have not yet been processed by the module.	-
80C2	The module is currently processing the maximum possible amount of jobs for a CPU.	-
80C3	Required resources (e.g., memory, and so on) are currently busy.	-
80C4	Communication error: Parity error SW-Ready not set Error in block length calculation Checksum error on CPU side Checksum error on module side	-
80C5	Distributed I/O not available	Distributed I/O
80C6	Transmission of data record was terminated due to priority class termination (restart or background).	Distributed I/O

Note

For additional information on error codes which are not listed here, see the documentation of the SIMATIC S7.

5.5 Sample Program

Example of writing a data record

The specified values are stored in data block DB50 starting at address 30 (4 bytes). These values should be transferred to the SIWAREX U.

```
CALL SFC 58
     REQ       :=TRUE          // Request to write
     IOID      :=B#16#54       // 54 means I/O module
     LADDR     :=W#16#100      // Module address 256
     RECNUM    :=B#16#6        // Data record number 6 (specified values)
     RECORD    :=P#DB50.DBX 30.0 BYTE 4
     RET_VAL   :=MW200         // Return value (error code)
     BUSY      :=M210.0        // BUSY status
```

Note on RECORD:

Data from data block DB50
→ Starting at address 30.0
→ Data record length: 4 bytes
If the data record length is specified incorrectly, this is reported with an appropriate error code.

Example of reading a data record

The measured value, status and so on (data record 31) is to be read from the SIWAREX U and stored in data block DB50 starting at address 0.0 (total of 10 bytes).

```
CALL SFC 59
     REQ       :=TRUE          // Request to read
     IOID      :=B#16#54       // 54 means I/O module
     LADDR     :=W#16#100      // Module address 256
     RECNUM    :=B#16#1F       // Data record number 31 (measured values, etc.)
     RET_VAL   :=MW200         // Return value (error code)
     BUSY      :=M210.0        // BUSY status
     RECORD    :=P#DB50.DBX 0.0 BYTE 10
```

Note on RECORD:

Data in data block DB50
→ Starting at address 0.0
→ Data record length: 10 bytes
If the data record length is specified incorrectly, this is reported with an appropriate error code.

For the S7 400 CPUs and data set lengths of 2 or 4 bytes, the data source must be absolutely defined as 2 or 4 bytes because the S7 program editor otherwise calculates a direct address from the ANY pointer.

Example:
DB10.DBW10 is defined as a word in DB 10 and you write RECORD=:P#DB10.DBX10.0 Byte 2. The S7 program editor converts this to DB 10.DBW18, which is not accepted by a S7-400 CPU. Error 0x8092 is output in the “RET_VAL” of the SFC.

SIMATIC S5

6

Note

A knowledge of the SIMATIC S5 and COM ET200 Windows or COM PROFIBUS is required for comprehension of the steps described in this section.

Link to the SIMATIC S5

The SIWAREX U module can be linked as distributed I/O to the SIMATIC S5 using PROFIBUS-DP.

The modular ET 200M I/O device (IM 153-1 or IM 153-2 interface) is required to link the SIWAREX U modules to PROFIBUS-DP. The SIMATIC S5 is coupled to PROFIBUS-DP with the IM 308-C interface. A SIMATIC S5-95U/DP master with integrated PROFIBUS-DP interface can also be used instead.

6.1 Hardware Prerequisites

IM 308-C

Release status 4 or later

When the diagnostics are used:

- IM 308-C, starting with release status 6 (firmware status starting with V3.0)
- FB 192 starting with library number ...-A3 (i.e., release status 3)

Note

An FB 192 with release status 3 can only be used with an IM 308-C starting with release status 6.

When release status 2 of the FB 192 is used, all versions of the IM 308-C can be used starting with release status 3.

Note

Loading the firmware to the IM 308-C is described in section 3.5 of the manual on the ET 200 (release 3). V 3.0 firmware can only be executed on an IM 308-C starting with release status 6.

S5-95U/DP master

Release status 2 or later

The maximum transmission speed is 9600 Kbaud to 1.5 Mbaud, depending on the cable length.

Transmission speeds

The transmission speed is limited for the IM 308-C with release status 3 (firmware status 2.0). The speed depends on the capacity of the CPU. The table below shows the maximum speeds. The values shown in the table are calculated values.

Table 6-1 Maximum transmission speeds

CPU	IM 308-C with Release Status 3	IM 308-C with Release Status 4 or Later
CPU 941, 942	19.2 Kbaud	12 Mbaud
CPU 943	93.75 Kbaud	12 Mbaud
CPU 944	1.5 Mbaud	12 Mbaud
CPU 945	12 Mbaud	12 Mbaud
CPU 922	187.5 Kbaud	12 Mbaud
CPU 928	500 Kbaud	12 Mbaud
CPU 946/947	3 Mbaud	12 Mbaud
CPU 948	12 Mbaud	12 Mbaud
SIMATIC S5-95U (starting with release status 2): 1.5 Mbaud		

IM 153-1

An IM 153-1 (MLFB no: 6ES7 153-1AA02-0XB0), Release status 2 or later is required for the link.

Up to 7 SIWAREX U modules can be connected to one IM 153-1 interface.

Exception: Maximum of one SIWAREX U per IM 153-1 with distributed connection to a SIMATIC S5-95U/master DP
Maximum of 8 SIWAREX Us per IM 153-1 with distributed connection to a SIMATIC S7 (CPU 318-2 DP, CPU 417-4 DP, CP 443-5 Ext., and IM 467)

IM 153-2

An IM 153-2 is only required when other modules need it (e.g., FM 353). Prerequisite for connection is an IM 153-2
(MLFB no. 6ES7 153-2AA01-0XB0) with release status 2 or greater.

A maximum of 7 SIWAREX U modules can be connected to one IM 153-2.

Exception: Maximum of one SIWAREX U per IM 153-2 with distributed connection to a SIMATIC S5-95U/master DP
Maximum of 8 SIWAREX Us per IM 153-2 with distributed connection to a SIMATIC S7 (CPU 318-2 DP,
CPU 417-4 DP, CP 443-5 Ext., and IM 467)

6.2 Delivery Form

The SIWAREX U configuration package is delivered on CD-ROM.

For additional information, see the documentation of the configuration package.

6.3 Parameterization

SIWAREX U

There are two ways to parameterize the SIWAREX U.

- Parameterization of the SIWAREX U via the PC parameterization software “SIWATOOL”
- Parameterization of the SIWAREX U via the SIMATIC S5 (via data record transmission or ForceVar)

The DR0 basic parameters are parameterized with COM PROFIBUS.

COM PROFIBUS

The SIWAREX U module is informed of the type of CPU master it is connected to when the programmable controller starts up. PROFIBUS-DP can be used to connect the SIWAREX U to a SIMATIC S7 or a SIMATIC S5.

The S5-95U/DP master or IM 308-C interface module is parameterized with the COM PROFIBUS software. With newer COM PROFIBUS versions, you should be able to find the SIWAREX U module within the ET 200M (i.e., the IM 153-1 interface) under its order number 7MH4 601-1*A01. See figure 7-1.

If you are unable to find the SIWAREX U, you must copy the type or GSD files contained in the SIWAREX configuration package to the appropriate directory of COM PROFIBUS. Which files must be copied depends on the version of COM PROFIBUS which you are using.

- COM PROFIBUS (version ≤ 3.2): Copy the type files to directory “TYPDAT5X”.
- COM PROFIBUS (version ≥ 3.3): Copy the GSD files to the directory “GSD”.

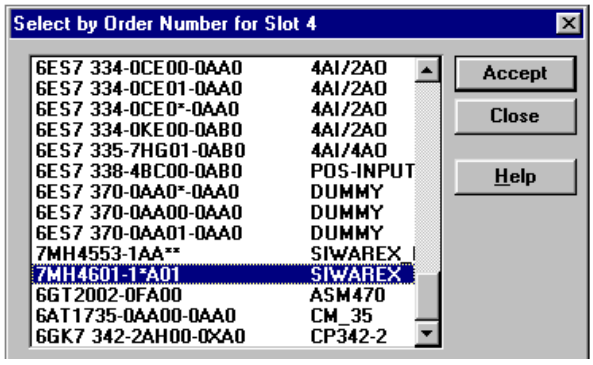


Figure 6-1 Selection of SIWAREX U module during configuration of the ET 200M

Table 6-2 Type and GSD files

File Name	Use
SI801DV*.200	Typ file for IM 153-1
ST801EU*.200	Typ file for IM 153-2
SIM801D.GS*	GSD file for IM 153-1
SIM801E.GS*	GSD file for IM 153-2
SIM8071.GS*	GSD file for IM 153-2 FO

* Identifies the particular language version

Note

The latest GSD files (only for COM PROFIBUS versions ≥ 3.3) can be downloaded from the Internet (SIMATIC customer support).

Copy the new GSD files to the “GSD” directory, and execute the menu command “read file > GSD files.”

The disadvantage of using the GSD files included in the SIWAREX configuration package is that you will not have the latest GSD file and may not be able to find other new modules, for example.

The type files are only required for older COM PROFIBUS versions ≤ 3.2. In the future, they will be completely replaced by the GSD files.

6.4 Addressing the SIWAREX U

Module address (when IM 308-C is used)

The same start address is used for the input area and the output area. The SIWAREX U module occupies 16 bytes in the input area and 16 bytes in the output area. The module address must be a whole-number multiple of 16. The start address is also required for the configuration via COM PROFIBUS.

Addressing in the process image (i.e., PY0 to PY127) is not permitted.

Table 6-3 Possible addresses

SIWAREX U number[1)]		1	2	3	4	5	6	7	8
Possible SIWAREX U addresses	P:	128	144	160	176	192	208	224	240
SIWAREX U number		9	10	11	12	13	14	15	16
Possible SIWAREX U addresses	Q:	0	16	32	48	64	80	96	112
SIWAREX U number		17	18	19	20	21	22	23	24
Possible SIWAREX U addresses	Q:	128	144	160	176	192	208	224	240

1) There is no fixed relationship between the SIWAREX U number and the address. Up to 24 SIWAREX U modules can be connected to each IM 308-C interface.

Module address when using the S5-95U/DP

Input/output bytes 64 to 127 are used for both the local I/O (e.g., analog input/output modules, slots 0 to 7) and the distributed I/O (i.e., DP slaves). When the local I/O is used (e.g., analog input/output modules), the address areas must be reserved by the user in the host parameters with COM PROFIBUS.

Table 6-4 Possible addresses

SIWAREX U number		1	2	3	4	5	6	7	8
Possible SIWAREX U addresses	P:	64	80	96	112	128	144	160	176

Data consistency

Data consistency must be ensured when accessing the distributed I/O. Data are called consistent when their contents belong together.

SIMATIC S5-95U/DP master

There are two areas of consistency (i.e., I/O addresses 64 to 127 and 128 to 191). Overlapping of these areas in a DP slave causes data inconsistency and must thus be avoided.

IM 308-C

Data consistency for the IM 308-C is enabled on by read or write accessing an enable byte. As long as data consistency is on, the DP slaves are not poled and the data cannot be changed during the access procedure. Data consistency is disabled again by read or write accessing a disable byte.

Which byte is the enable byte and which is the disable byte depends on the CPU used. For more information see the manual of the ET 200.

6.5 Types of Addressing of the IM 308-C

The IM 308-C can be operated in the operating modes “linear addressing” and “page frame addressing.”

Linear addressing

Linear addressing can be used in the P and Q area of the CPU. Linear addressing has the advantage of not having to first select an appropriate page frame before SIWAREX U modules can be accessed.

If possible, use linear addressing.

Page frame addressing

When page frame addressing is used, 16 page frames with page frame numbers n to (n+15) are set up on each IM 308-C. The first page frame number (i.e., n) is used as the number of the IM 308-C. The number of the IM 308-C is a multiple of 16. It is entered with COM PROFIBUS under the master parameters.

Using a maximum configuration, 256 page frames can be set up distributed over 8 IM 308-C modules.

Before the I/O area is called for a SIWAREX U, the appropriate page frame must be entered in the address area of the CPU. The number of the desired channel is written in the **page frame selection address** (PY 255 for P-page frame addressing and QB 255 for Q-page frame addressing).

Note

Remember that after the page frame is selected via the **page frame selection address**, it is very important to ensure that communication via the I/O area cannot be interrupted by a time OB or an interrupt OB since this would change the page frame in the OB which was called.

There are two ways to prevent such a conflict.

1. Calls of time OBs, interrupt OBs and similar are disabled until a page frame is selected via the page frame selection address. The page frame is then selected and communication with the SIWAREX U takes place. After communication is concluded, the time and interrupt OBs are enabled again.
2. If, for example, a time OB is called while the I/O area of the SIWAREX U is being processed, the page frame selection must be saved in a flag byte. All page frames can now be selected in the time OB. The “old” page frame must be reset before the time OB is exited so that the user program can continue processing under the same page frame number.

If none of these measures are taken, the wrong SIWAREX U module may be accessed.

For further information, see the appropriate documentation of the IM 308-C.

6.6 Types of Addressing of the S5-95U

Only linear addressing can be used for the S5-95U/DP master.

6.7 Principle of Communication

Basic parameters DR0 and DR1

The basic parameters DR0 and DR1 are permanently stored in a type or GSD file (ET 200M) and are transferred to the SIWAREX U each time the SIMATIC S5 CPU starts up.

The following parameters can be assigned via COM PROFIBUS.

- Process interrupts: On/off
- Diagnostic alarms: On/off

Because of an entry in DR0, the SIWAREX U switches the interface to S5 mode. In S5 mode, the SIWAREX U can be addressed via the I/O area.

User-related parameters

User-related parameters can be modified by transferring data records DR57 to DR79 (byte or word accesses in the I/O area). **The type or GSD file of the SIWAREX U only permits byte accesses.**

Any handling or data errors (synchronous errors) are reported to the user, and the error information is made available.

Data records 3 to 40 cannot be transferred via the I/O area.

Interface to the SIMATIC S5

The SIWAREX U can be decentrally linked to the SIMATIC S5 via the PROFIBUS interface modules IM 308-C (SIMATIC S5) and IM 153-1 or IM 153-2 (ET 200M). Data are transferred in 2-byte data records. A special function block for communication with the SIWAREX U is not required.

The one-channel and the two-channel SIWAREX U modules each occupy 16 bytes in the input area and 16 bytes in the output area.

6.8 Allocation of the Input/Output Area

Table 6-5 Input/output of the SIWAREX U

Weighing Channel	Byte	S5 Output Area 2)	S5 Input Area2)
1	0	Read read-identifier (n) for DR (n) and DR (n+1)	Read read-identifier acknowledgment n for DR (n) and DR (n+1)
	1	Write write-identifier m for DR (m)	Status byte
	2	Not yet used	Weight (H) (is updated cyclically)
	3	Job control	Weight (L) (is updated cyclically)
	4	Value input (H) in acc. w. identifier m	Value output (H) in acc. w. identifier n
	5	Value input (L) in acc. w. identifier m	Value output (L) in acc. w. identifier n
	6	Specified value 1 (H) (is transferred cyclically)	Value output (H) in acc. w. identifier n+1
	7	Specified value 1 (L) (is transferred cyclically)	Value output (L) in acc. w. identifier n+1
2 1)	8 1)	Read read-identifier (n) for DR (n) and DR (n+1)	Read read-identifier acknowledgment n for DR (n) and DR (n+1)
	9 1)	Write write-identifier m for DR (m)	Status byte
	10 1)	Not yet used	Weight (H) (is updated cyclically)
	11 1)	Job control	Weight (L) (is updated cyclically)
	12 1)	Value input (H) in acc. w. identifier m	Value output (H) in acc. w. identifier n
	13 1)	Value input (L) in acc. w. identifier m	Value output (L) in acc. w. identifier n
	14 1)	Specified value **2** (H) (is transferred cyclically)	Value output (H) in acc. w. identifier n+1
	15 1)	Specified value **2** (L) (is transferred cyclically)	Value output (L) in acc. w. identifier n+1

1) Only used by two-channel SIWAREX U (same meaning as bytes 0 to 7)
2) Corresponds to the P or Q area of the SIMATIC S5

Example

SIWAREX U starting at address 128 (P area)

Commands to read the status byte:

```
L    PY   129
T    MB   200
```

Table 6-6 Job control (output byte 3)

Bit No.	Designation	Bit = 0	Bit = 1
0-5	Reserved		
6	Life bit	Can be specified by the user as desired. Is imaged by the SIWAREX U in the status bits.	
7	Job bit	Must be checked by the user for equality with job acknowledgment bit. See status. Must be inverted by the user to trigger a new job (data transfer, command)	

Table 6-7 Status byte (input byte 1)

Bit No.	Designation	Bit = 0	Bit = 1
0	Group error (asynchr. error)	No int./ext. error exists.	Int./ext. error exists.
1	Synchr. error	No error occurred during last write access.	Error occurred during last write access.
2	Limit value 1	Limit value 1 not active	Limit value 1 active
3	Limit value 2	Limit value 2 not active	Limit value 2 active
4	Scales adjusted	Scales not adjusted	Scales adjusted
5	Measured value update bit	Is inverted each time the SIWAREX U updates its measured value (starting with release status 5)	
6	Life bit acknowledgment	Is set or cleared based on the life bit	
7	Job acknowledgment bit	Is set or cleared based on the job bit after the job has been executed	

6.9 Description of Data Transmission

Addresses

The addresses are specified relative to the base address of the SIWAREX U module. The addresses for weighing channel 1, are given below.

Life bit

The life bit can be used to determine whether the module is still “alive.” The life bit must be evaluated for this purpose in status (I1.6). When the status of the life bit in status (I1.6) is equal to that in the job control (Q3.6), the SIWAREX U is still “alive.”

The life bit must then be inverted in job control. The SIWAREX U resets status to the same status for the life bit.

When this does not happen within a certain period of time, a module or communication failure has occurred. The time starting at which a module is declared as failed can be specified via the user program.

Measured value update bit (starting with release status 5)

The measured value update bit is inverted on the SIWAREX U module each time the weight value is updated. See also section 3.3.

Measured value, status and specified value

The weight value (IW2) and the status byte (IB1) are all cyclically updated by the SIWAREX U every 20 msec (every 100 msec up to release status 4).

The specified value for the remote displays can be specified via QW6. It is cyclically read by the SIWAREX U and output to the remote displays.

When the life bit determines that the SIWAREX U is “alive,” the measured value, status and specified value have also been updated.

Note

Since synchronous errors cannot be triggered by the specified value, information provided by QW6 has no effect on the error status (synchronous errors).

Read data records

If other data records are required in the SIMATIC S5 in addition to the measured value and the status, these can be read via the value output area (IW4, IW6).

Only the data records selected are read in the 4-byte value output area. Read-identifier n (QB0) is used to determine which data records are to be read from the SIWAREX U. Data record n and the next data record (n+1) are read and entered in the value output area.

The read-identifier acknowledgment (IB0) is now used to check to determine whether the SIWAREX U has already made the requested data records available in the value output area. Depending on the cycle time of the programmable controller, it may require several CPU cycles before the requested data records are available.

If read-identifier and read-identifier acknowledgment are equal and the life bit has determined that the module is "alive," the requested actual data records are now available in the value output area.

When a command or a data transmission is executed before reading a data record and the data record to be read is changed by this, the read access may only be performed when the job bit and the job acknowledgment bit are equal (i.e., no write job is running).

Example:
The "Adjust" command affects data record DR61 (i.e., adjustment digits).

Writing data records

When other data records are to be written to the SIWAREX U in addition to the specified value, this can be implemented via the value input area (QW4).

The data to be written must be entered by the user program in the 2-byte value input area. Write identifier m (QB1) is used to specify which data record is to be written to the SIWAREX U.

The job acknowledgment bit (I1.7) in status must now be used to check whether the SIWAREX U has read the data record. Depending on the cycle time of the programmable controller, it may require several CPU cycles before the SIWAREX U has accepted the data record.

The job acknowledgment bit (I1.7) in status signals whether a job has been concluded. When a job has been concluded, status can be used to determine whether an error occurred while the data record was being transferred or a command was being triggered.

Data record description

For a detailed description of the data records, see section 9.

Job acknowledgment bit

The job bit is only required for writing data records. Proceed as follows:

- Scan the job acknowledgment bit in status (I1.7) until it is identical to the job bit (Q3.7) in job control.
- Place desired data record m in the output area of the S5, and invert the job bit in job control.
- Scan the job acknowledgment bit in status until it is identical to the job bit in job control.
- When the job bit and the job acknowledgment bit are equal, the job has been concluded.

  → When no further data records are to be written, the write identifier must be set to 0. See note below.
- Error scan: The status byte in the input area must be scanned.
- When a synchronous error has occurred, data record 76 (synchronous errors) can be requested for detailed information.

Note

To prevent undesired triggering of scales commands (e.g., during a restart of the CPU), we recommend setting the write identifier to 0 particularly after writing scales commands, if no further data records are to be written).

Special features

Write data records

A write request is only accepted by the SIWAREX U when the job bit differs from the job acknowledgment bit. When a job has been accepted, other jobs are not accepted until the SIWAREX U has made the two job bits equal again (i.e., the data transfer is concluded).

This mechanism prevents write-accesses from being performed continuously (i.e., cyclically). It is mandatory that the job bit be inverted when a data record is written again to the SIWAREX U.

Update data records

When data records are read from the SIWAREX U, these records are updated every 20 msec in accordance with the measuring cycle if the identifier remains the same. Up to release status 4: every 100 msec.

When different data records are requested (e.g., DR66 -> DR68 -> DR70 -> ...), the data records are read from the SIWAREX U as quickly as the processor load permits. This has the advantage of being able to read out the parameterization of the SIWAREX U very quickly.

The parameters themselves are only updated every 20 msec on the SIWAREX U. Up to release status 4: every 100 msec.

6.10 Sample Program

Description

Using a decentral link with PROFIBUS-DP, the SIWAREX U module can also be used with the SIMATIC S5. The connection is provided by the IM 308-C in the central controller of the SIMATIC S5 and an ET 200M distributed I/O device with the IM 153-1 or IM 153-2 interface module. The example here describes linking the SIWAREX U module to a user program.

DEMO

The sample program is included with the configuration package.

The table below shows the CPUs which can be used and the address areas which can be addressed by the FB10.

Table 6-8 Sample program DEMO

CPU Type	P Area	Q Area
CPU 941	PY128 to PY240	Not possible with FB 10
CPU 942	PY128 to PY240	Not possible with FB 10
CPU 943	PY128 to PY240	Not possible with FB 10
CPU 944	PY128 to PY240	Not possible with FB 10
CPU 945	PY128 to PY240	QB0 to QB240
CPU 922	PY128 to PY240	QB0 to QB240
CPU 928	PY128 to PY240	QB0 to QB240
CPU 946/947	PY128 to PY240	QB0 to QB240
CPU 948	PY128 to PY240	QB0 to QB240

The I/O area is always accessed by **byte**. See also parameter assignment of the ET 200.

Parameter assignment of the IM 308-C

The IM 308-C interface module is parameterized with the COM PROFIBUS software. With newer COM PROFIBUS versions, you should be able to find the SIWAREX U module within the ET 200M (IM 153-1 interface) under its order number 7MH4 601-1*A01.
If you are unable to find the SIWAREX U, copy the type or GSD files contained in the SIWAREX configuration package to the appropriate directory of COM PROFIBUS. Which files must be copied depends on the particular version of COM PROFIBUS which you are using.

- COM PROFIBUS (version ≤ 3.2): Copy the type files to the directory “TYPDAT5X”.
- COM PROFIBUS (version ≥ 3.3): Copy the GSD files to the directory “GSD”.

The following files are supplied for the sample program.

SIW115DP.ET2	→	S5-115U / CPU 943B / P area (2 SIWAREX U + 2 digital inputs)
SIW135P.ET2	→	S5-135U / CPU 928B / P area (2 SIWAREX U + 2 digital inputs)
SIW135Q.ET2	→	S5-135U / CPU 928B / Q area (2 SIWAREX U + 2 digital inputs)

The host parameters must be adjusted accordingly when other S5 CPUs are used.

A similar screen appears after COM PROFIBUS has been called, “File/Open/ SIW115DP.ET2” has been entered, and the text “Master 1” has been double-clicked.

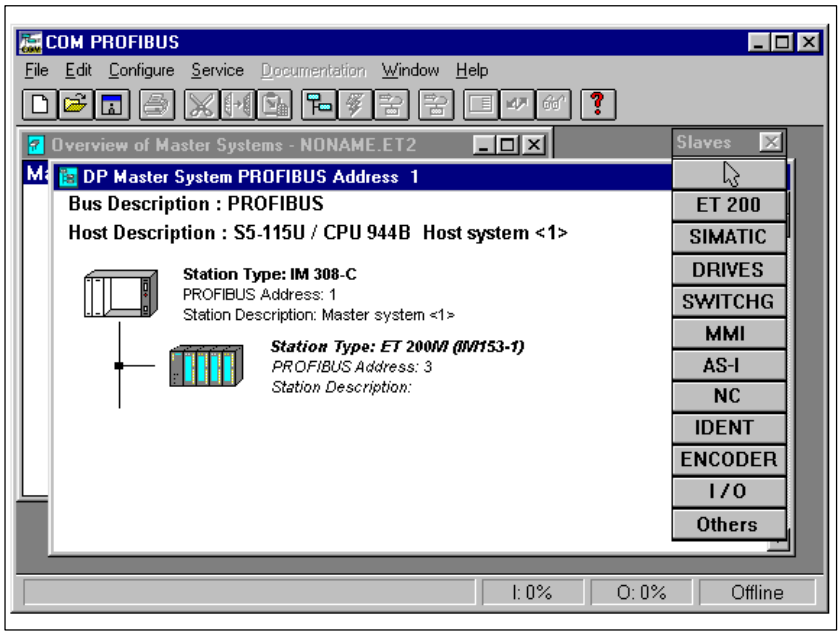


Figure 6-2 Parameter assignment with COM PROFIBUS

Parameter assignment of the IM 308-C

Using COM PROFIBUS, two SIWAREX U modules have been parameterized with start I/O addresses P128 and P144 for the inputs and outputs. This occupies the address area P128 to P159. The address area for inputs and outputs must be identical.

In addition, 2 digital input SM321 modules have been parameterized with start I/O addresses P000 and P002.

Using “File/Export/Memory Card,” the configuration is loaded to the flash EPROM module of the IM 308-C.

Note

When the S5-95U/DP is being used, the parameter assignment is loaded to the 32-Kbyte EEPROM memory module.

Parameter assignment of the SIWAREX U

The SIWAREX U must be connected as described in section 2. We recommend using SIWATOOL to perform commissioning (e.g., adjustment, parameterization, and so on). You can start linking the SIWAREX U as soon as the measured values are indicated correctly by SIWATOOL.

Installation

After an overall reset of the CPU (i.e., operating mode STOP), transfer the complete example to user memory. With the **power off**, install the flash EPROM which was loaded via COM PROFIBUS in the memory slot of the IM 308-C.

Turn on the power again, and turn the operating mode switch from STOP to RUN. The interfaces indicate the RUN state (i.e., permanent light). Shortly afterwards, the CPU also assumes RUN status.

Function of the sample program (FB10)

Using FB10, a single data record or all data records can be read or written. The data which were read are stored in a scales DB. The data which were written are fetched from there and written to the SIWAREX U.

Call interface

When called, FB10 must be supplied with the following parameters.

Table 6-9 Call interface

Parameter	Format	Meaning	Value Range
WADB	B	No. of the scales DB	Depends on CPU, permissible DB numbers
WADR	KY	Address area and base address of the scales	KY 0,128 to KY0,240; 0 = P area KY1,0 to KY1,240; 1 = Q area
NRCH	KF	Number of channels of the SIWAREX U	1 or 2
LIFE	KF	Counting value for LIFE monitoring	1 to 32767 CPU cycles

Short description of FB10

SEGMENT 2
In segment 2 the parameters WADR and NRCH are checked for compliance with permissible limits and, if errors are detected, an error identifier is entered in DW19 of the scales DB. When parameter errors occur, the FB is exited, and communication is not possible.

SEGMENT 3
The 16-byte I/O inputs are read and stored in the I/O area of the scales DB (i.e., DW0 to DW7).

SEGMENT 4
In segment 4 the life bit is processed for channel 1. If the SIWAREX U does not return the life bit correctly within the number of CPU cycles specified by the “LIFE” parameter, the error identifier KH1001 is entered in DW19 of the scales DB.

SEGMENT 5
Segment 5 handles the read data record jobs for channel 1. The user enters the DR no. to be read in DW44. If a communication error is queued, the read access is not performed and DW44 is cleared. Permissible DR numbers for read accesses: DR58 to DR78. When DR255 is specified as the identifier, all data records will be read.

If no communication errors are queued and the contents of DW44 have been set to 0, this ensures that the specified DR(s) has/have actually been read. A timeout is not required since this function has already been included in LIFE monitoring.

SEGMENT 6
Segment 6 handles the write jobs for channel 1. The user enters the DR no. to be written in DW46. If a communication error is queued, the write access is not executed and DW46 is cleared. Permissible DR numbers for write accesses: DR57 to DR72. If DR255 is specified as the identifier, all data records are written. When the identifier is “write all DR,” DR57 (scales commands) is not written since this DR must always be transferred as a single write job. This prevents a command from being mistakenly issued for this channel. If no communication errors are queued and the contents of DW46 have been set to 0, all DRs have arrived at the scales. Using DW49 of the scales DB, the user can check to determine whether certain DRs have been rejected with a synchronous error message. The structure of DW49 is shown below.

Table 6-10 Structure of DW49

DW49 Bit No.	Meaning for Value of 0	Meaning for Value of 1
0	No error detected in DR58.	Error detected in DR58.
1	No error detected in DR59.	Error detected in DR59.
2	No error detected in DR60.	Error detected in DR60.
3	No error detected in DR61.	Error detected in DR61.
4	No error detected in DR62.	Error detected in DR62.
5	No error detected in DR63.	Error detected in DR63.
6	No error detected in DR64.	Error detected in DR64.

Table 6-10 Structure of DW49

DW49 Bit No.	Meaning for Value of 0	Meaning for Value of 1
7	No error detected in DR65.	Error detected in DR65.
8	No error detected in DR66.	Error detected in DR66.
9	No error detected in DR67.	Error detected in DR67.
10	No error detected in DR68.	Error detected in DR68.
11	No error detected in DR69.	Error detected in DR69.
12	No error detected in DR70.	Error detected in DR70.
13	No error detected in DR71.	Error detected in DR71.
14	No error detected in DR72.	Error detected in DR72.
15	Not used	Not used

Remarks
DW49 is only updated when all DRs are transferred. During writing single DRs, the user can recognize any errors directly in the status byte.

A timeout is not necessary since this function is already included in LIFE monitoring.

SEGMENT 7 to 9
Same as segments 4 to 6, except applicable to channel 2 (see DB structure)

SEGMENT 10
The I/O output area in DB (DW10 to DW17) is written to the output address.

Structure of the scales DB

Table 6-11 Structure of the scales DB

DW No.	Meaning
0	Channel 1: IB0 image, IB1 image
1	Channel 1: IB2 image, IB3 image
2	Channel 1: IB4 image, IB5 image
3	Channel 1: IB6 image, IB7 image
4	Channel 2: IB0 image, IB1 image
5	Channel 2: IB2 image, IB3 image
6	Channel 2: IB4 image, IB5 image
7	Channel 2: IB6 image, IB7 image
8	Reserved
9	Reserved
10	Channel 1: QB0 image, QB1 image
11	Channel 1: QB2 image, QB3 image
12	Channel 1: QB4 image, QB5 image
13	Channel 1: QB6 image, QB7 image
14	Channel 2: QB0 image, QB1 image

Table 6-11 Structure of the scales DB

DW No.	Meaning
15	Channel 2: QB2 image, QB3 image
16	Channel 2: QB4 image, QB5 image
17	Channel 2: QB6 image, QB7 image
18	
19	Error indications for parameter assignment errors and communication malfunctions KH 0201: Error in WADR para. (area identifier not 0 or 1) KH 0301: Error in NRCH para. (number of channels not permitted) KH 1001: Comm. malfunction for chan. 1 (life counter has expired.) KH 2001: Comm. malfunction for chan. 2 (life counter has expired.) KH 3001: Communication malfunction channel 1+ 2 (life counter has expired.)
20	Reserved
21	Channel 1: DR57 = commands
22	Channel 1: DR58 = module number
23	Channel 1: DR59 = interface parameter
24	Channel 1: DR60 = adjustment digit 0
25	Channel 1: DR61 = adjustment digit 1
26	Channel 1: DR62 = adjustment weight
27	Channel 1: DR63 = LED allocation
28	Channel 1: DR64 = zero setting value
29	Channel 1: DR65 = LC char. values, filter, decimal point, setting data
30	Channel 1: DR66 = limit value 1 ON
31	Channel 1: DR67 = limit value 1 OFF
32	Channel 1: DR68 = limit value 2 ON
33	Channel 1: DR69 = limit value 2 OFF
34	Channel 1: DR70 = specified value 1, remote display
35	Channel 1: DR71 = specified value 2, remote display
36	Channel 1: DR72 = type of remote display
37	Channel 1: DR73 = current digit value
38	Channel 1: DR74 = gross weight
39	Channel 1: DR75 = asynchronous error word
40	Channel 1: DR76 = synchronous error word
41	Channel 1: DR77 = version
42	Channel 1: DR78 = checksum
43	Channel 1: DR79 = reserved
44	Channel 1: User entry, “DR to be read”
45	Channel 1: Auxiliary word for read DR
46	Channel 1: User entry, “DR to be written”
47	Channel 1: Auxiliary word for write DR
48	Channel 1: Counter for LIFE monitoring

Table 6-11 Structure of the scales DB

DW No.	Meaning
49	Channel 1: Status word for writing all DRs
50	Reserved
51	Channel 2: DR57 = commands
52	Channel 2: DR58 = scales number
53	Channel 2: DR59 = interface parameter
54	Channel 2: DR60 = adjustment digit 0
55	Channel 2: DR61 = adjustment digit 1
56	Channel 2: DR62 = adjustment weight
57	Channel 2: DR63 = LED allocation
58	Channel 2: DR64 = zero setting value
59	Channel 2: DR65 = LC char. values, filter, decimal point, setting data
60	Channel 2: DR66 = limit value 1 ON
61	Channel 2: DR67 = limit value 1 OFF
62	Channel 2: DR68 = limit value 2 ON
63	Channel 2: DR69 = limit value 2 OFF
64	Channel 2: DR70 = specified value 1, remote display
65	Channel 2: DR71 = specified value 2, remote display
66	Channel 2: DR72 = type of remote display
67	Channel 2: DR73 = current digit value
68	Channel 2: DR74 = gross weight
69	Channel 2: DR75 = asynchronous error word
70	Channel 2: DR76 = synchronous error word
71	Channel 2: DR77 = version
72	Channel 2: DR78 = checksum
73	Channel 2: DR79 = reserved
74	Channel 2: User entry, “DR to be read”
75	Channel 2: Auxiliary word for read DR
76	Channel 2: User entry, “DR to be written”
77	Channel 2: Auxiliary word for write DR
78	Channel 2: Counter for LIFE monitoring
79	Channel 2: Status word for writing all DRs
80	Not used

User DB interface

The following data words (DW) are available to the user for handling the communication functions.

Table 6-12 User DB interface

DW	Meaning
DR0	Status byte of channel 1
DR4	Status byte of channel 2
DW19	Error indications for WADR and NRCH parameters and indication of communication errors
DW44	Channel 1: Specification of the DR to be read (58 to 78, or 255 for all DRs)
DW46	Channel 1: Specification of the DR to be written (57 to 72, or 255 for all DRs)
DW49	Channel 1: Indication of write errors for DW46 = 255
DW74	Channel 2: Specification of the DR to be read (58 to 78, or 255 for all DRs)
DW76	Channel 2: Specification of the DR to be written (57 to 72, or 255 for all DRs)
DW79	Channel 2: Indication of write errors for DW76 = 255

Write access, channel 1

When no communication errors are queued (i.e., DW19 = 0), the user enters the number of the DR to be written in DW46. After x CPU cycles DW46 is set to 0 by FB10 and the write access is concluded. If no synchronous errors are indicated in DR0, the write access was performed correctly. If, however, a synchronous error is queued, the contents of the DR which was written must be checked for plausibility.

If all DRs are to be written, DW46 must be preset to 255. When FB10 has set DW46 to 0 again, a check can be performed in DW49 to determine whether one of the written DRs contained an error. DW49 = 0 indicates that no errors occurred and all DRs were transferred correctly to the scales.

Read access, channel 1

When no communication errors are queued (i.e., DW19 = 0), the user enters the number of the DR to be read in DW44. After x CPU cycles, DW44 is set to 0 by FB10. This concludes the read access. When a communication error occurs during the read access, the read access is canceled and DW44 is cleared. DW19 contains the error message KH 1001.

STEP 5 program

The sample program contains commentary and is self-explanatory.

The programming example is located under the sub-directory **DEMO** on the floppy disk 3/3.

6.11 Diagnostic Capabilities with Link to SIMATIC S5

Synchronous errors

The occurrence of a **synchronous error** is reported in the input area (bit 1 of the status byte). Data record 76 contains additional information on the error.

Asynchronous errors

The occurrence of an **asynchronous error** is reported in the input area (bit 0 of the status byte). Data record 75 contains additional information on the error.

6.11.1 Diagnostic Capabilities with the IM 308-C

The standard FB for the IM 308-C (FB192) must be linked to cyclic program processing so that a diagnostic alarm can be triggered on the SIMATIC S5. FB192 is included with COM PROFIBUS.

Note

If FB192 is not required for other modules on the ET 200M interface, we strongly recommend not using diagnostic alarms to perform error evaluation for the SIWAREX U. Since FB192 has to be linked to the cyclic program, this increases run time. The SIWAREX U reliably reports internal and external errors via the I/O area so that FB192 can be omitted.

Table 6-13 Call FB192

```
SPA     FB 192
NAME:   IM308C
DPAD:   KH F800                 ;IM 308-C address = F800h
IMST:   KY 0,3                  ;No. of the IM 308-C = 0, no. of the IM 153-1 = 3
FCT:    KC SD                   ;SD = Read slave diagnosis
GCGR:   KM 00000000 00000000    ;Irrelevant for slave diagnosis
TYP:    KY 0,10                 ;Data are located in DB10
STAD:   KF +0                   ;Data are located in DB starting at DW0
LENG:   KF 29                   ;Length of diagnostic data in bytes
ERR:    MW 20                   ;Error message

        A M21.7                 ;If group error set,
        JU = ERRO               ;then error evaluation
```

The slave diagnosis provides the user with up to 29 bytes of diagnostic information (i.e., bytes 0 to 28). A data block of 15 data words (i.e., 30 bytes) must be set up for the diagnostic data.

Since the SIWAREX U is a SIMATIC S7-300 module, the diagnostic information provided by the SIWAREX U is presented in accordance with SIMATIC S7 conventions.

For additional information, see the manuals of COM PROFIBUS and the modular ET 200M I/O device.

Table 6-14 Contents and layout of the diagnostic data

Byte	Explanation	
0	Station status 1	
1	Station status 2	
2	Station status 3	
3	Master station number	
4	Manufacturer's identifier (high byte)	
5	Manufacturer's identifier (low byte)	
6-8	Identifier-related diagnosis: The identifier-related diagnosis specifies which module in which slot is faulty.	
6	Bit 7-6=01 Bit 5-0=000011	Code for identifier-related diagnosis Length of the identifier-related diagnosis incl. byte 6 (=3)
7	Bit 7: Bit 6: Bit 5: Bit 4: Bit 3: Bit 2: Bit 1: Bit 0:	Module in slot 8 is faulty. Module in slot 7 is faulty. Module in slot 6 is faulty. Module in slot 5 is faulty. Module in slot 4 is faulty. Reserved Module in slot 2 is faulty (i.e., IM 153-1) Reserved
8	Bit 7-3: Bit 2: Bit 1: Bit 0:	Reserved Module in slot 11 is faulty. Module in slot 10 is faulty. Module in slot 9 is faulty.
9-28	Device-related diagnosis: The device-related diagnosis provides detailed information on the DP slave. Data record 1 (typical for SIMATIC S7) is stored in the device-related diagnosis. The data records and diagnostic data are described for the SIMATIC S7/M7 in the STEP 7 manual in the section on standard and system functions. The contents of the device-related diagnosis depend on which module of the ET 200 M has reported a diagnosis.	
9	Bit 7-6=00 Bit 5-0=??????	Code for device-related diagnosis Length of the device-related diagnosis incl. byte 9: • For diagnostic alarms: Max. of 20 bytes • For process interrupts: Max. of 8 bytes
10	01 hex: Code for S7 diagnosis 02 hex: Code for S7 process interrupt	

Table 6-14 Contents and layout of the diagnostic data

Byte	Explanation	
11	S7 diagnosis: Slot of the module with diagnosis (2, 4 to 11)	S7 process interrupt: Slot of the module with process interrupt (4 to 11)
12	Reserved	Reserved

Table 6-15 Contents and layout of the process interrupt data

Byte	Explanation	
13	Bit 7: Bit 6: Bit 5: Bit 4: Bit 3: Bit 2: Bit 1: Bit 0:	Limit value 2, departing, channel 2 Limit value 2, arriving, channel 2 Limit value 1, departing, channel 2 Limit value 1, arriving, channel 2 Limit value 2, departing, channel 1 Limit value 2, arriving, channel 1 Limit value 1, departing, channel 1 Limit value 1, arriving, channel 1
14-16	Not used currently for SIWAREX U	

Table 6-16 Contents and layout of the diagnostic alarm data (contents of data record DR1)

Byte	Bit	Meaning	Remarks
13	0	Module error	
	1	Internal error	
	2	External error	
	3	Channel error exists	
	4	External auxiliary voltage missing	
	5		Not used, always 0
	6	Parameterization missing	
	7	Wrong parameters on the module	(EEPROM error here)
14	0 to 3	Module class	0101 = Analog module 0000 = CPU 1000 = Function module = SIWAREX U 1100 = CP 1111 = Digital module
	4	Channel information exists	
	5	User information exists	
	6		Not used, always 0
	7		Not used, always 0
15	0		Not used, always 0
	1		Not used, always 0
	2		Not used, always 0
	3	Watchdog error	
	4		Not used, always 0
	5		Not used, always 0
	6		Not used, always 0
	7		Not used, always 0
16	0		Not used, always 0
	1		Not used, always 0
	2	EPROM error	
	3	RAM error	
	4	ADC error	(ADC error during read-access)
	5		Not used, always 0
	6	Process interrupt lost	
	7		Not used, always 0
17	0 to 6	Channel type	0x50
	7	(Additional channel type present)	-
18	0 to 7	Number of diagnostic bits per channel	All bits are used.

Table 6-16 Contents and layout of the diagnostic alarm data (contents of data record DR1)

Byte	Bit	Meaning	Remarks
19	0 to 7	Number of channels	(Here 1 or 2)
20	0	Channel error, channel 0 (SIWAREX U: Weighing channel 1)	Channel-related errors, see byte 9/10
	1	Channel error, channel 1 (SIWAREX U: Weighing channel 2)	
	2		
	3		
	4		
	5		
	6		
	7		
21/22	0	0	Byte 9 = channel 1 Byte 10 = channel 2
	1	0	
	2	0	
	3	0	
	4	Min. voltage underranged on sense lines	
	5	0	
	6	Number overflow for gross weight	
	7	Measuring area exceeded	
23-28		Not used (default 0)	

6.11.2 Diagnostic Capabilities with the S5-95U/DP Master

The standard FB (i.e., FB230) must be linked to cyclic program processing so that a diagnostic alarm can be triggered on the SIMATIC S5-95U/DP master.

Overview diagnostics

Each bit of diagnostic word IW56 is allocated to a DP slave. A “1” means that the DP slave has reported a diagnosis or that the DP slave cannot be addressed by the master.

Lowest station number: I56.0 = Station 0
Highest station number: I57.7 = Station 15

Evaluation of overview diagnostics

Scan IW56 in the STEP 5 user program, and call FB230. The bits in IW56 are reset when FB230 is called.

Table 6-17 Example

```
L       KM 00000000 00000000
L       IW56                    ;Load diagnostic word IW56
!=F                             ;No station with errors?
BEC

JC      FB 230                  ;If error, then request station diagnosis
NAME:   S_DIAG
S_NR:   KY 0,0                  ;Indirect parameter assignment, station number 0
DBNR:   KY 230,0                ;Diagnostic data are stored in DB230 starting with DW0
```

The slave diagnosis provides the user with up to 34 bytes of diagnostic information (i.e., bytes 0 to 33). A 17-data word data block (i.e., 34 bytes) must be set up for the diagnostic data.

Structure of the slave diagnosis

Since the SIWAREX U is a SIMATIC S7-300 module, the diagnostic information provided by the SIWAREX U are presented in accordance with the SIMATIC S7 convention.

For more information see the manuals of COM PROFIBUS and the modular ET 200M I/O device.

Table 6-18 Contents and structure of the diagnostic data

DW	Meaning of DL	Meaning of DR
0	Number of the slave station for which diagnostic data are available	Number of subsequent diagnostic bytes
1	Station status 1	Station status 2
2	Station status 3	Master station number
3	Manufacturer's identifier	
4 to 16	Additional slave-related diagnostic data (device-related, identifier-related or channel-related diagnostics) Cf. also diagnostic capabilities of the IM 308-C	

Standard DP Master

7

Connection to standard master

GSD files are required for connection of modular ET 200M I/O devices to standard DP masters of other manufacturers. GSD files are an easy and convenient way to parameterize the standard DP master with the configuration software.

Note

The latest GSD files can be downloaded from the Internet (SIMATIC customer support).

The disadvantage of using the GSD files included with the SIWAREX configuration package is that you will not have the latest GSD file and may not be able to find other new modules, for example.

Serial Coupling

8

Introduction

A link can be established to other host systems with the RS 232 serial interface. A SIWAREX driver is available for this purpose. By transferring or fetching (fetch telegrams) data records, the SIWAREX U can be adjusted, parameterized and controlled.

8.1 Transmission Protocol (SIWAREX Driver)

How it works

The SIWAREX U is always the slave when a host system link is established with the SIWAREX driver.

When the partner (i.e., master) wants to read a data record from the SIWAREX U, this must be requested beforehand with a fetch telegram (DR100). The SIWAREX U returns the requested data record in a response telegram. When the master transfers a data telegram (e.g., DR3), the SIWAREX U returns an acknowledgment telegram (DR101). The acknowledge telegram can contain positive and negative response messages.

The SIWAREX driver operates at the lowest level with a simple protocol with two end characters. The telegrams contain additional characters to improve transmission reliability and identification (i.e., BCC and length information). These must be evaluated at a higher level (e.g., with PC software).

A module number is stored in every telegram header for identification. Module numbers from 1 to 16 are permitted. When the module number does not correspond to the entry in DR5/DR58, the telegram received by the SIWAREX U is rejected. When the module number and the entry correspond, the sender address of the request telegram is entered as the receiver address in the response telegram. Every scale can not only be addressed by its individual module number but also with address 0. The host uses the default sender address 255.

Data records available

The data records which are available are listed in section 9.

Special features

When the character delay time is exceeded on the SIWAREX module, the interface is reset to its basic state. An error message is not generated. In addition, the block check character and the length information are verified on the SIWAREX module. Any errors are reported in the acknowledgment telegram with the identifier 60hex. This information is not checked when the length byte and the BCC byte in the telegram are zero.

Telegram layout

Table 8-1 Telegram layout

1st byte	Receiver address
2nd byte	Sender address
3rd byte	Data record number
4th byte	Length in n bytes (user data length + 7)
5th byte	User data DRx, first byte
. n-3rd byte	. User data DRx, last byte
n-2nd byte	BCC (EXOR)
n-1st byte	End identifier 1 (DLE) 0x10
nth byte	End identifier 2 (ETX) 0x3

When a byte with the code DLE (0x10) occurs within bytes 1 to n-2, this byte is doubled by the sender (to prevent a chance end identifier within the user data) but not counted for the length.

The receiver must cancel this doubled byte.

The BCC block check character is generated with bytes 1 up to and including n-3.

Technical data of the SIWAREX driver

Table 8-2 Interface data

baud rate	9600 bit/sec
Parity bit	• Even or odd • With or without parity bit
Number of data bits	8
Number of stop bits	1
Character frame	11 bits
Character delay time	220 msec
Mode	SIWAREX driver interpretation with 2 end identifiers
Signals	TxD, RxD

Table 8-3 RS 232 interface and SIWAREX driver

Function	Data Record, Channel 1 (Channel 2)					Format	Comments
	S5	S7					
	DR No.	DR No.	DR Byte	DR Bit	Length (Byte)		
Module number	58	5	0		6	BYTE	0 (*)
Interface parameter for RS 232C and TTY interface	59	5	1		6	BYTE	Bit 0 = 0: With parity (*) Bit 0 = 1: Without parity Bit 1 = 0: Even parity (*) Bit 1 = 1: Odd parity

(*) Factory setting

Data Record Description

9

9.1 Overview of Data Records

Overview of data records

The following table gives you an overview of data records which are provided by the SIWAREX U and are required for communication with a host system.

Table 9-1 Overview of the data records

	DR No.		Function	Channel[1)]	Length Bytes	Interfaces[2)]			
	Hex.	Dec.				SFC/DR	I/O	RS 232	EEPROM
S7 data records	0/1	0/1	Diagnostic data	-	4/16	O	-	-	No
	0/1	0/1	Basic parameters	-	4/16	I	I	-	No
	3	3	Adjustment data and scales parameters	1	10	I/O	-	I/O	Yes
	4	4	Adjustment data and scales parameters	2	10	I/O	-	I/O	Yes
	5	5	General parameters	-	6	I/O	-	I/O	Yes
	6	6	Specified value, remote display	-	4	I/O	-	I/O	No
	B	11	Commands	1	2	I	-	I	No
	C	12	Commands	2	2	I	-	I	No
	15	21	Limit values	1	8	I/O	-	I/O	3)
	16	22	Limit values	2	8	I/O	-	I/O	3)
	1F	31	Measured values/status/ error	1	10	O	-	I	No
	20	32	Measured values/status/ error	2	10	O	-	I	No
	28	40	Version/checksum	-	8	O	-	I	No

1) Explanation:
1: Only channel 1
2: Only channel 2
X: Both channels
-: Not dependent on channel

2) I: Input (from external source to SIWAREX U)
O: Output (from SIWAREX U to external source)

3) Dependent on parameterization bit

Table 9-1 Overview of the data records

	DR No.		Function	Channel[1]	Length Bytes	Interfaces[2]			
	Hex.	Dec.				SFC/DR	I/O	RS 232	EEPROM
S5/S7 data records (once per channel)	39	57	Commands	X	2	-	I	-	No
	3A	58	Module number	-	2	-	I/O	-	Yes
	3B	59	Interface parameters	-	2	-	I/O	-	Yes
	3C	60	Adjustment digit 0	X	2	-	I/O	-	Yes
	3D	61	Adjustment digit 1	X	2	-	I/O	-	Yes
	3E	62	Adjustment weight	X	2	-	I/O	-	Yes
	3F	63	LED allocation	-	2	-	I/O	-	Yes
	40	64	Zero setting value	X	2	-	I/O	-	Yes
	41	65	Char. value of LC/filter/ setting data	X	2	-	I/O	-	Yes
	42	66	Limit value 1 on	X	2	-	I/O	-	3)
	43	67	Limit value 1 off	X	2	-	I/O	-	3)
	44	68	Limit value 2 on	X	2	-	I/O	-	3)
	45	69	Limit value 2 off	X	2	-	I/O	-	3)
	46	70	Specification value 1 for TTY	-	2	-	I/O	-	No
	47	71	Specification value 2 for TTY	-	2	-	I/O	-	No
	48	72	Remote display type	-	2	-	I/O	-	Yes
	49	73	Current digit value	X	2	-	O	-	No
	4A	74	Gross	X	2	-	O	-	No
	4B	75	Asynchronous errors	X	2	-	O	-	No
	4C	76	Synchronous errors	X	2	-	O	-	No
	4D	77	Version	-	2	-	O	-	No
	4E	78	Checksum	-	2	-	O	-	No
	4F	79	Reserved	-	2	-	O	-	No
Communication telegrams	64	100	Fetch telegram	-	1	-	-	I	No
	65	101	Acknowledgment telegram	-	3	-	-	O	No

1) Explanation:
   1: Only channel 1
   2: Only channel 2
   X: Both channels
   -: Not dependent on channel
2) I: Input (from external source to SIWAREX U)
   O: Output (from SIWAREX U to external source)
3) Dependent on parameterization bit

Caution

With channel-independent data records, the data for the first or second channel can be transferred for a two-channel module. When different values are transferred simultaneously for both channels, the value for channel 2 overwrites the value for channel 1.

9.2 Data Formats

Data formats in S7

Table 9-2 Data record formats

DR byte n+3	DR byte n+2	DR byte n+1	DR byte n+0
Byte, char			
2^7 2^0			
Word			
High byte	Low byte		
2^{15}	2^7 2^0		
	dint	, time (msec)	
High word		Low word	
High byte	Low byte	High byte	Low byte
2^{31}	2^{23}	2^{15}	2^7 2^0

Comparison of S5/S7 formats

Since the data operands in the data blocks are addressed by byte with STEP 7 and by word with STEP 5, the addresses of the data operands must be recalculated accordingly.

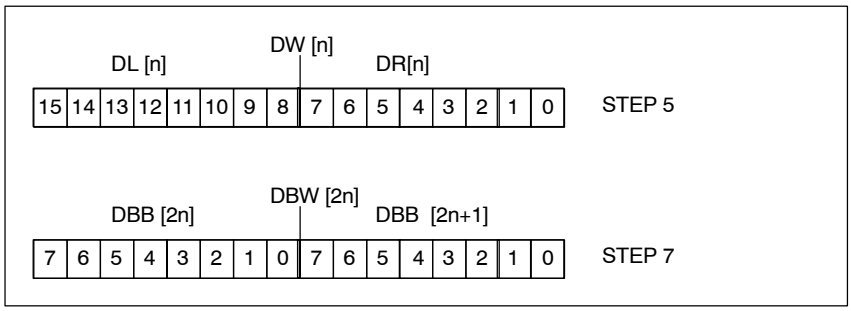


Figure 9-1 Comparison of data addressing with STEP 5 and STEP 7

In contrast to STEP 5, the address of a data word is doubled with STEP 7. A data byte can no longer be divided into a right and a left data byte. Bit numbering is always from 0 to 7.

Data formats for Intel/Motorola

Intel: Low byte: bits 0 to 7; high byte: bits 8 to 15

Motorola: Low byte: bits 8 to 15; high byte: bits 0 to 7

SIWAREX U uses the Intel format.
High and low bytes must be reversed when couplings to Motorola-based systems are used.

9.3 Description of the Data Records

Basic parameters DR0 and DR1

These basic parameters are transferred to the module by the applicable SIMATIC system during startup. They contain settings which determine the behavior of the module in the SIMATIC system. The basic parameters are stored in the SIWAREX U in a memory area which is not protected against power failure.

User-related parameters, starting with DR3

These parameters can be transferred via the SIMATIC or via the serial interface. The parameters are checked on the module for plausibility and, after a positive check, stored in a memory area which is **protected against power failure**. If a data record contains parameters which are not plausible, the entire data record is rejected (i.e., the data are not accepted by the SIWAREX U).

9.3.1 DR0: Basic Parameters (Write)

Table 9-3 DR0: Basic parameters (length: 4)

DR No.	P No.	Mode	Parameter (Menu String)	Data Format	Value Range (Visible)	Value Range (Coding)	Factory Setting	ADR Byte	ADR Bit
0	1	BPAR	Alarm generation	BYTE	{NO | YES}	{ 0|1 }	1	0	-
0	2	SPAR	Alarm selection	BYTE	{(none) | diagnosis | process | diagnosis+ process)}	{(0) | (1|2|3)}	1	1	-
0	3	Not used by SIWAREX U							-
0	4	0	Data interface	BYTE	{SFC| I/O}	{ 0 | 1 }	0	4	-

BPAR: Parameter is a basic parameter.

SPAR: Parameter is a sub parameter.

9.3.2 DR1 - Parameter (Write)

Table 9-4 DR1 - Parameter (length: 16)

DR No.	P No.	Mode	Parameter (Menu String)	Data Format	Value Range (Visible)	Value Range (Coding)	Factory Setting	ADR Byte	ADR Bit
1	5		In reserve				0		
1	6-16		In reserve				0		

9.3.3 DR0: Diagnosis, Part 1 (Read)

Table 9-5 Diagnostic data

Byte	Bit	Meaning	Remarks
0	0	Module error	
	1	Internal error	
	2	External error	
	3	Channel error exists	
	4	External auxiliary voltage missing	
	5		Not used, always 0
	6	Parameterization missing	
	7	Wrong parameters on the module	(EEPROM error here)
1	0 to 3	Module class	0101 = Analog module 0000 = CPU 1000 = Function module = SIWAREX U 1100 = CP 1111 = Digital module
	4	Channel information exists	
	5	User information exists	
	6		Not used, always 0
	7		Not used, always 0
2	0		Not used, always 0
	1		Not used, always 0
	2		Not used, always 0
	3	Watchdog error	
	4		Not used, always 0
	5		Not used, always 0
	6		Not used, always 0
	7		Not used, always 0
3	0		Not used, always 0
	1		Not used, always 0
	2	EPROM error	
	3	RAM error	
	4	ADC error	(ADC error during read-access)
	5		Not used, always 0
	6	Process interrupt lost	
	7		Not used, always 0

Note

The data of DR0 are also available in the local data of OB82.

9.3.4 DR1 - Diagnosis, Part 2 (Read)

Table 9-6 Diagnostic data

Byte	Bit	Meaning	Remarks
4	0 to 6	Channel type	
	7	(Other channel type present)	-
5	0 to 7	Number of diagnostic bits per channel	All bits are used
6	0 to 7	Number of channels	(Here 1 or 2)
7	0	Channel error, channel 0 (SIWAREX U: Weighing channel 1)	Channel-related error, 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	Min. voltage underranged on sense lines	
	5	0	
	6	Number overflow for gross weight	
	7	Measuring area exceeded	
10-15		Not used (factory setting 0)	

9.3.5 DR3: Adjustment Data, Channel 1

Table 9-7 DR3: Adjustment data, channel 1 (length: 10 bytes)

Meaning	Byte	Unit	Format	Factory Setting	Explanation
Zero setting value	0, 1	Digits	WORD	0	
Char. value, LC/filter setting/ setting data	2, 3	-	16 x BOOL	0000 0000 0100 0001	
Adjustment digit 0	4, 5	Digits	WORD	0	
Adjustment digit 1	6, 7	Digits	WORD	0	
Adjustment weight	8, 9	Weight	INT	10000	-32768 to +32767

Table 9-8 Char. value, LC/filter setting/setting data

Bit															Meaning
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1 0	
															Characteristic value of the load cell
														0 0	≤ 1 mV/V
														0 1	≤ 2 mV/V **(factory setting)**
														1 0	≤ 4 mV/V
														1 1	In reserve
															Decimal point for remote display
											0	0	0		Decimal point 0 **(factory setting)**
											0	0	1		Decimal point 1
											0	1	0		Decimal point 2
											0	1	1		Decimal point 3
											1	0	0		Decimal point 4
											1	0	1		Decimal point 5
															Filter setting
								0	0	0					Not filtering
								0	0	1					Limit frequency: 5 Hz
								0	1	0					Limit frequency: 2 Hz **(factory setting)**
								0	1	1					Limit frequency: 1 Hz
								1	0	0					Limit frequency: 0.5 Hz
								1	0	1					Limit frequency: 0.2 Hz
								1	1	0					Limit frequency: 0.1 Hz
								1	1	1					Limit frequency: 0.05 Hz
															Average value filter
							0								Average value filter disabled **(factory setting)**
							1								Average value filter enabled
															Data to EEPROM (Only applicable to limit values and zero setting value via command)
						0									Store in EEPROM **(factory setting)**
						1									Store only in RAM
															Channel in operation
					0										Channel enabled
					1										Channel disabled

9.3.6 DR4: Adjustment Data, Channel 2

Table 9-9 DR4: Adjustment data, channel 2 (for two-channel modules only) (length: 10 bytes)

Meaning	Unit	Format	Factory Setting	Explanation
- Allocation same as DR3 -				

9.3.7 DR5: General Parameters (Regardless of Channel)

Table 9-10 DR5: General parameters (length: 6 bytes)

Meaning	Byte	Unit	Format	Factory Setting	Explanation
Module number	0		BYTE	0	
Interface parameters	1		BYTE	0	
Type of remote display	2		BYTE	0	
Allocation, LED 1	3		BYTE	101	Limit 1, channel 1
Allocation, LED 2	4		BYTE	102	Limit 2, channel 1
In reserve	5		BYTE	0	

Table 9-11 TTY/RS 232C interface parameters
(fixed: 8 data bits, 1 stop bit, 9600 baud)

Bit No.	Reset	Set
0	With parity bit (default setting)	Without parity bit
1	Even parity (default setting)	Odd parity
2	In reserve	
3	In reserve	
4	In reserve	
5	In reserve	
6	In reserve	
7	In reserve	

Table 9-12 Type of remote display

Code (Dec.)	Meaning
0	No remote display
1	4-position remote display
2	5-position remote display
3	6-position remote display

Table 9-13 Allocation of LED 1 or LED 2

Code (Hex.)	Code (Dec.)	Status	Channel
64	100	Channel error	Channel 1
65	101	Limit value 1	Channel 1
66	102	Limit value 2	Channel 1
67	103	Scales adjusted	Channel 1
C8	200	Channel error	Channel 2
C9	201	Limit value 1	Channel 2
CA	202	Limit value 2	Channel 2
CB	203	Scales adjusted	Channel 2

9.3.8 DR6: Specified Values, Remote Display

Table 9-14 DR6: Specified values, remote display (length: 4 bytes)

Meaning	Byte	Unit	Format	Factory Setting	Explanation
Specified value 1	0, 1		INT	0	
Specified value 2	2, 3		INT	0	

9.3.9 DR11: Commands, Channel 1

Table 9-15 DR11: Commands, channel 1 (length: 2 bytes)

Meaning	Unit	Format	Factory Setting	Explanation
Command word	-	WORD	0	

Table 9-16 Possible entries, command word

Code (Dec.)	Meaning
0	No command (Synchronous errors are deleted)
1	Set as zero
2	Adjust
3	Move zero point (set to zero)
4	
5	Load factory setting (affects both channels of a two-channel SIWAREX U)
100	100 msec measuring cycle, sevice command, starting with release status 5 (affects both channels of a two-channel SIWAREX U)

9.3.10 DR12: Commands, Channel 2

Table 9-17 DR12: Commands, channel 2 (for two-channel modules only) (length: 2 bytes)

Meaning	Unit	Format	Factory Setting	Explanation
- Allocation same as DR11 -				

9.3.11 DR21: Limit Values, Channel 1

Table 9-18 DR21: Limit values, channel 1 (length: 8 bytes)

Meaning	Byte	Unit	Format	Factory Setting	Explanation
Limit value 1 ON	0, 1	Weight	INT	10000	
Limit value 1 OFF	2, 3	Weight	INT	9990	
Limit value 2 ON	4, 5	Weight	INT	1000	
Limit value 2 OFF	6, 7	Weight	INT	1010	

9.3.12 DR22: Limit Values, Channel 2

Table 9-19 DR22: Limit values, channel 2 (for two-channel modules only) (length: 8 bytes)

Meaning	Byte	Unit	Format	Factory Setting	Explanation
Limit value 1 ON	0, 1	Weight	INT	10000	
Limit value 1 OFF	2, 3	Weight	INT	9990	
Limit value 2 ON	4, 5	Weight	INT	1000	
Limit value 2 OFF	6, 7	Weight	INT	1010	

9.3.13 DR31: Measured Values/Status/Error, Channel 1

Table 9-20 DR31: Measured values/status/error, channel 1 (length: 10 bytes)

Meaning	Byte	Unit	Format	Factory Setting	Explanation
Gross	0, 1	Weight	INT	-	-32768 to +32767
Status	2		8 x BOOL	-	
Measured value update counter	3		BYTE	-	Starting with release status 5
Current digit value (filtered)	4, 5	Digits	WORD	-	0 to 65535
Asynchronous error	6, 7		16 x BOOL	-	
Synchronous error	8, 9		16 x BOOL	-	

9.3.14 DR32: Measured Values/Status/Error, Channel 2

Table 9-21 DR32: Measured values/status/error, channel 2 (length: 10 bytes)

Meaning	Byte	Unit	Format	Factory Setting	Explanation
Gross	0, 1	Weight	INT	-	-32768 to +32767
Status	2		8 x BOOL	-	
Measured value update counter	3		BYTE	-	Starting with release status 5
Current digit value (filtered)	4, 5	Digits	WORD	-	0 to 65535
Asynchronous error	6, 7		16 x BOOL	-	
Synchronous error	8, 9		16 x BOOL	-	

Status byte Contains current status information

Table 9-22 Status byte

Bit No.	Designation	Bit = 0	Bit = 1
0	Asynchronous error (group error)	No internal/external error	Internal/external error
1	Synchronous error	No error occurred during last write-access	An error occurred during last write-access
2	Limit value 1	Limit value 1 not active	Limit value 1 active
3	Limit value 2	Limit value 2 not active	Limit value 2 active
4	Scales adjusted	Scales not adjusted	Scales adjusted

Table 9-22 Status byte

Bit No.	Designation	Bit = 0	Bit = 1
5	Measured value update bit	Is inverted each time the SIWAREX U updates its measured value (starting with release status 5)	
6	Life bit	Only used for I/O communication	
7	Job acknowledgment bit	Only used for I/O communication	

Asynchronous errors

- Can happen any time
- Are automatically deleted when error disappears
- Several errors can be queued at the same time.

Table 9-23 Asynchronous errors

Bit No.	Designation	Bit = 0	Bit = 1
0	Control limit ADC[1)]	Not exceeded	Exceeded
1	Minimum voltage on sense line [1)]	Not underranged	Underranged
2	Watchdog	Has not been triggered	Has been triggered
3	Error in EPROM (program)	Does not exist	Exists
4	Error in EEPROM (data)	Does not exist	Exists
5	RAM error (read/write error)	Does not exist	Exists
6	ADC error during read-access	Does not exist	Exists
7	Number overflow for gross weight [1)]	Does not exist	Exists
8	Ext. supply voltage (24 V)	Is available	Is not available
9	In reserve		
10	In reserve		
11	In reserve		
12	In reserve		
13	In reserve		
14	In reserve		
15	In reserve		

1) These errors are only reported for the specific channel. The other errors are entered for both channels.

Synchronous errors

- Can occur after command input
- Are reported in DR31, 32 and 76 only on the interface which caused the synchronous error
- Are only output to the interface via which the applicable job arrived
- This DR is not updated again until a new command is issued or a reset occurs.

Table 9-24 Synchronous error

Bit No.	Bit = 0	Bit = 1
0	-	Adjustment command could not be executed since distance to adjustment points is too small.
1	-	Job could not be executed due to malfunction.
2	-	A non-existent or inactive channel was addressed.
3	-	Code not defined (e.g., limit frequency, digital filter and so on)
4	-	Data record/identifier unknown
5	-	Command not possible since scales not adjusted
6	-	Wait time of 5 sec not adhered to during adjustment commands
7	-	The adjustment weight is negative.
8	-	In reserve
9	-	In reserve
10	-	In reserve
11	-	In reserve
12	-	In reserve
13	-	In reserve
14	-	In reserve
15	-	In reserve

9.3.15 DR40: Version/Checksum/Switches

Table 9-25 DR40: Version/checksum/switches (length: 8 bytes)

Meaning	Byte	Unit	Format	Factory Setting	Explanation
Version	0, 1		WORD	-	FW version
Checksum	2, 3		WORD	-	0 to 65535
In reserve	4		8 x BOOL	-	
Module type	5		BYTE	1/2	Depends on number of channels
In reserve	6, 7		INT	-	

9.3.16 DR57 to 79: Data Records for I/O Area

Table 9-26 DR57 to 79: Data records for I/O area (S5 data records)

DR No.	Meaning	Unit	Format	Factory Setting	Explanation
57	Commands	Digit	WORD	0	
58	Module number	Digit	CHAR	0	
59	Interface parameters	Digit	BOOL	0	
60	Adjustment digits 0	Digit	WORD	0	
61	Adjustment digits 1	Digit	WORD	0	
62	Adjustment weight	Weight	INT	1000	
63	LED allocation	Code	2 x BYTE	101 102	
64	Zero setting value	Digit	WORD	0	
65	Characteristic value, LC/filter setting/ setting data		16 x BOOL	0000 0000 0100 0001	
66	Limit value 1 ON	Weight	INT	10000	
67	Limit value 1 OFF	Weight	INT	9990	
68	Limit value 2 ON	Weight	INT	1000	
69	Limit value 2 OFF	Weight	INT	1010	
70	Specified value 1 for remote display	-	INT	0	
71	Specified value 2 for remote display	-	INT	0	
72	Type of remote display	-	WORD	0	Only low byte used
73	Current digit value	Digit	WORD	-	0 to 65535
74	Gross	Weight	INT	-	-32768 to +32767
75	Asynchronous errors	-	16 x BOOL	-	
76	Synchronous errors	-	16 x BOOL	-	
77	Version	-	WORD	-	
78	Checksum	-	WORD	-	
79	Reserved	-	BOOL	-	

Setup of data records DR57 to 78

The setup of data records DR57 to DR78 is similar to the setup of data records DR3 to DR40.

Example:
For DR65, see setup of byte 2–3 of DR3.

9.3.17 DR100: Fetch Telegram

Table 9-27 DR100: Fetch telegram (length: 1 byte)

Meaning	Format	Factory Setting
Number of request data record	BYTE	0

9.3.18 DR101: Acknowledgment Telegram

Table 9-28 DR101: Acknowledgment telegram (length: 3 bytes)

Meaning	Format	Factory Setting
No. for acknowledged data record (0 for error type 60hex)	BYTE	0
Type of error	BYTE	0
Error number (See also section 12)	BYTE	0

Table 9-29 Error types in the acknowledgment telegram

Code	Meaning
00 hex	No error
40 hex	Synchronous errors (handling or data errors)
60 hex	Transmission error

Error number

The error number is only valid for the “synchronous error” type of error and corresponds to the less significant byte of the synchronous error word.

Optional Components

10

Optional components are external devices such as remote displays and so on. The figure below shows how external devices can be connected.

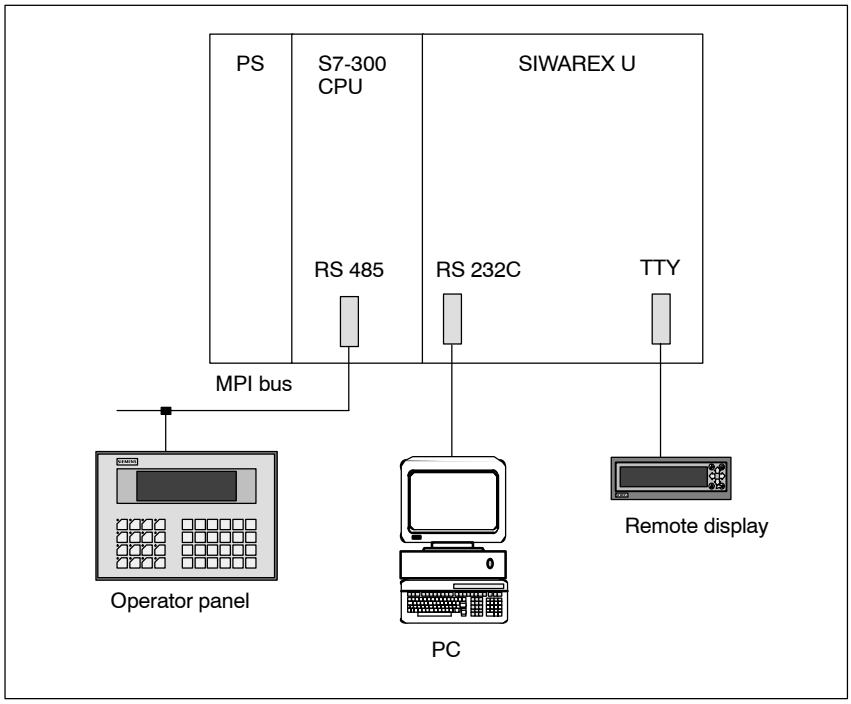


Figure 10-1 Connection of optional components

A remote display can be connected to the TTY interface. A PC can be connected to the RS 232 interface for commissioning purposes, or a host can be connected.

10.1 Connection of Digital Remote Displays

Introduction

Digital remote displays can be connected to the TTY interface of the SIWAREX U. The SIWAREX U contains an appropriate protocol for connection of digital remote displays. All digital remote displays which support this protocol and are equipped with a TTY interface can be connected to the SIWAREX U. 4-digit, 5-digit and 6-digit remote displays are supported.

Note

It is the user's responsibility to determine whether the digital remote display chosen actually supports this protocol. Siemens AG accepts no liability for damage caused by connection of remote displays.

The documentation of the remote display manufacturer must be adhered to.

Description

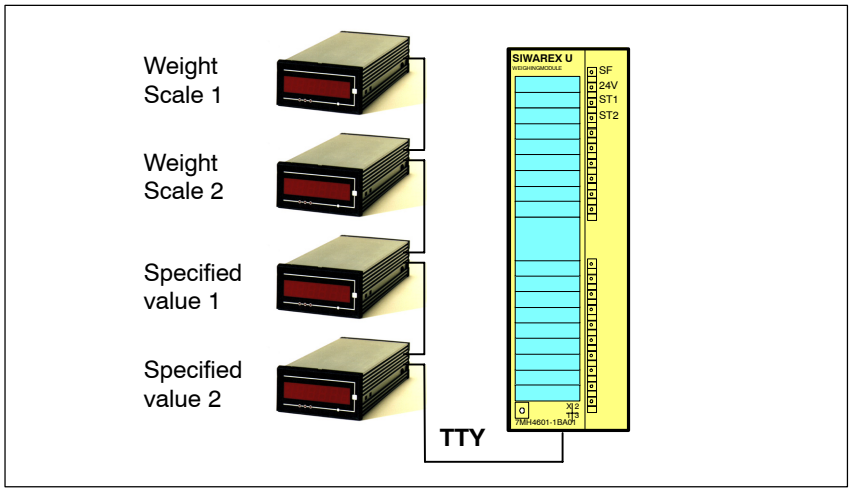


Figure 10-2 Example: Connection of 4 digital remote displays to the SIWAREX U

Value output

The following values can be indicated on a digital remote display:

- Gross weight value, weighing channel 1
- Gross weight value, weighing channel 2 (for two-channel SIWAREX U only)
- Specified value 1 (can be assigned as desired via SIMATIC)
- Specified value 2 (can be assigned as desired via SIMATIC)

The value to be indicated is set on the remote display.

Note

Since the specified values are stored in the RAM of the SIWAREX U, the specified values must be supplied again by the SIMATIC CPU after a power OFF/ON.

Special operating states

When special operating states occur (e.g., the indication range of the remote display is exceeded), the SIWAREX U sends appropriate ASCII characters via the protocol. If the remote display can indicate these ASCII characters, the special operating state is indicated on the remote display. See also character set used for display data, table 5-8.

Table 10-1 Special operating states

Indication	Description
“ – – – – – ”	The indication range of the remote display has been exceeded (e.g., 11.456 kg cannot be shown on a 4-digit display).
“E r r”	The SIWAREX U reports a system error SF (e.g., EEPROM error).
“ – – – – – ” or “≡ ≡ ≡ ≡ ≡”	Timeout function for monitoring the serial connection for wire break. This function must be included in the remote display. The function is indicated differently depending on the type of display.

Connection of the remote displays

The connection to the remote display is made with the free-floating TTY interface of the SIWAREX U (via 20-way multipoint connection strip). The interface is unidirectional (i.e., the weight values are transferred cyclically to the remote display(s)).

Several digital remote displays can be connected to the SIWAREX U.

Example: Connection of two remote displays, remote display 2 active.

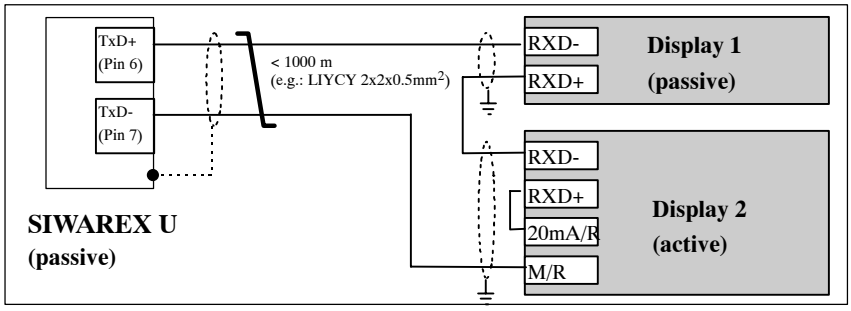


Figure 10-3 Connection of remote displays

Assignment

Table 10-2 Pin assignment of the TTY interface

Connection		Assignment of the TTY Interface
Pin	**Signal Name**	
6	TxD2+	Sending data + of SIWAREX U
7	TxD2-	Sending data - of SIWAREX U

For pin assignment of the remote display, see the documentation of your remote display.

Note

Pin assignment of the remote displays may differ depending on the manufacturer. For example, S+/S- is used for sender power, and TX+/TX-/RX+/RX- is used for sender or receiver lines. Some remote displays use the 24 V connection instead of 20 mA/R and GND instead of M/R since these types of remote displays are equipped with constant current control which limits the current on the TTY interface. For details, see the documentation of your remote display.
When several remote displays are to be connected to the TTY interface of the SIWAREX U, we recommend asking the manufacturer of the remote displays whether the power capacity of the active remote display is sufficient.

Settings on the SIWAREX U

4-digit, 5-digit and 6-digit displays can be connected to the SIWAREX U. Selection of the display to be connected is made in the appropriate data record via the SIMATIC or via SIWATOOL.

The number of positions set applies to all remote displays connected to the TTY interface.

In addition, the specified values can be specified via the SIMATIC.

Table 10-3 Remote display

Function	Data Record, Channel 1 (Channel 2)					Format	Comments
	S5	S7					
	DR No.	DR No.	DR Byte	DR Bit	Length (Byte)		
Number of positions of the remote display	72	5	2		6	BYTE	Selection code (dec.) No indication = 0 (*) 4-position indication = 1 5-position indication = 2 6-position indication = 3
Specified value 1 for remote display	70 QB 6, 7	6	0		6	INT	0 (*)

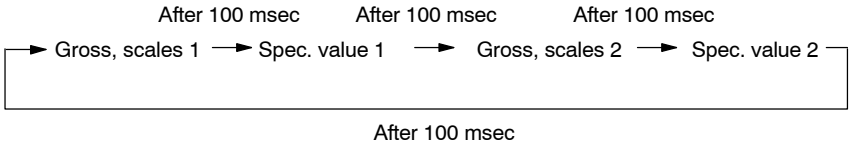
Table 10-3 Remote display

Function	Data Record, Channel 1 (Channel 2)					Format	Comments
	S5	S7					
	DR No.	DR No.	DR Byte	DR Bit	Length (Byte)		
Specified value 2 for remote display	71 QB 14, 15	6	2		6	INT	0 (*)
Interface parameters for RS 232C and TTY interface	59	5	1		6	BYTE	Bit0=0: With parity (*) Bit0=1: Without parity Bit1=0: Even parity (*) Bit1=1: Odd parity

(*) Factory setting

Output of the indication data

When the type of indication is set via data record 5 or 72 (parameters not dependent on the channel), the indication data are output on the TTY interface every 100 msec.



Settings on the remote display

When a digital remote display is connected to the SIWAREX U, settings must be made on the remote display. The number of settings depends on the remote display used.

For detailed information on the parameterization of remote displays, see the documentation of the manufacturer of your remote display.

Table 10-4 Settings of the remote display

Meaning	Setting
Interface	TTY
Data format	8 bit
Parity	Even/odd/without
Baud rate	9600 Baud
Protocol	STX/ETX
Protocol response	None
Ignore characters (See protocol layout)	Ignore one character
Address length	2 positions

Table 10-4 Settings of the remote display

Meaning	Setting
Address	Gross value, channel 1 = 01 Specified value 1 = 05 Gross value, channel 2 = 21 Specified value 2 = 06
Timeout	Example: timeout after 2 sec
Decimal point	No decimal point
Leading zeros	Leading zeros are indicated.
Segment test	If present on the remote display, segment test should be enabled.

Number range which can be represented

Depending on the remote display selected, the weight value can be indicated with 4, 5 or 6 digits. When negative values are involved, the minus sign takes up one of the positions.

Example of a 5-digit display with 2 positions after the decimal point: Display range -99.99 to 999.99.

When the number range which can be represented is exceeded, this is shown by "- - - -".

The following configurations should be avoided when representing output values since negative values cannot be represented otherwise.

Table 10-5 Number range which can be indicated on the remote display

Remote Display Type	Number of Positions Configured after the Decimal Point	Example
4-digit remote display	3 positions after the decimal point	0.123 -0.123 cannot be represented since 5 positions required.
5-digit remote display	4 positions after the decimal point	0.1234 -0.1234 cannot be represented since 6 positions required.
6-digit remote display	5 positions after the decimal point	0.12345 -0.12345 cannot be represented since 7 positions required.

Position of the decimal point

Weight values

The position of the decimal point can be specified via SIWATOOL or via the SIMATIC separately for weight channel 1 and weight channel 2.
The decimal point position is kept static. After a decimal point position has been parameterized, it is transferred with the protocol. When several remote displays are used, the decimal point position can be set individually on some remote displays by not specifying a decimal point position for the SIWAREX U. The desired decimal point position must then be set directly on the remote display.

Specified value

The SIWAREX U always transfers the specified values to the remote display(s) without a decimal point. If you want to have a decimal point indicated, this must be set on the remote display.

Addressing

An address must be set on each display (e.g., by using the appropriate parameterization menu of the display). The address determines the value to be indicated.

The following settings are possible

Table 10-6 Assignment of the addresses on the remote display

Address ASCII coded [1])	Remote Display Data
01	Gross value, channel 1
05	Specified value 1
06	Specified value 2
21	Gross value, channel 2

1) Since the address is represented as ASCII characters in the remote display protocol, address “01” corresponds to the ASCII characters 30h and 31h.

Protocol layout

The layout of the protocol will now be described. All digital remote displays which can be connected electrically to the SIWAREX U and which can be operated with the described protocol can be used with the SIWAREX U.

Description of the protocol

Data format:	8 bits, 1 stop bit
Baud rate:	9600 Baud
Protocol:	STX/ETX without protocol response
Addressing:	2 bytes for addressing the displays

Table 10-7 Description of the string layout

Byte No.			Contents		Commentary/Example
4-Digit Display	5-Digit Display	6-Digit Display		HEX (Ex.)	
1	1	1	STX	02	02h
2	2	2	Address	30	2 digits, ASCII-coded
3	3	3	Address	31	(can be parameterized on display)
4	4	4	Reserved	20	Blank
5	5	5	1st digit	35	Weight value channel 1, 2 Specified value 1, 2
6	6	6	2nd digit	34	
7	7	7	Decimal point	2C	(*)
8	8	8	3rd digit	33	
9	9	9	4th digit	32	
Blank	10	10	5th digit	31	
Blank	Blank	11	6th digit	30	
12	12	12	Reserved	20	Blank
13	13	13	Reserved	20	Blank
14	14	14	Reserved	20	Blank
15	15	15	ETX	03	

(*) Position depends on the decimal point position parameterized for SIWAREX U.
If no decimal point is parameterized, the data string has one byte less.

Table 10-8 Character set used for display data

Character	Hexadecimal Code	Commentary
Digits 0 to 9	30 to 39	Representation of the digits
Minus sign “-”	2D	Sign for negative values
Underline “_”	5F	For “range exceeded” - indicated in all character positions
Decimal point	2C	Decimal point representation
Blank	20	For blanking out characters
Letter E Letter r	45 72	For error display: “Error”
STX	02	Protocol control character for start of data string
ETX	03	Protocol control character for end of data string

Siebert remote displays

Digital remote displays from the company Siebert Industrieelektronik GmbH can be directly connected to the SIWAREX U via the TTY interface.

Remote displays which can be used:
-S10/SX10
-S30
-S70 (with option 97/16)
-S300

Siebert Industrieelektronik GmbH
Postfach 1180
D-66565 Eppelborn
Tel: +49 (0) 6806/980-0
Fax: +49 (0) 6806/980-111
Internet: http://www.siebert.de

Contact the manufacturer for detailed information.

10.2 Ex-i Interface for SIWAREX U

Description

An Ex-i interface must be switched between the SIWAREX U and the force and pressure sensors when these sensors are located in potentially explosive areas. The Ex-i interface SIWAREX Pi or SIWAREX IS is used for this purpose. This interface can be used for the SIWAREX U, P, M.

When the two-channel model of the SIWAREX U is used, each measuring channel requires an Ex-i interface.

The Ex-i interface makes the 6 lines for connection of a load cell (i.e., supply, sense and measuring lines) intrinsically safe in accordance with ignition protection type [EEx ib] IIC. ATEX approval certifies that pertinent standards and regulations have been complied with.

Danger

The safety of the potentially explosive area is dependent on this device. Only qualified personnel may perform the required connection and installation work.

In case of non-adherence:

D A N G E R O F E X P L O S I O N !

10.2.1 Layout

The Ex-i interface provides 6 safety barriers.

Two voltage limiters and 2 active current limiters are provided for each of the two supply lines.

Two voltage limiters and 2 passive current limiters are provided for each of the measured value lines and sense lines.

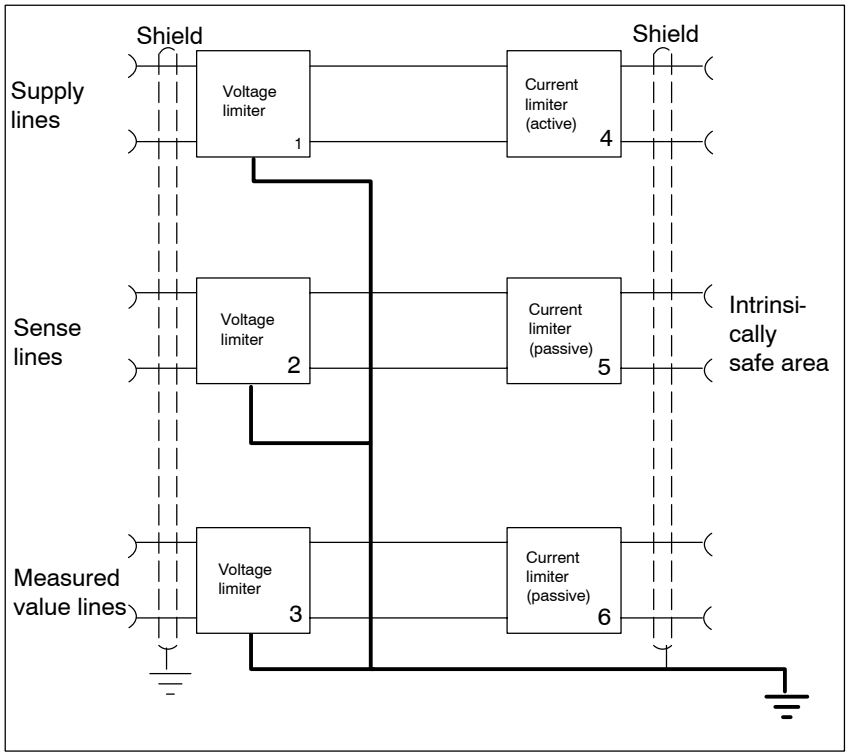


Figure 10-4 Diagram of the Ex-i interface

SIWATOOL - Description and Use

11

Purpose

SIWATOOL is used for error diagnostics and to parameterize and commission the SIWAREX U. SIWATOOL can be started with Windows and STEP 7.

SIWATOOL permits several SIWAREX U modules to be processed at the same time.

However, only **one** SIWAREX U module can be parameterized online at the same time.

When several scales are parameterized, the individual parameterization windows of several offline modules and one online module can be indicated simultaneously on the monitor screen.

This makes it easy to adjust parameters of different modules to each other, or compare them.

Use

SIWATOOL runs under WINDOWS. It uses the typical WINDOWS environment and structure.

WINDOWS users will have no trouble using SIWATOOL. Its well-organized pull-down menus make it almost self-explanatory. On-line aids provide support when commissioning the scales.

The status of the scales can be used as a diagnostic tool or for error diagnostics.

11.1 Installing SIWATOOL on PC/PG

Requirements

The following requirements apply to the installation and use of SIWATOOL.

- PC (processor 80486 or later)
- Working storage (min. of 4 Mbytes)
- Windows 95/98/NT/ME/2000
- Hard disk (10 Mbytes free memory space)
- Free serial interface (COM n)

Installation

Proceed as follows to install SIWATOOL:

1. Place the installation CD (SIWAREX U configuration package) in the drive.
2. Call the installation program via the Windows Explorer.
   – SETUP.EXE is located in the “SIWATOOL” directory
3. Specify the installation directory and a program group.
4. Setup is now performed automatically.

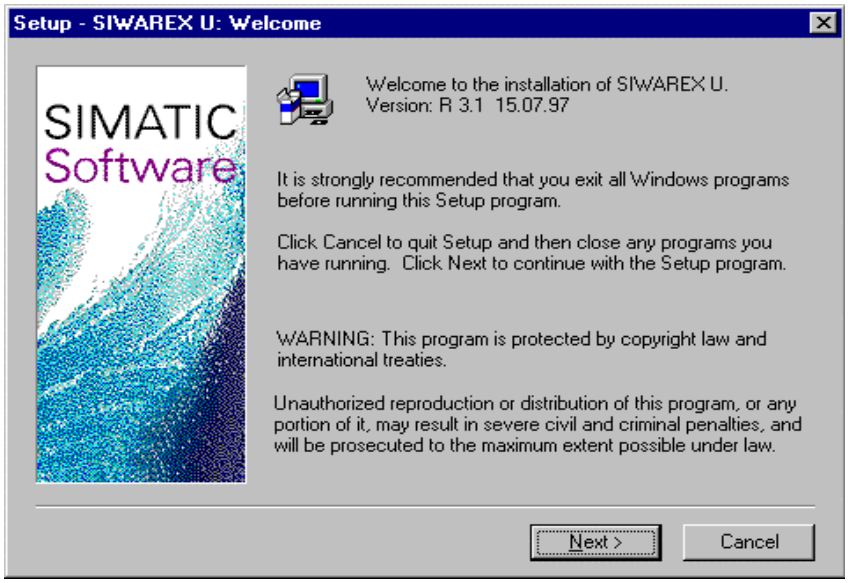


Figure 11-1 S7 setup

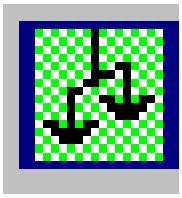
11.2 Commissioning SIWAREX U with SIWATOOL

If your SIWAREX U is to be commissioned online, the SIWAREX U must be connected to the PC or PG (i.e., programmer) with a suitable, serial interface cable (order no. 7MH4 607-8CA).

Start SIWATOOL

Call SIWATOOL:

- Double click the program icon



- Or double click SIWATOOL.EXE in Explorer

Set up new scales

After the interface has been selected, a new set of scales can be set up via the menu command “File > New”. The scales names and units of weights must be set. The numbers 0 to 15 may be used as module numbers.

Note

Every SIWAREX U can be addressed with module number “0” regardless of which module number is assigned to it.

If, for example, the module number “4” was assigned to a SIWAREX U, this SIWAREX U can be addressed under module number “0” and “4”.

On delivery, the module number for the SIWAREX U has been set to “0” at the factory. This means that the module number must always be specified as “0” during initial commissioning. The module number can then be changed later in the menu.

Select interface

After SIWATOOL has been started, the serial interface used on the PC/PG (e.g., COM1) must be set via the menu command “Option > Select Interface”.

Set interface

After the new set of scales has been set up, the message “No communication” appears in the status bar. To establish communication, the serial RS 232 interface must now be set via the menu command “Option > Select Parity”.

Factory setting of SIWAREX U: Even parity

Activate communication

The menu command “Module > Connect” causes the PC to establish communication with the SIWAREX U. The message “offline” disappears, and a measured value is indicated.

If the SIWAREX U has not been adjusted yet, the measured value is still “frozen” (i.e., it does not change when the scales are loaded).

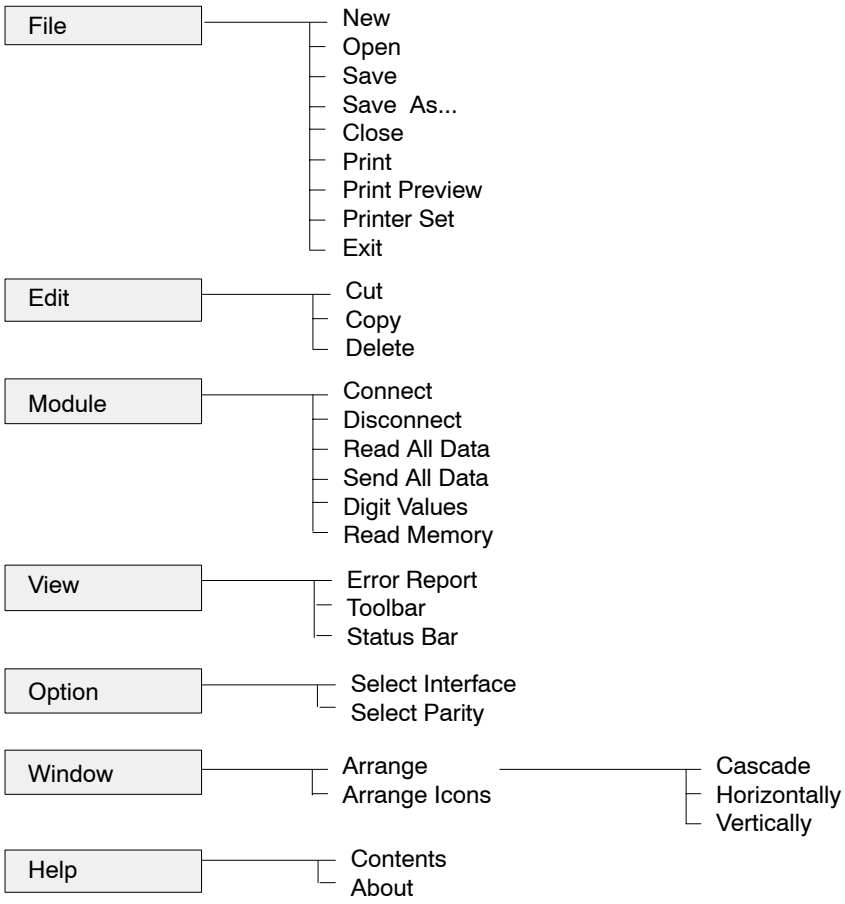
Note

Even if the parity of the RS 232 interface has been set incorrectly, SIWATOOL determines the correct interface setting automatically. If communication cannot be established after 20 seconds, check the following.

- The wiring
- The COM setting (COM1, COM2 ...)
- The module number

11.3 SIWATOOL Menu Tree

After a new set of scales has been set up, the main menu bar is displayed. The main menu bar contains the following submenus.



11.4 Adjustment of the Scales

Before adjusting the scales, you should always know the number of positions after the decimal point since it determines the available resolution (see also section 11.5).

Use the  button to access the “Adjustment Data” dialog.

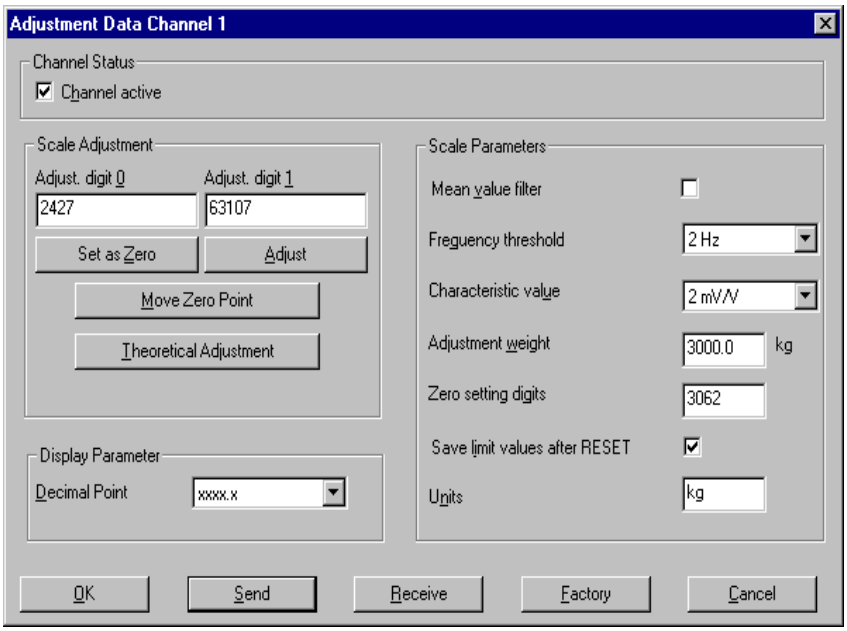


Figure 11-2 Dialog on scales adjustment

New adjustment

When a new adjustment is to be performed, the factory settings should always be loaded first (“Factory” button).

The number of positions after the decimal point should then be specified since the format of all other entries are based on this factor.

As the next step, enter the adjustment weight. These values are transferred to the SIWAREX U by activating the Send button.

Note

Decimal points are indicated as “.” in SIWATOOL.

Adjust with test weight

Adjustment with a test weight is described in detail in section 3.3.

Proceed as follows with SIWATOOL.

- Enter characteristic value, decimal point and adjustment weight and then press the “Send” button.
- Empty the scales, and activate the “Set as Zero” button.
- Load the scales with the test weight, and activate the “Adjust” button.

The adjustment digits “0” and “1” are not indicated by SIWATOOL until the scales are in adjusted status (i.e., both the zero point and the adjustment weight have been declared valid).

Theoretical adjustment

Theoretical adjustment is also described in section 3.3.

Other settings

After the scales have been adjusted, you can then enter the remaining settings (e.g., filter and so on).

SEND

Clicking the “Send” button sends the settings entered with SIWATOOL to the SIWAREX U.

RECEIVE

In reverse, the parameters set in SIWAREX U can be sent to SIWATOOL by clicking the “Receive” button.

11.5 Important Notes on Settings in SIWATOOL

Decimal point

The decimal point only applies to the remote displays. The weighing values are represented as fixed point numbers without decimal point on the S7 bus and the serial interfaces.

Example:

If the decimal point **XX.XXX** is set via SIWATOOL, a weighing value is indicated by SIWATOOL as 4,123 kg for example, and as the fixed point number 4123 by the SIMATIC.

(The weight values are shown on a remote display as they are shown in SIWATOOL.)

The setting of the number of positions after the decimal point determines the resolution available.

Table 11-1 Example

Adjustment Weight	Measuring Range	Digit Increment	Resolution in g	Resolution of Measuring Range
100 kg	0 to 200 kg	1	1000 g	200 parts
100.00 kg	0 to 200.00 kg	1	10 g	20,000 parts

Changing the decimal point later may mean that you will also have to make changes on the SIMATIC side.

Special case, DR5

- Module number
- Interface parameters
- Indication type
- Allocation of the LEDs

are parameterized in different SIWATOOL screens but are all stored in data record DR5 of the SIWAREX U.

Remember that these 4 settings can only be read and written together.

Example:

When the indication type is written to the SIWAREX U, the module number, interface parameters and LED allocation are also written to the SIWAREX U.

11.6 Weighing Status

The status window can be used to view the weighing status of the SIWAREX U.

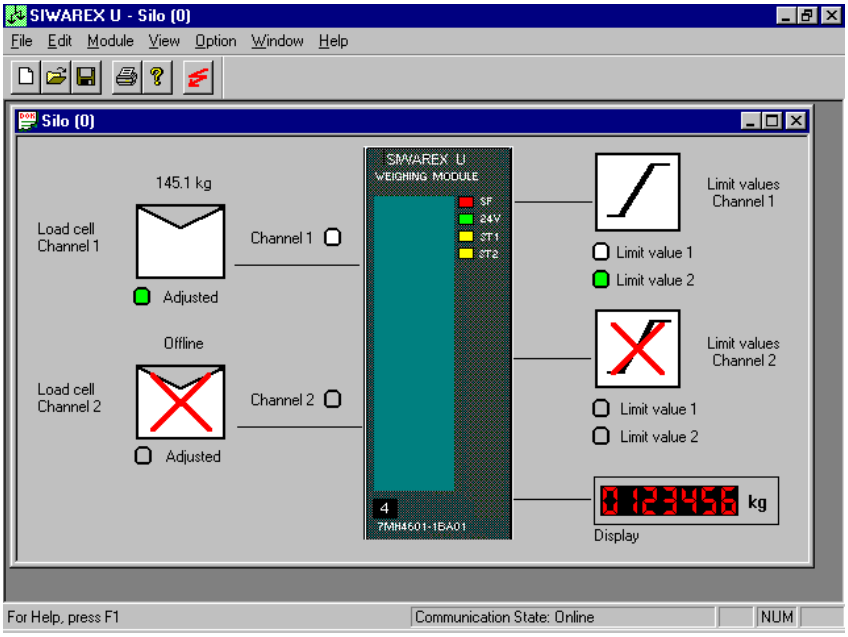


Figure 11-3 Status window of the set scales

Functions of the function keys (from left to right)

1st function key:	Set new weighing parameters
2nd function key:	Load weighing parameters
3rd function key:	Store weighing parameters
4th function key:	Print
5th function key:	Indicate program information
6th function key:	Error report

The weighing status and the weighing value are displayed on the monitor screen.

11.7 Diagnostic Capabilities with SIWATOOL

Error handling

When an online connection exists, the synchronous errors triggered by SIWATOOL actions are indicated in an online error report. “Cut” or “Delete” can be used to delete the synchronous errors from the error report. Currently queued asynchronous errors are also indicated in the online error report. The error status of the SIWAREX U (i.e., group errors) is also indicated in the main window.

Online error report

During online operation, SIWATOOL acquires and logs the errors of the scales.

The online error report is indicated by clicking on  .

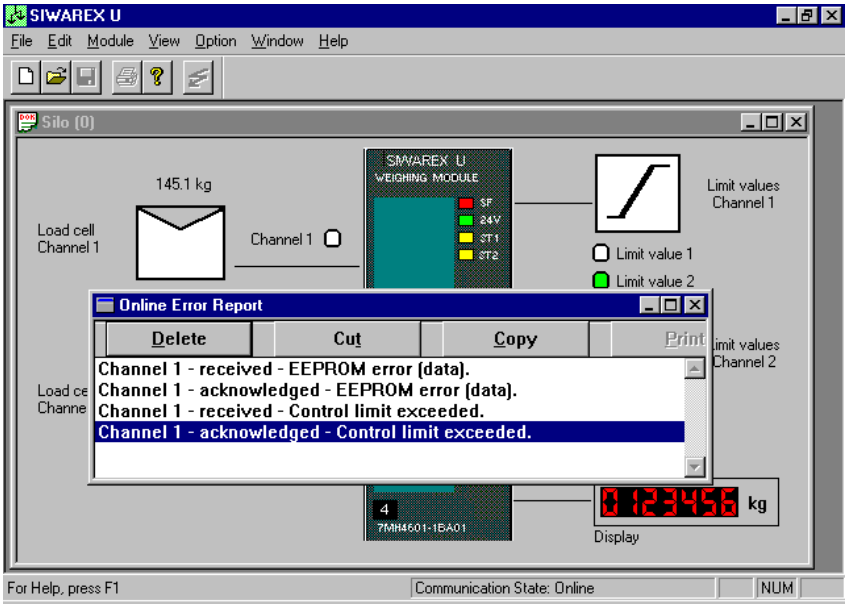


Figure 11-4 Online error report

Version information

The menu command “Help > About” can be used to read the firmware version of the SIWAREX U. In addition, the software status of SIWATOOL is indicated. Before contacting our hotline for technical problems, please read:

1. The firmware version of SIWAREX U
2. The software status of SIWATOOL

Read memory

This function is only used by the Siemens hotline for service purposes.

Error Diagnostics and Treatment 12

General faults

The SIWAREX U supports the user during commissioning and trouble-shooting with a structured diagnostic concept. The malfunction and error messages are divided into various classes of errors.

When an error causes the SIWAREX U to switch to FAULT operating mode, no weighing commands are possible. This operating mode is retained until the fault has been corrected. An error acknowledgment is not required.

In this state, a command is rejected with an error message. Reading and writing of data records is still possible if the type of error permits.

Internal errors and **external errors** cause the group error status (→ SF LED goes on). The module switches to FAULT operating mode.

FAULT operating mode is exited automatically after the fault has been corrected (e.g., A/D converter, control level limit exceeded).

Error classification

The following table provides an overview of the various types of fault and error messages and their differences.

Table 12-1 Types of errors

Type of Error	Description
Data errors (synchronous error) (*)	Plausibility errors which occur when parameters and pre-specified values are transferred
Handling errors (synchronous error) (*)	Errors which occur while a command is being executed. The command is then not executed.
Internal errors (asynchronous error)	Hardware errors which can be detected by the module and which are reported
External errors (asynchronous error)	Errors of the connected periphery (hardware errors)
Other errors (section 12.2)	Errors which do not fit into one of the above mentioned classes

(*) Synchronous errors are only reported back to the interface which caused the error.

Synchronous errors

Synchronous errors are only output on the interface which caused the error.

Evaluation via data record DR31, 32 or 76.

Table 12-2 Synchronous errors

Bit No.	Bit = 1	Corrective Measures
0	Adjustment command could not be executed since the distance to the adjustment point is too short.	Use heavier adjustment weight (at least 5% of the set measuring range).
1	Job could not be executed due to malfunction.	Correct module malfunction first.
2	A non-existent or inactive channel was addressed.	Use another channel or enable the channel.
3	Code not defined (e.g., limit frequency, digital filter and so on)	Use correct code.
4	Data record identifier unknown	Check data record identifier.
5	Command not possible since scales not adjusted	Adjust scales first.
6	Wait time of 5 sec not adhered to during adjustment command	Adhere to the 5-sec wait time between two adjustment commands.
7	The adjustment weight is negative.	Adhere to the permissible number range.
7-15	Reserved	

When the SIWAREX U is coupled to a host system with the RS 232C interface, a synchronous error in the acknowledgment telegram (DR101) may be reported to the host. The error number is only valid for synchronous errors and corresponds to the less significant byte of the synchronous error word.

Warning

In the event of an error, take appropriate measures by evaluating the error.

Asynchronous errors

Asynchronous errors cause the group error state. The SF LED goes on, and the module assumes malfunction status. This malfunction state is automatically exited as soon as the error is corrected. When a channel-related error occurs on a two-channel module, the channel which is not malfunctioning remains fully functional although the malfunction state is assumed.

Asynchronous errors are available on all interfaces.

Evaluation via data records DR31, 32 or 75

Table 12-3 Asynchronous errors

Bit No.	Bit = 1	Corrective Measures
0	Control limit, ADC (*)	Is SIWAREX U characteristic value range set incorrectly, or are the scales overloaded?
1	Minimum voltage on sense line ($U_{sense\pm}$ < 5V) (*)	• Check lines for wire breaks • Load cells with 4-conductor technology: Were wire jumpers forgotten? • Max. cable length exceeded • Short circuit in the power lines? If so, both channels are affected.
2	Watchdog	Reset module via power OFF/ON. If the error continues to occur, execute the load factory settings command. If the error is still reported, contact the hotline.
3	Error in EPROM (program)	
4	Error in EEPROM (data)	
5	RAM error (read/write error)	
6	ADC error during read-access	
7	Number overflow for gross weight (*)	Is SIWAREX U characteristic value range set incorrectly, or are the scales overloaded?
8	Ext. supply voltage (24 V)	Check 24 V supply.
9-15	Reserved	

(*) These errors are only reported for specific channels. The other errors are entered for both channels.

12.1 Error Treatment

Data errors

Data errors are plausibility errors which occur during the transmission of parameters and prespecified values.

These error messages are reported in the acknowledgment telegram and in data record DR31/32 on the serial RS 232C interface.

When a data error occurs, none of the data of this data record are accepted and processing continues with the old data.

Handling errors

Handling errors are errors which usually occur while a command is being executed. When a handling error occurs, the desired command is not executed.

These error messages are reported in the acknowledgment telegram and in data record DR31/32 on the serial interface.

Internal errors

Internal errors are hardware errors which have been detected by the module and which can be reported.

These errors are reported on the S7 interface with a diagnosis alarm.
The current error states can be fetched with a fetch telegram on the serial interfaces.

External errors

External errors are hardware errors of the connected periphery.

These errors are reported on the S7 interface with a diagnosis alarm.
The current error states can be fetched with a fetch telegram on the serial interfaces.

12.2 General Behavior During Malfunctions

Behavior during malfunctions

When one channel of the module is malfunctioning due to an internal or external hardware error, commands cannot be issued to this channel. This does not affect reading and writing data, or commands for other channels.

Channel-related asynchronous errors (minimum voltage underranged on sense lines or measuring range exceeded, and so on) are only reported by individual channel when the channel is enabled or is present. This makes it possible to use only one channel of a two-channel module without wire breaks being reported for the unused channel.

Other errors

Other errors are errors which do not fit the error classes previously mentioned. Examples include errors which can be deduced from the front LEDs or errors which cause unusual behavior.

Various status and error message lamps are located on the right side of the housing (see view of the front). These LEDs indicate various operating states.

Table 12-4 Diverse errors

Behavior	Possible Cause	Corrective Measures
24 V present (24 V LED on), but no other function	Soldered in fuse on the power supply PCB is defective, or other hardware defect	Send in module for repairs
24 V present (24 V LED on), but no other function	SIWAREX U is not being supplied with 5 V by the S7 bus	Check bus plug connector. Is S7 CPU or IM 153-1 turned on?
24 V LED off	24 V supply voltage is not present	Turn on supply voltage
SF-LED on	Internal or external error	Cf. description of internal and external errors

Failure of the 24 V supply voltage triggers a diagnostic alarm on the SIMATIC S7.

13 Technical Specifications

13.1 Interfaces

Voltage supply, 24 V DC

A function low voltage with safe isolation (in accordance with EN 60 204-1, section 6.4, PELV) must be provided by the system voltage supply.

Nominal voltage	24 V DC (Protection Against Pole Reversal)
Lower/upper limits, static	20.4 V/28.8 V DC (in acc. with DIN 19 240)
Lower/upper limits, dynamic	18.5 V/30.2 V DC (in acc. with DIN 19 240)
Noncyclic overvoltages	35 V DC for 500 msec at a recovery time of 50 sec
Maximum current consumption	220 mA
Power loss of the module (typical)	4.8 W
Switchon current surge at 25° C (typical)	2.5 A

Voltage supply from the SIMATIC S7-300 backplane bus

Current consumption from S7-300 backplane bus	100 mA (typical)

Load cell interface

Class accuracy at 20° C ± 10 K	0.05 % (0.05% with Ex-i interface)
Minimum measuring signal Δu_{Min} per d	1.5 µV
Update rate	20 msec 100 msec (up to release status 4)
Internal resolution	16 bits (65,535 parts)
Representation range of the weight values	-32,768 to 32,767
3 measuring ranges	0 to 1 mV/V 0 to 2 mV/V 0 to 4 mV/V
Permissible range of the measuring signal (largest characteristic value set)	–1.5 to 42.5 mV
Max. distance of the load cell	1000 m (*)
Max. distance of the load cell to the Ex-i interface in Ex area	Gas group II B: 1000 m (*) Gas group II C: 300 m (*)
Load cell supply • Voltage • Current per channel	• Short circuit and overload-proof • 6-conductor technology • Wire break monitoring Typical DC 10.3 V (**) ≤ 240 mA (one-channel SIWAREX U) ≤ 120 mA (two-channel SIWAREX U per channel)
Permissible load cell resistance without Ex-i interface	> 41 Ω (one-channel SIWAREX U) > 82 Ω (two-channel SIWAREX U) < 4010 Ω
Permissible load cell resistance with Ex-i interface	> 87 Ω < 4010 Ω
Monitoring of the sense inputs	± 2.5 V Hysteresis, 300 mV
Max. permissible input voltage on the signal and sense inputs	15 V
Triggering time of the sense line monitor	1 sec
Noise (band width of 10 Hz)	150 nV, typical
Common mode suppression, CMRR @ 50 Hz	200 dB, typical
Measured value filter - Digital filter, 4th order, critical attenuation - Switchable, average value filter	 0.5 to 5 Hz Average value over 32 measured values

(*) The minimum voltage must be maintained on the sense lines.
(**) Measured values apply to the output of the module.

RS 232 interface

Baud rate	9600 baud
Max. distance	15 m
Signal level	In acc. with EIA-RS 232C

TTY interface

Max. loop current for external supply (Must be provided by the user)	25 mA
Operating mode	One-direction (i.e., only sending (TxD))
Typ. loop current	20 mA
Potential isolation (external supply)	500 V
Baud rate	9600 baud
Max. distance (external supply)	1000 m
Max. external voltage, sender	Max. of 28.8 V
Voltage drop, sender (typ.)	0.5 V

Data buffering

Basic data (i.e., parameterization data and adjustment data) are backed up on EEPROM memory safe from loss due to a power failure.

Since it is not equipped with a battery, the module is completely maintenance free.

Buffering time of the data in the EEPROM	100 years
Permissible number of write accesses for EEPROM	100,000

Reliability

MTBF in acc. with SN 29500	40 years

13.2 Physical Requirements and Data

Dimensions

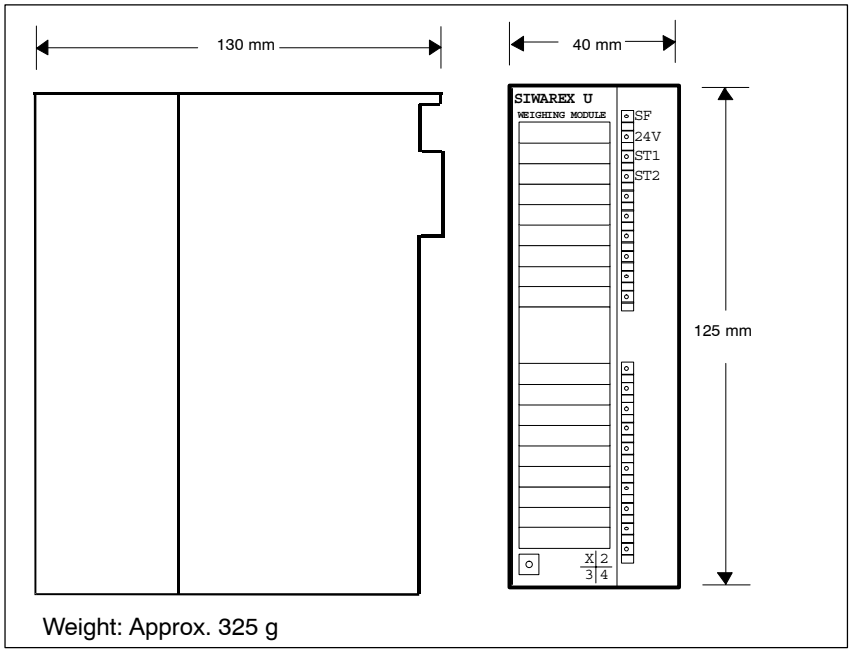


Figure 13-1 Dimensions

Tests

Test	Standards	Test Values
Vibration stress during operation	DIN IEC 68-2-6 DIN IEC 721, part 3-3 IEC 1131-2	Class 3M3 Test Fc 10 to 58 Hz: 0.075 mm displacement 58 to 150 Hz: 9.8 m/sec^2 10 cycles per axis 1 octave/min.
Shock stress during operation	DIN IEC 68-2-27 DIN IEC 721, part 3-3 IEC 1131-2	Class 3M3 Test Ea 150 m/sec^2, semi-sinus Duration: 11 msec Number: 3 per axis In neg. and pos. direction

13.3 Electrical, EMC and Climatic Requirements

Electrical Protection and Safety Requirements		
Requirement Met	**Standards**	**Remarks**
Safety regulations	EN 60 204, DIN VDE 0113 IEC 1131, UL 508 CSA C22.2, no. 142 FM class I, div. 2 UL/CSA	The electrical protection and safety requirements stated in UL, CSA and FM are met. UL, CSA, and FM certification has been granted.
Protection class	VDE 0106, part 1 IEC 536	Protection class I, with protective conductor
IP protection class	DIN 60 529 (x.xx) IEC 529	In S7 rack: IP20 SIWAREX U alone: IP10
Air and creep paths	IEC 1131 UL 508 CSA C22.2, no. 142	Overvoltage category II Degree of soiling: 2 PCB material IIIa Printed circuit interval: 0.5 mm
Isolation test	IEC 1131-2: 1992 CSA C22.2, no. 142	Nominal voltage: 24 V Test voltage: 500 V DC
Fire resistance	For open type controller: IEC 1131-2: 1992, UL 508	
Manufacturing materials	SN 36350 (3.93)	

Electromagnetic Compatibility		
Remarks	**Standards**	**Accuracy**
Burst pulses on current supply lines:	DIN EN 61 000-4-4 (DIN VDE 0843 T4)	2 kV (in acc. with 90/384/EWG 1 kV)
Burst pulses on data and signal lines:	DIN EN 61 000-4-4 (DIN VDE 0843 T4)	2 kV (in acc. with 90/384/EWG 0,5 kV)
Electrostatic contact discharge (ESD)	DIN EN 61 000-4-4 (DIN VDE 0843 T2)	6 kV
Electrostatic air discharge (ESD)	DIN EN 61 000-4-4 (DIN VDE 0843 T4)	8 kV
Impulse voltage/surge on current supply lines	DIN EN 61 000-4-5 (DIN VDE 0843 T10)	± 2 kV non-symmetric(*) ± 1 kV symmetric
Impulse voltage/surge on data and signal lines:	DIN EN 61 000-4-5 (DIN VDE 0839 T10)	± 1 kV non-symmetric(*)
RF emission (electromagnetic fields), 10 kHz to 80 MHz	DIN EN 61 000-4-3 (DIN VDE 0843 T3)	Up to 3 V/m
RF emission (electromagnetic fields), 80 MHz to 1000 MHz	DIN EN 61 000-4-3 (DIN VDE 0843 T3)	Up to 10 V/m (in acc. with 90/384/EWG 3 V/m)
RF electrification 10 kHz to 80 MHz	IEC 801-6	10 V (mod: 80% AM with 1 kHz)

Remarks	Standards	Accuracy
Interference suppression (**)	EN 55 011, VDE 0875, part 11	Class A

(*) Must be ensured via external protective components
(**) Additional measures are required (e.g., installation in 8MC cabinets) when used in residential areas.

EMC

The guidelines contained in part 1 of NAMUR NE21, and 89/336/EWG covering emission and resistance to electromagnetic interferences have been complied with for electromagnetic compatibility.

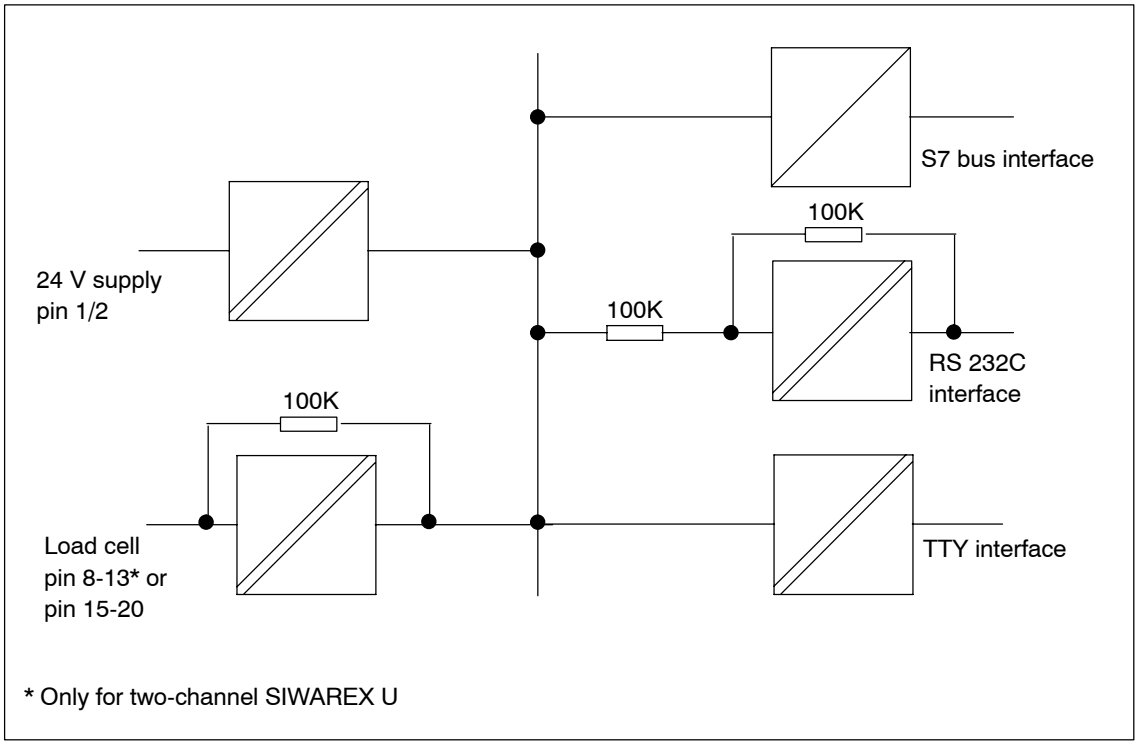
Environmental requirements

The SIWAREX U is designed for permanent use in SIMATIC S7-300 systems, protected from the weather. IEC 1131-2 describes the conditions of use.

When used under particularly rugged operating conditions (e.g., high degree of dust, presence of caustic fumes or gases, etc.), additional protection must be provided (e.g., encapsulation).

Climatic Requirements		
Remarks	**Environmental Requirements**	**Application Areas**
Operating temperature: Vertical installation in S7-300 Horizontal installation in S7-300	 0° to +60° C 0° to +40° C	The standard S7-300 modules may not be operated at temperatures of under 0° C.
Storage and transportation temperature	-40° to +70° C	
Relative humidity	5 to 95%	Without condensation. Corresponds to relative humidity degree 2 in acc. with DIN IEC 1131-2.
Air pressure during operation	795 to 1080 hPa	Corresponds to a height of (-1000 to 1500 m above sea level)
Air pressure during storage	660 to 1080 hPa	Corresponds to a height of (-1000 to 3500 m above sea level)
Pollution concentration	SO_2: < 0.5 ppm H_2S: < 0.1 ppm	Rel. hum. < 60%, no condensation

13.4 Potential Isolation



* Only for two-channel SIWAREX U

Hotline/Repairs/Replacement Parts/Internet

14

Hotline

Siemens AG
A&D PI 14
Tel: +49 (0)721 595 2811
Fax: +49 (0)721 595 2901

Repairs/ replacement parts

Contact your Siemens representative at your local or national branch.

Internet

Information available under Internet address
http://www.siwarex.de/

- Product information
- Training courses
- Information on current software states
- Downloads

Index

G

H

I

J

L

M

N

O

P

R

S

T

W